Archives 1—10,000—5-10-76.

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(2) Date of repair 10·11·86.

(3) Initials of the Referencer

TAMIL NADU ARCHIVES

OVERNMENT OF TAMIL NADU

PUBLIC WORKS DEPARTMENT

G.O. No.
B.P. No. 657-58-59. Press.
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GOVERNMENT OF MADRAS.

PUBLIC WORKS DEPARTMENT.

5th March 1879, No. 657 W.

Buildings and Roads.

Civil Works.

Read the following paper :—

No. 44. From W. PARKES, Esq., M. Inst. C.E., Engineer-in-Chief, Madras Harbour Works, to the Acting Secretary to Government, Public Works Department, (Buildings and Roads), dated Madras, 25th February 1879, No. 7 W.

Having, since my arrival in Madras on the 12th January last, submitted to the Government three reports, the first dated 24th January on the expenditure on the Harbour Works up to 31st December last, the second dated 15th February on the diversion of the town sewage from the Harbour, and the third dated this day on the changes of the shore line north and south of the Harbour, it now only remains for me, before my departure, to submit to you the result of the personal observations I have made during my stay as to the present state and prospects of the work.

2. One main object of my present visit was to have the opportunity of witnessing the actual progress of the works during the most favorable season. It is only by this means that I am enabled to judge of the efficiency of the organisation in its several parts, and how far the prospects which I have from time to time submitted to the Government are likely to be realised.

3. It is not to be expected that a work of this magnitude can be carried out in strict accordance with a previously prepared specification. To insist upon this would be to discard the advantages of the practical local experience gained as the work progresses. But it is at the same time desirable to keep in view not only the ultimate object of the works, but certain broad features of the means by which that object is to be attained, and not to be hastily led away from these by the apparent advantages offered by some modification which may at the same time introduce evils likely to escape observation in any but a comprehensive review of the whole question.

4. It is in the settlement of such questions as these that the occasional personal communication between the Superintendent as the possessor of the greater amount of local information and experience and myself as the original organiser of the works is important. Unless however the result of our conferences be to introduce any important change in the arrangements of the work, they afford little material for special report to the Government.

5. I have only to report therefore that after having made a careful examination of all departments of the work, I am satisfied that they are all in a fairly efficient state. I do not consider that the full attainable speed of work has ever yet been reached, and probably it never will be maintained for any great length of time, for the several parts of the organisation which have to be brought into work together are more numerous and complicated than is at first sight apparent, and the failure of any one will affect the whole.

6. It is only since my arrival at Madras that one important operation has been brought into full action, viz., the deposit of stone for the rubble base from the steam hopper barges *Salisbury* and *Hobart*, though the latter has been temporarily disabled and is now under repair. It is satisfactory to find that these vessels are quite equal to the work which was expected of them, although our better acquaintance with the local circumstances has led us to adopt a plan of loading them different from that originally contemplated.

7. As the work advances into deeper water a much larger proportion of rubble stone will be required for a given length of pier, and their full powers will be taxed to keep it supplied, but on the other hand the shelter afforded by the piers will be more complete and the work therefore more regular. When the water is fairly calm, the vessels lie alongside the face of the concrete blocks easily, and are loaded by coolies carrying stone from the Madras Railway trucks standing on the pier itself.

8. The supply of stone from the Ambatoor quarries on which we must depend for the great bulk of our rubble base is in the hands of the most competent contractor in the neighbourhood on terms which, though not excessive, will give him no excuse for not pushing on the work with energy, and I am bound to say that so far no complaints have been made. The present rate of supply however about 1,120 tons per day will have to be increased by 50 per cent., but there is a large area of quarry ground as yet untouched.

9. The Madras Railway Company also perform their part of the work in the transport of the stone with fair regularity.

10. The rubble base for the south pier is mainly formed by the deposit from the steam hoppers, but the top has to be levelled by stone carried out by cargo boats or thrown in from the top of the Titan or from the pier itself. This stone is more conveniently supplied from Pallaveram and brought by the South Indian Railway, but at the present time great complaints are made of the irregularity of the stone trains on this line, and this irregularity has latterly retarded the progress of the south pier by 25 per cent. I hope however that the evil is only temporary.

11. This is only an example of the kind of friction which acting on one part or another of the machine retards its motion in a way that cannot be calculated on. If there were nothing to do but to set blocks as fast as they can be set, the rate of progress would exceed any anticipations that have been expressed in any quarter. As the natural obstacles caused by sea disturbance and accumulation of sand are surmounted, those due to inevitable imperfections of organisation become more prominent. Some allowance must be made for these to the end of the work, but as it progresses the weak parts of the organisation will be strengthened, and the rate of progress be less and less retarded.

12. The north pier is now 1,481 feet from the commencement of the block work, and there remains 2,480 feet to complete it. The south pier is 923 feet, and there remains 3,080 feet. Apart from interruptions 200 feet per month is a rate of advance quite attainable, but allowing 150 feet as the average rate for ten months of the year, and entire stoppage for two, it would result that the north pier may be completed in September 1880, and the south in March 1881.

13. There are some suggested possible obstacles to the realisation of this prospect of completion as to which it is desirable that I should offer some remarks. It is said that we have had no experience of the effect of such a sea as is raised within the actual limits of a cyclone, and that this may turn out to be very destructive. It would be presumption to deny that such an event may produce unexpected results, but I think there are circumstances which tend to reduce the limits of uncertainty to

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within what they would appear to be at first sight. First the difference in the destructive power of a cyclone sea, and that of the propagated swell which we have experienced on more than one occasion, and notably in December last, must not be measured by the difference in the destructive power of the cyclone itself with its furious wind and torrents of rain on shipping and objects on shore, and that of a simple rolling swell in the roads, and a heavy surf on the beach. Wind and rain can have no direct effect on the Harbour piers however much they may intensify the apparently irresistible fray of a storm.

14. It is certain that the sea disturbance is propagated more quickly, and to a greater distance from the centre of a cyclone than the atmospheric disturbance, and therefore the only conclusion that can be drawn is that the propagated swell has a force more nearly equal to that of the central sea disturbance than is the case in regard to the atmospheric disturbance.

15. Again, it is the experience of all Engineers of marine works in England that the swell preceding or propagated from a storm at some distance is more destructive than the sea raised under the direct influence of the wind, and it is a fair inference that the same rule would hold good in India.

16. Further, there is a large margin of stability in the works as carried out with the full depth of foundation 24 feet below mean sea-level over any force they have yet had to resist either here or elsewhere. The slight disturbances that have taken place where this depth was not attained confirmed former experience of the value of deep foundations. This and the size of the blocks and the mode of packing them together are elements of strength which do not exist in any of the sea works the damage to which furnishes the most useful lessons.

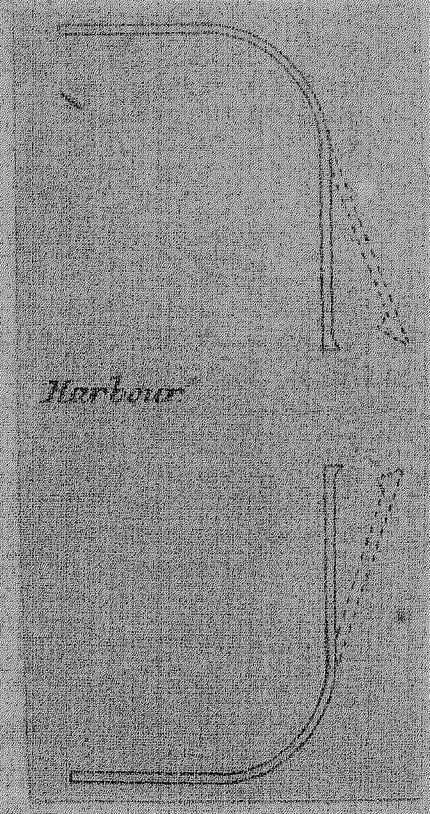
17. On the whole therefore while fully admitting that a repetition of one of the great historical cyclones may exhibit results of an unexpected kind, I am bound to contend that such a lesson is required to teach us where we can apply additional strength. So far as the present experience of Engineers goes we are armed at all points. There is one case on record, that of Wick in the North of Scotland, where a mass of masonry 45 feet wide was bodily displaced by the sea, and the sea has in that case so far remained the acknowledged victor. But the case is entirely exceptional, and to take it as a precedent would be to condemn many works of well tested stability. The Madras piers are only 24 feet wide, but the difference of conditions in other respects is more than a balance for the less width.

18. I think this is the only suggested cause of failure in the completion of the works which has not already been negatived by the event. The accumulation of sand over the foundations which was so troublesome at the north pier in 1877 was repeated in 1878 at the south pier, but its entire absence at the north pier in the latter year was a good ground for the anticipation that it would be also only temporary at the south pier. It will however be a satisfaction to find that there is no return of the trouble in the approaching monsoon.

19. The accumulation extended a considerable distance from the pier and had intruded upon the available deep water in November last to the extent of 6 acres beyond the four fathom line of the previous February. More recent soundings show some recovery of depth, and there will probably be more. I expect however that some loss of Harbour space must be accepted as permanent, but I have no fear that it will be added to now that the pier has advanced into a greater depth of water.

20. Assuming then that the completion of the Harbour at no distant date is an event that may be anticipated, I would now beg to bring to notice of Government some questions which will shortly be pressing for settlement.

21. The first of these is the form of the seaward side of the Harbour and the entrance. This is a question which I have always looked upon as desirable to be kept open till near the time when a final decision was necessary, and in the interim I have availed myself of such opportunities as presented themselves for collecting evidence as to the merits of different forms.



22. The result is that I am rather disposed to favor a change of the design to the form shown in red on the accompanying tracing and by dotted lines in the marginal sketch. The main argument in favor of the originally proposed straight eastern front is that if the present Harbour should be followed by a series of similar basins ranged along the coast, a series of re-entering angles would be formed in which converging waves would be concentrated to an inconvenient extent. On the other hand the projecting entrance though more in accordance with precedent and undoubtedly more convenient for the entrance of vessels under sail did not appear to have so much superiority for steamers.

23. I find, however, that Commanders of steamers would generally prefer the projecting entrance as leading the cross current off from acting on the after part of a long ship while the fore-part is in still water, and with little way on her; also it would give a greater space to bring up in without danger of fouling ships at moorings. Captain Taylor, the Master Attendant, prefers this form.

24. Theoretically it is rather inferior to the original line for calming the interior of the Harbour, but I do not think the difference would be appreciable in practice. The future difficulty of the re-entering angles may, I think, be left to be dealt with when it arises, and thus both these points may fairly give way to the immediate nautical advantage of the modified form. The cost will not be appreciably affected by the change, as the width of entrance is proposed to be increased to 550 feet, so as to compensate for the increased length of the two sides of the triangle.

25. I would therefore beg to recommend this modification for consideration. An immediate final decision is not necessary if the Government should think it desirable to obtain more nautical evidence upon the question.

26. Another question is even more urgently requiring early action, viz., that of providing fixed moorings for ships in the new Harbour. These will be absolutely necessary before the Harbour can be fairly utilised, because only a very limited number of ships could be accommodated swinging to their own anchors. There is little doubt that in the north-east monsoon of 1880-81 if moorings are laid down under the lee of the north pier, ships may be secured to them. For this purpose they should be fixed in the previous fair season of January and February.

27. I have conferred with Captain Taylor on this subject, and we are agreed upon an arrangement which will, I think, give the maximum of accommodation and security at a minimum cost. He will bring the matter before the Government more suitably than I can, and I have therefore left the nautical part of the question in his hands.

28. With regard to its engineering and financial aspects, however, I may state that the cost will be about £40,000. The exact amount may be affected by such modifications of detail as Captain Taylor may recommend. This is not included in my estimate for the Harbour Works, and it will probably be treated as a distinct financial question, and a charge made on *shipping* to cover the interest on first cost and maintenance independent of the Harbour dues on *cargo* inwards and outwards.

29. But I would venture to raise the question whether the funds may not be considered to be already in the hands of the Government by a reappropriation of the savings already effected on the estimate for the Harbour Works. The Government had sanctioned £20,000 over and above my estimate for purposes for which it has not been and never will be required; and a further £20,000 has, as shown in my letter, dated 24th January, been saved upon my estimate on works already completed. Such excesses as have occurred on other items are well under the 10 per cent. on actual past expenditure estimated for contingencies, so that if these £40,000 were transferred to the charge for moorings, the Harbour Works expenditure up to the present time would still be within the estimate.

3/657(58-83)

30. The screw moorings, cables, and buoys will have to be procured from England, so that it will be seen that in order to ensure their being laid down this time next year, early action should be taken.

31. In my letter to the Under Secretary of State, dated 18th October 1878, I raised the question of considering the details of the mode in which the Harbour revenue should be raised. My only concern with this as Engineer was to see that any proposals were consistent with the engineering and physical features of the future Harbour. I found on arrival at Madras that the subject was already under the consideration of some leading members of the Chamber of Commerce to whom I gave what information I could relating to my own share of the question. I believe that proposals to Government may be expected as the result of this movement. It may perhaps be as well to state that I am no party to the proposals themselves, having only assisted in giving them a practical form.

32. I would beg to conclude by stating generally my belief that this important undertaking is now in a state which gives promise of an early and successful accomplishment.

No. 45. ORDER THEREON, 5th March 1879, No. 657 W.

MR. PARKES in this letter reviews the present state and prospects of the Harbour Works, and brings to the notice of Government the following questions which will before long require to be settled :—

(1) The form of the seaward side of the Harbour and of the entrance.

(2) The provision of fixed moorings for ships in the new Harbour.

2. His Grace the Governor in Council considers that it will be satisfactory to obtain the best professional opinion as to the form of entrance of the Harbour Works, and the Secretary of State will therefore be requested to refer the question to some English Engineer of eminence possessing experience in Harbour Works.

3. The proposed change of form is apparently approved from a nautical point of view by the Master Attendant and by the majority of the Steamer Commanders whom Mr. Parkes has been able to consult. His Grace in Council resolves to request Captain A. D. Taylor, the Superintendent of Marine Surveys, to favor him with his views on the matter.

4. Copies of these Proceedings will also be furnished to the Directors of the Peninsula and Oriental Steam Navigation Company, and of the British India Steam Navigation Company, through their local agents, with a request that this Government may be favored with an opinion upon the proposed modification in the form of Harbour entrance from such of the Commanders in the service of those Companies as may be possessed of the greatest experience in such matters.

5. The report on the provision of moorings should be expedited by the Master Attendant. It is desirable that no time should be lost in fixing them.

6. The Government note that some further expression of views of the Chamber of Commerce, as regards the details of the mode of raising the Harbour revenues, may be shortly expected.

7. The Government understand that the Consulting Engineer for Railways is in communication with the South Indian Railway authorities with respect to the irregularity in the running of the stone trains noticed in paragraph 10 of Mr. Parkes' report.

(True Extract.)

(Signed) J. H. M. SHAW-STEWART, Colonel, R.E.,
Ag. Secy. to Govt., P.W.D.

To the Superintendent, Madras Harbour Works.
" Marine Department.
" Master Attendant.
" Chairman, Chamber of Commerce.
" Consulting Engineer for Railways.
• Harbour Committee

Exd. C. Howarth.
Spare Copies

4/657-58 57.

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6/657-885

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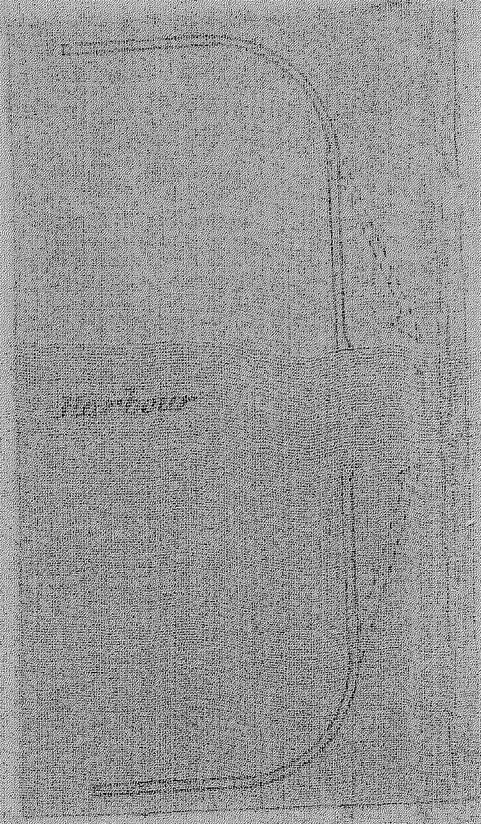

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7/657-8655

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Ag. Secy. to Govt., P.W.D.

To the Superintendent, Madras Harbour Works.
„ Marine Department.
„ Master Attendant.
„ Chairman, Chamber of Commerce.
„ Consulting Engineer for Railways.
„ [illegible] Howarth

No. 46. (DOCKET No. 658 W, dated 5th March 1879).

COPY of the above forwarded to the Government of India.

Colonel, R.E.,
Ag. Secretary to Govt., P.W.D.

Fwd. C. Howarth.
Spare Copies

8/657-58.55

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652-8-35

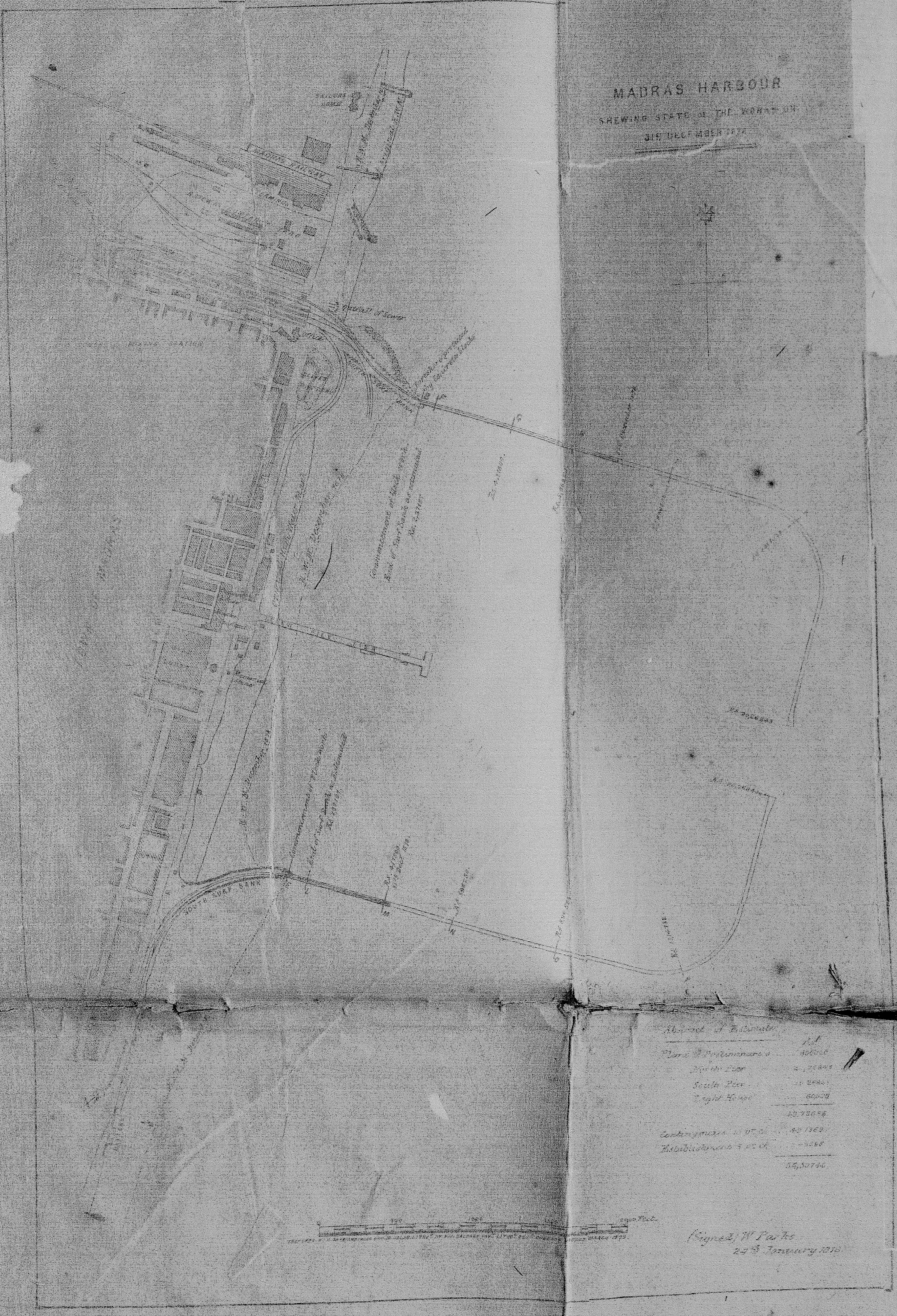
APPENDIX No 2.

1/657-8/85

MADRAS HARBOUR

SHEWING STATE OF THE WORKS ON

31st DECEMBER 1877.



Abstract of Estimate	Rs
Plans & Preliminaries	[illegible]
North Pier	[illegible]
South Pier	[illegible]
Light House	60000
	[illegible]
Contingencies 10 %	[illegible]
Establishment 5 %	[illegible]
	[illegible]

(Signed) W Parkes
24th January 1878

BUILDINGS AND ROADS,
CIVIL WORKS.

Govt. of (1879) Madras,

PUBLIC WORKS.

To

The SUPERINTENDENT of MARINE
SURVEYS.

Dated March 5th.

Issued

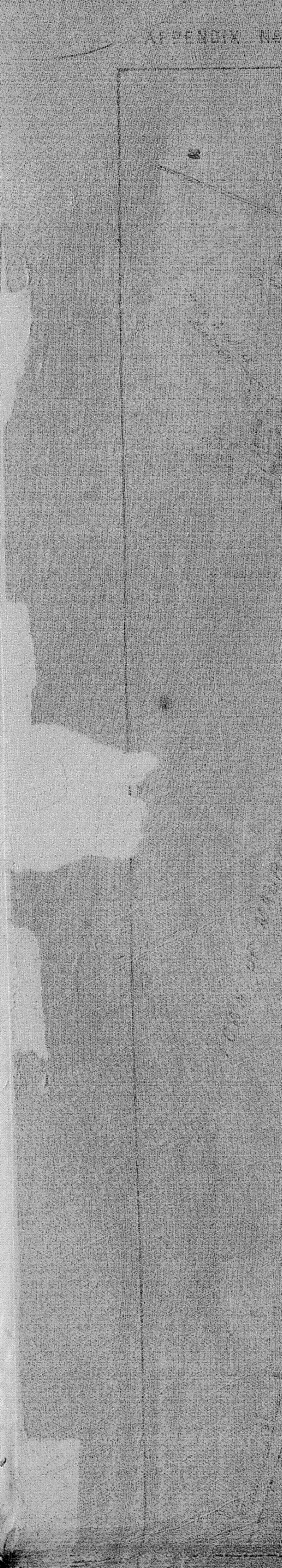
Recd. Rec.

G. O., 5th March 1879, No. 609 W.

MARINE

No. 47.

Requests to favor the Madras Government with an expression of your views regarding the proposed change of form of entrance of the Madras Harbor Works.



12/657-58

GOVERNMENT OF MADRAS.

PUBLIC WORKS DEPARTMENT.

27th February 1879, No. 608 W.

Buildings and Roads.

Civil Works.

Read the following papers :—

No. 275. From W. PARKES, Esq., M.I.C.E., Engineer-in-Chief, Madras Harbour Works, to the Secretary to Government, Public Works Department, Buildings and Roads, dated Madras, 24th January 1879.

I HAVE thought it desirable to take the opportunity while at Madras of examining the accounts of expenditure on the Harbour Works with the view of comparing them with my original estimate and of submitting the comparison to the Government in such a form as will enable them to judge how far our experience up to the present time justifies my estimate of the total expenditure on the Harbour.

2. To facilitate this I have prepared a rearrangement of the figures of my estimate in a form that will show more clearly the anticipated cost of the successive stages of the work (Appendix No. 1). Not only the total amount, but all the dimensions and prices are the same as in the original, the only difference being that the money column is carried out to show the cost of *sections* of the completed work instead of the total cost of each *class* of work (rubble stone, concrete blockmaking, setting blocks, &c.). The money column is also carried out in Rupees at 10 to the £ sterling which was the value when the estimate was made.

3. I also beg to submit a tracing of the completed Harbour with the several sections shown and the estimated cost marked on each (Appendix No. 2).

4. The boundaries of the sections were determined by the positions of the contour lines of depth shown on the plan on which I originally based my design, and the substantial correctness of which has since been confirmed by the special surveys made. Thus from the shore to the $2\frac{1}{2}$ fathom line at each pier F and L represents the rubble stone "surf banks." From the $2\frac{1}{2}$ to the 4 fathom line F to G and L to M the shallow water or three course sections, and from thence outwards the rubble base is calculated for according to the increasing depth by each successive fathom, and the superstructure at the uniform height of four courses of blocks. In addition to the aggregate cost of these several sections Rupees 8,00,000 is allowed for "Plant and Preliminaries," 10 per cent. for "Contingencies," and 5 per cent. for "Establishment," making a total of Rupees 56,50,740.

5. The statement of expenditure naturally lends itself to a somewhat similar arrangement, but a little modification of form in the statements hitherto submitted is required to present a clear ground for comparison. I have prepared the accompanying statement of the expenditure to 31st December (Appendix No. 3) with such necessary modifications the nature of which is explained in detail in Appendix No. 4, and the result shown is that the expenditure on the two piers apart from "Plant and Preliminaries," "Contingencies," and "Establishment" as far as completed to the 31st December was—

	RS.
For the North Pier	6,61,151
For the South Pier	3,13,256
Total ...	9,74,407

which includes about Rupees 20,000 for rubble stone deposited in advance of the completed portions of the work.

6. The estimated expenditure on the same portions was as under :—

North Pier.	RS.
Surf bank A to F	2,37,188
Shallow water, Section F G	1,80,612
4 to 5 fathoms G H	1,78,150
Proportion of 5 to 6 fathoms [illegible] of H I	1,41,312
Total ...	7,37,262
South Pier.	
Surf bank D to L	2,37,188
Shallow water, Section L M	1,80,612
Proportion of 4 to 5 fathoms [illegible] of M N	19,794
Total ...	4,37,594
or total for the two piers	11,74,856

showing a saving on the estimate of Rupees 2,00,449 without making any allowance for the advanced rubble stone.

7. There were also on the ground at the date under notice 1,011 concrete blocks containing 15,132 cubic yards prepared at an actual cost of Rupees 1,47,012, of which the estimated cost was Rupees 1,54,320, showing a further saving of Rupees 7,308.

8. If it were justifiable to make the cost of the work so far as executed the basis of a revised estimate for the whole the result would be a smaller total than that of my original estimate, but the difference would still be within the limits of uncertainty which may naturally be expected in such an undertaking. I would therefore ~~only~~ submit the general conclusion that the present comparison of estimate and expenditure affords a strong presumption that the work will be completed within the original estimate of Rupees 56,50,000. The bulk of the saving is not in the pier works proper,* but in the surf banks, for which my original estimate was undoubtedly excessive. It was, however, impossible for any one to form any definite idea of the difficulties and obstructions which would be met with in pushing through the surf and shallow water. The result has proved that I over-estimated the cost of the operation, and perhaps somewhat under-estimated the time required for it.

9. The head of "Plant and Preliminaries" shows an expenditure to date of Rupees 8,91,198, and about Rupees 2,000 additional will be required for an office and store for the south pier under the sub-head "Buildings." All the other sub-heads will now be absolutely closed; any necessary additions to the plant or machinery will be charged to the works with which they are connected. Indeed in the modified

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* The actual rates are as under—
Rubble stone: Rupees 2 per ton as against Rupees 1-8-0 estimated, but this is already much reduced.
Blocks: Rupees 9-1-0 per cubic yard as against Rupees 10 estimated.
Blocksetting: Rupees 17 per lineal foot as against Rupees 12 and Rupees 30 for three and four course work respectively.

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statement I submit I have made this rule to some extent retrospective, and have transferred several items to the accounts of the actual works. If any important additions should be required it will be for some purposes unforeseen when the original estimate was made, and these should be charged to "Contingencies." To this heading I have removed the charge for the new block ground at the south pier. The total amount charged to "Plant and Preliminaries" in my revised statement is Rs. 1,456 in excess of that in the statement already submitted, but this total is arrived at after making considerable changes in the several items. An aggregate of about Rs. 39,500 has been transferred from it to the several heads of the works in progress with which they are connected, and a sum of Rupees 41,004 has been transferred to it from "Rubble Base," being the charge for the current expenses of the steam hopper barges up to the time they were employed in depositing stone. This I consider to be a fair charge against "Preliminaries," because the delay in bringing the barges into work has rendered unnecessary the costly jetty for loading the stone which was originally contemplated, for which it is therefore a substitution. The comparatively small arrangements which will now be required for this purpose may be fairly charged against the current expenses of depositing the rubble base. The same rule has been as far as possible followed in all cases; as soon as the several works were fairly started they were made to bear the charges of not only the working and maintenance of the plant and machinery, but also of various small additions which experience showed to be desirable. Where more important additions are made as in the case of the new block ground at the south pier it may be presumed that the occasion for them will have been due to unforeseen conditions and the charges should be carried to "Contingencies."

10. Comparing the cost of "Plant and Preliminaries" (now with the small exception noted completed) with the estimate of Rupees 8,00,000, an excess of about Rupees 93,000 is shown, but a considerable portion of this is due to the loss on exchange in English purchases. With regard to the remainder it is only necessary to explain that the original estimate could not be other than a very rough one. I know that every economy was exercised in making the several provisions, and I think a proof of the general efficiency and sufficiency of the plant is given in the fact that so considerable a portion of the works have been executed under the estimated rates.

11. For *Contingencies* an allowance of 10 per cent. was made in the estimate. Ten per cent. on the expenditure of Rupees 20,12,617 would be Rupees 2,01,262, but hitherto only Rupees 49,778 have been charged to this head, being only 2½ per cent. As this is the fund specially reserved for unforeseen requirements it would be improper to hazard any prediction as to what future claims may be made upon it.

12. The item of *Establishment* shows so far an excess over my estimate, being 9 per cent. on the expenditure instead of 5. This is in great measure accounted for by the delays which occurred to the works preventing expenditure without the possibility of reducing the establishment at the same time. I hope a great part of the excess will be recovered as the works progress more rapidly.

13. The head of *materials in store* is not comparable with the estimate as the charges are not brought into the account till the materials are issued to the works.

14. I beg to recommend the substitution of my amended statement of expenditure to the 31st December for that already presented as giving a fairer view of the relative cost of the different departments of the work, but any orders the Government may give on this will not effect future monthly statements except in the case of the few items which I propose to withdraw from the head of "Plant and Preliminaries" and on which expenditure is going on.

15. It will be observed that in my amended form of estimate I have not inserted the additions and sub-divisions which were made after the original passed out of my hands. I hope the Government will sanction their omission in future.

16. In conclusion I would suggest that as this letter contains some conclusions of public interest and calculated to correct some prevalent misapprehensions it might be advisable to communicate it to the Editors of the local papers.

APPENDIX No. 1.

Original Estimate rearranged.

			RS. A. P.	RS. A. P.
1	Plant and Preliminaries			8,00,000 0 0
	North Pier.			
2	Surf Bank from the shore to F 80 feet seaward of point B— 158,125 tons laterite at Rs. 1-8-0 ...			
3	Shallow water section 3 course work F to G (580 from B)—			2,37,187 8 0
		2½ to 4 fathoms.	Rubble base 19,575 tons Rs. 1-8-0 ...	29,362 8 0
			Concrete blocks 20¼ cubic yards to a foot lineal, and allowing 50 feet extra for expenses of junction with surf bank, at Rs. 10 per cubic yard, 650 lineal feet blocks at Rs. 265	1,11,750 0 0
			Do. setting at Rs. 70 ...	39,500 0 0
4	Section from G to H (1,030 feet from B)—			1,80,612 8 0
		4 to 5 fathoms.	Rubble base 15,480 tons at Rs. 1-8-0	23,220 0 0
			Concrete blocks 20¼ cubic yards to a foot lineal 450 lineal feet, at Rs. 265	1,19,250 0 0
			450 do. setting Rs. 80 ...	36,000 0 0
5	Section from H to I (1,710 feet from B)—			1,78,470 0 0
		5 to 6 fathoms.	Rubble base 43,792 tons Rs. 1-8-0 ...	65,688 0 0
			680 lineal feet blocks, Rs. 265 ...	1,80,200 0 0
			680 do. setting Rs. 80 ...	54,400 0 0
6	From I to K (2,560 feet from B)—			3,00,288 0 0
		6 to 7 fathoms.	Rubble base 83,300 tons Rs. 1-8-0 ...	1,24,950 0 0
			850 lineal feet blocks Rs. 265 ...	2,25,250 0 0
			850 do. setting Rs. 80 ...	68,000 0 0
7	From K to the end—			4,18,200 0 0
		7 to 7½ fathoms.	Rubble base 159,637 tons Rs. 1-8-0 ...	2,39,455 0 0
			1,370 lineal feet blocks, Rs. 265 ...	3,63,050 0 0
			1,370 do. setting, Rs. 80 ...	1,09,600 0 0
8	Light-house		...	7,12,105 0 0
				30,000 0 0
	South Pier.			
9	Surf bank from shore to point L 150 feet from E same as No. 2.		...	2,37,187 8 0
10	Shallow water section L to M (650 feet from E) same as No. 3.		...	1,80,612 8 0
11	M to N (1,100 feet from E) same as No. 4		...	1,78,470 0 0
12	N to O (1,720 feet from E) same as No. 5 ...		...	3,00,288 0 0
13	O to P (2,630 feet from E) same as No. 6 ...		...	4,18,200 0 0
14	From P to the end, same as No. 7 ...		...	7,12,105 0 0
15	Light-house		...	30,000 0 0
	Total for Works of both Piers ...			49,13,720 0 0
	Contingencies 10 per cent.			4,91,369 0 0
	Establishment at 5 per cent.			2,45,685 0 0
	Total ...			56,50,780 0 0

24th January 1879.

(Signed) W. PARKES, M.I.C.E.,
Engineer-in-Chief, Madras Harbour Works.

12/65

APPENDIX No. 3.

REVISED STATEMENT of Outlay on Madras Harbour Works to 31st December 1878.

Heads of Expenditure.	Cost to end of December 1878.		Estimate.	Remarks.
	RS.	RS.	RS.	
PRELIMINARIES.				
Marine Surveys	6,408	...	...	Closed.
Railways—				
Rails from England ...	1,38,197	...	...	Do.
Sleepers	39,385	...	...	Do.
Formation and materials.	66,027	...	...	Do.
Block ground	45,033	...	...	Do.
Buildings	62,005	...	...	Rupees 2,000 required for buildings at south pier.
PLANT.				
Locomotive engines ...	55,171	...	...	Closed. The cost of one locomotive, Rupees 18,657, has hitherto been wrongly charged to "Machinery."
Rolling Stock	20,035	...	...	Closed.
Floating Plant	1,80,004	...	...	Do.
Machinery, Cranes, &c. ...	2,42,125	...	...	Do. Rupees 18,657 transferred to "Locomotive Engines."
General Tools	32,778	...	...	Do.
Office Furniture	4,030	...	...	Do.
		8,91,198	8,00,000	
BLOCKMAKING.				
3,691 blocks	5,36,685	...		
Credit by 1,880 blocks used in north pier and 800 in south pier.	3,89,672	...		
Cost of 808 blocks of 16 cubic yards and 203 of 12¼ cubic yards, in all 15,432 cubic yards.	...	1,47,013		
CONSTRUCTION OF PIERS.				
North Pier.				
Surf Bank complete ...	*1,76,585			*This includes Rupees 1,770 formerly charged to "Extra Rubble," which item is discontinued.
Rubble base, 82,498 tons ...	1,47,141			
1,880 concrete blocks ...	2,73,352			
Setting concrete, 1,350 lineal feet.	64,072	...	5,96,270	Estimate of pier complete to 1,030 feet.
		6,61,150		
			3,00,288	Estimate of section from 1,030 to 1,710 feet (now in progress).
			11,20,305	Estimate of remainder of pier.

REVISED STATEMENT of Outlay on Madras Harbour Works to 31st December 1878—concluded.

Heads of Expenditure.	Cost to end of December 1878.		Estimate.	Remarks.
	RS.	RS.	RS.	
CONSTRUCTION OF PIERS—*continued.*				
South Pier				
Surf Bank complete ...	*67,328			
Rubble base, 45,979 ...	97,950			
800 concrete blocks ...	1,16,320			
Setting do. 700 lineal feet.	31,658			* This includes Rupees 15,287, the cost of the extension of the South Indian Railway.
		3,13,256	4,17,860	Estimate to 650 feet (completed).
			1,78,470	Estimate of section from 650 to 1,100 feet (now in progress).
			14,36,593	Estimate of remainder of pier.
Two Light-houses ...	...	...	60,000	
		20,12,617	49,13,726	
CONTINGENCIES.				
Protective works north of harbour.	20,996			
Other charges as specified in former statements.	22,675	...	...	As authorised at various times by Government.
Block ground at south pier.	6,106			
		49,777	4,91,369	Authorised by G.O., No. 3,730 W., dated 21st September 1878.
ESTABLISHMENT.				
Salaries	1,47,838			
Office contingencies ...	2,675			
Travelling allowances ...	20,762			
Medical	318			
Assistance in Surveys ...	4,631			This item has been hitherto charged to "Preliminaries."
		1,76,224	2,45,685	
Total Expenditure on Works.	...	22,38,618	56,50,780	
VALUE OF MATERIALS IN STORE.				
Cement, English ...	7,539			
Do. Indian	8,301			
Fuel	21,407	...	...	Those materials are charged to the works when they are issued from the store.
Timber	13,371			
Iron and steel	19,922			
General stores	14,719			
Spare gear for machinery ...	7,000			
		92,709	...	Hitherto charged to "Plant."
Total Disbursements ...	...	24,24,035	...	

24th January 1879.

(Signed) W. PARKES, M.I.C.E.,
Engineer-in-Chief, Madras Harbour Works.

15

APPENDIX No. 4.

DETAILED STATEMENT of the Revisions recommended in the Account of Plant and Preliminaries.

Heads of Expenditure.	Original.	Amended.	To what Heads transferred.	Explanations.
	RS.	RS.		
1. Detailed surveys	4,631	...	4,631 transferred to "Establishment" ...	1. This has been from the first wrongly charged to Preliminaries. It follows and does not precede the work, and the expenditure will continue to the end. It should be charged to Establishment and called "Assistance in Surveys."
2. Marine do.	6,408	6,408	Account closed.	
3. Railways	2,47,122	2,43,609	1,171 transferred to blocksetting ... ... 2,342 transferred to rubble base	3. The preliminary account for Railways is closed as from September 1877 and subsequent charges divided among the works served by them.
4. Opening quarries ...	2,433	...	2,433 transferred to do.	4, 8. Opening quarries is an unnecessary item. A lump sum is sometimes paid for the purpose, but sometimes the cost is included in the tonnage rate. In either case the charge should be debited to the same head. The same remark applies to such land as may be required for quarries, the only purpose for which land is wanted for these works.
5. Block ground	51,139	45,033	6,106 transferred to Contingencies	5. The cost of the new block ground at the south pier not having been originally contemplated is a fair charge against "Contingencies."
6. Jetties for loading stone ...	1,922	...	1,922 transferred to Rubble base	6. The jetties now intended will be much smaller works than those originally contemplated. One is now being erected as an experiment, and others will have to be added when the best form is determined on. In the meantime no estimate can be given, but the cost will in any case be small, compared with the value of the rubble stone which will pass over them, and may therefore without undue disturbance of the rates be charged to "Rubble Base"—(See also remarks on No. 11).

DETAILED STATEMENT of the Revisions recommended in the Account of Plant and Preliminaries—*continued.*

Heads of Expenditure.	Original.	Amended.	To what Heads transferred.	Explanations.
7. Buildings	RS. 62,005	RS. 62,005	Rupees 2,000 required	7. *Buildings.*—The account may be closed after completion of certain necessary buildings (an office and store) at the South Pier.
8. Land	1,220	...	Rupees 1,220 transferred to rubble base ...	8. See above.
9. Locomotive Engines ...	44,401	55,171	Rs. 18,657* transferred from machinery below. Rs. 7,000 transferred to materials in store ... Rs. 443 transferred to rubble base ... Rs. 444 transferred to blocksetting ...	9. *Locomotive Engines.*—The amount Rupees 55,171 represents the cost of three locomotives ready for work. The Rupees 7,000 transferred to the store account represents spare parts sent out for renewals, and the sums of Rupees 443 and Rupees 444 are small current expenses since September 1877 chargeable to the works.
10. Rolling Stock	20,035	20,035	Account closed	10. This account will now be closed, any further rolling stock that may be wanted being charged to the works.
11. Floating Plant	1,43,535	1,80,004	Rs. 4,535 transferred to rubble base Rs. 41,094 transferred from rubble base	11. *Floating Plant.*—A sum of Rs. 4,535 has been transferred from this to rubble base, being the aggregate of several small charges connected with the deposit of rubble base since September 1877; on the other hand Rupees 41,094 has been transferred from rubble base to this head, being the cost of maintaining the two hopper barges from their arrival in May 1876 till they began to be employed in April 1878. This may be considered as a set off against the saving of the leading jetty which would have been required if they had been employed at an earlier date.
12. Machinery, Cranes, &c. ...	2,67,366	2,42,125	Rs. 18,657* transferred to locomotive engines. Rs. 4,390 transferred to blocksetting ... Rs. 2,194 transferred to blockmaking ...	12. In the case of machinery all charges incurred since the machines got to work in a fairly complete state have been transferred to the works.
13. General Tools	32,778	32,778	Account closed	13. Account now closed.

14. Buoys and Beacons ...	717	...	Rs. 717 transferred to rubble base	14. The account for buoys and beacons is necessarily kept open; but as the use of them is only for depositing rubble base that head should bear them.
15. Office Furniture	4,030	4,030	Account closed	15. *Office Furniture.*—Account closed.

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* Correction of an old error in the accounts.

General Remarks.—It is not to be assumed that because the above accounts are closed there will be no more charges of the same kind, but no such charges should be incurred unless with the ultimate view of reducing the current rates. Those rates may therefore fairly bear such charges, and the notice of the authorities should be directed to them by a special explanation in the column of "Remarks" in the monthly returns.

(Signed) W. PARKES, M.I.C.E.,
Engineer-in-Chief, Madras Harbour Works.

24th January 1879.

No. 275-A. From the Examiner of Public Works Accounts, dated 17th February 1879, No. 43 B.

No. 276. Order thereon, 27th February 1879, No. 608 W.

With the foregoing letter Mr. Parkes submits statements prepared with the object of showing how far his original estimate of the cost of the Madras Harbour Works has been borne out by actual experience.

2. In 1875 it was considered desirable that Mr. Parkes' original estimate of £565,000 for the works should be thrown into such a form as would enable the local Accounts Officers to deal with the monthly expenditure in the manner prescribed by the Government of India, and a revised estimate, prepared in some detail and amounting to Rs. 64,00,000, was submitted by the late Mr. May.

	£
Mr. Parkes' original estimate ...	565,000
Added by Government of India for additional rubble	20,000
Interest during construction ...	43,000
Total ...	628,000

3. This revised estimate was objected to by Mr. Parkes on various grounds, and in May 1876 another estimate was prepared by the Chief Engineer, which in its abstract form, and with the exception of the one item for additional rubble, was accepted by Mr. Parkes.

4. To facilitate a comparison between the estimated and actual cost of the Harbour up to the end of last year Mr. Parkes has rearranged this estimate, dividing the work into sections, and showing the expenditure, estimated or actual as the case may be, upon each section.

5. He has carried out the money column at Rupees 10 to the pound sterling, which was the rate at which the estimate was made.

The effect of this rearrangement is shown in the following abstracts:—

Chief Engineer's Estimate.	RS.	*Mr. Parkes' Estimate.*		RS.
Plant	4,20,000			
Buildings	75,000			
Preliminaries	2,75,000			
Land	30,000			
	8,00,000	Plant and Preliminaries		8,00,000
Rubble stone work	14,39,720	... ...		4,74,375
Piers from 2¼ to 4 fathoms ...	3,02,500	... ...		3,61,225
Piers from 4 fathoms out-wards ...	23,11,500	From 4 to 5 fathoms	3,56,940	
		" 5 to 6 "	6,00,576	
		" 6 to 7 "	8,36,400	
		" 7 to 7¼ "	14,24,210	
				32,18,125
Light-houses	60,000	... ...		60,000
Establishment	2,45,690	... ...		2,45,685
Maintenance and Contingencies ...	4,91,380	... ...		4,91,380
	56,50,790			
Additional sum on account of rubble.	2,00,000	... ...		56,50,790
	58,50,790			

6. With this rearranged estimate Mr. Parkes submits a statement of actual outlay to the end of 1878, showing that on the northern arm of the Harbour, which had then been advanced about half-way through the five to six fathom section, the sum of Rupees 6,61,151 had been expended, against the estimated cost for the same length of Rupees 7,37,262; while on the southern arm, which was beginning to enter the four to five fathoms section, the real and estimated expenditure were respectively Rupees 3,13,256 and Rupees 4,37,594; the total saving on both piers thus amounting to Rupees 2,00,449, irrespective of the cost of the advanced rubble foundation, and of a considerable saving on the concrete blocks manufactured up to the 31st December.

7. On other items of the estimate, such as Plant and Preliminaries, and Establishment, the expenditure is in excess of that anticipated, but the first named heads may with good reason be held to have been practically closed at the present date.

8. His Grace the Governor in Council concurs with Mr. Parkes in considering that, while the undertaking is in its present stage, it would be unwise to build too confidently upon these favorable results; but it is satisfactory to find that, so far, the expenditure on the works has on the whole been kept within the estimated cost.

9. It must also not be forgotten that, although the amount spent on tools and plant and machinery has necessarily been treated as a final charge, those articles represent a very considerable sum which will eventually be credited to the works.

10. Turning to Mr. Parkes' proposals in regard to the transfer of expenditure from one sub-head to another, His Grace the Governor in Council considers that each transfer should be brought forward on its own merits, and that the matter should be discussed between the Superintendent and the Examiner, Public Works Accounts. Such a transfer as that of the new block ground at the south pier from Preliminaries to Contingencies, being at variance with the procedure in the case of the north block ground, does not commend itself to the Government.

11. Nor can the Governor in Council consent to the proposal made in the 15th paragraph of Mr. Parkes' letter. The additions made to the original estimate were included in the sanction given by the Secretary of State, and must so remain until actuals can be substituted for estimate at the completion of the work.

12. These Proceedings will be forwarded to the Secretary of State and the Government of India, and communicated to the Harbour Committee and the Chamber of Commerce; and will also be placed on the Editors' Table.

(True Extract.)

(Signed) J. H. M. SHAW-STEWART, Colonel, R.E.,
Ag. Secy. to Govt., P.W.D.

To the Superintendent, Madras Harbour Works.
„ Examiner of Public Works Accounts.
„ Marine Department.
„ Chamber of Commerce.
„ Harbour Committee.
„ Editors' Table.

11.a

Exd. C. Howarth.
Spare Copies

BUILDINGS AND ROADS.
CIVIL WORKS.

Govt. of 1879, Madr

PUBLIC WORKS.

The SUPERINTENDENT
MADRAS HARBOUR WORK

Dated, February 21

PROCEEDINGS
No. [illegible]

No 7 W.

P1

2

Madras Harbour

From
W. Parkes, Esq., M. Inst. C. E.
Engineer in Chief
Madras Harbour Works.

To
Colonel J. H. M. Shaw-Stewart, R.E.
Acting Secretary to Government
Public Works Department,
(Buildings & Roads)
Fort Saint George

Madras, 25th February 1879

Sir,

Having since my arrival in Madras on the 12th January last submitted to the Government three reports, the first dated 24th January on the expenditure on the Harbour Works up to 31st December last, the second dated 15th February on the diversion of the town sewage from the Harbour, and the third dated the this day on the changes of the shore line north and south of the Harbour, it now only remains for me before my departure to submit to you the result of the personal observations I have made during my stay as to the present state and prospects of the work.

2. One main object of my present visit was to have the opportunity of witnessing the actual progress of the works during the most favourable season. It is only by this means that I am enabled to judge of the efficiency of the organization in its several parts, and how far the prospects which I have from time to time submitted to the Government are likely to be realized.

3. It is not to be expected that a work of this magnitude can be carried out in strict accordance with a previously prepared specification. To insist upon this would be to discard the advantages of the practical

local

local experience gained as the work progresses. But it is at the same time desirable to keep in view not only the ultimate object of the works, but certain broad features of the means by which that object is to be attained, and not to be hastily led away from these by the apparent advantages offered by some modification which may at the same time introduce evils likely to escape observation in any but a comprehensive review of the whole question.

4. It is in the settlement of such questions as these that the occasional personal communication between the superintendent as the possessor of the greater amount of local information and experience, and myself, as the original organizer of the works is important. Unless however the result of our conferences be to introduce any important change in the arrangements of the work, they afford little material for special report to the Government.—

5. I have only to report therefore that after having made a careful examination of all departments of the work, I am satisfied that they are all in a fairly efficient state — I do not consider that the full attainable speed of work has ever yet been reached and probably it never will be maintained for any great length of time, for the several parts of the organization which have to be brought into work together are more numerous and complicated than is at first sight apparent, and the failure of any one will affect the whole.

6. It is only since my arrival at Madras, that one important operation has been brought into full action viz: the deposit of stone for the rubble base from the steam hopper barges "Salisbury" and "Hobart," though the latter has been temporarily disabled and is now under repair. It is satisfactory to find that these vessels are quite equal to the work

which

which was expected of them, although our better acquaintance with the local circumstances have led us to adopt a plan of loading them different from that originally contemplated.

7. As the work advances into deeper water a much larger proportion of rubble stone will be required for a given length of pier, and their full powers will be taxed to keep it supplied, but on the other hand the shelter afforded by the piers will be more complete and the work therefore more regular — When the water is fairly calm the vessels lie alongside the face of the Concrete blocks easily, and are loaded by coolies carrying stone from the Madras Railway trucks standing on the pier itself.

8. The supply of stone from the Ambatoor quarries on which we must depend for the great bulk of our rubble base is in the hands of the most competent contractor in the neighbourhood on terms which though not excessive,

will give him no reason for not pushing on the work with energy, and I am bound to say that so far no complaints have been made. The present rate of supply however about 100 tons per day will have to be increased by 30 per cent, but there is a large area of quarry ground as yet untouched.-

9. The Madras railway company also perform their part of the work in the transport of the stone with fair regularity

10. The rubble base for the South Pier is mainly formed by the deposit from the Steam hoppers, but the top has to be levelled by stone carried out by cargo boats or thrown in from the top of the Titan or from the pier itself. This stone is more conveniently supplied from Pallavaram and brought by the South Indian Railway, but at the present time great complaints are made of the irregularity of the stone trains on this line, and this irregularity has lately retarded the progress of the South Pier by 25 feet or so. I hope however that the evil is only temporary.-

11. This is only an example of the kind of friction which acting on one part or another of the machine retards its motion in a way that cannot be calculated on.- If there were nothing to do but to set blocks as fast as they can be set the rate of progress would exceed any anticipations that have been expressed in any quarter.- As the natural obstacles caused by sea disturbance and accumulation of sand are surmounted those due to inevitable imperfections of organization become more prominent.- Some allowance must be made for these to the end of the work, but as it progresses the weak parts of the organization will be strengthened, and the rate of progress be less and less retarded.-

12. The North Pier is now 1431 feet from the commencement of the blockwork and there remains 2430 feet to complete it. The South Pier is 923 feet, and there remains 3080 feet. Apart from interruptions

200 feet per month is a rate of advance quite attainable, but allowing 150 feet as the average rate for 10 months of the year, and entire stoppage for two, it would result that the North Pier may be completed in September 1880, and the South in March 1881.—

13. There is one suggested possible obstacle to the realization of this prospect of completion as to which it is desirable that I should offer some remarks. It is said that we have had no experience of the effect of such a sea as is raised within the actual limits of a cyclone, and that this may turn out to be very destructive. It would be presumptuous to deny that such an event may produce unexpected results, but I think there are circumstances which tend to reduce the limits of uncertainty to within what they would appear to be at first sight. First the

difference

difference in the destructive power of a cyclone sea and that of the propagated swell which we have experienced on more than one occasion, and notably in December last, must not be measured by the difference in the destructive power of the cyclone itself with its furious wind and torrents of rain on shipping and objects on shore, and that of a simple rolling swell in the roads, and a heavy surf on the beach. Wind and rain can have no direct effect on the Harbour piers however much they may intensify the apparently irresistible fury of a storm.—

14. It is certain that the sea disturbance is propagated more quickly, and to a greater distance from the centre of a cyclone than the atmospheric

disturbance and therefore the only conclusion that can be drawn is that the propagated swell has a force more nearly equal to that of the actual sea disturbance than is the case in regard to the atmospheric disturbance.

15. Again it is the experience of all Engineers of marine works in England that the swell preceding or propagated from a storm at some distance is more destructive than the sea raised under the direct influence of the wind, and it is a fair inference that the same rule would hold good in India.

16. Further there is a large margin of stability in the works as carried out with the full depth of foundation, 24 feet below Mean Sea Level, over any force they have yet had to resist, either here or elsewhere. The slight disturbances that have taken place where this depth was not attained confirmed former experience of the value of deep foundations. This and the size of the blocks and the mode of packing them

together

22/6538

together are elements of strength which do not exist in any of the sea works the damage to which furnishes the most useful lessons.

17. On the whole therefore while fully admitting that a repetition of one of the great historical cyclones may exhibit results of an unexpected kind, I am bound to contend that such a lesson is required to teach us where we can apply additional strength. So far as the present experience of Engineers goes we are armed at all points. There is one case on record, that of Wick in the North of Scotland, where a mass of masonry 45 feet wide was bodily displaced by the sea, and the sea has in that case so far remained the acknowledged victor. But the case is entirely exceptional, and to take it as a precedent would be to condemn many works of well tested stability. The Madras piers are only 24 feet wide but the difference of conditions in other respects is more than a balance for the

Cop

less width.—

18 I think this is the only suggested cause of failure in the completion of the works which has not already been negatived by the event. The accumulation of sand over the foundations which was so troublesome at the North Pier in 1877 was repeated in 1878 at the South Pier, but its entire absence at the North Pier in the latter year was a good ground for the anticipation that it would be also only temporary at the South Pier— It will however be a satisfaction to find that there is no return of the trouble in the approaching monsoon.—

19. The accumulation extended a considerable distance from the pier and had intruded upon the available deep water in November last to the extent of six acres beyond the 6 fathom line of the previous February— More recent soundings shew some recovery of depth, and there will probably be more— I expect however that some

23/65588 17

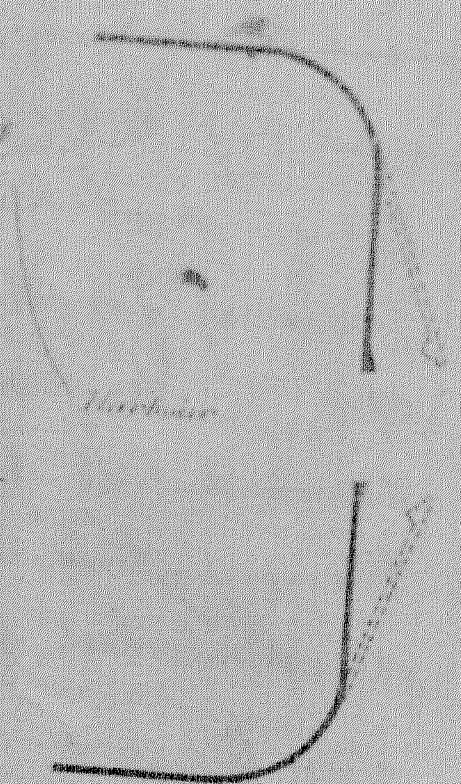
some loss of harbour space must be accepted as permanent, but I have no fear that it will be added to, now that the pier has advanced into a greater depth of water.

20/ Assuming then that the completion of the Harbour at no distant date is an event that may be anticipated, I would now beg to bring to notice of Government some questions which will shortly be pressing for settlement.

21 The first of these is the form of the seaward side of the Harbour and the entrance. This is a question which I have always looked upon as desirable to be kept open till near the time when a final decision was necessary and in the interim I have availed myself of such opportunities as presented themselves for collecting evidence as to the merits of different forms.

22. The result is that I am rather disposed to favour a change of the design

to the form shewn in red on the accompanying tracing and by dotted lines in the marginal sketch. The main argument in favour of the originally proposed straight eastern front is that if the present harbour should be followed by a series of similar basins ranged along the coast, a series of reentering angles would be formed in which converging waves would be concentrated to an inconvenient extent. On the other hand the projecting entrance though more in accordance with precedent and undoubtedly more convenient for the entrance of vessels under sail did not appear to have so much superiority for Steamers.—



23. I find however that Commanders of Steamers would generally prefer the projecting entrance as leading the cross current off from acting on the after part of a long ship while the fore part is in still water, and with little way on her— Also it would give a greater space to bring up in without danger of fouling ships at moorin Captain Taylor the Master Attendant prefers this form.—

24. Theoretically it is rather inferio to the original line for calming the interio of the harbour but I do not think the difference would be appreciable in practic The future difficulty of the reentering angle may I think be left to be dealt with when it arises, and thus both these points m fairly give way to the immediate nautica advantage of the modified form. The cost will not be appreciably affected b the change, as the width of entrance is proposed to be increased to 650 feet so a to compensate for the increased length of the two sides of the triangle.—

25. I would therefore beg to recommend this modification for consideration. An immediate final decision is not necessary if the Government should think it desirable to obtain more nautical evidence

upon the question

26. Another question is even more urgently requiring early action, viz, that of providing fixed moorings for ships in the new harbour. These will be absolutely necessary before the harbour can be fairly utilized because only a very limited number of ships could be accommodated swinging to their own anchors. There is little doubt that in the North East Monsoon of 1880/81 if moorings are laid down under the lee of the North Pier, ships may be secured to them. For this purpose they should be fixed in the previous fair season of January and February.

27. I have conferred with Captain Taylor on this subject and we are agreed upon an arrangement which will I think give the maximum of accommodation and security at a minimum cost. He will bring the matter before the Government more suitably than I can, and I have therefore left the nautical part of the

question

question in his hands.–

28. With regard to its engineering and financial aspects however I may state that the cost will be about £40,000– The exact amount may be affected by such modifications of detail as Captain Taylor may recommend.– This is not included in my estimate for the Harbour Works and it will probably be treated as a distinct financial question, and a charge made on *shipping* to cover the interest on first cost and maintenance independent of the Harbour dues on *cargo* inwards and outwards.–

27. But I would venture to raise the question whether the funds may not be considered to be already in the hands of the Government by a reappropriation of the savings already effected on the Estimate for the Harbour Works. The Government had sanctioned £20,000 over and above my estimate for purposes

for which it has not been and never will be required; and a further £ 20000 has as shewn in my letter dated 22nd January been saved upon my estimate on works already completed. Such excesses as have occurred on other items are well under the 10 per cent on actual past expenditure estimated for contingencies, so that if these £20000 were transferred to the charge for moorings the Harbour works expenditure up to the present time would still be within the estimate.

30. The screw moorings, cables and buoys will have to be procured from England, & that it will be seen that in order to ensure their being laid down this time next year early action should be taken.

31. In my letter to the Under Secretary of State dated 18th October 1878 I raised the question of considering the details of the mode in which the Harbour revenue should be raised. My only concern with this as Engineer was to see that any proposal were consistent with the Engineering

and

and physical features of the future harbour. I found on arrival at Madras that the subject was already under the consideration of some leading members of the Chamber of Commerce to whom I gave what information I could, relating to my own share of the question. I believe that proposals to Government may be expected as the result of this movement. It may perhaps be as well to state that I am no party to the proposals themselves having only assisted in giving them a practical form.

32. I would beg to conclude by stating generally my belief that this important undertaking is now in a state which gives promise of an early and successful accomplishment.

I have the honor to be
Sir
Your most Obedient Servant
W Parkes M. Inst. C.E.
Engineer in Chief
Madras Harbour Works

Buildings & Roads

From
The Engineer in Chief
Madras Harbour Works

[illegible] 1877

No 7 W
Dated 25th February 1877

No of enclosures one

20.7.75 No 2060.
26.1.74 " 175A.
4.12.73 " 2925.
7.11.73 " 2725B.

Submits observations on the shore line North & South of the Harbour.-

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27/65755 53

P. W. Dept.

Letter from Mr Parkes, dated 25th February No 7 W.

Circulated for orders.

Send me copy [illegible]
[illegible]

I concur in the proposals in the note. Wd. let Mr. Parkes have the copies herewith of his own Report.
I think we shd. get the best professl. opinion we can on the question of proper entrance - which [illegible] do the same for us.
I wd. expedite the reports on the moorings question. There is no time to lose in getting them down. I think we may reasonably hope

Mr Parkes in this letter reviews the present state and prospects of the Harbour Works, and brings to the notice of Government the following questions which will before long require to be settled.

(1) the form of the seaward end of the Harbour and of the entrance;

(2) the provision of fixed moorings for ships in the new harbour;

(3) the details of the mode in which the

harbour revenue is to be
raised

2. A review of the present
state of the harbour works
from a financial point
of view has lately been
in circulation.

It would seem advisable
that the report should
be forwarded to the Secy
of State and to the Govt
of India in continuation
of the financial review

3. With regard to the
three questions specially
brought to notice, it is
suggested that Capt
A. S. Taylor, the Superin-
tendent of the Marine
Survey, be requested to
give his opinion upon
the proposed alteration
in the form of the harbour
entrance. The proposal
is apparently approved

Will the cost with be
correct - or nearly so
by the origl sanction
S.H.

28/652-88

by the Master Attendant
and by the majority of
the Steamer Commanders
whom Mr Parkes has
been able to consult.

4. With reference to
the commencement of
Mr Parkes' 24th paragraph
the Government may
perhaps desire that the
Comparative superiority
of the two forms of entrance
should be specially re-
ported upon by Mr Bateman
who has already sub-
mitted a report upon the
original design

See para 3 of his report
recorded in Gd No 2060
of the 20th July 1875.

5. The other points
regarding the moorings,
and the mode of raising
the harbour revenues,
need not be considered
until the promised

Communication from the Master Attendant and the Chamber of Commerce have been received.

6. The proposal brought forward in paragraph 24 of the report has been already disposed of. It is dealt with in another draft Order now in circulation.

7. The Consulting Engineer for Railways is in communication with the S.I. Railway Authorities with respect to the irregularity in the running of the stone trains noticed in paragraph 10 of Mr Parkes report.

8. In the accompanying demi-official letter Mr Parkes has request-
ed by

7

for permission to ta
with him to England
50 copies of this repo
Orders upon this point
are requested.

Col
Ag Secretary to Gov
P. W. Dep

28 Feby 1879.

No. 657 W Public Works Department

PROCEEDINGS OF THE MADRAS GOVERNMENT.

Under date the 5th March 79

Read the following :—

From

Mr. W. Parkes M.I.C.E. (H.C. No. 7 W d/25th Feby 79)

Mr. Parkes in this letter reviews the present state and prospects of the Harbour Works, and brings to the notice of Government the following questions which will before long require to be settled:-

(1) the form of the seaward side of the Harbour and of the entrance;

(2) the provision of fixed moorings for ships in

W. 3/3

the new harbour;

(3) the details of the mode in which the Harbour revenue is to be raised.

2. His Grace the Governor in Council considers that it will be satisfactory to obtain the best professional opinion as to the form of entrance of the Harbour Works, and the Secretary of State will therefore be requested to refer the question to some English Engineer [illegible] possessing experience in Harbour Works. ~~of eminence~~

3. The proposed change of form is apparently approved from a nautical point of view, by the Master Attendant, and by the majority of the Steamer Commanders whom Mr. Parkes has been able to consult. His Grace in Council resolves to request Captain A. D. Taylor, the Supt. of Marine Surveys, to favor him with his views on the matter.

4. Copies of these Proceedings will also be furnished to the Directors of the P. & O. S. N. Co., and of the B. I. S. N. Co., through their local Agents, with a request that this Govt. may be favoured with an Opinion upon the proposed modification in the form of Harbour entrance, from such of ~~[illegible]~~ the Commanders in the service of those Companies as may be possessed of the greatest experience in such matters.

5. The report on the provision of moorings should be expedited by the Master Attendant. It is desirable that no time should be lost in fixing them.

take views of the
Chamber of Commerce,
as regards the details
of the mode of passing
the harbour premises, [illegible]
will be awaited.

27. The Government understand
that the Consulting Engineer
for Railways is in
communication with the
S. I. Railway Authorities
with respect to the
irregularity in the running
of the stone trains
noticed in paragraph
10 of Mr Parkes' report.

G.O. No. 658 W. 15/3/79.

Copy of the above
forwarded to the
Government of India

3/3.

Desp 8-3-79 with note.

Copy to H. Works
Marine Dept.
Agent Harbour Works
Chairman Chamber of Commerce
C.E. for Rys.
Office - 40

32/15088

Desp. 8-3-79
to Harbour Committee.

1 37/58   No. 659 W, 5th March/79

To the Superintendent of
Marine Surveys

Sir

I am directed to request that you wil be so good as to favour this Governmen with an expression of your views regardin the proposed change of form of entrance of the Madras Harbou Works, shown in the report by Mr Parkes which is recorded in the accompanying proceedings.

A.M. 3/3   2 ~~Conf. 8-3-77 with No. 4~~ [illegible] 68/7   3/3. WS

9 P. W. Dept

30/6 [illegible]

To

The Right Honorable
The Secretary of State
for India

My Lord,

In continuation of our Despatch of the No forwarding a report of the present financial position of the Harbour Works, we have the honor to furnish a copy of the Proceedings passed by us on a further report received from Mr Parkes, and, with reference to the

N.P. 5/3

second paragraph, to request that your Lordship will obtain the highest professional opinion on the question of the form of entrance of the Harbour. We would suggest that Mr Bateman, who in 1875 reported upon the original design for the works, might with advantage be asked to report on the proposed modification of it.

Your Lordship will observe that the opinions of several nautical men have already been obtained on this point by Mr Parkes, ~~but~~ and that we propose to refer the question to Capt A. D. Taylor, the Superintendent of Marine Surveys for an expression of his views.

3/5. W.

11 March 1877

Govt. of [1879] Madras.
PUBLIC WORKS.

Files
12.45

G.O. 5 Mar 1879 Nos. 657/658/659 W

Nos.

Madras Govt with a[illegible]
pression of your views
regarding the proba[illegible]
change of form of [illegible]
of the Madras Harbour
Works.

Ref 0

Madras Harbour

Requests to obtain
highest professional
opinion on the quest[illegible]
the form of entrance
the Harbour.

Madras Harbour Works

[illegible]ssing Orders on letter
[illegible] Mr Parkes' reviewing
present state & works

1

Forwards copy of Proc
[illegible] Madras Govt on
[illegible] Mr Parker
[illegible]ng the present stat[illegible]
[illegible]fects of the Harbour

11.5