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TAMIL NADU ARCHIVES

OVERNMENT OF TAMIL NADU

P.W.D. DEPARTMENT

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GOVERNMENT OF MADRAS.

PUBLIC WORKS DEPARTMENT.

Buildings and Roads.
Civil Works.

Read—the following papers :—

From R. B. BUCKLEY, Esq., Officiating Under Secretary to the Government of India, Public Works Department (Civil Works—Miscellaneous), to the Secretary to the Government of Madras, Public Works Department, dated Simla, 17th May 1884, No. 198 M.

In continuation of previous correspondence on the subject, I am directed to forward, for the information of His Excellency the Governor, the accompanying copy of a despatch* and enclosures from Her Majesty's Secretary of State for India regarding the proposed scheme for the restoration of the Madras Harbour, and to request that the Government of India may be favored with an expression of the views of the Madras Government in the matter.

* No. 23, Public Works Department, dated 24th April 1884.

2. Copies of notes on the subject by the Consulting Engineer to the Government of India for State Railways, and the Secretary in this department, are also forwarded for information.

Despatch from the Right Honorable the Secretary of State for India, to His Excellency the Most Honorable the Governor-General of India in Council, dated India Office, London, 24th April 1884, No. 23, Public Works.

On receipt of your Excellency's Public Works letter, No. 59, of 13th November 1883, which forwarded a correspondence with the Madras Government relative to the engineering merits of the scheme proposed for the restoration of the Madras Harbour, I caused the subject to be again referred to the Select Committee who had been originally appointed to consider the subject, and requested that I might be furnished with their views on the modifications of the plan recommended in their report of 23rd January 1883, which had been suggested by the Committee appointed by the Government of Madras.

2. Sir John Hawkshaw has, in the accompanying report, furnished me with an expression of the joint opinion of himself and his colleagues on the recommendations of that Committee, and after giving my careful consideration to the same in Council, I have come to the conclusion that the opinion now expressed must be accepted as the final decision on the questions raised.

3. The entrance to the harbour will accordingly be retained in its original position, and may be narrowed as recommended.

4. The side piers must be raised to the height of 12 feet above high-water level, as originally recommended, and if loading places are provided, in the manner suggested, inside the harbour and near the piers, the necessity for raising them still higher will have to be considered.

5. With regard to the method of reinstating the work, your Excellency will perceive that the Committee have not pronounced definitely in favor of any one of the three systems mentioned in their original report.

6. In accordance with the recommendation of the Committee, I have caused a reference to be made to Mr. Parkes on the subject. I forward, herewith, copy of a letter which I have accordingly caused to be addressed to him. After very carefully considering whether, in consequence of the partial failure of the works, it was expedient to remove Mr. Parkes from the position of advising engineer, I have come to the conclusion that his removal would not be justifiable, and I consider that it will be desirable for him to proceed to Madras, and there personally arrange the measures which it will be necessary to take for carrying out in the most efficient and economical manner the works now to be undertaken. I shall be glad to receive your Excellency's views upon this point after you have communicated with the Government of Madras.

Joint Report of Sir JOHN HAWKSHAW, Sir JOHN COODE and Professor STOKES, to the Under Secretary of State for India, India Office, London, S. W., dated London, 12th March 1884.

MADRAS HARBOUR.

In obedience to instructions contained in a communication from the India Office, dated 6th of February last, copy of which is annexed, we have read and considered the papers forwarded to us, and have now the honor to report our opinions on the modifications suggested by the Madras Committee of the plan we last year recommended.

2. The change suggested by the Madras Committee requiring the gravest consideration is their proposal to make a new entrance to the harbour at its north-eastern elbow and to stop up the existing entrance. Their object in making this proposal is to secure stiller water inside the harbour, a thing desirable in itself if attainable with due regard to other considerations, and they state that the work remodelled in this and in other respects as they recommend will cost much the same as the works advised by us in our report of the 23rd January 1883.

3. The Madras Committee arrive at this conclusion of equality of cost by leaving out from their project the wave-breaker on the south side and the concrete cap on both sides of the harbour, and appear to have assumed, though we are at a loss to know why, that we did not attach any very indispensably constructive value to this portion of our recommendation. They seem to have looked at our proposal to raise the piers by a concrete capping mainly as a question of waves spilling over them into the harbour, though the observation in our report was that raising the piers to the height we advised would add to the security of vessels within the harbour in rough weather, and would greatly strengthen the work.

4. We cannot approve of further expensive works, the money for which is chiefly to be found by reducing the strength and efficiency of those recommended in our report of January 1883, which we now see no reason to abate.

5. It follows, therefore, in our opinion, that the proposal to form a new entrance and to stop up the old one must be treated as an additional expenditure to that previously contemplated by us.

6. We have consequently estimated the cost of making the new entrance and of stopping up the old one; and taking the overlapping arm, as the Madras Committee show it, to be 600 feet long, which, in our opinion, would be the minimum length required, we make this additional cost to amount to £127,000. In considering the propriety of incurring such further expenditure, the following observations should be borne in mind.

7. The danger to vessels within the harbour in a cyclone would arise from the winds as well as from the waves, probably more from the former than the latter, and we think that prudent commanders, on those occasions, would prefer getting out to sea to remaining inside the harbour.

8. If the piers at the sides of the harbour were left as low as is contemplated by the Madras Committee, they would in cyclones be nearly, and might be altogether, submerged, and vessels lying in the harbour would be floating in a receptacle brimful, or nearly so, of water, and exposed on the north and south to the full force of the cyclone. In such case, with submerged piers, vessels breaking from their moorings would in all probability be lost.

9. Though the piers raised to the height we have recommended, while strengthening the work, would afford some additional protection from the wind, we do not assume that even then it would be safe to remain in harbour during a cyclone. Mr. Dalrymple, late Master Attendant, Madras, who has had lengthened experience of that coast, and who favored us with his views on the occasion of our former inquiry, was of opinion that nothing short of 18 feet above high water would be high enough for the piers, and we consider the height of 12 feet, which we have recommended, to be quite low enough. Hereafter, in special cases, should vessels be required to lie at loading places inside the harbour and near the piers, screens or walls, say 6 feet high, increasing the total height above high water to 18 feet, could be erected, and might prove necessary to give further protection from wind.

10. In large harbours it may almost be taken as an axiom that in proportion as you seek greater stillness inside you have to obtain it by rendering access to and egress from the harbour less easy.

11. On the occasion of our inquiry last year we were informed that a new entrance to the harbour had been suggested at the south-east elbow, and we then considered the question of changing the entrance, and reported against it.

12. Though the Madras Committee say that the strongest winds are from the north-east, and though winds blow twice as long from that quarter as from the south-east, they now propose a new entrance fully open to those prevailing winds.

13. It is, perhaps, more a nautical than an engineering question, but we fear that access and egress through this new entrance would, in cyclones, be very difficult, the difficulty increasing just in proportion as the entrance was made to face the north, and diminishing as it faced easterly. Even with the north-easterly kant shown on the Madras Committee's plan, vessels could not make or leave the harbour without being exposed to waves striking them on their beam, and tending to heel them over, or to carry them into shoal water on shore, or to cause them to strike against the end of the northern pier.

14. With regard to the new entrance, there is another consideration of some moment. The present entrance could not be stopped up until the new entrance was made, and there would, therefore, for a considerable time, be two entrances, and during that period there would necessarily be greater disturbance in the harbour.

15. With regard to the methods of reinstating the work, the Madras Committee appear to prefer the random block system. This is shown in our report of 23rd January 1883 by cross section No. 5. Though we did not give it a preference, we stated in that report that it possessed advantages, and was a safe system to follow.

16. In framing that report we had to deal with a work which had been much more damaged in some places than in others, the extent of damage at some points not being very clearly ascertainable, nor capable of being determined until the work of restoration should be in progress; and hence we devised different methods of restoration.

17. Besides the objections we pointed out to the random block system, not perhaps very weighty in themselves, we were also influenced, to some extent, by difficulties of manipulation in that system.

18. On this subject we beg to remark generally that, referring to the three methods of reconstruction shown in our previous report, viz.:—

1. According to cross sections 1, 2, and 3,
2. Do. do. do. 1, 2, and 4,
3. Do. do. do. 1, 2, and 5,

we consider that any of them may be adopted with safety, provided they are in nowise weakened by diminution of their dimensions or otherwise.

19. In considering the matters now referred to us, we have had interviews with Mr. Parkes, who has explained to us his views. He sees some difficulty, as we did,

in carrying out the system shown on cross section No. 5, and seems farther to be of opinion that he should prefer to adopt cross sections 1, 2, and 4. With regard to this question, we think you may be guided by Mr. Parkes with the clear understanding, so far as we are concerned, that nothing is done to weaken any of the works recommended by us, whichever of the methods be adopted, and that the piers be not built to a lower level than we have already advised.

20. The only question remaining to be dealt with is the important one of change of entrance.

21. We have already pointed out that the change of entrance would add £127,000 to the cost of what we consider to be necessary works. We think also that in cyclones there would be difficulty in getting into and out of the harbour through the proposed north-eastern entrance, and if, during a cyclone, captains were not disposed to remain in the harbour, and could not get their vessels out, it would be a serious matter. We have also mentioned that, if a new entrance be formed, the harbour will, for some time, be left with two openings instead of one, and will consequently be more disturbed.

22. We are still of opinion that the present entrance might, with advantage, be reduced to 450 feet, having walls vertical, or nearly so, on both sides of the entrance as we always contemplated, and see no reason to alter the opinion given in the last paragraph but one of our former report of the utility of the harbour if completed in accordance with our recommendations.

23. It must not be forgotten that, whether the harbour were completed with the present or with a new entrance, there are now no sufficient facilities within it for loading or unloading vessels; and if further expenditure is to be incurred, it is a question whether it would not be better to incur it in providing such facilities at or near the base or shore end of the harbour, rather than in making a new entrance.

24. After giving the fullest consideration to this question, we cannot recommend the construction of the proposed new entrance.

25. In conclusion, we beg to call attention to the fact that in all the estimates we have made, whether in this or our previous report, we dealt with our own prices in English money only, and our prices were in nowise modified or increased (as Mr. Parkes seems to have inferred) by adopting his rates and converting them into sterling money at the rate of two shillings to the rupee. The conversion of our estimates into rupees must, therefore, be made at the current value of the rupee, whatever that may be.

ENCLOSURE.

From J. K. CROSS, Esq., to Sir JOHN HAWKSHAW, dated India Office, S.W., 6th February 1884.

With reference to the report prepared by yourself in conjunction with Sir J. Coode and Professor Stokes, dated 23rd January 1883, on the subject of the steps to be adopted for the restoration of the Madras Harbour, I am directed to inform you that copies of that report were duly furnished to the Governments of India and Madras for their information and guidance.

2. Before taking measures for carrying out the work of restoration, it is necessary that certain important questions, which have been raised in India, should be definitely settled.

3. The Secretary of State in Council is accordingly desirous of receiving the opinion of the Committee, of which you before were a member, upon certain modifications of the plan which they last year recommended, which have been proposed by a Committee at Madras and are generally concurred in by the Government of India; and I am directed to furnish you with the accompanying papers which will place you in possession of all the proceedings which have since occurred in India in connection with the subject.

4. The Committee will understand that they are at liberty to communicate with Mr. Parkes in respect to any points on which they may deem it advisable to obtain further explanations.

5. I am to add that, in view to the desirableness of coming to an early decision in the matter, the Secretary of State in Council trusts that the further inquiries now rendered necessary will be completed as soon as possible, and that the Committee will be able to limit their meetings so that the charges may be kept below the maximum amount named by Mr. Hayter in his letter to Mr. Danvers of the 24th January 1884, namely, 450 guineas.

ENCLOSURE.

From J. K. CROSS, Esq., to W. PARKES, Esq., dated India Office, 21st April 1884, No. 502.

I am directed by the Secretary of State for India in Council to forward, herewith, copy of a second report by the Committee appointed by the Secretary of State in 1882 to consider the question of restoring the Madras Harbour.

2. This report contains the opinions of the Committee on certain modifications in the measures recommended in their original report of 23rd January 1883, which have been suggested by a Committee appointed by the Government of Madras.

3. With reference to the recommendation at page 5 of the report, you will observe that the Committee are of opinion that any one of the methods of reconstruction proposed by them in their first report may be safely followed, and that, after consulting you on the subject, they think that your advice may be taken by the Secretary of State, and I am accordingly desired by Lord Kimberley to request that you will furnish him with your opinion on this point.

4. I am to add that your position in connection with this work will be the same as it was before the letter of the 12th October last was addressed to you, and that your salary will accordingly be at the rate of £500 per annum from the present date, it being understood that your engagement may at any time be determined on payment to you of the sum of £500.

5. I have further to state that Lord Kimberley is inclined to think that it will be desirable for you to proceed to Madras with the view of organising arrangements for carrying out the works on the basis of the Committee's recommendation. I have to request, therefore, that you will furnish His Lordship with your opinion on this proposition, and state when you would be prepared to act upon it in the event of its being decided in the affirmative.

Notes on the Joint Report of Sir John Hawkshaw, Sir John Coode and Professor Stokes, dated 12th March 1884.

The joint report makes no allusion to the notes made by Colonel Brownlow and myself, and there is nothing in this report to induce me to modify the views I have expressed in my note of the 17th August 1883.

2. In that note I proposed a postponement of the raising the sides until further experience had been gained as to the necessity for the work, and I still think that course should be pursued. Nothing would be lost and much might be gained by such a course of action, as the work of reconstruction of the faces and elbows is that which is the most pressing.

3. In page 2 of the report it is stated—

> "The danger to vessels within the harbour in a cyclone would arise from the winds as well as the waves; probably more from the former than the latter: and we think that prudent commanders on the occasions would prefer getting out to sea to remaining in the harbour."

4. I entirely agree with this opinion; in fact my views have been already indicated in my note as follows:—

> "I must confess that I am somewhat sceptical of the absolute safety of vessels in Madras harbour during a cyclone, even under the conditions of having raised the face and elbows and closed the seaward entrance."

5. I may go still further and express my conviction that the capping would afford no protection against wind worth mention; and that even with this I consider it would be an act of madness for the commander of any vessel to remain in the harbour during a cyclone. If the capping and wave-breaker are to be added for wind protective purposes only, and not for constructive purposes, I think their construction will be a waste of money, as it is practically admitted that vessels cannot remain in the harbour during a cyclone.

6. The report also states (page 4) that with the northern entrance proposed by the Madras Committee—

> "Vessels could not make or leave the harbour without being exposed to waves striking them on the beam, and tending to heel them over, or to carry them into shoal water on shore, or to cause them to strike against the end of the northern pier."

7. This agrees with the opinion I have already expressed in my note in the following terms:—

> "When a vessel is entering such a harbour, half protected by the entrance and half exposed to the action of a heavy wave, it is liable to be swung round and strike the entrance before it

in carrying out the system shown on cross section No. 5, and seems farther to be of opinion that he should prefer to adopt cross sections 1, 2, and 4. With regard to this question, we think you may be guided by Mr. Parkes with the clear understanding, so far as we are concerned, that nothing is done to weaken any of the works recommended by us, whichever of the methods be adopted, and that the piers be not built to a lower level than we have already advised.

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23. It must not be forgotten that, whether the harbour were completed with the present or with a new entrance, there are now no sufficient facilities within it for loading or unloading vessels; and if further expenditure is to be incurred, it is a question whether it would not be better to incur it in providing such facilities at or near the base or shore end of the harbour, rather than in making a new entrance.

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4. I entirely agree with this opinion; in fact my views have been already indicated in my note as follows:—

> "I must confess that I am somewhat sceptical of the absolute safety of vessels in Madras harbour during a cyclone, even under the conditions of having raised the face and elbows and closed the seaward entrance."

5. I may go still further and express my conviction that the capping would afford no protection against wind worth mention; and that even with this I consider it would be an act of madness for the commander of any vessel to remain in the harbour during a cyclone. If the capping and wave-breaker are to be added for wind protective purposes only, and not for constructive purposes, I think their construction will be a waste of money, as it is practically admitted that vessels cannot remain in the harbour during a cyclone.

6. The report also states (page 4) that with the northern entrance proposed by the Madras Committee—

> "Vessels could not make or leave the harbour without being exposed to waves striking them on the beam, and tending to heel them over, or to carry them into shoal water on shore, or to cause them to strike against the end of the northern pier."

7. This agrees with the opinion I have already expressed in my note in the following terms:—

> "When a vessel is entering such a harbour, half protected by the entrance and half exposed to the action of a heavy wave, it is liable to be swung round and strike the entrance before it

can recover itself. This is a contingency to which modern vessels, from their extreme length, are especially liable."

8. The report, however, makes no allusion to the alternative I suggested in my note (as shown in diagram No. 4) with the view of meeting this difficulty.

9. The whole question, however, is, as the report suggests, "more a nautical than an engineering one," and I presume that the difficulty was considered by the nautical authority in the Madras Committee, and that it was preferred to face this difficulty rather than to incur the risk of narrowing the entrance. I would, therefore, repeat my previous recommendation on this point that—

> "With regard to the alternative entrance from one side, I would advise that the question be referred to some eminent nautical authority in India, bearing in mind that a *concave face to the breakwater* is quite inadmissible."

10. No allusion has been made in the report to the suggestion I made in my note of a modification of the section originally proposed by the Home Committee, although I pointed out that this section was, in my opinion, open to the very serious objection of tending to break rather than to deflect the wave, and thus to set up a very destructive wave action.

11. We know so little of the possible ultimate force of cyclonic waves, that I am very strongly of opinion that every endeavour should be made to *minimise the wave action on the structure.*

12. With regard to this question, I annex some extracts from the opinion of Mr. Scott Russell, the highest authority on wave action.

13. It will be seen from these extracts that the *breaking* of the wave is "a formidable thing to attempt," and that the limiting angle for *reflecting* a wave is 45° or a slope of 1 to 1; whilst the section proposed by the Home Committee has a slope greater than $1\frac{1}{2}$ to 1 for the blocks and nearly 4 to 1 for the rubble, which is clearly within the limits of wave action.

14. It is useless to argue that flat slopes have stood the effects of the waves at the English ports, for most of those ports are so land-locked that they are never exposed to any wave action at all approaching that of a *cyclonic* wave. They have, in fact, to deal with little more than the ordinary "oscillating" or surface waves which, as the extract shows, are not the "deadliest enemies with which breakwaters have to contend."

15. The Alderney breakwater, which is more exposed than the majority of English breakwaters, has been constructed with slopes of 2 to 1, changing to more than 4 to 1, and it has suffered severely.

16. The French engineers have acknowledged the soundness of the principles laid down by Mr. Scott Russell, and their more modern breakwaters are constructed with slopes of 1 to 1 on the seaward face.

17. I am of opinion, therefore, that this slope should be adopted for the Madras breakwater.

18. The report considers that Government "may be *guided by Mr. Parkes*" with reference to the adoption of cross section No. 4; but it makes no allusion to the difficulty to which I have drawn attention in my previous note respecting the irregularity of the *débris* of the original wall which—

> "being in advance of the new wall would probably set up a very serious wave action, of which it is impossible to predict the result;"

and such an action ought, in my opinion, to be avoided.

19. The report, moreover, states that Mr. Parkes sees some difficulty in carrying out cross section No. 5 (random blocks); but as it has not stated the precise character of that difficulty, I would suggest that its exact nature should be ascertained with the view of obtaining from Mr. Thorowgood a report as to the practical value of the objection, and whether this difficulty may not be overcome.

20. In conclusion, I may say that I adhere to all the recommendations I have previously made in my note of the 17th of August 1883.

19th April 1884. G. L. M.
20th April 1884. R. B. B.

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Secretary.

It strikes me that the distinguished authors of the joint report are under a very serious misapprehension as to the character of a cyclone. They talk of vessels going into and coming out of the harbour during a cyclone as if such a feat were easy of accomplishment with a sufficiently open entrance. As a matter of fact, it would be simply impossible for any vessel to make head against the wind and sea of these storms. If they wish to get out of the harbour to ride out the cyclone at sea, they must leave it at the first premonitory signs of its approach, which are generally unmistakable. Once the storm has fairly set in, the ships then in the harbour must trust to their moorings and to them only for safety.

2. If the force of the waves rolling in from seaward be effectually broken by the breakwaters, and the water in the harbour be no rougher than the wind acting on its limited area could make it, I for my part fail to see altogether what special risks ships attached to secure moorings, with their top hamper lowered, would run from the wind alone.

3. It has been my lot to be in two cyclones in Calcutta and one at sea. The first cyclone in Calcutta did immense damage to the shipping, owing entirely, in my opinion, to the defective moorings. Numbers of ships broke loose and drifted up and down the river till they were sunk by collisions with others or were finally lodged on the banks. A larger number still were sunk at their moorings being cut down by the drifting vessels.

4. Before the second cyclone occurred the moorings had all been renewed, and though it was quite as severe as the first, the shipping scarcely suffered at all, though almost all the boats, as on the previous occasion, were destroyed. Wind alone won't sink a ship properly moored and in good trim, though heavy breakers without wind may. If then the breakers can be kept out of the harbour and proper moorings provided within it, every sea-worthy ship should be able to ride out a cyclone in perfect safety.

5. What is wanted, therefore, for the Madras harbour is—

1st.—A form of entrance which will not allow the heavy rollers from the bay access to the interior in any weather.

2nd.—Sufficient height and strength of breakwaters effectually to do the same.

3rd.—Good moorings for the ships inside. If the entrance is also such that vessels may safely go in and out in all ordinary monsoon weather, I do not see that anything more is either wanted or attainable. But to achieve so much, I would not shrink from expending £200,000 or £300,000 additional. Safe harbours are as much a want of the country as improved internal communications; and as the Government grudges nothing spent on the latter, it should equally little grudge expenditure on the former, which are practically only places for the transfer of goods from land to sea carriage, and *vice versâ, en route* to their ultimate destinations.

W. S. T.

21st April 1884.

ENCLOSURE.

Extracts from remarks made by MR. J. SCOTT RUSSELL *(Min. Inst. C. E., Vol. XIX), page 653, 1860.*

* * * * Now, in deep water, there were not only the *oscillating surface waves* to be encountered, but also those which he had termed *waves of translation*, forming what were called rollers at the Cape of Good Hope, and, when on a smaller scale, known as ground swell. These were a much more troublesome class of waves; it was mainly with them that the engineer had to deal in places open to the Atlantic: and after a storm of some duration at sea, they became the deadliest enemies, in the cases of deep water, against which breakwaters for harbours of refuge had to contend * * * * *

To reflect, or send back the roller was the most effectual plan. For this purpose, nothing more was necessary than a deep perpendicular face of perfect masonry, and so long as it stood

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can recover itself. This is a contingency to which modern vessels, from their extreme length, are especially liable."

8. The report, however, makes no allusion to the alternative I suggested in my note (as shown in diagram No. 4) with the view of meeting this difficulty.

9. The whole question, however, is, as the report suggests, "more a nautical than an engineering one," and I presume that the difficulty was considered by the nautical authority in the Madras Committee, and that it was preferred to face this difficulty rather than to incur the risk of narrowing the entrance. I would, therefore, repeat my previous recommendation on this point that—

"With regard to the alternative entrance from one side, I would advise that the question be referred to some eminent nautical authority in India, bearing in mind that a *concave face to the breakwater* is quite inadmissible."

10. No allusion has been made in the report to the suggestion I made in my note of a modification of the section originally proposed by the Home Committee, although I pointed out that this section was, in my opinion, open to the very serious objection of tending to break rather than to deflect the wave, and thus to set up a very destructive wave action.

11. We know so little of the possible ultimate force of cyclonic waves, that I am very strongly of opinion that every endeavour should be made to *minimise the wave action on the structure.*

12. With regard to this question, I annex some extracts from the opinion of Mr. Scott Russell, the highest authority on wave action.

13. It will be seen from these extracts that the *breaking* of the wave is "a formidable thing to attempt," and that the limiting angle for *reflecting* a wave is 45° or a slope of 1 to 1; whilst the section proposed by the Home Committee has a slope greater than 1½ to 1 for the blocks and nearly 4 to 1 for the rubble, which is clearly within the limits of wave action.

14. It is useless to argue that flat slopes have stood the effects of the waves at the English ports, for most of those ports are so land-locked that they are never exposed to any wave action at all approaching that of a *cyclonic* wave. They have, in fact, to deal with little more than the ordinary "oscillating" or surface waves which, as the extract shows, are not the "deadliest enemies with which breakwaters have to contend."

15. The Alderney breakwater, which is more exposed than the majority of English breakwaters, has been constructed with slopes of 2 to 1, changing to more than 4 to 1, and it has suffered severely.

16. The French engineers have acknowledged the soundness of the principles laid down by Mr. Scott Russell, and their more modern breakwaters are constructed with slopes of 1 to 1 on the seaward face.

17. I am of opinion, therefore, that this slope should be adopted for the Madras breakwater.

18. The report considers that Government "may be *guided by Mr. Parkes*" with reference to the adoption of cross section No. 4; but it makes no allusion to the difficulty to which I have drawn attention in my previous note respecting the irregularity of the *débris* of the original wall which—

"being in advance of the new wall would probably set up a very serious wave action, of which it is impossible to predict the result;"

and such an action ought, in my opinion, to be avoided.

19. The report, moreover, states that Mr. Parkes sees some difficulty in carrying out cross section No. 5 (random blocks); but as it has not stated the precise character of that difficulty, I would suggest that its exact nature should be ascertained with the view of obtaining from Mr. Thorowgood a report as to the practical value of the objection, and whether this difficulty may not be overcome.

20. In conclusion, I may say that I adhere to all the recommendations I have previously made in my note of the 17th of August 1883.

19th April 1884. G. L. M.
20th April 1884. R. B. B.

Secretary.

It strikes me that the distinguished authors of the joint report are under a very serious misapprehension as to the character of a cyclone. They talk of vessels going into and coming out of the harbour during a cyclone as if such a feat were easy of accomplishment with a sufficiently open entrance. As a matter of fact, it would be simply impossible for any vessel to make head against the wind and sea of these storms. If they wish to get out of the harbour to ride out the cyclone at sea, they must leave it at the first premonitory signs of its approach, which are generally unmistakable. Once the storm has fairly set in, the ships then in the harbour must trust to their moorings and to them only for safety.

2. If the force of the waves rolling in from seaward be effectually broken by the breakwaters, and the water in the harbour be no rougher than the wind acting on its limited area could make it, I for my part fail to see altogether what special risks ships attached to secure moorings, with their top hamper lowered, would run from the wind alone.

3. It has been my lot to be in two cyclones in Calcutta and one at sea. The first cyclone in Calcutta did immense damage to the shipping, owing entirely, in my opinion, to the defective moorings. Numbers of ships broke loose and drifted up and down the river till they were sunk by collisions with others or were finally lodged on the banks. A larger number still were sunk at their moorings being cut down by drifting vessels.

4. Before the second cyclone occurred the moorings had all been renewed, and though it was quite as severe as the first, the shipping scarcely suffered at all, though almost all the boats, as on the previous occasion, were destroyed. Wind alone won't sink a ship properly moored and in good trim, though heavy breakers without wind may. If then the breakers can be kept out of the harbour and proper moorings provided within it, every sea-worthy ship should be able to ride out a cyclone in perfect safety.

5. What is wanted, therefore, for the Madras harbour is—

1st.—A form of entrance which will not allow the heavy rollers from the bay access to the interior in any weather.

2nd.—Sufficient height and strength of breakwaters effectually to do the same.

3rd.—Good moorings for the ships inside. If the entrance is also such that vessels may safely go in and out in all ordinary monsoon weather, I do not see that anything more is either wanted or attainable. But to achieve so much, I would not shrink from expending £200,000 or £300,000 additional. Safe harbours are as much a want of the country as improved internal communications; and as the Government grudges nothing spent on the latter, it should equally little grudge expenditure on the former, which are practically only places for the transfer of goods from land to sea carriage, and *vice versâ, en route* to their ultimate destinations.

W. S. T.

21st April 1884.

Enclosure.

Extracts from remarks made by Mr. J. Scott Russell *(Min. Inst. C. E., Vol. XIX), page 653,* 1860.

* * * * Now, in deep water, there were not only the *oscillating surface waves* to be encountered, but also those which he had termed *waves of translation*, forming what were called rollers at the Cape of Good Hope, and, when on a smaller scale, known as ground swell. These were a much more troublesome class of waves; it was mainly with them that the engineer had to deal in places open to the Atlantic: and after a storm of some duration at sea, they became the deadliest enemies, in the cases of deep water, against which breakwaters for harbours of refuge had to contend * * * * *

To reflect, or send back the roller was the most effectual plan. For this purpose, nothing more was necessary than a deep perpendicular face of perfect masonry, and so long as it stood

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firm, it was faultless, and the water inside was smooth as in a millpond: for the reflection really
converted the whole effect of the roller on itself into a simple pressure of water. When such a
wave was reflected on a perpendicular wall, it merely produced a hydraulic pressure equal to that
due to little more than double its own height. * * * * An inclined wall, he had ascer-
tained, would reflect a roller or deep wave nearly as well as a vertical wall down to an inclination
of 45°. This observation was of value, because at 45° large blocks judiciously placed would not
move out of position even although a considerable breach was made in the wall near them. He
had carefully watched the action of the sea when approaching this slope, and his opinion was
favorable to the trial of a wall of heavy rubble blocks fairly laid, so as to form a tolerably even
face, or slope of 45°, when the nature of the materials and the local circumstances would permit.
When any approximative attempt at reflection of the wave, by walls not *too remote from the*
vertical, had to be abandoned, recourse must generally be had to breaking the wave; *this was a*
formidable thing to attempt on a deep-sea roller, and it could only be done by opposing mass to
mass.

From J. H. TAYLOR, Esq., Lieutenant, R.N.R., Master Attendant, Administrative Department, Madras, to the Chief Secretary to Government, dated Madras, 6th May 1884, No. 4354.

I must beg leave respectfully to apologise for addressing Government on a point of which I have no official knowledge, but the reports of which have reached me from sources that seem reliable. I hear that the restoration of the harbour of Madras is to be carried out with the omission of the one great alteration that will alone give any real value to it. I mean the closing of the eastern entrance.

2. Smooth water, upon which the whole comfort of the interior and the only
chance of improvement in interior arrangements depend, will never be obtained, and
Madras will be condemned to perpetual inferiority as a harbour, after so much will
have been spent upon it. I would, with deep respect, but all the urgency that
language can convey, implore His Excellency in Council not to accept such a conclusion
until, at all events, the sense of the community has been sought, and its concurrence
obtained. Every recurring storm, or presence of cyclonic wave in the neighbourhood
of Madras, will repeat all the injuries that we witnessed on the occasion of the sea of
November 1881. The sea that came through the east opening on that occasion
destroyed the newly commenced low-level jetties, wrecked all the lighters, and
committed general havoc on the beach among all classes of boats, before the walls
showed any disposition to fall. His Excellency the Governor may perhaps remember
that I waited upon him about 11 o'clock to report upon the weather, and that I
reported the walls secure, but the damage abovementioned committed. It was on my
return to the beach that I was an eye-witness of the very commencement of the work
of destruction. The strongest portion of the walls, *i.e.*, each side of entrance of four
blocks wide was the first to go, unmistakably owing to the sea and current rushing
round them and attacking on two faces at once. If this fearful blunder is not remedied
now that an opportunity providentially offers itself, the last chance of a useful harbour
for Madras is thrown away.

3. I know Mr. Thorowgood cordially endorses these opinions, though delicacy towards his chief interferes with their expression; but no sentiment ought to be allowed to interfere where such enormous public interests are concerned.

4. I am also told that the east opening is adhered to from nautical reasons. This is entirely opposed to fact. All commanders of vessels who have been consulted, and that includes nearly all that have visited Madras since the accident, approve entirely the alteration from every point of nautical convenience. I submitted some of the chief opinions, but I could have collected hundreds, all giving testimony of the same nature.

5. The public are now committed to a tax upon the understanding that they will have a sufficient harbour, but I distinctly dare to assert they will never have one worth the name, or worth anything like the amount, unless smooth water is secured. Then all the conveniences of a harbour will soon follow, and few ports be in a better position than Madras. If no lesson is to be learnt from the destruction before us,

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correction for the fault will fall upon the innocent public, who, I respectfully submit,
should be invited in some way to express an opinion upon a point of such vital import-
ance to their future interests. The question is not one of engineering, where the
judgment of such men as Sir John Hawkshaw, Sir John Coode, &c., is unassailable,
but is one of observation and experience in a perfectly novel situation. Observation
convinces all who were witnesses of the former accident that the east opening is a fatal
defect, and all experience teaches us that the sand on this coast is not to be depended
on for a single season for the support of regular work like the upright wall.

6. Public feeling will, no doubt, be strongly excited when it is generally known
that the anxiously expected harbour is only an unsatisfactory compromise, and that
without any appreciable saving in money, they will be called upon to abandon
the prospect they have had of docks, jetties, and countless advantages, which the plan
of the Madras Committee would have secured to the port.

7. I have marked this confidential, but of course that is only to secure the first
consideration by Government. The facts will soon be patent and open to public
controversy. I can write in officially if desired, and append the opinions of all my
department.

ENCLOSURES.

From J. H. TAYLOR, Esq., Lieut., R.N.R., Master Attendant, Administrative Department, to the Acting Chief Secretary to Government, dated Madras, 4th September 1883, No. 8607.

I have the honor to forward, as desired, the opinions of the nautical men upon the proposed
closing of the east entrance of the harbour, and opening one to the north. The opinions are all
strongly in favor of the plan, and are all by men of great experience and good position. I could,
of course, continue the collection, but the result would be the same, while much valuable time
would be wasted. There can be no doubt that the change would be good in every way, and
the smooth water thus obtained, and the security offered by a wall, as recommended by the
Madras Committee appointed in G.O., Public Works Department, No. 1259 W., dated 30th
April 1883, would be of incalculable advantage to the port, and admit of immediate beach
improvements for landing and shipping.

From ARTHUR E. BARLOW, Esq., Commander, P. and O. S.S. *Parramatta*, to the Master Attendant, Madras, dated 1st August 1883.

I have read with much interest the reports of the local and Home Committees on the recon-
struction of the harbour of Madras, with which you were good enough to furnish me, having
had considerable personal experience of the port for upwards of thirty years.

On the particular point upon which you wish for my opinion, namely, the closing of the
present entrance to the harbour and the opening of one in the north-east angle of the north
arm, so far from seeing any objection to it, I think it will be a positive advantage, as, in my
opinion, it will be equally easy of ingress and egress with the present one, and will give a larger
area of deep water for mooring large vessels, and will, I think, under all conditions render the
water inside the harbour much smoother than it ever is at present. I return the reports, herewith,
with many thanks.

From J. S. MURRAY, Esq., Commander of the P. and O. S.S. *Shannon*, to the Master Attendant, Madras, dated 5th August 1883.

I have read with much interest the papers relating to the Madras Harbour, and having
closely studied the plans, I have come to the conclusion that the plan proposed for its recon-
struction by the Committee of June 1883 is the very best that can be undertaken, and that, while
giving larger accommodation for shipping than ever before, it will ensure what was deficient in
the old scheme, viz., shelter and protection in cyclonic weather.

For obvious reasons the new entrance must be to the northward; and there can be no
question about closing the present one.

I would venture to suggest that there should be no stint in the protecting arm for the new
entrance, and that it should be carried out more northerly than westerly.

From W. A. BURKITT, Esq., Master, B. I. S. N. Co.'s S.S. *Dacca*, to the Master Attendant, Madras, dated 10th August 1883.

I have looked over the plan for reconstructing the Madras Harbour, and think it an excellent
idea closing up the present entrance, and having the new one at the north-east corner, and

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when the wall of the break-water is built higher, we ought to have perfectly smooth water. The harbour ought also to be able to give accommodation to several more steamers, and I don't see why it should not be able to give protection to ships in case of a cyclone; in fact, the present plan is the first which has caused me to believe in the utility of a Madras Harbour.

From E. G. STEAD, Esq., Commander, S S. *Kaisar-i-Hind*, to the Master Attendant, Madras, dated 14th August 1883.

I have looked over the plans for the reconstruction of the Madras breakwater, and most certainly think the closing up of the present entrance the very best that could be done and the only plan by which smooth water can be looked for inside the harbour, which would then have greatly increased accommodation for more vessels, and with perfect safety:

The northern entrance would be quite as easy of ingress and egress, and to steamers preferring putting to sea on an approaching cyclone have perhaps less difficulty in getting out than through the present entrance, with possibly a gale of wind from north blowing full on her broadside.

From R. S. TURNER, Esq., Commander, S.S. *Booldana*, to the Master Attendant, Madras, dated 15th August 1883.

With reference to your request for my opinion regarding the proposed alteration in the Madras Harbour, I am of a most decided opinion that the only way in which smooth water and increased accommodation for shipping can be obtained is by closing the present entrance and making a new one at the outer end of the north pier. I cannot see why an entrance there should not, at all seasons, be as accessible as the present one.

The arm to protect the northern entrance, I think, should be curved *like* an arm towards the shore to protect the entrance from the north-east sea as much as possible, without interfering with the navigation.

My experience of the coast is twenty years in the British India Steam Navigation Company's service.

From J. DUFF, Esq., S.S. *Duke of Sutherland*, to the Master Attendant, Madras, dated 1st September 1883.

With regard to the reconstruction of Madras Harbour, I beg to state that, in my opinion, to ensure despatch in working cargo, and also safety in cyclonic weather, it is absolutely necessary that the present entrance should be closed, and a new one opened; from local circumstances this must be at the north side, with a protecting arm. This would give room for more vessels, and if the breakwater be raised, as proposed, give safety in a cyclone, vessels often being unfit to go to sea on short notice given.

From G. N. HECTOR, Esq., Master, S.S. *Carthage*, to the Master Attendant, Madras, dated 4th September, 1883.

I am obliged to you for a perusal of the plans now under consideration for the reconstruction of the Madras breakwater.

The proposed alteration of the entrance from its present position to the north-east angle of the northern arm commends itself to my judgment.

The advantages gained by this change will, I think, be—

Smooth water inside the harbour.
Increased moving space.
Less liability to accident to vessels entering or leaving the harbour.
Probably less difficulty to vessels putting to sea in bad weather.

Read again—

G.O., dated 14th May 1884, Mis. No. 203, Marine.

Order—dated 16th May 1884, Mis. No. 209, Marine.

These papers will be transferred to the Public Works Department.

(True Extract.)

(Signed) E. F. WEBSTER,
Chief Secretary.

1436/37
b

ORDER—dated 9th June 1884, No. 1436 W., Public Works.

Ordered that the Government of India be addressed.

(Here enter No. 1437 W., dated 9th June 1884.)

(True Extract.)

(Signed) J. SHAW-STEWART, Colonel, R.E.,
Secretary to Govt., P.W.D.

To the Marine Department, with copy of letter to the Government of India.

Exd. E. Fernandez.
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The advantages gained by this change will, I think, be—

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- Increased moving space.
- Less liability to accident to vessels entering or leaving the harbour.
- Probably less difficulty to vessels putting to sea in bad weather.

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(True Extract.)

(Signed) E. F. WEBSTER,
Chief Secretary.

ORDER—dated 9th June 1884, No. 1436 W., Public Works.

Ordered that the Government of India be addressed.

(Here enter No. 1437 W., dated 9th June 1884.)

(True Extract.)

(Signed) J. SHAW-STEWART, Colonel, R.E.,
Secretary to Govt., P.W.D.

To the Marine Department, with copy of letter
to the Government of India.

Exd. E. Fernandez.
Spare Copies

BUILDINGS AND ROADS.
CIVIL WORKS.

Govt. of (1884) Madras.

PUBLIC WORKS.

Dated June, 9th.

Recd.

Encl.

G.O., 9th June 1884, No. 1436 W.

JUNE.

Madras Harbour

Ordered that the letter from the Government of India calling for the views of this Government on certain points connected with proposed scheme for the restoration of the —, be replied to.

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9TH JUNE 1884, No. 1437 W., PUBLIC WORKS.

PUBLIC WORKS DEPARTMENT.

Buildings and Roads.
Civil Works.

LETTER—from

COLONEL J. SHAW-STEWART, R.E.,
Secretary to the Government of Madras,
Public Works Department,

To

THE SECRETARY TO THE GOVERNMENT OF INDIA,
PUBLIC WORKS DEPARTMENT.

SIR,

I am directed to acknowledge receipt of your letter, dated 17th May 1884, No. 198 M., with which is forwarded copy of a despatch and enclosures from Her Majesty's Secretary of State for India respecting the proposed scheme for the restoration of the Madras Harbour, and in which you request that the Government of India may be favored with an expression of the views of this Government in the matter.

2. The three points specially dealt with in the papers now under acknowledgment are—

(1) The position of the entrance to the harbour, together with its shape and width.
(2) The section to be given to the sea-face.
(3) The officer under whom, as chief executive authority, the restoration of the harbour is to be proceeded with.

3. With respect to the first point, I am to state that His Excellency the Governor in Council still remains strongly of opinion that the entrance should be placed at the north-east angle of the harbour, in from 7 to 7½ fathoms of water, as recommended by the Madras Committee; and that it should have a width of 500 feet.

4. As bearing on this point, it appears to this Government that sufficient weight has not been attached to the unanimous opinions of nautical experts on the spot, copies of which were forwarded to you with my letter, dated 11th October 1883, No. 2862 W. It is admitted by Sir John Hawkshaw's Committee that the question of access and egress through the proposed new entrance is "*more a nautical than an engineering question.*" That it is emphatically a nautical question scarcely admits of doubt; and on this point the nautical authorities who have been consulted are singularly unanimous. In a letter, dated 6th May, No. 4354, copy of which accompanies this, and to which special attention is solicited, the Master Attendant of Madras states: "All commanders of vessels who have been consulted, and that includes nearly all that have visited Madras since the accident, approve entirely the alteration from every point of nautical convenience." Captain Taylor adds: "I submitted some of the chief opinions, but could have collected hundreds, all giving testimony of the same nature."

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5. I am directed to again solicit attention to those opinions; and, in doing so, to point to the fact that they represent the views of experienced men, commanding the largest steamers visiting the port; men who have known this coast and these seas for years, and who have watched the progress of the harbour works from the beginning. If there be any more competent nautical authority, thoroughly conversant with the somewhat complicated local conditions and with the nature of cyclonic storms, I am to state that His Excellency in Council earnestly requests that the question at issue may be referred to such authority before it is irrevocably decided.

6. In further connection with this point, I am directed to observe that Sir John Hawkshaw's Committee appear to have misapprehended the circumstances from want of the necessary local knowledge. In paragraph 11 of their last report, they state that during 1883 they considered the question of forming a new entrance at the south-east elbow, and reported against it; and in paragraph 12 they continue: "Though the Madras Committee say that the strongest winds are from the north-east, and though winds blow twice as long from that quarter as from the south-east, they now propose a new entrance fully open to those prevailing winds." The argument being apparently that, if a southern entrance cannot be entertained, *a fortiori* a northern entrance must be objected to still more strongly.

7. With advertence to this, I am to point out that the Madras Committee did not say the strongest winds were from the north-east, but "the heaviest seas yet observed have invariably been from the north and the north-east." As matter of fact, the wind does not at Madras blow from the north and north-east for more than four months of the year, from October to February, the direction of the wind during the remaining eight months being more or less southerly. The direction of the wind, however, seems to have little effect on the swell, which rolls in with the crests of the waves parallel, or nearly so, to the coast line; with the result that seas enter the present mouth freely, and do not disperse before reaching the shore at the base of the harbour. Those seas would be deflected from a north-east entrance by the proposed protecting horn.

8. A further objection to the north-east entrance raised by Sir John Hawkshaw's Committee is (paragraph 14 of report) that "there would, for a considerable time, be two entrances;" but I am directed to state that this Government do not attach much weight thereto, inasmuch as the old entrance could probably be closed, and the new one opened, during the interval between two stormy seasons.

9. After most carefully considering all that has been urged against the proposed new entrance, His Excellency the Governor in Council adheres strongly to the opinion he has already recorded in favor of it. He considers that the retention of the eastern entrance will involve the loss of the greater part of the advantage which Madras might otherwise confidently expect to obtain from the harbour, and that it will also, in all probability, involve heavy and ever recurring outlay to repair storm damages. And I am directed to add that this opinion is in no way contingent upon the decision that may be arrived at with respect to the necessity for providing the south arm of the harbour with a wave-breaker. If such provision can be dispensed with, as recommended by the Madras Committee, the new entrance can probably be opened within the sum (£480,000) named by Sir John Hawkshaw's Committee; but if otherwise, this Government are of opinion that the additional outlay, estimated by the same body at £127,000, *must* be incurred in view to the efficiency of the harbour and the security of vessels lying therein.

10. The question of whether ships could safely ride out a cyclone in the harbour may, in the opinion of this Government, be left to be decided by the commanders of such vessels. In most cases sufficient warning is given of the approach of a cyclone to enable vessels to get to sea, if they desire to do so; but it is impossible to entertain doubt that a vessel in the harbour would have a much better chance during a cyclone if the eastern entrance were closed, than if it were open. It should, moreover, be remembered that the main object of the harbour is not to provide a refuge for vessels during the brief period of cyclonic storms, but to secure smooth water for landing and shipping operations in ordinary weather, and to protect the jetties and other appliances necessary thereto from the destructive effects of a cyclone to which they are liable so long as they are exposed to the direct influence of the sea from the east. Every convenience of this sort was wrecked in 1881; and unless the proposal to close the eastern entrance is accepted, it will be useless to attempt their reconstruction.

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11. Respecting the proposal to reduce the width of the present eastern entrance to 450 feet, which is renewed by Sir John Hawkshaw's Committee in paragraph 22 of their late report, I am directed to observe that this too is more a nautical than an engineering question, and that the weight of local nautical opinion has been recorded strongly against the proposal. Upon this point I am to refer to paragraphs 25 to 27 of the Madras Committee's first report. With that opinion on record, His Excellency the Governor in Council must continue to object to the proposal.

12. With respect to the second point dealt with in the papers under acknowledgment, namely, the section to be given to the sea-face of the harbour, I am directed to state that His Excellency the Governor in Council greatly prefers the third of the methods of reconstruction quoted by Sir John Hawkshaw's Committee in paragraph 18 of their last report, namely, the random block-work system. Its adoption was strongly recommended by the Madras Committee; and as Sir John Hawkshaw's Committee consider that it may be adopted with safety, it is hoped by this Government that all objection will now be removed.

13. With respect to the third point, namely, the chief executive authority under which the restoration of the harbour is to be carried out, I am directed to draw attention to paragraphs 10 and 11 of General Sankey's letter, under date 4th July 1883, No. 1856 W., where the opinion on this important matter of His Excellency the Governor in Council is stated clearly and unmistakably; and I am to say that His Excellency has seen no reason for modifying that opinion.

I have the honor to be,
Sir,
Your most obedient servant,
(Signed) J. SHAW-STEWART, Colonel, R.E.,
Secretary to Govt., P.W.D.

OOTACAMUND,
9th June 1884.

Exd. E. Fernandez.
Spare Copies

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BUILDINGS AND ROADS.
CIVIL WORKS.

Govt. of (1884) Madras.

PUBLIC WORKS.

Dated June, 9th.

Recd.

Encl.

9th June 1884, No. 1437 W.

JUNE.

Madras Harbour

Expressing opinion on certain points connected with proposed scheme for the restoration of the —

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India Office,
London, 24th April 1884.

Public Works,
No. 23.

To His Excellency The Most Honourable The Governor General of India in Council.

My Lord Marquis,

Para. 1. On receipt of your Excellency's Public Works Letter, No. 59, of 13th November 1883, which forwarded a correspondence with the Madras Government relative to the engineering merits of the scheme proposed for the restoration of the Madras Harbour, I caused the subject to be again referred to the Select Committee who had been originally appointed to consider the subject, and requested that I might be furnished with their views on the modifications of the plan, recommended in their report of 23rd January 1883, which had been suggested by the Committee appointed by the Government of Madras.

2. Sir John Hawkshaw has, in the accompanying report, furnished me with an expression of the joint opinion of himself and his colleagues on the recommendations of that Committee, and after giving my careful consideration to the same in Council, I have come to the conclusion that the opinion now expressed must be accepted as the final decision on the questions raised.

3. The entrance to the harbour will accordingly be retained in its original position, and may be narrowed as recommended.

4. The side piers must be raised to the height of 12 feet above high water level, as originally recommended, and if loading places are provided in the manner suggested inside the harbour and near the piers, the necessity for raising them still higher will have to be considered.

5. With regard to the method of reinstating the work, your Excellency will perceive that the Committee have not pronounced definitely in favour of any one of the three systems mentioned in their original report.

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6. In accordance with the recommendation of the Committee, I have caused a reference to be made to Mr. Parkes on the subject. I forward herewith copy of a letter which I have accordingly caused to be addressed to him. After very carefully considering whether, in consequence of the partial failure of the works, it was expedient to remove Mr. Parkes from the position of Advising Engineer, I have come to the conclusion that his removal would not be justifiable, and I consider that it will be desirable for him to proceed to Madras, and there personally arrange the measures which it will be necessary to take for carrying out in the most efficient and economical manner the works now to be undertaken. I shall be glad to receive your Excellency's views upon this point after you have communicated with the Government of Madras.

I have the honour to be,
My Lord Marquis,
Your Lordship's most obedient humble Servant,
(Signed) KIMBERLEY.

India Office,
London, 15th May 1884.

Public Works,
No. 28.

To His Excellency The Most Honourable The Governor General of India in Council.

MY LORD MARQUIS,

Para. 1. With reference to my Public Works Despatch, No. 23, dated the 24th April last, I transmit herewith, for information of your Government, copy of a communication which has recently been addressed to this Office by Mr. Parkes* respecting the first steps to be taken for proceeding with the reconstruction of the Madras Harbour works.

2. The reasons adduced by Mr. Parkes for the deputation, in the first instance, to this country of Mr. Thorowgood for personal consultation respecting the supply of machinery for proceeding with the works appear to be reasonable, and I have accordingly requested the Government of Madras, by telegram, to despatch Mr. Thorowgood to this country.

3. This preliminary step will not, of course, interfere with a personal inspection of the works later by Mr. Parkes himself.

I have the honour to be,
My Lord Marquis,
Your Lordship's most obedient humble Servant,
(Signed) KIMBERLEY,

---

* Letter from Mr. Parkes, dated 26th April 1884.

ENCLOSURE.

India Office,
21st April 1884.

P.W. 502/84.

Sir,

I am directed by the Secretary of State for India in Council to forward herewith copy of a second Report by the Committee appointed by the Secretary of State in 1882 to consider the question of restoring the Madras Harbour.

This Report contains the opinions of the Committee on certain modifications in the measures recommended in their original Report of 23rd January 1883, which have been suggested by a Committee appointed by the Government of Madras.

With reference to the recommendation at page 5 of the Report, you will observe that the Committee are of opinion that any one of the methods of reconstruction proposed by them in their first Report may be safely followed, and that, after consulting you on the subject, they think that your advice may be taken by the Secretary of State, and I am accordingly desired by Lord Kimberley to request that you will furnish him with your opinion on this point.

I am to add that your position in connection with this work will be the same as it was before the letter of the 12th October last was addressed to you, and that your salary will accordingly be at the rate of 500*l*. per annum from the present date, it being understood that your engagement may at any time be determined on payment to you of the sum of 500*l*.

I have further to state that Lord Kimberley is inclined to think that it will be desirable for you to proceed to Madras, with the view of organizing arrangements for carrying out the works on the basis of the Committee's recommendation. I have to request, therefore, that you will furnish His Lordship with your opinion on this proposition, and state when you would be prepared to act upon it in the event of its being decided in the affirmative.

I am, &c.,
(Signed) J. K. Cross.

W. Parkes, Esq.

ENCLOSURE.

MADRAS HARBOUR.

P. W., 748.

23, Abingdon Street,
26th April 1884.

Sir,

I have the honour to acknowledge receipt of your letter of the 21st instant, accompanied by a copy of the Second Report of the Committee appointed by the Secretary of State in 1882 to consider the question of restoring the Madras Harbour.

2. Your letter renews my appointment as Engineer-in-Chief of the works on the same terms as existed before your previous letter to me of 12th October last, and for this I beg to express my thanks to the Secretary of State in Council.

3. The Report of the Committee has reference to some other proposals than those which form the subject of your present instructions to me, and with regard to these, and especially the question of the change of entrance, I think it only right to say that, after very careful consideration, I had independently arrived at the same conclusion as that submitted by the Committee.

4. With regard to the question especially referred to me, involving the first steps in the arrangements to be made for the resumption of work, I would remark that the matter has been somewhat complicated by the lapse of time and the various discussions which have taken place since the Committee presented their first Report in January 1883. Mr. Thorowgood was in England when the Committee had completed their investigations, and they communicated to him and to myself personally their general conclusions, but Mr. Thorowgood left for India before we had either of us an opportunity of perusing the report.

5. It was a not unnatural consequence of this that, in our subsequent independent consideration of the whole question, with the full text of the report before us, we should have been led in rather different directions in our ideas of forming a practical project within the limits allowed by the Committee. The divergence, slight at first, was emphasized, if not widened, by the consultations of the Committee appointed by the Madras Government, and, though the subsequent mutual explanations between Mr. Thorowgood and myself have shown that there is no essential difference of opinion between us, I feel strongly that it would be unsatisfactory for me to impose upon him a complete scheme of work without having given such full consideration to the reasons which had led him in a different direction as could only be given in personal conference.

6. The first thing to be done, therefore, is to arrange a meeting, and the question arises whether this would be better done by my going out to Madras, as suggested by the Secretary of State, or by summoning Mr. Thorowgood home for a full consideration of the whole question in England.

7. I will now submit, for your consideration, what I think are the superior advantages of the latter alternative.

8. It must be remembered that not a single block can be set in the breakwaters without new machinery, the original Titans having been completely lost. The modifications proposed in the sections will

1436/3
12

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7. I will now submit, for your consideration, what I think are the superior advantages of the latter alternative.

8. It must be remembered that not a single block can be set in the breakwaters without new machinery, the original Titans having been completely lost. The modifications proposed in the sections will

require modified machinery, and it is mainly as to the precise character of these modifications that further discussion is required. No orders for new machinery can be given till these points are settled, that is, if the conference takes place at Madras, till my return to England. If it take place in England, however, the most urgent points will be disposed of first, and action taken accordingly, while there would be in addition the great advantage of direct consultation with the manufacturers.

9. On the other hand, the local works that can be undertaken in anticipation of block setting are of a kind for which the organization is complete, and they can be very well carried on, during Mr. Thorowgood's three months' absence, under Mr. Beardmore. There is no change in the physical conditions since I left Madras myself two years ago, so that I have full materials for giving the necessary instructions for such works as are not dependent on the questions requiring further discussion.

10. It may perhaps be desirable that I should explain rather more in detail what are the questions requiring further discussion. It will be remembered that Sir John Hawkshaw's Committee suggested three sections (III., IV., and V.) as applicable to the restoration of the most seriously damaged portions of the breakwaters. Of these No. III. was put forward as that on which operations would probably be commenced, and the others were given rather to show in what directions modifications might be made if the difficulties of carrying out No. III. should prove so great as to warrant a change of system. The anticipated difficulties consisted mainly in the removal of the fallen blocks, of the time and cost involved in which it was impossible to make any reliable estimate.

11. The result of my further consideration of the matter was that it would be better to make no attempt at No. III. section, but at once to adopt No. IV. as the standard, though it might be necessary for some portion of the length to adopt No. V.

12. Mr. Thorowgood's conclusion, formed independently at Madras, was in agreement with my own, so far as the abandonment of No. III. section was concerned, but his inclination was towards adopting No. V. rather than No. IV. in substitution for it, and this inclination was developed into a definite recommendation by the Committee appointed by the Madras Government. Mr. Thorowgood himself, however, has since expressed his general concurrence in the suggestions I have made as to the mode of carrying out No. IV. section, and his perfect willingness to concur in its adoption.

13. When lately in conference with Sir John Hawkshaw and Sir John Coode, I found that they had already come to the same conclusion as myself, that the difficulties of manipulation were a serious objection to the adoption of No. V. section for any considerable length, though when once made it would be a safe and satisfactory structure; and it would appear to be specially to this that they allude in recommending the Secretary of State to take my advice, as quoted by you.

14. It may be taken, therefore, that my recommendation is that the breakwaters be restored in accordance with Sections I. and II. for the comparatively uninjured portions, and of Section IV. for those more seriously injured, and that the details of the *modus operandi* be settled in personal conference with Mr. Thorowgood.

15. I may mention that I have made a careful estimate of the cost of restoration upon this system, entirely independent of that of the Committee, based on my own quantities, and the rates at which similar work has hitherto been executed on the Madras Harbour works, and the total amount is 43 lacs of rupees. The Committee's estimate for the same scheme was 430,000*l.* based on rates of similar works elsewhere. I note their correction of my misunderstanding as to their rates being convertible into rupees at 10 to the £ sterling, but my estimate is quite independent of any such question.

16. It is possible that in going over this estimate with Mr. Thorowgood we may think it desirable to make some additions to the rates for future work, but the additions will not be serious, and I think it may be useful to put this forward at once as an approximate estimate with a view to correcting the false impressions which may have been created by the much larger estimates which have been put forward on no proper authority.

17. The considerations above submitted appear to me to justify my recommendation that Mr. Thorowgood should be summoned home for consultation with me rather than that I should myself go to Madras for the same purpose. I shall, however, be perfectly willing to adopt the latter course if the Secretary of State should be of opinion that there would be other advantages in my visit to Madras, which I do not myself at present see, but which would outweigh the saving of time and the more complete discussion which will be secured by Mr. Thorowgood's visiting England.

18. Should his Lordship decide on adopting my recommendation, I would ask that telegraphic instructions be forwarded at the earliest practicable time. During the interval, before Mr. Thorowgood's arrival, I will take measures for collecting the necessary materials for our consultations, and I will also communicate with Mr. Beardmore as to the works which he can proceed with on his receiving the necessary sanction from the Government of Madras.

I have, &c.,
(Signed) W. Parkes.

The Under Secretary of State
for India.

GOVERNMENT OF MADRAS

As under instructions from India the Chamber of Commerce have been asked to express their opinion in regard to the constitution of a Port Trust it is but fair that they should know the full extent of the responsibility which will devolve on that body:- We all know that Taylor & the Madras Committee, of which Thorogood was a member, are right and that if the Eastern Entrance is retained the first cyclone will knock the structure into a cocked hat and jetties or other landing conveniences will be useless in ordinary monsoon weather. I propose that we should wire to India that the Chamber have been asked to express their opinion in re creation of Port Trust and ask whether we may communicate the decision of the House

Yes. I think this should be done
MW

Govt: to keep the Eastern Entrance open as we consider they should be in possession of this information – If India says yes – I'd let the Chamber have copy of Taylor's letter and perhaps H.E. wd send a copy to the Secretary of State – I am pretty sure the Chamber will repudiate the idea of the Port Trust if the Home Govt do not give way as regards the entrance and as they seem bent on creating one at once this may perhaps secure the plan of the local Committee further consideration HEJ

10/5

GW
12/5

Madras Harbour

Hon. W. Master
The Rt. Honble. The Governor

GOVT. OF MADRAS. } 188 . { P. W. DEPT.

SECRETARY.

Ootacamund -
~~Chepauk~~, 30-5 1884.

OFFICE NOTE. 1436-37/16

To E. I.

Kindly favour me, at your earliest convenience, with an expression of your opinion upon the points connected with the Madras Harbour Restoration, dealt with in the papers attached to the accompanying letter from the Govt. of India No. 198 M. dated 17.5.84.

As matters stand, especially as Captain Taylor & Mr. Thorowgood are absent from Madras, I do not think it necessary to advise another meeting of the Madras Committee, but as you have acted on that Comtee. from the first, and are thoroughly cognisant of the grounds on which its two reports were based, it would be highly satisfactory to the Govt. to have before them an expression of

Madras Harbour

Honble. Mr. Master
The Rt. Honble. The Governor

Kp. Encl. [illegible]

GOVT. OF MADRAS. } 188 . { P. W. DEPT.

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~~Chepauk~~, Ootacamund - 30-5-1884.

OFFICE NOTE.

1436-37
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1430(37).

your views on the points dealt with.

In a confidential cover accompanying this, you will also find a letter on the subject addressed to Govt. by Captain Taylor before his departure from Madras.

30.5.84

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To W.

2/0 (1430) [illegible]

Note.

1430(37)
17

I quite agree in considering it unnecessary to call another meeting of the Committee under existing circumstances. The [illegible] Secy. of State has stated very clearly that the opinion of Sir J. Hawkshaw's Committee must be accepted as the final decision on the questions raised, and our Committee could hardly express themselves more strongly than they have done. The only chance of shaking the decision is to bring forward an overwhelming nautical opinion on the question of the harbour entrance.

It seems to me that sufficient weight has not been attached to the nautical opinions which accompanied our last report. We could hardly have better opinions than those of Captains of the largest steamers visiting the port, who have known the coast for years, and have watched the progress of the harbour from its commencement.

37

It is true that only some of the chief opinions, 7 in all, were given, but Captain Taylor states he could have collected hundreds, all in favour of closing the existing entrance & opening one on the north. Of the 7 given 4 consider the northern entrance would be as easy for ingress & egress as the present entrance, & 2 consider that there would probably be less difficulty in vessels beating to sea in bad weather – while all consider it will be a great advantage to close the present entrance. This is altogether in opposition to the axiom that 'in proportion as you seek greater stillness inside you have to obtain it by rendering access to and egress from the harbour less easy'.

The question of whether ships could safely ride out a cyclone in the harbour may be left to ship captains to decide – there is generally sufficient warning given to enable them to get to sea if they desire to do so. There can be no doubt

whatever that a ship in the harbour would have a much better chance in a cyclone if the eastern entrance were closed than if it were open. My own opinion (take it for what it is worth) agrees with that expressed by Colonel Trevor, and is, that if the swell and the breakers can be kept out of the harbour, a ship properly moored should be able to ride out a cyclone.

The capping of the piers from the shore was not considered essential by our Committee, the protection it would afford from wind during cyclones has certainly been overestimated by the Home Committee, for the full force of the cyclone is, I believe, never felt from the north or south; and if a vessel broke from its moorings in the harbour the risk would be as great with the piers raised as if they were submerged. Our Committee only thought that the capping might safely be omitted and its estimated cost be made available towards meeting the expense of ~~the~~ opening & protecting the new Entrance.

Mr Lemon says that Sir John Hawkshaw's Committee have not clearly understood the circumstances of the case from want of local knowledge. They say that last year they considered the question of forming a new Entrance at the South East Elbow, and reported against it, and they go on to say 'Though the Madras Committee say that the strongest winds are from the North-East, and though winds blow more as long from that quarter as from the South-East, they now propose a new Entrance fully open to these prevailing winds' – the argument, as I understand it, being, if the idea of ~~the~~ a Southern Entrance cannot be entertained, a fortiori, a Northern Entrance must be objected to. Now there is some misconception here, our Committee did not say the strongest winds were from the North-East, but the heaviest seas yet observed have invariably been from the North and North East,

and the North East wind does not, I believe, blow for more than 3 months of the year, the direction of the wind for the remaining 9 months being more or less Southerly.

The Southerly Entrance had been considered & objected to by our Committee as will be seen by a reference to our second report, and in our first report it is stated that the swell on the coast rolls in with the crests of the waves parallel, or very nearly so, to the coast line, and our 'protecting horn' was so arranged as to deflect the seas from the Entrance.

The objection to the new Entrance because 'there would, for a considerable time, be two Entrances' I do not think of any importance. I imagine the old Entrance might be closed & the new opened in the interval between two stormy seasons.

As regards the section to be adopted, I have no doubt of the wisdom of adopting the random block system which was strongly recommended by our Committee & which Sir John Hawkshaw's Committee considers may be adopted with safety. Mr. Parkes is apparently the only objector & I conclude that though ~~the firm may~~ ~~consider~~ Mr. Parkes is still the firm's advisers, the firm will not consider themselves bound to accept his advice on this point

Sir John Hawkshaw's Committee having allowed that 'the difficulty of entering & leaving the harbour by a ~~[illegible]~~ northern Entrance' is perhaps more a nautical than an Engineering question' ~~[illegible]~~ and that 'to secure stiller water inside the Harbour is desirable if attainable with due regard to other considerations' I think the nautical opinion which is very forcibly expressed by Captn Taylor might lead to a reconsideration of the decision of the Secy of State. If the capping to the piers from the shore is insisted on, it would increase

---

our Relative Estimate by (say) 3 lakhs.

No notice has been taken of Mr Molesworth's suggestion that the Sea face of the Breakwater should not have a greater slope than 1 to 1, but I conclude from the remark that the sections should be 'in no wise weakened by diminution of their dimensions or otherwise' that the Committee do not agree to it.

31/5/84.

Letter from the Govt. of India
dated 17.5.84
No. 198. M.
with enclosures.

1436/37
21

I have the honour to submit for orders draft of a reply proposed to be sent to above.

It did not seem necessary, especially in the absence of Captain Taylor & Mr. Thorowgood, to recommend another meeting of the Madras Committee; but I asked Colonel Hasted who has acted on that Com^tee throughout, to place his views on paper for the information of Govt.; and a note by him is circulated herewith.

V. Hawthorne

3.6.84

Nothing could be better
HW
3/6

~~39~~

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Send me this approved by MED

Para 7 of draft to India. Might it not be as well to note more clearly what Col. Hasted says about

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[illegible]

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the way the swell
on the coast rolls
in viz "with the
crests of the waves
parallel, or very
nearly so, to the
coast line" if, as
I presume to be the
case, this holds good
for both monsoons?

6/6

1438/37
22

~~40~~ 41

Special

Hon: H. E. Sullivan

Rt. Hon: the Governor

Hon: C. G. Master

SECRETARY TO GOVERNMENT P.W. DEPARTMENT
6 JUN 84

P.W.S. 7/5 Cir: 3/6

9th June/84, No. [illegible]

[illegible]

Civil Works

1436/37/23

Read the following papers:—

p 1

MADRAS HARBOUR.

JOINT REPORT OF SIR JOHN HAWKSHAW, SIR JOHN COODE, AND PROFESSOR STOKES.

Dated 12th March, 1884.

19 copies kept separately L.

54 20 94

Special

Hon: H. E. Sullivan

Rt. Hon: the Governor

Hon: E. G. Master

1438/37

SECRETARY TO GOVERNMENT
6 JUN 84
P.W. DEPARTMENT

4

P.W.S. 71/5 Cir: 3/6

9th June/84, No [illegible]

[illegible]

Civil Works

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P. W. DEPARTMENT

P.W.S. 71/5 Cir: 3/6

9th June/84, No 1436 Cir 1 Mr

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1436/37
24

LONDON,
12th *March*, 1884.

TO THE UNDER SECRETARY OF STATE FOR INDIA,
INDIA OFFICE, LONDON, S.W.

SIR,

MADRAS HARBOUR.

In obedience to instructions contained in a communication from the India Office, dated 6th of February last, copy of which is annexed, we have read and considered the papers forwarded to us and have now the honour to report our opinions on the modifications, suggested by the Madras Committee, of the plan we last year recommended.

2. The change suggested by the Madras Committee requiring the gravest consideration is their proposal to make a new entrance to the Harbour at its north-eastern elbow and to stop up the existing entrance. Their object in making this proposal is to secure stiller water inside the Harbour, a thing desirable in itself if attainable with due regard to other considerations, and they state that the work remodelled in this and in other respects as they recommend will cost much the same as the works advised by us in our report of the 23rd January, 1883.

3. The Madras Committee arrive at this conclusion of equality of cost by leaving out from their project the wave breaker on the south side, and the concrete cap on both sides of the Harbour, and appear to have assumed, though we are at a loss to know why, that we did not attach any very indispensably constructive value to this portion of our recommendation. They seem to have looked at our proposal to raise the piers by a concrete capping mainly as a question of waves spilling over them into the Harbour, though the

observation in our report was that raising the piers to the height we advised would add to the security of vessels within the Harbour in rough weather, and would greatly strengthen the work.

4- We cannot approve of further expensive works, the money for which is chiefly to be found by reducing the strength and efficiency of those recommended in our report of January 1883, which we now see no reason to abate.

5. It follows therefore, in our opinion, that the proposal to form a new entrance and to stop up the old one must be treated as an additional expenditure to that previously contemplated by us.

6. We have consequently estimated the cost of making the new entrance and of stopping up the old one; and taking the overlapping arm, as the Madras Committee show it, to be 600 feet long, which, in our opinion, would be the minimum length required, we make this additional cost to amount to £127,000. In considering the propriety of incurring such further expenditure, the following observations should be borne in mind.

The danger to vessels within the Harbour in a cyclone would arise from the winds as well as from the waves, probably more from the former than the latter, and we think that prudent commanders, on those occasions, would prefer getting out to sea to remaining inside the Harbour.

8- If the piers at the sides of the Harbour were left as low as is contemplated by the Madras Committee, they would in cyclones be nearly, and might be altogether, submerged, and vessels lying in the harbour would be floating in a receptacle brimful, or nearly so, of water, and exposed on the north and south to the full force of the cyclone. In such case, with submerged piers, vessels breaking from their moorings would in all probability be lost.

9- Though the piers raised to the height we have recommended, while strengthening the work, would afford some additional protection from the wind, we do not assume that even then it would be safe to remain in harbour during a cyclone. Mr. Dalrymple, late Master Attendant, Madras, who has had lengthened experience of that coast, and who favoured us with his views on the occasion of our former enquiry, was of opinion that nothing short of 18 feet above high water would be high enough for the piers, and we consider the height of 12 feet, which we have recommended, to be quite low enough. Hereafter, in special cases, should vessels be required to lie at loading places inside the Harbour and near the piers, screens or walls, say 6 feet high, increasing the total height above high water to 18 feet, could be erected, and might prove necessary to give further protection from wind.

10. In large harbours it may almost be taken as an axiom that in proportion as you seek greater stillness inside you have to obtain it by rendering access to and egress from the harbour less easy.

11- On the occasion of our enquiry last year we were informed that a new entrance to the Harbour had been suggested at the south-east elbow, and we then considered the question of changing the entrance, and reported against it.

12- Though the Madras Committee say that the strongest winds are from the north-east, and though winds blow twice as long from that quarter as from the south-east, they now propose a new entrance fully open to those prevailing winds.

13- It is, perhaps, more a nautical than an engineering question, but we fear that access and egress through this new entrance would, in cyclones, be very difficult, the difficulty increasing just in proportion as the entrance was made to face the north and diminishing as it faced easterly. Even with the north-easterly p 8

kant shown on the Madras Comm ttee's plan, vessels could not make or leave the Harbour wit ut being exposed to waves striking them on their beam, and t ding to heel them over, or to carry them into shoal water on sl re, or to cause them to strike against the end of the northern pie

14. With regard to the new entrance there is another consideration of some moment. The present entrance could not be stopped up until the new entrance was made, and there would, therefore, for a considerable time be two entrances, and during that period there would necessarily be greater disturbance in the Harbour.

15. With regard to the methods of reinstating the work, the Madras Committee appear to prefer the random block system. This is shown in our report of 23rd January 1883, by Cross Section No. 5. Though we did not give it a preference, we stated in that report that it possessed advantages and was a safe system to follow.

16. In framing that report we had to deal with a work which had been much more damaged in some places than in others, the extent of damage at some points not being very clearly ascertainable, nor capable of being determined until the work of restoration should be in progress; and hence we devised different methods of restoration.

p 9

17. Besides the objections we pointed out to the random block system, not perhaps very weighty in themselves, we were also influenced to some extent by difficulties of manipulation in that system.

18. On this subject we beg to remark generally that, referring to the three methods of reconstruction shown in our previous report, viz.:—

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1. According to Cross Sections 1, 2, and 3,
2. According to Cross Sections 1, 2, and 4,
3. According to Cross Sections 1, 2, and 5,

we consider that any of them may be adopted with safety, provided they are in nowise weakened by diminution of their dimensions or otherwise.

19. In considering the matters now referred to us we have had interviews with Mr. Parkes, who has explained to us his views. He sees some difficulty, as we did, in carrying out the system shown on Cross Section No. 5, and seems farther to be of opinion that he should prefer to adopt Cross Sections 1, 2, and 4. With regard to this question, we think you may be guided by Mr. Parkes with the clear understanding, so far as we are concerned, that nothing is done to weaken any of the works recommended by us, whichever of the methods be adopted, and that the piers be not built to a lower level than we have already advised.

20. The only question remaining to be dealt with is the important one of change of entrance.

21. We have already pointed out that the change of entrance would add £127,000 to the cost of what we consider to be necessary works. We think also that in cyclones there would be difficulty in getting into and out of the Harbour through the proposed north-eastern entrance, and if during a cyclone captains were not disposed to remain in the Harbour, and could not get their vessels out, it would be a serious matter. We have also mentioned that if a new entrance be formed, the Harbour will for some time be left with two openings instead of one, and will consequently be more disturbed. 11

22. We are still of opinion that the present entrance might with advantage be reduced to 450 feet, having walls vertical, or nearly

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so, on both sides of the entrance as we always contemplated, and see no reason to alter the opinion given in the last paragraph but one of our former report of the utility of the Harbour, if completed in accordance with our recommendations.

23- It must not be forgotten that whether the Harbour were completed with the present or with a new entrance, there are now no sufficient facilities within it for loading or unloading vessels; and if further expenditure is to be incurred, it is a question whether it would not be better to incur it in providing such facilities at or near the base or shore end of the Harbour, rather than in making a new entrance.

24- After giving the fullest consideration to this question, we cannot recommend the construction of the proposed new entrance.

25- In conclusion, we beg to call attention to the fact that in all the estimates we have made, whether in this or our previous report, we dealt with our own prices in English money only, and our prices were in nowise modified or increased (as Mr. Parkes seems to have inferred), by adopting his rates and converting them into sterling money at the rate of two shillings to the rupee. The conversion of our estimates into rupees must, therefore, be made at the current value of the rupee, whatever that may be.

We have the honour to be Sir,

Your very obedient Servants,

JOHN HAWKSHAW.
JOHN COODE.
G. G. STOKES

Enclosure 1436/37
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8p 14

INDIA OFFICE, S.W.,
6th February, 1884.

SIR,

With reference to the report prepared by yourself in conjunction with Sir J. Coode and Professor Stokes, dated 23rd January, 1883, on the subject of the steps to be adopted for the restoration of the Madras Harbour, I am directed to inform you that copies of that report were duly furnished to the Governments of India and Madras for their information and guidance.

Before taking measures for carrying out the work of restoration, it is necessary that certain important questions which have been raised in India should be definitely settled.

The Secretary of State in Council is accordingly desirous of receiving the opinion of the Committee of which you before were a member, upon certain modifications of the plan which they last year recommended, which have been proposed by a Committee at Madras and are generally concurred in by the Government of India, and I am directed to furnish you with the accompanying papers which will place you in possession of all the proceedings which have since occurred in India in connection with the subject.

The Committee will understand that they are at liberty to communicate with Mr. Parkes in respect to any points on which they may deem it advisable to obtain further explanations.

I am to add that, in view to the desirableness of coming to an early decision in the matter, the Secretary of State in Council trusts that the further enquiries now rendered necessary will be completed as soon as possible, and that the Committee will be able to limit their meetings so that the charges may be kept below the maximum amount named by Mr. Hayter in his letter to Mr. Danvers of the 24th January, 1884, namely, 450 guineas.

I am, Sir,
Your obedient Servant,
J. K. CROSS.

SIR J. HAWKSHAW.

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MADRAS HARBOUR.

Note on the Joint Report of Sir John Hawkshaw, Sir John Coode, and Professor Stokes, dated 12th March 1884.

The Joint Report makes no allusion to the notes made by Colonel Brownlow and myself, and there is nothing in this Report to induce me to modify the views I have expressed in my note of the 17th August 1883.

In that note I proposed a postponement of the raising the sides until further experience had been gained as to the necessity for the work, and I still think that course should be pursued. Nothing would be lost and much might be gained by such a course of action, as the work of reconstruction of the faces and elbows is that which is the most pressing.

In page 2 of the Report it is stated—

> "The danger to vessels within the harbour in a cyclone would arise from the winds as well as the waves; probably more from the former than the latter: and we think that prudent Commanders on those occasions would prefer getting out to sea to remaining in the harbour."

I entirely agree with this opinion; in fact my views have been already indicated in my note as follows:—

> "I must confess that I am somewhat sceptical of the absolute safety of vessels in Madras harbour during a cyclone, even under the conditions of having raised the face and elbows and closed the seaward entrance."

I may go still further and express my conviction that the capping would afford no protection against wind worth mention; and that even with this I consider it would be an act of madness for the Commander of any vessel to remain in the harbour during a cyclone. If the capping and wave breaker are to be added for wind protective purposes only, and not for constructive purposes, I think their construction will be a waste of money, as it is practically admitted that vessels cannot remain in the harbour during a cyclone.

The Report also states (page 4) that with the northern entrance proposed by the Madras Committee

> "vessels could not make or leave the harbour without being exposed to waves striking them on the beam, and tending to heel them over, or to carry them into shoal water on shore, or to cause them to strike against the end of the northern pier."

This agrees with the opinon I have already expressed in my note in the following terms:—

> "When a vessel is entering such a harbour, half protected by the entrance, and half exposed to the action of a heavy wave, it is liable to be swung round and strike the entrance before it can recover itself. This is a contingency to which modern vessels, from their extreme length, are especially liable."

The Report, however, makes no allusion to the alternative I suggested in my note (as shown in Diagram No. 4) with the view of meeting this difficulty.

The whole question, however, is, as the Report suggests, "more a nautical than an engineering; one," and I presume that the difficulty was considered by the nautical authority in the Madras Committee, and that it was preferred to face this difficulty rather than to incur the risk of narrowing the entrance. I would, therefore, repeat my previous recommendation on this point that

> "with regard to the alternative entrance from one side, I would advise that the question be referred to some eminent nautical authority in India, bearing in mind that a *concave face to the breakwater* is quite inadmissible."

No allusion has been made in the Report to the suggestion I made in my note of a modification of the section originally proposed by the Home Committee, although I pointed out that this section was, in my opinion, "open to the very serious objection of tending to break rather than to deflect the wave, and thus to set up a very destructive wave action.

We know so little of the possible ultimate force of cyclonic waves, that I am very strongly of opinion that every endeavour should be made to *minimise the wave action on the structure.*

With regard to this question, I annex some extracts from the opinion of Mr. Scott Russell, the highest authority on wave action.

It will be seen from these extracts that the *breaking* of the wave is "a formidable thing to attempt," and that the limiting angle for *reflecting* a wave is 45° or a slope of 1 to 1; whilst the section proposed by the Home Committee has a slope greater than 1½ to 1 for the blocks and nearly 4 to 1 for the rubble, which is clearly within the limits of wave action.

It is useless to argue that flat slopes have stood the effects of the waves at the English ports, for most of those ports are so landlocked that they are never exposed to any wave action at all approaching that of a *cyclonic* wave. They

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have in fact to deal with little more than the ordinary "oscillating" or surface waves which, as the extract shows are not the "deadliest enemies with which breakwaters have to contend."

The Alderney breakwater, which is more exposed than the majority of English breakwaters, has been constructed with slopes of 2 to 1, changing to more than 4 to 1, and it has suffered severely.

The French Engineers have acknowledged the soundness of the principles laid down by Mr. Scott Russell, and their more modern breakwaters are constructed with slopes of 1 to 1 on the seaward face.

I am of opinion, therefore, that this slope should be adopted for the Madras breakwater.

The Report considers that Government "may be *guided by Mr. Parkes*" with reference to the adoption of cross-section No. 4; but it makes no allusion to the difficulty to which I have drawn attention in my previous note respecting the irregularity of the *débris* of the original wall which

> "being in advance of the new wall would probably set up a very serious wave action, of which it is impossible to predict the results;"

and such an action ought, in my opinion, to be avoided.

The Report, moreover, states that Mr. Parkes sees some difficulty in carrying out cross-section No. 5 (Random blocks); but as it has not stated the precise character of that difficulty, I would suggest that its exact nature should be ascertained with the view of obtaining from Mr. Thorowgood a Report as to the practical value of the objection, and whether this difficulty may not be overcome.

In conclusion, I may say that I adhere to all the recomendations I have previously made in my note of the 17th of August 1883.

G. L. M.

19-4-84.

R. B. B.

20-4-84.

Secretary.

It strikes me that the distinguished authors of the Joint Report are under a very serious misapprehension as to the character of a cyclone. They talk of vessels going into and coming out of the harbour during a cyclone as if such a feat were easy of accomplishment with a sufficiently open entrance. As a matter of fact, it would be simply impossible for any vessel to make head against the wind and sea of these storms. If they wish to get out of the harbour to ride out the cyclone at sea, they must leave it at the

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first premonitory signs of its approach, which are generally unmistakeable. Once the storm has fairly set in, the ships then in the harbour must trust to their moorings and to them only for safety.

If the force of the waves rolling in from seaward be effectually broken by the breakwaters, and the water in the harbour be no rougher than the wind acting on its limited area could make it, I for my part fail to see altogether what special risks ships attached to secure moorings, with their top hamper lowered, would run from the wind alone.

It has been my lot to be in two cyclones in Calcutta and one at sea. The first cyclone in Calcutta did immense damage to the shipping, owing entirely, in my opinion, to the defective moorings. Numbers of ships broke loose and drifted up and down the river till they were sunk by collisons with others or were finally lodged on the banks. A larger number still were sunk at their moorings being cut down by the drifting vessels.

Before the second cyclone occurred the moorings had all been renewed, and though it was quite as severe as the first, the shipping scarcely suffered at all, though almost all the boats, as on the previous occasion, were destroyed. Wind alone won't sink a ship properly moored and in good trim, though heavy breakers without wind may. If then the breakers can be kept out of the harbour and proper moorings provided within it, every seaworthy ship should be able to ride out a cyclone in perfect safety.

What is wanted, therefore, for the Madras harbour is—

1st.—A form of entrance which will not allow the heavy rollers from the bay access to the interior in any weather.

2nd.—Sufficient height and strength of breakwaters effectually to do the same.

3rd.—Good moorings for the ships inside. If the entrance is also such that vessels may safely go in and out in all ordinary monsoon weather, I do not see that anything more is either wanted or attainable. But to achieve so much, I would not shrink from expending £200,000 or £300,000 additional. Safe harbours are as much a want of the country as improved internal communications, and as the Government grudges nothing spent on the latter, it should equally little grudge expenditure on the former, which are practically only places for the transfer of goods from land to sea carriage, and *vice versa, en route* to their ultimate destinations.

W. S. T.

21-4-84.

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MADRAS HARBOUR.

Extracts from remarks made by MR. J. SCOTT RUSSELL *(Min. Inst. C. E., Vol. XIX), page 653, 1860.*

* * * * Now, in deep water, there were not only the *oscillating surface waves* to be encountered, but also those which he had termed *waves of translation*, forming what were called rollers at the Cape of Good Hope, and when on a smaller scale, known as ground swell. These were a much more troublesome class of waves; it was mainly with them that the Engineer had to deal, in places open to the Atlantic: and after a storm of some duration at sea, they became the deadliest enemies, in the cases of deep water, against which breakwaters for harbours of refuge had to contend * * * * *.

To reflect, or send back the roller was the most effectual plan. For this purpose, nothing more was necessary than a deep perpendicular face of perfect masonry, and so long as it stood firm, it was faultess, and the water inside was smooth as in a millpond: for the reflection, really converted the whole effect of the roller on itself, into a simple pressure of water. When such a wave was reflected on a perpendicular wall, it merely produced a hydraulic pressure, equal to that due to little more than double its own height. * * * * An inclined wall, he had ascertained, would reflect a roller, or deep wave nearly as well as a vertical wall down to an inclination of 45°. This observation was of value, because at 45°, large blocks judiciously placed, would not move out of position, even although a considerable breach was made in the wall near them. He had carefully watched the action of the sea, when approaching this slope, and his opinion was favorable to the trial of a wall of heavy rubble blocks fairly laid, so as to form a tolerably even face, or slope of 45°, when the nature of the materials and the local circumstances would permit.

When any approximative attempt at reflection of the wave, by walls not *too remote from the vertical*, had to be abandoned, recourse must, generally be had to breaking the wave, *this was a formidable thing to attempt* on a deep-sea roller, and it could only be done by opposing mass to mass.

Govt. C. B. Press, Simla.—No. 37.—P. W. D.—24-4-84—50.

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India Office,
London, 24th April 1884.

Public Works,
No. 23.

To His Excellency The Most Honourable The Governor General of India in Council.

MY LORD MARQUIS,

Para. 1. On receipt of your Excellency's Public Works Letter, No. 59, of 13th November 1883, which forwarded a correspondence with the Madras Government relative to the engineering merits of the scheme proposed for the restoration of the Madras Harbour, I caused the subject to be again referred to the Select Committee who had been originally appointed to consider the subject, and requested that I might be furnished with their views on the modifications of the plan, recommended in their report of 23rd January 1883, which had been suggested by the Committee appointed by the Government of Madras.

2. Sir John Hawkshaw has, in the accompanying report, furnished me with an expression of the joint opinion of himself and his colleagues on the recommendations of that Committee, and after giving my careful consideration to the same in Council, I have come to the conclusion that the opinion now expressed must be accepted as the final decision on the questions raised.

3. The entrance to the harbour will accordingly be retained in its original position, and may be narrowed as recommended.

4. The side piers must be raised to the height of 12 feet above high water level, as originally recommended, and if loading places are provided in the manner suggested inside the harbour and near the piers, the necessity for raising them still higher will have to be considered.

5. With regard to the method of reinstating the work, your Excellency will perceive that the Committee have not pronounced definitely in favour of any one of the three systems mentioned in their original report.

2 D A

6. In accordance with the recommendation of the Committee, I have caused a reference to be made to Mr. Parkes on the subject. I forward herewith copy of a letter which I have accordingly caused to be addressed to him. After very carefully considering whether, in consequence of the partial failure of the works, it was expedient to remove Mr. Parkes from the position of Advising Engineer, I have come to the conclusion that his removal would not be justifiable, and I consider that it will be desirable for him to proceed to Madras, and there personally arrange the measures which it will be necessary to take for carrying out in the most efficient and economical manner the works now to be undertaken. I shall be glad to receive your Excellency's views upon this point after you have communicated with the Government of Madras.

I have the honour to be,
My Lord Marquis,
Your Lordship's most obedient humble Servant,
(Signed) KIMBERLEY.

P 1436/37/33

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ENCLOSURE.

P.W. 502/84.

India Office,
21st April 1884.

Sir,

I am directed by the Secretary of State for India in Council to forward herewith copy of a second Report by the Committee appointed by the Secretary of State in 1882 to consider the question of restoring the Madras Harbour.

This Report contains the opinions of the Committee on certain modifications in the measures recommended in their original Report of 23rd January 1883, which have been suggested by a Committee appointed by the Government of Madras.

With reference to the recommendation at page 5 of the Report, you will observe that the Committee are of opinion that any one of the methods of reconstruction proposed by them in their first Report may be safely followed, and that, after consulting you on the subject, they think that your advice may be taken by the Secretary of State, and I am accordingly desired by Lord Kimberley to request that you will furnish him with your opinion on this point.

I am to add that your position in connection with this work will be the same as it was before the letter of the 12th October last was addressed to you, and that your salary will accordingly be at the rate of 500*l*. per annum from the present date, it being understood that your engagement may at any time be determined on payment to you of the sum of 500*l*.

I have further to state that Lord Kimberley is inclined to think that it will be desirable for you to proceed to Madras, with the view of organizing arrangements for carrying out the works on the basis of the Committee's recommendation. I have to request, therefore, that you will furnish His Lordship with your opinion on this proposition, and state when you would be prepared to act upon it in the event of its being decided in the affirmative.

I am, &c.,
(Signed) J. K. CROSS.

W. Parkes, Esq.

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No. 5.

Public Works
24th April 1884.

Two copies of
Letter to the Govt of India
No. 23. & enclosure.

PW 3/4336/84

1 copy sent to
H.M. 15/5
with the Report

Print

No. 198 Mc.

1436/37/34 R 28

All communications should be addressed to the Secretary.

GOVERNMENT OF INDIA.

PUBLIC WORKS DEPARTMENT.

Civil Works.
Miscellaneous.

To,
The Secy to the Govt. of Madras
in the P.W. Department

Simla, 17th May 1884.

Sir,

In continuation of previous correspondence on the subject, I am directed to forward, for the information of His Excellency the Governor, the accompanying × copy of a Despatch and enclosures from Her Majesty's Secretary of State for India regarding the proposed scheme for the restoration of the Madras Harbour, and to request that the Govt. of India may be favored with

× No. 23 P.W. d/. 24th April/84.

24 an

an expression of the views of the Madras Government in the matter.— R.Ch. 4336

2.. Copies of notes on the Subject by the Consulting Engineer to Government of India for State Railways and the Secretary in this Department are also forwarded for information.— (4)

Red 23/5/84

I have the honor to be, Sir
Your most obedt. Servant,

Enc 3 (2 S.C. qn 185)

R.B. Buckley.

Offg Under Secy to the Govt. of India,

No. 1436/1437 W. of 9.6.84

G.G. No 780W. 23-3-82
" " 781W 23- " "
" " 1008 & 1009 W. 24-4-82
" 1675 & 1676W 3-7-82
" 1691 & 1695W 6-7-82
" 1989W — 5-8-82
" 1259W. — 30-4-83
" 1853W 4-7-83
" 1856W 4-7-83
2, 614. 9. 34/1815 W 4- " "
G.G. 2861 & 2862W 11-10-83
" 430 & 431W 16-2-84 orig
" 1056W. 25-4-84.

O.H.S. 7/5.

Confidential
Administrative Department.

No. 4354 1436/37 35

MADRAS,
Marine Office,
May 6th 1884

From
J. H. TAYLOR, Esq., Lieut., R.N.R.,
Master Attendant,
Administrative Department,
Madras,

To
The Honble E. Forster Webster
Chief Secretary to Government,
Marine Department,
Fort Saint George.

N 29

Sir,

I must beg leave respectfully to apologise for addressing Government on a point of which I have no official knowledge, but the reports of which have reached me from sources that seem reliable. I hear that the restoration of the Harbour of Madras is to be carried out with the omission of the one great alteration that will alone give any real value to it. I mean the closing of the Eastern entrance.

2 Smooth water, upon which the whole comfort of the interior and the only chance of improvement in interior arrangements depend, will never be obtained, and Madras will be condemned to perpetual inferiority as a harbour, after so much will have been spent upon it. I would, with deep respect, but all the urgency that language can convey, implore

His

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His Excellency in Council not to accept such a conclusion, until, at all events, the sense of the community has been sought, and its concurrence obtained. Every recurring storm, or presence of Cyclonic wave in the neighbourhood of Madras will repeat all the injuries that we witnessed on the occasion of the sea of November 1881. The sea that came through the East opening on that occasion destroyed the newly commenced low level jetties, wrecked all the lighters, and committed general havoc on the beach among all classes of boats, before the walls showed any disposition to fall. His Excellency the Governor may perhaps remember that I waited upon him about eleven o'clock to report upon the weather, and that I reported the walls secure, but the damage abovementioned committed. It was on my return to the beach that I was an eye witness of the very commencement of the work of destruction. The strongest portion of the walls, i.e each side of entrance of four blocks wide was the first to go, unmistakeably owing to the sea and current

rushing

rushing round them, and attacking on two faces at once. If this fearful blunder is not remedied now that an opportunity providentially offers itself, the last chance of a useful harbour for Madras is thrown away.

Jw

3 I know Mr. Thorowgood cordially endorses these opinions, though delicacy towards his chief interferes with their expression, but no sentiment ought to be allowed to interfere where such enormous public interests are concerned.

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4 I am also told that the East opening is adhered to from Nautical reasons. This is entirely opposed to fact. All Commanders of vessels, who have been consulted, and that includes nearly all that have visited Madras since the accident, approve entirely the alteration from every point of Nautical convenience. I submitted some of the chief opinions, but I could have collected hundreds, all giving testimony of the same nature.

5 The public are now committed to a tax, upon the understanding that they will have a sufficient harbour, but I distinctly dare to assert they will never have one worth the name or worth anything like the amount,

unless

unless smooth water is secured. Then all the conveniences of a Harbour will soon follow, and few ports be in a better position than Madras. If no lesson is to be learnt from the destruction before us, correction for the faults will fall upon the innocent public, who I respectfully submit should be invited in some way to express an opinion upon a point of such vital importance to their future interests. The question is not one of Engineering where the judgment of such men as Sir John Hawkshaw, Sir John Coode, &c is unassailable, but is one of observation and experience in a perfectly novel situation. Observation convinces all who were witnesses of the former accident that the East opening is a fatal defect, and all experience teaches us that the sand on this coast is not to be depended on for a single season for the support of regular work like the upright wall.

6 Public feeling will no doubt be strongly excited when it is generally known that the anxiously expected harbour is only an unsatisfactory compromise, and that without any appreciable saving in money, they will be called upon to abandon the prospect they have had of docks, jetties, and countless advantages, which the plan of the Madras Committee would have secured to the port.

7 I have marked this confidential, but of course that is only to secure the first consideration by Government. The facts will soon be patent and open to public controversy. I can write in officially if desired, and append the opinions of all my department.

I have the honour to be
Sir
Your most obedient servant

J W Taylor

Master Attendant
Administrative Department

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1486/37
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(188) Department.

From

The Master Attendant,
Administrative Department,
Madras,

To

The Chief Secy. to Government,
Marine Department,
Fort St. George.

No.

Dated
Received } 6th May — 1884

No. 4354

Subject.

Urging that the restoration of the Harbour at Madras be carried out with the closing of the Eastern entrance.

CHIEF SECRETARY
8 MAY 84
GOVERNMENT OF MADRAS

Enclosures

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Administrative Department.

No. 8607.

Madras,
Marine Office,
4th September 1883.

From

J. H. TAYLOR, Esq., Lieut., R.N.R.,
Master Attendant,
Administrative Department,
Madras.

To

The Honourable E. FORSTER WEBSTER,
Acting Chief Secretary to Government,
Marine Department,
Fort Saint George.

Sir,

I have the honour to forward, as desired, the opinions of Nautical men upon the proposed closing of the East entrance of the Harbour, and opening one to the North. The opinions are all strongly in favour of the plan, and are all by men of great experience and good position. I could of course continue the collection, but the result would be the same, while much valuable time would be wasted. There can be no doubt that the change would be good in every way, and the smooth water thus obtained, and the security offered by a wall, as recommended by the Madras Committee, appointed in G. O. Public Works Department, No. 1259 W., dated 30th April 1883, would be of incalculable advantage to the Port, and admit of immediate Beach improvements for landing and shipping.

I have the honour to be,
Sir,
Your most obedient Servant,

Master Attendant,
Administrative Department.

Peninsular and Oriental Steam Navigation Company,
S.S. "Parramatta,"
August 1st, 1883.

Captain J. H. TAYLOR,
Master Attendant, Madras.

Dear Sir,

I have read with much interest the reports of the local and home Committees on the reconstruction of the Harbour of Madras, with which you were good enough to furnish me, having had considerable personal experience of the port for upwards of thirty years.

On the particular point upon which you wish for my opinion, namely, the closing of the present entrance to the Harbour, and the opening of one in the North-east angle of the North arm, so far from seeing any objection to it, I think it will be a positive advantage, as in my opinion it will be equally easy of ingress and egress with the present one, and will give a larger area of deep water for mooring large vessels, and will I think under all conditions render the water inside the Harbour much smoother than it ever is at present. I return the reports herewith with many thanks and remain

Dear Sir,
Yours faithfully,
(Signed) ARTHUR E. BARLOW,
Commander, P. & O. S. S. "Parramatta."

8/p 34

(188) DEPARTMENT.

From

THE MASTER ATTENDANT,
ADMINISTRATIVE DEPARTMENT,
Madras,

To

THE CHIEF SECY. TO GOVERNMENT,
MARINE DEPARTMENT,
Fort St. George.

No.

Dated 6th } May — 188~~4~~
Received

No 4354

Subject.

Urging that the restoration of the Harbour at Madras be carried out with the closing of the Eastern entrance.

CHIEF SECRETARY
8 MAY 84
GOVERNMENT OF MADRAS

Enclosures

1436/87
39

8/33

Administrative Department.

No. 8607.

MADRAS,
MARINE OFFICE,
4th September 1883.

From

J. H. TAYLOR, ESQ., LIEUT., R.N.R.,
Master Attendant,
Administrative Department,
Madras.

To

THE HONOURABLE E. FORSTER WEBSTER,
Acting Chief Secretary to Government,
Marine Department,
Fort Saint George.

SIR,

I have the honour to forward, as desired, the opinions of Nautical men upon the proposed closing of the East entrance of the Harbour, and opening one to the North. The opinions are all strongly in favour of the plan, and are all by men of great experience and good position. I could of course continue the collection, but the result would be the same, while much valuable time would be wasted. There can be no doubt that the change would be good in every way, and the smooth water thus obtained, and the security offered by a wall, as recommended by the Madras Committee, appointed in G. O. Public Works Department, No. 1259 W., dated 30th April 1883, would be of incalculable advantage to the Port, and admit of immediate Beach improvements for landing and shipping.

I have the honour to be,
Sir,
Your most obedient Servant,

Master Attendant,
Administrative Department.

PENINSULAR AND ORIENTAL STEAM NAVIGATION COMPANY,
S.S. "Parramatta,"
August 1st, 1883.

CAPTAIN J. H. TAYLOR,
Master Attendant, Madras.

DEAR SIR,

I have read with much interest the reports of the local and home Committees on the reconstruction of the Harbour of Madras, with which you were good enough to furnish me, having had considerable personal experience of the port for upwards of thirty years.

On the particular point upon which you wish for my opinion, namely, the closing of the present entrance to the Harbour, and the opening of one in the North-east angle of the North arm, so far from seeing any objection to it, I think it will be a positive advantage, as in my opinion it will be equally easy of ingress and egress with the present one, and will give a larger area of deep water for mooring large vessels, and will I think under all conditions render the water inside the Harbour much smoother than it ever is at present. I return the reports herewith with many thanks and remain

Dear Sir,
Yours faithfully,
(Signed) ARTHUR E. BARLOW,
Commander, P. & O. S. S. "Parramatta."

8/34

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MADRAS,
STEAM SHIP "SHANNON,"
PENINSULAR AND ORIENTAL STEAM NAVIGATION COMPANY,
5th August 1883.

CAPTAIN J. H. TAYLOR, R.N.R.,
Master Attendant, Madras.,

DEAR SIR,

I have read with much interest the papers relating to the Madras Harbour, and having closely studied the plans, I have come to the conclusion that the plan proposed for its reconstruction by the Committee of June, 1883, is the very best that can be undertaken, and, that while giving larger accommodation for shipping than ever before, it will ensure what was deficient in the old scheme—viz., shelter and protection in Cyclonic weather.

For obvious reasons the new entrance must be to the Northward; and there can be no question about closing the present one.

I would venture to suggest that there should be no stint in the Protecting arm for the new entrance, and that it should be carried out more Northerly than Westerly.

I beg to remain, &c.,
(Signed) J. S. MURRAY,
Commander of the "Shannon."

B. I. S. N. COY.'S S.S. "DACCA,"
MADRAS, *10th August* 1883.

CAPTAIN TAYLOR,
Master Attendant.

SIR,

I have looked over the plan for reconstructing the Madras Harbour, and think it an excellent idea closing up the present entrance, and having the new one at the North-East corner, and when the wall of the break-water is built higher, we ought to have perfectly smooth water. The Harbour ought also to be able to give accommodation to several more steamers, and I dont see why it should not be able to give protection to ships in case of a Cyclone, in fact, the present plan is the first which has caused me to believe in the utility of a Madras Harbour.

I am Sir,
Yours obediently,
(Signed) W. A. BURKITT,
Master S.S. "Dacca."

MADRAS,
PENINSULAR AND ORIENTAL
STEAM NAVIGATION COMPANY,
S.S. "Kaisar-i-Hind,"
August 14th, 1883.

CAPTAIN J. H. TAYLOR,
Master Attendant, Madras.

DEAR SIR,

I have looked over the plans for the reconstruction of the Madras Break-water, and most certainly think the closing up of the present entrance, the very best that could be done, and the only plan by which smooth water can be looked for inside the Harbour which would then have greatly increased accommodation for more vessels, and with perfect safety.

The Northern entrance would be quite as easy of ingress and egress, and to steamers preferring putting to sea on an approaching Cyclone, have perhaps less difficulty in getting out, than through the present entrance with possibly a gale of wind from North blowing full on her broad side.

I am dear Sir,
Yours faithfully,
(Signed) E. G. STEAD,
Commander S.S. "Kaisar-i-Hind."

B. I. S. N. COY.'S STEAM SHIP "BOOLDANA,"
MADRAS, *15th August* 1883.

To

CAPTAIN J. H. TAYLOR,
Master Attendant,
Administrative Department, Madras.

SIR,

With reference to your request for my opinion regarding the proposed alteration in the Madras Harbour, I am of a most decided opinion, that the only way in which smooth water and increased accommodation for shipping can be obtained is by closing the present entrance and making a new one at the outer end of the North Pier. I cannot see why an entrance there should not at all seasons be as accessible as the present one.

The arm to protect the Northern entrance I think, should be curved like an arm towards the shore to protect the entrance from the North-East sea, as much as possible, without interfering with the navigation.

My experience of the Coast is twenty years in the British India Steam Navigation Company's Service.

I have the honor to be,
Sir,
Your most obedient Servant,
(Signed) R. S. TURNER,
Commander S.S. "Booldana."

MADRAS,
1st September 1883.

CAPTAIN J. H. TAYLOR,

DEAR SIR,

With regard to the reconstruction of Madras Harbour, I beg to state that in my opinion to ensure dispatch in working cargo and also safety in Cyclonic weather, it is absolutely necessary that the present entrance should be closed, and a new one opened, from local circumstances this must be at the North side, with a protecting arm. This would give room for more vessels, and if the Break-water be raised as proposed give safety in a Cyclone, vessels often being unfit to go to sea on short notice given.

I am,
Dear Sir,
Yours truly,
(Signed) J. DUFF,
S. S. "Duke of Sutherland."

28A

Peninsular and Oriental Steam Navigation Company,
S.S. "Carthage,"
4th September 1883.

Captain J. H. TAYLOR, R.N.R.,
Master Attendant, Madras.

Dear Sir,

I am obliged to you for a perusal of the plans now under consideration for the reconstruction of the Madras Break-water.

The proposed alteration of the entrance from its present position to the North-East angle of the Northern arm commends itself to my judgment.

The advantages gained by this change will, I think, be:

Smooth water inside the Harbour.

Increased moving space.

Less liability to accident to vessels entering or leaving the Harbour.

Probably less difficulty to vessels putting to sea in bad weather.

Marine Department.

PROCEEDINGS OF THE MADRAS GOVERNMENT.

1436/37
41

Read the following

Letter from the Master Attendant, Madras, D 6 May 1884, No. 4354

p 39

Order. D/ 14th May 1884. No. 203 Mis

Ordered that the following telegram be despatched to the Govt. of India, Dept. of Finance Commerce.

"Madras Chamber of Commerce have been asked to express their opinion in re creation of port trust. May this Govt. communicate the decision of Home Govt. to keep the Eastern entrance open. We consider they should be in possession

of

of this information?

1438/37
42

G.O's Nos 780 W d-23-3-82
" " 781 W d-23-3-82
" " 1098 W d-24-4-82
" " 1009 W d-24-4-82
" " 1675 W d 3-7-82
" " 1676 W d-3 7-82
" " 1694 W d-6-7-82
" " 1695 W d-6-7-82
" " 1989 W d-5-8-82
" " 1856 W d-4-7-83
" " 2662 W d 22-9-83
" " 2861 W d 11-10-83
" " 2862 W d-11-10-83
" " 430/431 W d 16-2-84
" " 1056 W d-25-4-84
" " 1259 W d 30-4-83
" " 1259 W d-30-4-83
" " 1855 W d-4-7-83
" " 34/1855 W d 4-7-83

Port Trust
& Madras harbour

SECRETARY TO GOVERNMENT
16 MAY 84
DEPARTMENT MADRAS

quote p 40

~~Read again G.O. No. 203 Mis., 14 May, 1884.~~

Order:- No 209 Mis

These papers will be transferred to the Public Works department.

Chief Secretary.

16 May/84

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33

I pointed out to the Chief Secretary that the Master Attendants letter of 6th Current should have been transferred for disposal in the P. W. Dept. This he fully admitted, & said it was owing to an error in his Office that the transfer had not been made before Circulation of the paper -

16.5.84

P. W. C. No. 4800

From Marine dept

16 MAY 84

No. 1436/1437 wd/9-6-84

No. 209 Mis

Dated 16 May/84

Received 9 June/84

Enclosures 2-3

SUBJECT.

Madras harbour Entrance

1436/1437

For

Civil Works

PUBLIC WORKS DEPARTMENT.

No. 1436

1436/37

PROCEEDINGS OF THE MADRAS GOVERNMENT.

UNDER date the 9th June/84

READ the following

(3) Joint Report of Sir John Hawkshaw, Sir John Coode, and Professor Stokes d/ 12th March 1884.

(4) Notes on — do — do —

(2) Despatch from the Secretary of State to the Governor General of India in Council d/ 24th April/84.

(1) Letter from the Govt. of India P. W. Dept. No. 198 M d/ 17th May 1884.

(5) Letter from the Master Attendant, Madras, No. 4354 d/ 6th May 1884.

(6) Proceedings in the Marine Dept. No. 209 d/ 16th May 1884.

~~41~~ 42 p 41

Ordered that the

Govt. of India be
addressed.

(H.C. No. 1437 W d/ 9th June /84)

3-6-84

Orders to [illegible]

The Marine Dept. with
copy of letter to the
S. of S.

Serial spare copies despd 19/6/84

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13 KW
Civil Works

Public Works Dept.

No. 1437 W d/ 9th June

To,

The Secretary to the Govt. of India.

P. W. Department.

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K 42

Sir,

I am directed to acknowledge receipt of your letter dated 17th May 1884 No. 198 M, with which is forwarded copy of a despatch and enclosures from Her Majesty's Secretary of State for India respecting the proposed scheme for the restoration of the Madras Harbour, and in which you request that the Govt. of India may be favoured with an expression of the views of this Government in the matter.

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2. The three points specially

dealt with in the papers now under acknowledgment are

(1) The position of the entrance to the harbour, together with its shape and width.

(2) The protection to be given to the sea face.

(3) The officer under whom as Chief Executive authority the restoration of the harbour is to be proceeded with.

3. With respect to the first point, I am to state that H.E. the Governor in Council still remains strongly of opinion that the entrance should be placed at the north east angle of the harbour, in from 7 to 7½ fathoms of water, as recommended by the Madras Committee, and that it should have a width of 500 feet.

4. As bearing on this point, it appears to this Government that sufficient weight has not been attached to the unanimous opinions of nautical experts on the spot, copies of which were forwarded to you with my letter dated 11th October 1883 No. 2862 W. It is admitted by Sir John Hawkshaw's Committee that the question of access and egress through the proposed new entrance is "more a nautical than an "engineering question". That it is emphatically a nautical question scarcely admits of doubt, and on this point the nautical authorities who have been consulted are singularly unanimous. In a letter dated 6th May No. 4354, copy of which accompanies this, and to which

In paragraph 11 of their last report, they state that during 1883 they considered the question of forming a new entrance at the south east elbow, and reported against it; and in paragraph 12 they continue, "Though the Madras "Committee say that the strongest winds are from the north-"east, and though winds "blow twice as long from that "quarter as from the south-"east, they now propose a "new entrance fully open to "those prevailing winds." The argument being apparently that, if a southern entrance cannot be entertained, *a fortiori* a northern entrance must be objected to still more strongly.

7. With advertence to this, I am to point out that, the Madras Committee did not say the strongest winds were from the north east, but "the heaviest "seas yet observed have invariably been from the north "and the north east." As matter of fact, the wind does not at Madras blow from the north and northeast for more than four months of the year, from October to February, the direction of the wind during the remaining eight months being more or less southerly.

× The direction of the wind, however, seems to have little effect on the swell, which rolls in with the crests of the waves parallel, or nearly so, to the coast line, with the result that seas enter the present mouth freely and do not disperse before reaching the shore at the base of the harbour. Those seas would be deflected from a North East entrance by the proposed protecting horn.

8. A further objection to the north east entrance raised by Sir John Hawkshaw's Committee is (para 14 of report) that "there would for a "considerable time be two "entrances;" but I am directed to state that this Government

In paragraph 11 of their last report, they state that during 1883 they considered the question of forming a new entrance at the south east elbow, and reported against it; and in paragraph 12 they continue, "Though the Madras "Committee say that the strongest winds are from the north-east, and though winds "blow twice as long from that "quarter as from the south-east, they now propose a "new entrance fully open to "those prevailing winds." The argument being apparently that, if a southern entrance cannot be entertained, a fortiori × a northern entrance must be objected to still more strongly.

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8. A further objection to the north east entrance raised by Sir John Hawkshaw's Committee is (para 14 of report) that "there would for a "considerable time be two "entrances;" but I am directed to state that this Government

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special attention is solicited, the Master Attendant of Madras states, "All commanders "of vessels who have been "consulted, and that includes "nearly all that have visited "Madras since the accident, "approve entirely the alteration "from every point of nautical "convenience." Capt. Taylor adds "I submitted some of the "chief opinions, but could have "collected hundreds, all giving "testimony of the same nature."

5. I am directed to again solicit attention to those opinions, and in doing so to point to the fact that they represent the views of experienced men, — commanding the largest steamers visiting the port, — men who have known this coast and these seas for years, and who have watched the progress of the Harbour works from the beginning. If there be any more competent nautical authority, thoroughly conversant with the somewhat complicated local conditions and with the nature of cyclonic storms, I am to state that His Excellency in Council earnestly requests that the question at issue may be referred to such authority, before it is irrevocably decided.

6. In further connection with this point, I am directed to observe that Sir John Hawkshaw's Committee appear to have misapprehended the circumstances, from want of the necessary local knowledge

In paragraph 11 of their last report, they state that during 1883 they considered the question of forming a new entrance at the south east elbow, and reported against it; and in paragraph 12 they continue, "Though the Madras "Committee say that the strong-"est winds are from the north-"east, and though winds "blow twice as long from that "quarter as from the south-"east, they now propose a "new entrance fully open to "those prevailing winds." The argument being apparently that, if a southern entrance cannot be entertained, a *fortiori* * a northern entrance must be objected to still more strongly.

7. With advertence to this,

I am to point out that the Madras Committee did not say the strongest winds were from the north east, but "the heaviest "seas yet observed have invaria-"bly been from the north "and the north east." As matter of fact, the wind does not at Madras blow from the north and northeast for more than four months of the year, from October to February, the direction of the wind during the remaining eight months being more or less southerly.

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The direction of the wind, however, seems to have little effect on the swell, which rolls in with the crests of the waves parallel, or nearly so, to the coast line; [illegible] seas enter the present mouth freely and do not disperse before reaching the shore at the base of the harbour. These seas would be deflected from a North-East Entrance by the proposed protecting horn.

8. A further objection to the north east entrance raised by Sir John Hawkshaw's Committee is (para 14 of report) that "there would for a "considerable time be two "entrances;" but I am directed to state that this Government

do not attach much weight ~~to it~~ thereto, inasmuch as the old entrance could probably be closed, and the new one opened, during the interval between two stormy seasons.

9. After most carefully considering all that has been urged against the proposed new entrance, His Excellency the Governor in Council adheres strongly to the opinion he has already recorded in favour of it. He considers that the retention of the eastern entrance will involve the loss of the greater part of the advantage which Madras might otherwise confidently expect to obtain from the harbour, - and that it will

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also in all probability involve heavy and ever recurring outlay to repair storm damages. And I am directed to add that this opinion is in no way contingent upon the decision that may be arrived at with respect to the necessity for providing the South arm of the harbour with a wave-breaker. If such provision can be dispensed with, as recommended by the Madras Committee, the new entrance can probably be opened within the sum (£ 480,000) named by Sir John Hawkshaw's Committee; but if otherwise, this Govt. are of opinion that the additional outlay

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estimated by the same body at £ 127,000, – must be incurred in view to the efficiency of the harbour and the security of vessels lying therein.

10. The question of whether ships could safely ride out a cyclone in the harbour may, in the opinion of this Govt., be left to be decided by the Commanders of such vessels. In most cases, sufficient warning is given of the approach of a cyclone to enable vessels to get to sea, if they desire to do so; ~~and~~ but it is impossible to entertain doubt that a vessel in the harbour would have a much better chance during

1436/37

I suggest the following addition

entrance were closed, than if it were open.

It should moreover be remembered that the main object of the harbour is not to provide a refuge for vessels during the brief period of cyclonic storms, but to secure smooth water for landing and shipping operations in ordinary weather, and to protect the jetties and other appliances necessary thereto from the destructive effects of a cyclone to which they are liable so long as they are exposed to the direct influence of the sea from the East. Every convenience of this port was wrecked in 1881, ~~and~~ unless the proposal to close the Eastern entrance is accepted, it will be useless to attempt their reconstruction.

I agree

11. Respecting the proposal to reduce the width of the present eastern entrance to 450 feet, which is renewed by Sir John Hawkshaw's Committee in para: 22 of their late report, I am directed to observe that this too is more a nautical than an engineering question, and that the weight of local nautical opinion has been recorded strongly against the proposal. Upon this point I am to refer to paragraphs 25 to 27 of the Madras Committee's first report. With that opinion on record, His Excellency the Governor in Council must continue to object

to the proposal.

12. With respect to the second point dealt with in the papers under acknowledgment, namely, the section to be given to the sea face of the harbour, I am directed to state that His Excellency the Governor in Council greatly prefers the third of the methods of reconstruction quoted by Sir John Hawkshaw's Committee in paragraph 18 of their report, namely, the random block-work system. Its adoption was strongly recommended by the Madras Committee, and as Sir John Hawkshaw's Committee consi that it may be adopted with safety, it is hoped by this Govt. that all object will now be removed.

p 48

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13. With respect to the third point, namely, the Chief Executive authority under which the restoration of the harbour is to be carried out, I am directed to draw attention to paragraphs 10 and 11 of General Sankey's letter under date 4th July 1883, No. 1856 W, where the opinion on this important matter of His Excellency the Governor in Council is stated clearly and unmistakeably; and I am to say that His Excellency has seen no reason for modifying that opinion.

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3.6.84

G. E. S.

25 S.C. of the Order &c
25 do of the Letter } Desp. 19/6/84

1486/37
152

F.C
a 1618-9 h 27.6.82.
a 1517 h 18.6.82
a 1554 h 20.6.82

Urgent

[illegible]

Letter to be signed by the

6.6.84

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7.C
a 1618-9 h 27.6.82.
a 1517 h 18.6.82
a 1554 h 20.6.82

4800, 480
4a

Govt. of (1884) Madras.

PUBLIC WORKS.

Dated

Recd.

Recd.

G.O., 9 June 1884, No. 1436 W
1437 W

Madras Harbour

Advert that the letter from the Govt of India calling for the views of this Govt on certain points ~~respecting~~ connected with proposed scheme for the restoration of the — be replied to.

Madras Harbour

Expressing ~~the views of this Govt~~ opinion on certain points ~~respecting~~ connected with proposed scheme for the [illegible]ration of the

6.84