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TAMIL NADU ARCHIVES

GOVERNMENT OF TAMIL NADU

FW

DEPARTMENT

GO No	66	Press
B.P. No.	(20)	Mis
Dated	9.1.1985	1985

Not to be folded or roughly handled.

50
9TH JANUARY 1885, No. 66 W, PUBLIC WORKS

66
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GOVERNMENT OF MADRAS.
PUBLIC WORKS DEPARTMENT.

Buildings and Roads
Civil Works

READ—the following letter from F N THOROWGOOD, Esq, M INST C E, Superintendent, Madras Harbour Works, to the Secretary to Government, Public Works Department, dated Madras, 7th January 1885, No 32 W —

I have the honor to acknowledge the receipt, this day, of G O, No 3127 W, of 19th December 1884, passing orders on recommencement of work on the harbour piers.

2 I apprehend that orders will shortly be passed sanctioning a further grant of funds without which I cannot push things forward more rapidly than at present (*vide* my letter No 30 W, of 20th December 1884)

3 I can, however, at once, frame the estimate for restoration in the required form and consult with the Examiner, Public Works Accounts, on the detailed arrangements of the same

ORDER—dated 9th January 1885, No. 66 W, Public Works

The Superintendent should, at once, take up the revision of the estimate, as directed in paragraph 3 of G O, No 3127 W., dated 19th December 1884.

2 Additional funds have been applied for (G O, No 3152 W, dated 23rd December 1884); meanwhile expenditure must be limited to the sanctioned grant for the works

(True Extract)

Major, R E,
Under Secy. to Govt, P W D.

To the Superintendent, Madras Harbour Works
" Examiner, Public Works Accounts.

Ltd. A Grubert
Spare Copies

BUILDINGS AND ROADS
CIVIL WORKS

Govt. of {1885} Madras.

PUBLIC WORKS.

Dated January, 9th

Recd

Encl

G.O., 9th Jan. 1885, No. 66 W.

JANUARY.

Madras Harbour Works

The Superintendent instructed to at once
take up the revision of the estimate for L.
restoration of the —.

BUDGET ESTIMATE OF EXPENDITURE ON THE HARBOUR WORKS IN
MADRAS DURING 1885-86

PART I—SECTION A

	Budget Estimate, 1885-86	Revised Estimate, 1884-85	Budget Estimate, 1884-85.	Actual, 1883-84
	RS	RS	RS	RS
Reconstruction	8,03,684	1,42,444	1,00,000	1,59,857
Repairs	66,087	59,239	54,900	68,694
Establishment	2,67,529	1,74,050	5,000	—7,725
Tools and Plant		—633		
Suspense	1,50,000	40,000	20,000	4,030
		—10,900		
Total	12,87,300	4,04,200	1,79,900	2,24,856

Payments in England
Do in India

RS

2,14,050

10,73,250

Total 12,87,300

MADRAS,
10th October 1884

(Signed) F. N THOROWGOOD,
Superintendent, Madras Harbour Works.

GOVERNMENT OF MADRAS

PART III

Detail of the Budget Estimate for Establishments for the Harbour Works in Madras for 1885-86

Number	Particulars	Salary of Office.	ESTIMATE FOR 1885-86			ESTIMATE FOR 1884-85
			Per Mensem.	Per Annum	Total	Charges per Annum
	DIRECTION	RS.	RS.	RS.	RS.	RS.
	<i>Engineer Establishment</i>					
1	Engineer-in-Chief	..	..	6,154	..	..
1	Total, Direction Salaries	..	..	6,154	6,154	5,000
	CONSTRUCTION					
	<i>Engineer Establishment</i>					
1	Superintendent of Works	1,250	1,250	..	..	..
1	Assistant Superintendent	700	700	..	..	..
2	Total	..	1950	23,400	..	23,400
	<i>Upper Subordinate Establishment</i>					
1	Sub-Engineer, 3rd grade	250	250	..	..	..
1	Head Foreman of Works	410	440	..	..	..
1	Mechanical or Foreman Engineer	350	350	..	..	..
1	Foreman Diver (transferred from Works)	350	350	..	..	..
1	Accountant, 4th grade	115	115	..	..	..
4	Total	..	1,505	18,060	..	14,484
	<i>Petty Establishment,</i>					
1	Chief Storekeeper	220	220	..	..	..
1	Assistant Storekeeper, 4th class, 2nd grade	35	35	..	..	..
1	Godown-keeper, 4th class, 3rd grade	25	25	..	..	..
1	Writer for copying, 5th class, 1st grade	17½	17½	..	..	..
1	Lascars	7	14	..	..	..
4	Total	..	311½	3,738	..	3,384
	OFFICE ESTABLISHMENT					
	<i>Superintendent of Works.</i>					
1	Managing Clerk, 2nd class, 3rd grade	110	110	..	..	..
1	Clerk, 4th class, 1st grade	45	45	..	..	..
3	Clerks, 4th class, 2nd grade	35	105	..	..	..
1	Writer for copying, 5th class, 1st grade	17½	17½	..	..	..
1	Cashier, 4th class, 1st grade	45	45	..	..	..
1	Draughtsman, 1st class	60	60	..	..	..
1	Second do 2nd class	42½	42½	..	..	..
3	Peons	7	21	..	..	..
7	Total	..	449	5,352	..	2,412

Detail of the Budget Estimate for Establishment for the Harbour Works in Madras—cont

Number	Particulars	Salary of Office.	ESTIMATE FOR 1885-86			ESTIMATE FOR 1884-85
			Per Mensem.	Per Annum	Total	Charges per Annum
	OFFICE ESTABLISHMENT—cont	RS.	RS.	RS.	RS.	RS.
	<i>Assistant Superintendent.</i>					
1	Clerk, 4th class, 1st grade	45	45	..	..	..
1	Surveyor (as Draughtsman 1st class)	60	60	..	..	..
1	Draughtsman, 3rd class	25	25	..	..	..
3	Peons	7	21	..	..	..
6	Total	..	151	1,812	..	1,452
	<i>Sub-Engineer Establishment</i>					
1	First Clerk and Timekeeper, 4th class, 1st grade	45	45	..	..	..
1	Second Clerk, 4th class, 2nd grade	35	35	..	..	..
1	Stone Quarry Clerk, 4th class, 2nd grade	25	25	..	..	..
1	Draughtsman, 3rd class	25	25	..	..	..
2	Peons	7	14	..	..	..
6	Total	..	141	1,728	..	1,428
	Presidency house-rent and allowances to Sub-Engineer and accountant	..	110	1,320	..	1,800
	Total, Construction Salaries	..	..	55,410	..	48,360
	Travelling allowances	..	..	3,000	..	1,000
	Other expenses and contingencies	..	..	1,523	..	540
	Grand Total	..	..	66,087	..	54,900

ABSTRACT of foregoing provision for Establishment

	Salaries	Travelling Allowances	Contingencies	TOTAL	
				1885-86	1884-85
Direction	RS. 6,154	RS. ..	RS. ..	RS. 6,154	5,000
Construction	55,410	3,000	1,523	59,933	49,900
Total	61,564	3,000	1,523	66,087	54,900

MADRAS,
10th October 1884(Sd/-) F. N. THOROWGOOD,
Superintendent, Madras Harbour Works.

19TH NOVEMBER 1884, No 2892 W., PUBLIC WORKS.

6/3

GOVERNMENT OF MADRAS.

PUBLIC WORKS DEPARTMENT.

General
Account

READ—the following papers —

From F N. THOROWGOOD, Esq., M Inst C E. Superintendent, Madras Harbour Works, to the Secretary to Government, Public Works Department, dated Madras, 10th October 1884, No. 21 W

I have the honor to forward, for the sanction of Government, the budget estimate for 1885-86 of the establishments for the Madras Harbour Works.

From the same officer, dated Madras, 16th October 1884, No 23 W.

I have the honor to acknowledge the receipt, this day, of your endorsement or note (No. 768 E, of the 14th October, returned herewith in original), upon this office letter of 15th August 1884, No. 18 W., in which you ask my opinion as to whether special application to the Government of India is now desirable for a grant of Rs. 25,000 expended on the purchase of Carlton House.

2 I wish I could reply more definitely, but with my present information I am unable to do so

3 In the budget estimate submitted by me (letter, No 21 W., dated 10th October 1884) for the year 1885-86 and for the remaining portion of this current year, I put down Rs 2,24,300 as being possibly required for machinery, plant, &c., before 31st March 1885. This estimate is based upon the conclusions arrived at during the time I was working in London

4. If there is any chance of all or even a fair proportion of this sum of Rs 2,24,300 being granted shortly for the *new works*, it will not be necessary to apply for the Rs 25,000. But if there is a certainty of the original sanctioned grant of Rs 1,79,900 for the current year being rigidly adhered to up to March 31st, then there is no doubt whatever that the Rs. 25,000 expended on Carlton House will be required for the work as now going on.

ORDER—dated 19th November 1884, No. 2891 W., Public Works.

The revised estimate of the Madras Harbour Works for 1884-85 and the budget estimate for 1885-86, submitted by the Superintendent in charge of the works, will be forwarded for the sanction of the Government of India with recommendation that early orders be passed thereon.

2 It is observed that the revised estimate for the current official year is in excess of the grant already sanctioned by Rs 2,24,300. The increase is explained to be necessary to provide for expenditure based on the conclusions arrived at during Mr. Thorowgood's stay in England.

2

19TH NOVEMBER 1884, No 2892 W, PUBLIC WORKS.

3 The two clerks on Rs 17½ each, provided in the budget estimate under Petty and Office establishments, are in excess of the sanctioned scale, and should not be entertained without specific authority

(Here enter No 2892 W., dated 19th November 1884)

(True Extract.)

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

To the Marine Department
" Examiner, Public Works Accounts
" Superintendent, Madras Harbour Works

ENDORSEMENT—dated 19th November 1884, No 2892 W, Public Works

Forwarded

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

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Spare Copies

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GENERAL.
ACCOUNT.

Gobt. of (1884) Madras.

PUBLIC WORKS.

Dated November, 19th.

Recd

Encl.

G.O., 19th Nov. 1884, No. 2892 W.

NOVEMBER.

Madras Harbour Works

Forwarding revised estimate of the — for
1884-85 and budget estimate for 1885-86

19TH NOVEMBER 1884, No 2892 W, PUBLIC WORKS.

GOVERNMENT OF MADRAS
PUBLIC WORKS DEPARTMENT.

Buildings and Roads
Civil Works.

RFAD—the following letter from F N THOROWGOOD, Esq, M Inst C.E., Superintendent, Madras Harbour Works, to the Secretary to Government, Public Works Department, dated Madras, 4th November 1884, No. 25 W. —

I have not submitted, for the information of His Excellency the Governor in Council, any report upon these works since 3rd October 1883 (G O, dated 12th October 1883, No 2875 W) The reason of this is that the work that has been done has, until the last few months, been confined to repairing machines and cranes. I now have the honor to submit a general report of the state of the works at present.

2 North Pier—Foreshire Work — On 19th May last, in accordance with the sanction given in G O, dated 25th April 1884, No. 1056 W, the work of tipping rubble foreshore to the north of the north pier was commenced. The position and section of the foreshore to be made up were such as was shown on the plans of the Home Committee under the presidency of Sir John Hawkshaw, and were in no way affected by what appeared at the time to be the somewhat doubtful question of the position of the entrance to the harbour. The South Indian Railway Company at first were able to provide only one train daily from the quarry at Pallavaram to the works, but after a time more wagons were available and two trains of 24 wagons each were sent down daily when the weather permitted of work being done.

3 The stone has been deposited in its place by means of large cargo boats and cooly labor, and I am inclined to think that if we can get a sufficiently strong fleet of these craft nothing in the way of hopper barges (either for hand or steam power) will be required. No provision for any special craft is yet made in England, nor was such a requirement anticipated when I left, on 20th August.

4 From 19th May to 11th October (at which date the sea put an end to work at the north pier) there were deposited in the foreshore 32,124 tons of stone. This amount has almost completed the extra section required from 250 feet to 1,925 feet from the commencement of the breakwater. At a specially weak spot in the breakwater, about 200 feet from the commencement, an additional protection has been made by building on the top of the new rubble foreshore sixteen wave-breaker blocks, each weighing 30 tons. These are of interest in a general way as showing the size and shape of the blocks to be deposited as foreshore to the restored works.

5 Concrete Blocks — All this time I regret to state that it is not possible to proceed with making blocks for the new work of restoration as there are at present only sufficient funds at my disposal to keep the foreshore work going on. There is no longer any doubt as to the section and shape of the blocks to be made, as during my visit to England, from 20th May to 18th September, I received from Mr. Parkes full instructions in a general way on this head.

6 The block yards on which the blocks are made need very considerable alterations, which will cost not less than Rs. 10,000, and these cannot well be proceeded with until more funds are available. It seems to me therefore to be better to go on with the useful and necessary work of depositing rubble foreshore rather than to make a new departure before it is quite settled where the funds for such a purpose are to come from.

7. South Pier—Rubble Foreshore — After 11th October, the wind getting to the north of east, it became necessary to transfer stone trains and cargo boats to the south side of the south pier, since which date 2,691 tons of stone have been deposited as foreshore in accordance with Mr. Parkes's instructions received in Westminster.

As at the north pier, the foundation is deposited, although the amount at present is small, and will form the foundation of the very substantial series of wave-break blocks which are to protect the walls of the breakwaters.

8. *Plant and Machinery*—I am able to report that the Titan cranes for setting blocks and one of the wave-breaker cranes are in hand in England, and I hope that by January next one may be delivered here. It is hardly necessary to point out that until one of these machines is erected it is impossible to deposit a single block in the breakwater.

9. Here on the spot extensive renewals and repairs have been going on (with very few workmen) to the cranes, locomotives and trucks for carrying blocks. I only recently discovered that the timber work of the 40-ton Goliath crane at the south block-yard was much decayed, and needed entire rebuilding. The block carrying trucks also, I find, are very unsafe, and all need new frames. All these works give full employment to the skilled hands reduced in number to a minimum.

10. *Divers and Diving*—During October the diving staff were employed in making a species of submarine survey of the line of the foundation of the new work. This was carried on with much elaboration and care, and I have plotted the results on a plan of large size. The conclusion one is able to arrive at on inspecting the result is that the work of preparing the new foundation will not probably be so formidable as was at first anticipated.

11. *Encroachment to the North*—The sea continues to encroach to the north but not to any very serious extent. Some bungalows are becoming of less value owing to the encroachment, and many coconut trees belonging to Government have been washed away. The charge of this property is now entirely in the hands of the Collector of Madras, with the single exception of Carlton House, the rent of which is paid into this office.

12. With reference to this matter I feel bound, in justice to myself and staff, to correct a wrong impression. It has been conveyed to His Excellency the Governor in Council regarding the cost of collecting the rents of this harbour works property. In his letter attached to G.O. No. 908, dated 9th September 1881, Revenue, the Collector states that, whereas the monthly salaries of the staff collecting rents while under my charge amounted to Rs. 294, his people can do the work for Rs. 79. It must be borne in mind that carpenters and masons for repair work, chainmen and draughtsmen are included in the higher amount, and are included in the Collector's list.

ORDER—dated 19th November 1881, No. 2893 W, Public Works.

The report will be recorded, with remark, as regards paragraph 5 that the revised budget providing for additional expenditure on the works this year, in accordance with the conclusions adopted in London, has been recommended for the sanction of the Government of India.

2. Adverting to paragraph 11, there seems no reason why the charge of the Carlton House property should be retained by the harbour works staff. The property will be dealt with in the same manner as other properties referred to in G.O. No. 908 dated 9th February 1884, Revenue Department.

(True Extract)

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

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

As at the north pier, this foreshore so deposited, although the amount at present is insignificant, will form the foundation of the very substantial screens of wave-breaker blocks which are to protect the walls of the breakwaters.

8 *Plant and Machinery*—I am able to report that the Titan cranes for setting blocks and one of the wave-breaker cranes are in hand in England, and I hope that by January next one may be delivered here. It is hardly necessary to point out that until one of these machines is erected it is impossible to deposit a single block in the breakwater.

9. Here on the spot extensive renewals and repairs have been going on (with very few workmen) to the cranes, locomotives and trucks for carrying blocks. I only recently discovered that the timber work of the 10-ton Goliath crane at the south block-yard was much decayed, and needed entire rebuilding. The block carrying trucks also, I find, are very unsafe, and all need new frames. All these works give full employment to the skilled hands reduced in number to a minimum.

10 *Divers and Diving*—During October the diving staff were employed in making a species of submarine survey of the line of the foundation of the new work. This was carried on with much elaboration and care, and I have plotted the results on a plan of large size. The conclusion one is able to arrive at on inspecting the result is that the work of preparing the new foundation will not probably be so formidable as was at first anticipated.

11. *Encroachment to the North*—The sea continues to encroach to the north but not to any very serious extent. Some bungalows are becoming of less value owing to the encroachment, and many coconut trees belonging to Government have been washed away. The charge of this property is now entirely in the hands of the Collector of Madras, with the single exception of Carlton House, the rent of which is paid into this office.

12. With reference to this matter I feel bound, in justice to myself and staff, to correct a wrong impression that has been conveyed to His Excellency the Governor in Council regarding the cost of collecting the rents of this harbour works property. In his letter attached to G.O., No 908, dated 9th September 1884, Revenue, the Collector states that, whereas the monthly salaries of the staff collecting rents while under my charge amounted to Rs 291, his people can do the work for Rs 79. It must be borne in mind that carpenters and masons for repair, draughtsmen and draughtsmen are included in the higher amount, and are included in the Collector's list.

ORDER—dated 19th November 1884, No. 2893 W., Public Works

The report will be recorded, with remark, as regards paragraph 5 that the revised budget providing for additional expenditure on the works this year, in accordance with the conclusions adopted in London, has been recommended for the sanction of the Government of India.

2. Adverting to paragraph 11, there seems no reason why the charge of the Carlton House property should be retained by the harbour works staff. The property will be dealt with in the same manner as other properties referred to in G.O., No 290, dated 9th February 1884, Revenue Department.

(True Extract.)

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

To the Superintendent, Madras Harbour Works
" Examiner Public Works Accounts
" Revenue Department

Ld E Fernandez,
Spare Copies

BUILDINGS AND ROADS.
CIVIL WORKS

Govt. of (1884) Madras
PUBLIC WORKS.

Dated November, 19th.

Recd

Encl.

G.O., 19th Nov. 1884, No. 2893 W.

NOVEMBER.

Madras Harbour Works

Orders on report submitted by the Superintendent on the present state of the —.

23RD DECEMBER 1884, No 3153 W., PUBLIC WORKS

GOVERNMENT OF MADRAS

PUBLIC WORKS DEPARTMENT.

General
Account

READ—the following letter from F. N. THOROWGOOD, Esq., M. Inst. C.E., Superintendent, Madras Harbour Works, to the Secretary to Government, Public Works Department, dated Madras, 20th December 1884, No 30 W. —

I have the honor to place before Government the present financial state of affairs on the Madras Harbour Works

2 At present I am working only with the sanctioned grant of money for the current year, namely Rs 1,79,900. I am doing as much work as I can without exceeding this grant, but the work is small compared to what might be done if more funds were at hand, as I ventured to point out in my report accompanying G.O., No 2893 W., of 19th November 1884, paragraphs 5 and 6.

3 Rubble base is being deposited as briskly as the train service and the state of the sea will admit, and plant and machinery is being repaired to a small extent. There are however very heavy works to be carried out on shore, works that are of the utmost importance and which should be commenced at once, but they cannot be touched without more funds. Moreover, should one of the Titan cranes arrive next month, as is very probable, I shall not have funds available for promptly setting to work at erecting it, unless I at once stop all work at the rubble bases

4 The state of the accounts is now as follows. The balance in hand on December 31st will be Rs 46,616 as nearly as possible, and the expenditure during January, February and March 1885, if the work goes on *precisely as at present* without employing one extra hand or purchasing one piece of timber, will amount to Rs. 49,000

5. If the Rs. 25,000 for Carlton house, referred to in my letter, No 23 W., of 16th October (G.O., No. 2891 W., November 19th) were granted, the present difficulty would be surmounted; but I venture to think that it would be in the best interest of the works to apply for an additional grant of Rs. 50,000 for the next three months, as it is imperative that funds shall be at hand for landing and building the Titans, for altering and extending the block grounds, and for making new block frames and new blocks

ORDER—dated 23rd December 1884, No. 3152 W., Public Works

Ordered to be forwarded to the Government of India in continuation of the revised budget estimate for the current year, and with a view to early orders being passed thereon, and the additional funds applied for being made available

(Here enter No 3153 W., dated 23rd December 1884)

(True Extract.)

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

To the Superintendent, Madras Harbour Works.

ENDORSEMENT—dated 2nd December 1884, No. 3153 W., Public Works

Copy of the above forwarded to the Government of India in continuation of endorsement, No 2982 W., dated 19th November 1884

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

Ed A Grubert.
Spare Copies

GENERAL.
ACCOUNT.

Govt. of 1884 Madras.

PUBLIC WORKS.

Dated December, 23 d

Recd

Encl.

G.O., 23rd Dec. 1884, No. 3153 W

DECEMBER.

Madras Harbour Works
Forwarding application from the Super-
intendent, Madras Harbour Works, for an
additional grant for the Madras Harbour
Works.

19TH DECEMBER 1884, No. 3128 W, PUBLIC WORKS.

GOVERNMENT OF MADRAS

PUBLIC WORKS DEPARTMENT.

Buildings and Roads
Civil Works

READ—the following papers —

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, 25th September 1884, No 56, Public Works.

Your Excellency's Public Works letter, No 32, dated 4th July 1884, on the subject of the Madras Harbour works, has received my consideration in Council.

2. Your Excellency forwards a communication addressed to you by the Government of Madras, together with a letter from the Chairman of the Madras Chamber of Commerce, reiterating objections to certain features in the plan of restoration of the harbour works as settled by the committee, to whom the matter had been specially referred in this country, and you state that you concur generally in the views held by the Madras Government.

3 It is recognized by every one that the chief objects which have to be kept in view in carrying out the works of restoration are (1) the structural stability of the pier walls, (2) the selection of the best position for the entrance, in view to providing a safe and easy ingress and egress for ships, and (3) the security and accommodation to be given to shipping, especially local craft, by obtaining stiller water within the harbour.

4. It is to the position of the entrance to the harbour advocated by the committee, and to its supposed unfavorable effect on the stillness of the water within, that the objections taken by local opinion appear to apply, and I have anxiously considered what course I should follow in consequence of this much to be regretted divergence of judgment

5. The engineering questions discussed in the correspondence now forwarded to me have been so recently investigated a second time by Sir John Hawkshaw's committee, the engineer members of which are regarded as among the greatest living authorities on works of the description in question, and who were in possession of and carefully considered all the views before expressed by the authorities at Madras and of your own professional advisers, to which I cannot find that any argument or statement of fact have now been added, that, without underrating the value of local knowledge and opinions, I have felt that it would be useless again to ask the committee to reconsider their recommendations.

6 It appeared to me that, after consulting the best authorities available on the subject, no choice was left to me but to accept their decision on the questions raised, the whole of which are of an eminently technical nature, and trustworthy opinions on which can only be formed upon prolonged and extensive experience such as that possessed by Sir John Hawkshaw and Sir J. Coode, and in my despatch, No. 23, of 24th April last, I informed your Excellency that this was the conclusion at which I had arrived, and I am not now able to see any sufficient reason for changing it.

7 In the accompanying report * which Mr Parkes, in communication with Mr. Thorowgood, has made on the subject of future operations, he expresses concurrence with the conclusions of the committee. He points out that the larger vessels should have no difficulty in getting out to sea when a severe storm is threatened, and

* Dated 21st August 1884

that of the approach of such storms timely warning can be, and in fact always has been, given, while, as regards the smaller craft, he is of opinion that the provision of floating docks or basins, which he shows might be formed on the land reclaimed on the south side of the harbour, would protect them from danger. Nor is it anticipated that, in ordinary weather, the multitude of the water within the harbour would be better secured by a change in the entrance. These suggestions are in conformity with the views expressed in the report of Sir John Hawkshaw's committee, and, if acted upon judiciously, appear to offer a means by which to accomplish the object sought without changing the position of the entrance. Mr Thorowgood, who is in full possession of Mr Parkes' views, and of the reasons which have led him and the committee to adhere to the eastern entrance, has already started on his return to Madras, and will be able to furnish the authorities there with any additional particulars they may require, and it is to be hoped that conflicting views may be reconciled by further discussion. Meanwhile, the plan of operations which Mr. Parkes has proposed will not preclude the further consideration of the position of the entrance of the harbour for several months at least, and possibly for another working season, and his plans should be followed generally, on the understanding that if any additional facts or arguments are adduced bearing on the question of the entrance which appear of sufficient weight to justify the step, a further reference to engineering authority in this country may become desirable.

Two Titan cranes
One crane travelling wave-breaker

8 In the meantime the machinery, noted in the margin, has been ordered and will be despatched to Madras.

9 With regard to the estimates which form the appendices to Mr. Parkes' letter, I beg that they may be examined, and that I may be duly informed whether they are such as may be accepted.

ENCLOSURE.

MADRAS HARBOUR

P.W. 1612/84

23, ABINGDON STREET,
21st August 1884

In the concluding paragraph of my letter to you, dated 5th July last, I stated that I was preparing a report, in which I proposed to deal with the various questions which have accumulated in the last two years, and which would include a more detailed explanation and estimate of the proposed works of restoration, together with a classified statement of the operations carried on, and the expenditure incurred, during the period of the general suspension of work. I have now the honor to submit that report.

2. I will begin with the proposed works of restoration. The general character and extent of these works will be as laid down in the first joint report of the committee, consisting of Sir John Hawkshaw, Sir John Coode, and Professor Stokes, dated 23rd January 1883, which I accept as my implied instructions. But the proposals I am about to submit are the result of a careful reconsideration of the existing state of the works, based on records of later date than those laid before the committee above mentioned, and aided by personal conference with Mr Thorowgood. The details of the new work have been independently designed, but where my conclusions differed from those of the committee I have carefully investigated the grounds of difference, and when I thought there was reason for doing so, I have not scrupled to increase the dimensions given by the committee, and to introduce some additional precautions.

3. There are on the other hand one or two features of the committee's plan, of which I think it only right to state that I am not myself satisfied of the necessity, but I have included these in my own design and estimate in deference to the opinion of the committee. They are works for the execution of which no immediate provision can be made, and if I feel it my duty at some future time to raise the question of their being carried into execution, it will be in consequence of some definite confirmation of my present doubts.

4. On the accompanying general plan of the harbour, to a scale of 200 feet to an inch, the new works are shown in red, and on the sheet of cross sections the character of the work at the different points is shown.

5. Commencing with the shore end of the north pier, and noting that the numbers represent the distances in feet from the point B, the first cross section from 200 to 250 shows the addition required to a special weak point. It is simply the continuation of a form of protection which was applied in 1877 as far as 200, and was so far very effective. There was at that time no occasion to carry it further, but the rubble foreshore has since been worn away by the action

of the sea, and requires feeding and protection. This is shown not only by the foreshore being rather bare in front of the wall, but also by the fact of the centre joint having latterly opened a little, which indicates a settlement. It will be seen by the section that the superstructure is only two blocks high at this part, so that it is founded at a depth at which the action of the sea is considerable, and a wide sloping foreshore is the only protection. Beyond the site of this special protection the superstructure is three blocks high, and founded at a lower level. The protective work consists of a rubble bank 50 feet long and 22 feet wide at the top, and tapered off at either end for a further length of 40 feet. On the top of this rubble 16 concrete blocks, each 9 feet x 9 feet x 6 feet and weighing 30 tons, will be built during the ensuing three months, when the wind and sea may be expected to be invariably from the southward. The northerly seas of the next north-east monsoon will wash down the rubble bank, and the concrete blocks will drop and form a facing for the submerged foreshore, as was the case with similar work in 1877. As this work can be done with appliances now on the ground, as it is of importance to carry it out during the present season, and as it may fairly be considered included in the sanction already given for the protection of existing works, Mr Beardmore has been instructed to proceed with it; 2,500 tons of rubble and 288 cubic yards of concrete blocks will be required, and the cost will be about Rs 7,500.

6. The above work will occupy the length from 160 to 290. In the remainder of the length, from 0 to 400, all that is required is to fill up the existing foreshore with a little additional rubble as may be required. This is in accordance with section I of the committee.

7. At 400 the line of continuous protection by random blocks will commence, but from 400 to 900 it will be of gradually increasing dimensions, from a single block laid against the foot of the wall at 400 to a mound 20 feet wide at the level of high water at 900. Within this length the depth of water is such that any waves of sufficient height to be formidable will have been broken outside, and a wave-breaker, as such, is not required. All that is required is a protection against the scour of the foreshore.

8. At 900, where the depth at high water is 25 feet, and from thence outwards, the dimensions of the wave-breaker are intended to be such as to prevent the blow of the wave from falling with its maximum force on the superstructure. What these dimensions should be are not determinable, so far as I am aware, by any recognised rule, whether based on theory or experience. It is a matter in which each engineer must use his own judgment, and mine, based on the best data I am acquainted with, would give rather greater dimensions than those shown by the committee. The difference so far as cost is concerned is not very great. If the additions were made by increasing the quantity of concrete blocks, the increase of cost would be about a lakh and a half, but if made (as I think may be done without any infringement of the essential principles laid down by the committee) by forming the interior of the mound of large rubble, the increase of cost would be only half a lakh. I think I am justified in asking the Government to sanction this modification of the design, so that it may cover my own conceptions of the required conditions of stability, but I shall, of course, be prepared to submit my conclusions to further consideration if it is considered desirable to do so.

9. It will be understood then that the following dimensions for the wave-breaker are rather in excess of those shown by the committee, but the excess is obtained by forming a nucleus of large rubble against the face of the wall and covering it with blocks. This large rubble will be deposited immediately before the blocks, so that it may not be exposed to the wash of the sea before being covered with blocks.

10. At 900 feet, then, as before said, the width of wave-breaker at high water (taken as one foot above De Haviland's mean sea level) will be 20 feet, and the width will gradually increase to 28 feet at 2,200 (see sections at these points). The blocks will be allowed to form their own slope to seaward, each block being simply carried out by the wave-breaker crane to the required distance and dropped into the sea, till the mound has reached the required height. If future storms should draw the mound down to a flatter slope more blocks will have to be added to maintain the designed width at high water level. The slope of $1\frac{1}{2}$ to 1 shown on the sections is that at which it is anticipated the mound will be ultimately permanent in form, but this, of course, cannot be guaranteed.

11. The point 2,200 is the limit to which the existing work can be utilized as a built structure. Since the storm of November 1881 the upper blocks have been tied together with pieces of bent railway bars cemented into them, and the top has been levelled with concrete. Nothing more will be done till, as a final operation, after the whole length of the piers shall have been completed, the capping of concrete in mass about six feet high recommended by the committee is placed upon it.

12. From this point forwards the system of construction will be in a certain sense reversed. Instead of placing a new wave-breaker in front of the old work, the old work will be treated as part of the wave-breaker, and a new wall constructed inside it. By this arrangement the old work will be utilized to the fullest extent, while in the execution of the new work the elements of uncertainty will be reduced to a minimum. It will be a continuance of the system of work hitherto carried on with much success as an executive operation, and of which the cost is well

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known. Some modifications and some special works, however, will have to be introduced, which to a small extent will involve new conditions.

13 The mode of passing from one system to the other is shown upon the plan. The old building is standing complete to 2,200, and from that point the new building will commence as a complete section, but in order to form a continuous line along which the setting machines and the blocks and other materials can pass without interruption, it is proposed to build a wall 12 feet wide for a length of 160 feet back, starting at 2,040. This wall will curve away from the old wall (the space between the two being filled in with rubble and concrete) till sufficient space is gained to build the section to the full width of 24 feet.

14 The new building will be of the same general character and dimensions as its predecessor, but there will be some modifications of detail. The original building consisted of two independent walls placed in contact, but not tied together. It is recommended that for the future the blocks should be bonded together, so as to form one wall, and in this recommendation I concur. The unbonded system has great advantages in comparatively shallow water, in which the waves have little effect on the blocks themselves, but much on the foundations, while in deeper water the action of the sea on the foundations is less, but that on the blocks themselves is greater, and this fact turns the scale in favor of bond for the outer portions of the piers. At the same time the bond rather increases in some respects the difficulties inseparable from a compressible foundation, and new difficulties are introduced by the special circumstances of the case.

15 It will be seen from the sections that the new rubble base will be deposited over the inner slope of the old, and upon that slope some of the overthrown blocks are lying. All the blocks which lie under the line of the new building will have to be removed, either bodily or by blasting, for if they are allowed to remain they will cause inequalities in the settlement, which will be highly injurious to the superstructure above. In order to avoid these blocks as much as possible I have increased the distance at which the committee proposed to place the new pier from the old one by 9 feet, and this will also place the line of new building more clear of the old rubble.

16 But even with these precautions of removing the old blocks, and increasing the distance from the old work, there will still be a greater liability than there was in the original work to unequal settlement. The sea side of the new building will still partially rest on the old rubble, which has been consolidated by four or five years' exposure to the sea. The new rubble will be in the same position as the old was when first built upon, that is, it will be liable to be compressed to the extent of a foot or 18 inches within a few hours after the work. But the years' settlement upon it, and to a slower settlement subsequently extending over months, and perhaps years. This latter slow process of settlement, however, is not injurious to the work. But the first is so, it subjects the blocks to great and irregular strains, and is, I think, the most fruitful cause of many of the original blocks having been broken. The evils would be materially aggravated by the fact of one side being more liable to settlement than the other.

17 It is, however, possible materially to reduce these evils, if not to prevent them altogether, and it is proposed to do this by subjecting each length of bed after it is prepared by the divers, and before the blocks are set, to a compression rather greater than that of the blocks themselves. This will be accomplished by placing in front of the work a pile of iron (old rails, with the interstices filled up with cheap cast iron bars), covering the same area as a row of blocks, and having a weight rather greater than that of the blocks. This "compressor" will be moved forward in advance of the building by the Titan. If, after its removal, it is found to have compressed a bed unequally, the hollow parts will be fitted up with suitable flat pieces of stone before the blocks are set.

18 I propose to introduce another departure from the original design, which will also diminish the evils of settlement. In the original work the foundation blocks were 6 feet high, and above this there were three courses of blocks, each 8 feet high, the whole being 4½ feet wide. It is intended now to use blocks 6 feet high and 6 feet wide, of which there will be five courses, including the foundation course. These blocks will be stronger than those 4½ feet wide, and less liable to break. There is also the incidental advantage that the iron compressors would have to be advanced in stages of 6 feet instead of 1½ feet, and this would accord better with a fair rate of progress of one row per day.

19 It will be seen by the cross sections that the foundation course consists of two blocks of equal length (each 14 feet), the upper courses of blocks of 14 and 10 feet alternately breaking joint. Thus the foundation course will not be bonded. The reason for this is that there would be a practical difficulty in manipulating both the 16 feet and the 12 feet blocks in that situation. I pointed out these difficulties to the committee, and obtained their concurrence to this small departure from their recommendation. The importance of bonding is greatest in the top course, and diminishes in descending. In the bottom course it is practically nil.

20 The blocks will be further locked together by means of a projection on the top of one block fitting into a corresponding recess in the bottom of the block above. This principle was adopted in the original work, and was certainly successful in preventing the blocks from sliding on one another, as they had been found to do at Kurrachee and elsewhere. In the present case a

connection of a similar kind will be made between the ends of the 14 feet blocks on one side with the ends of the 14 feet blocks in the courses above and below on the other side, which overlap them, and there will also be hollows and projections on a somewhat similar principle in the backs and faces of the two top courses, thus giving additional ties throughout the whole width. A further tie will be given by means of a bent rail cemented into the two blocks of the top course in every row, but the cramp which is shown in the committee's sections in the second course from the top may, I think, be dispensed with, in consideration of the additional ties provided by the projections and hollows in the blocks themselves. The cramp could be only very imperfectly fixed, as it would be constantly in the wash of the sea, and the necessity of fixing it before setting the top course would be a serious obstruction to the work.

21 There will be an interval of about 45 feet between the face of the new wall and the back of the old one, and in this space the great bulk of the overthrown blocks are lying. The remainder of the space will be filled up with random blocks to form the wave-breaker, of which the remains of the old work will form the sea slope. Any of the old blocks of the two upper courses that remain in place will be removed to the body of the wave-breaker so as to leave the sea face fairly uniform. The two lower courses, of the sea wall at any rate, are very nearly perfect and will form a continuous toe to the slope of the wave-breaker very much as shown in the average section from 2,600 to 3,800.

22 There are now in stock 800 blocks which will be available for use in the wave-breaker. They are not of the best form for the purpose, but they will be used in the under parts where this is not of consequence. About 6,000 additional blocks will be required to complete the wave-breakers, and there will be uniformly 9 feet x 9 feet x 6 feet, and weigh 30 tons each.

23 The same system of work will be continued to the pier head, but the new built work will be curved round as shown on the plan, so as to avoid a great mass of fallen blocks among which the "Titan" is lying embedded, and also to obtain an entirely new foundation for the additional 50 feet of length required to obtain the narrower entrance. The old pier head is standing with the lower courses almost perfect, the interval between the ends of the old and the new work will be built up with a solid wall of concrete blocks, and the enclosed space behind filled in with random blocks. The last 200 feet of the new pier, including the portion facing the entrance, will be made 38 feet wide, instead of 24 feet, and will be founded 12 feet lower than that within the harbour, or 34 feet below mean sea level. Its toe will be protected by an apron of concrete blocks laid on the foreshore.

24 The work at the south pier will be generally similar to that at the north, except that, in consequence of the advance of sand, the protection works need not be commenced so near the shore, and there is no place requiring special protection like that proposed for from 200 to 250 at the north pier. There has been some advance of the sand since the date of the latest survey (1882), and in execution rather less work will be required than is shown upon the accompanying plan and sections, but for the present I have thought it better to base my estimates on the latest complete survey.

25 According to this then the protection by concrete blocks will commence at 1,900, and will gradually increase up to a high-water width of 20 feet at 1,300, where the depth at high water is 25 feet. It then continues with the width gradually increasing to 28 feet at 2,550, up to which point the existing pier is perfect.

26 At 2,550 the new pier commences, being connected with the existing work in the same manner as at the north pier, and is carried on to the head with only such variations as the different circumstances require. The line shown on the plan passes between the overthrown blocks and the Titan. The Titan is not in this case encumbered with blocks, and can be removed by blasting if it should be necessary to do so. The new head will be connected with the old one in the same manner as at the north pier. The difference in the form of the two heads is rendered necessary by the different positions of the fallen Titans, but there is no objection to it, as it will be scarcely noticeable from any accessible point of view.

27 I estimate that the above works will require 3½ years from the recommencement of blocksetting in June next, or till about the end of 1888. The estimated cost is Rs 45,90,051, including 7½ per cent for establishment, and 2½ for contingencies, but this estimate does not give a basis for determining the total cost of the harbour as completely restored, without taking into account the expenditure since the storm of November 1881, and the relation of that expenditure to the previous outlay on the one hand, and to the future outlay on the other, I shall show (in paragraph 42 post) that a sum of Rs. 2,96,334 has been already expended on works and materials included in this estimate.

28 The total expenditure up to 31st October 1881 was Rs 58,72,082 including Rs 1,53,945 expended in the purchase and partial fixing of moorings which were the subject of a different sanction from that of the harbour works proper. It also included the value of certain materials which had been acquired for the completion of the work and are still available.

29 Between 31st October 1881 and 30th April 1884 Rs 9,08,088 have been expended, and regular monthly statements purporting to account for the details of this expenditure have been

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regularly submitted to Government, but as, in conformity with the inflexible rule of the Public Works Department system, all charges are referred to heads for which there is a corresponding sanctioned estimate, the accounts would show that expenditure has gone on increasing for works to which no addition has been made. It is obvious that the present form of the accounts can only be viewed as provisional, and that any real explanation of the expenditure must be based on an entire re-arrangement of the statement.

30 At my request Mr Thorowgood has made such a re-arrangement, of which I append a copy (appendix A). From this it would appear that the total expenditure may be classed as follows —

	RS
1 Actual work, and purchase of materials for work	4,43,972
2 Purchase of land threatened with erosion, and compensation for land washed away	2,58,075
3 Establishment, and salaries of foremen under agreement	2,06,041
Total ..	9,08,088

But as the first and second of these items were incurred under the superintendence of the harbour works' staff, they should bear their fair charge for the cost of such, which I place at 10 per cent for the first, and the sum of Rs 6,600 (the actual salaries of the persons employed) for the second. With these correction the items would stand thus —

	RS
1 Actual work, &c	4,88,369
2 Purchase of land, &c	2,61,725
3 Establishment Cost during suspension of work	1,51,994
Total	9,02,088

31. Now I would submit that the last two of these items, although fairly debitable to the harbour undertaking, are not fairly chargeable to the works, and should be kept distinct in any statement of expenditure. I shall have occasion further on to explain the circumstances under which the outlay under the second head was incurred, and I will only now say that it ought to appear in a statement of gain and loss of land, in which there is a credit as well as a debit side. With regard to the third, I need only say that to add it to the item of "Establishment" in the accounts of either the old or the new works could only mislead. I submit that it should appear as an item by itself.

32 There remains to be accounted for the sum of Rs 4,43,972, or, including cost of management, Rs 4,88,369, little more than half the total of the official statement. This may be classed under four heads, as under —

	RS
A Stone revetment for protection of shore north of harbour	1,13,618
B Expenditure debitable to the original design	1,17,769
C Expenditure consequent on the storm of November 1881	39,509
D. Expenditure in anticipation of the restoration works	1,73,076
Total	4,43,972

33. The first of these items is part of a total of Rs 2,04,627 expended on this object and hitherto charged to "Contingencies." I think it might fairly be placed in the same category as the purchase of land, for which it is simply an alternative, but, at any rate, it should be kept apart as an exceptional item of expenditure.

34 Item B consists of Rs 75,023 expended on levelling and clamping the injured portions of the piers, and this would have been done even if the remaining portions of the work had not been damaged by the storm; Rs 16,328 is the expenditure on moorings in the month of November 1881 previous to the storm. The remainder of this item, Rs 27,412, covers Rs 16,013 expended on an extension of the town sewer at a spot more than half a mile from the harbour, and chargeable to the harbour funds on rather questionable grounds. This leaves Rs 11,399 for various small contingent expenses.

35 Item C consists of Rs 16,485 expended in clearing away the wrecks of the two hopper barges sunk in the storm, and this has to be reduced by more than half of a sum of Rs 12,835 (the proceeds of a sale of the recovered materials of the barges and some other old materials not easily separable), Rs 17,803 expended on the recovery, removal, painting, and tarring and stowing away for future use of mooring materials, and Rs 5,221, repairs to private property damaged in the storm.

36. Item D consists of Rs 87,230 for new concrete blocks, Rs 58,079 for various repairs and renewals of plant and machinery, and Rs 27,767, the net increase in the value of unused stores and materials since November 1881. The expenditure under this item (D) are charges against the estimate for the restoration works.

37 I have appended (appendix B) a statement of the total expenditure from the commencement of the works to 30th April last, classified under five principal heads, which I would submit for adoption in future accounts. The following is a summary —

Sanctioned estimate	Name of account	Expenditure
RS		RS
56,50,000	I Original design	56,57,840
2,00,000	II Moorings	1,90,589
	III Cost of establishment during suspension of works	1,51,994
	IV Gain and loss of land	4,82,114
	V. Restoration works	2,96,334
	Total as per official return	67,81,871

38 The first of these, I would suggest, may be considered a *closed account*. The official statement of expenditure up to 31st October 1881 has been amended by the addition of such subsequent works as are fairly debitable to the design, and by the removal from it of charges which must still be kept open, some being transferred, as shown in the appendix to account IV and some to account V.

39 The second (moorings) must be kept open, but no further expenditure will be incurred till the restoration works are further advanced. An amended estimate, though not a very large one, will then have to be submitted.

40 The third (cost of establishment during suspension of works) I would suggest should be treated as a *closed account*. A liberal allowance has been made for the legitimate cost of superintendence of such works as have been going on during the general suspension, and the sum of Rs 1,54,994 is the remainder.

41 The fourth (gain and loss of land) I shall explain more fully further on, and show that it should be treated from henceforth as one side of a Dr and Cr account.

42 The fifth will be absorbed in the regular accounts of expenditure on the restoration works, and will appear under the proper heads. Sanction is asked for an estimate of Rs 45,90,051, against which this amount of Rs 2,96,334 will be the first charge. The estimate itself, in the form which I submit for adoption, is given in appendix C.

43 I beg now to return to the subject above named, the gain and loss of land. This subject has been treated in former reports as the "sand difficulty" and the "changes of the coast line," but the two latter descriptions are now imperfectly applicable to it, while the first represents the result which is now most prominent.

44 It will be remembered that from the commencement of the works it became manifest that there were movements of sand up and down the coast in opposite directions in the two monsoons, of which the movement from south to north during the south-west monsoon was the greater. This movement being obstructed by the harbour piers the result was an annual advance of the shore line on the south of the harbour, and an annual retreat of the same on the north. The plans show the former in its successive steps for the last seven years. Each blue line shows the most shoreward position of high-water mark for the year. It advances every year from about March to about October, and then retreats from October to March. The rate of movement decreases with fair regularity from year to year, as the length of shore to be covered and the depth of water to be filled increase. It is clear on the one hand that there is no indication of a limit to the advance, and on the other that, considering the decreasing ratio in the rate of advance, the time when it will be injurious to the harbour is still very remote. The area of land gained from the sea up to the present time is 70 acres.

45 Within the harbour there has also been an advance of the shore line, but this took place almost entirely during the years 1876 and 1877, when the north pier formed the only barrier to the northerly movement, the south pier not having then advanced sufficiently to arrest it. Since the latter year there have been some variations in the positions of the high-water line, due to local causes, but no persistent annual advance. The area of land gained within the harbour is 18 acres.

46 To the north of the harbour the result is as might be anticipated, the reverse of that to the south. The preponderating northerly movement of sand causes an annual erosion instead of an accumulation. But the progress is much less regular. This is due to two causes, the one natural, the other artificial. The natural cause is thus. The sand within the influence of the waves is subject to two distinct movements, the alongshore movement due to the oblique stroke

of the wave (and this is greatest in moderate weather), the other a transverse movement which is on or off shore according as the wind is off or on shore. Thus the off shore wind in itself accumulative all along the coast acts with an accumulative alongshore movement to the south, and an erosive movement to the north, and the on shore wind of the remainder of the year, erosive all along the coast, acts with the erosive alongshore movement to the south, and the accumulative movement to the north. Hence the forces are in both seasons acting in concert to the south, and in opposition to the north, and the result is much greater irregularity in the annual changes where they are in opposition.

47. The artificial cause of irregularity is that whenever erosion is manifested protective measures are naturally at once taken, and these counteract the local erosion, even if they drive it to some other locality. As a whole, however, the protective measures appear to have been efficient, for while the gain of land to the south of the harbour has been, as already stated, 70 acres, the loss to the north has been only 41 acres, and this, of course, entirely beyond the limit of the protective works.

48. For the above reasons the conclusions to be drawn from the records of erosion north of the harbour are much less definite than those drawn from the records of the accumulation to the south. We know that erosion is going on, but both the rate of it and the locality for the future are very uncertain. Nevertheless, I think a provisional settlement has now been made upon a tolerably satisfactory basis, and I would ask for a confirmation of it.

49. To explain the present state of the question I must go back to the early stages of the work. The part of the shore affected extends for about two miles northward from the north pier. For three quarters of a mile there was a mile row along the shore, and on the landward side of this road stand in succession the Madras Railway Company's Railway terminus and offices, the Balcon Seafront's House (these are shown on the plan), some merchants' godowns, a first-class bungalow and compound belonging to the late Honorable J. O. Coleman (lately purchased by the Government), and a cluster of small brick-built native houses. Beyond this there was no regular road, but the shore was occupied by hut villages, with few permanent buildings, and timber yards. A little inland are two second-class bungalows standing in a row, having a depth of some 400 feet, beyond which is a good road parallel with the shore. To the northward of the last of these bungalows is a native village with a bazaar, but few permanent buildings, and beyond this agricultural land.

50. As the north pier advanced into the sea in 1876 the first effects of erosion were felt opposite the railway terminus. There were immediately met by the deposit of stone and bags of concrete, and little inconvenience resulted. As the pier advanced further seaward the locality of erosion was thrown further to the northward, and the protective works assumed the form of a continuous stone revetment between the pier and the sea, and upon this had been expended up to 31st October 1881 the sum of Rs 51,000. It extended to a point 3,450 feet from the north pier and a little beyond Mr. Coleman's property.

51. The storm of November 1881 showed, as had been anticipated, that this revetment required an addition of stone, as the pier was worked into the sand by the action of the sea. Some of the buildings close to the road were damaged, and were repaired at the expense of the harbour works, but, on the whole, the results of the storm were not serious so far as the revetment extended.

52. But the question was now prominently presented: How far is this protective revetment to be carried? It was effective as far as it went, but costly, and it became evident that it would be possible to spend more in protecting the land than the land itself was worth. In the early part of 1882, therefore, while at Madras, I investigated this question, and satisfied myself that though the revetment was fully justifiable as far as it had gone, for up to that point the evil of erosion would be even greater than the loss of the value of the land, this would not be the case much further on. I therefore recommended that the existing revetment should be strengthened, and that it should be extended northwards sufficiently to make a fair junction with the new line of shore, but that beyond that no further protection should be attempted. All the land abutting on the shore for some two miles northward should be purchased by the Government, so that no further questions of compensation to private owners should arise.

53. These recommendations have since been carried out. The revetment has been completed and extended at a cost of Rs 1,13,618 and 140 acres of land have been purchased, or its loss compensated for, at a cost of Rs 2,59,475, and these sums, together with the Rs 91,000 spent on the original revetment, and the cost of management, make up the sum of Rs 4,22,114, which I put forward in paragraph 37 as the debit side of the "Gain and Loss of Land Account."

54. I have now to show on what the credit side of this account will be based, and while I allow that the great bulk of this is still in the future, yet I submit that the longer the opening of the account is delayed the greater will be the difficulty in establishing it.

55. I have mentioned that 140 acres of land were purchased; of these 41 have been washed away, so that 99 acres remain. The rents of these are collected, and under present orders are to be credited to the harbour works funds. These at any rate should be placed in the new account.

56. Then there have been gained within the harbour limits, as stated in paragraph 45, 18 acres of land. A great part of this has been utilized, and two large godowns have been erected upon it by the Marine Department for port revenue purposes. The value of the accommodation thus given should be credited to the same account, either by the land being transferred to the Marine Department at its fair value, or by an annual payment proportioned to the use made of the land. This payment would no doubt increase from year to year.

57. To the south of the harbour 70 acres have been gained. The Commissariat Department have appropriated an advantageous site, which, five years ago, was in the surf, on which a building, 200 feet by 120 feet, has been erected. Another site has been appropriated in a similar manner by the Marine Department, on which was erected a shed for horses landed from ships. Other buildings of the same kind will no doubt follow, for the situation is a valuable one, and though it is no doubt gratifying to see it utilized, it is somewhat inconsistent that the outlay by which it has been acquired should be debited to one department, and the returns credited to another.

58. The above are Government appropriations, but private individuals are also profiting by the new site. The dealers whose timber yards north of the harbour were purchased at a high price out of harbour works funds are occupying the new beach south of the harbour for the same purpose *rent free*, or if rent is paid it is not credited to the harbour works accounts.

59. I am well aware that if revenue were collected from the sources I have indicated it would make at present but a small show in comparison with the expenditure, but it is certain that it would increase, and it is also desirable that the new land should be recognized as a property which has been acquired by the Government, at a cost of nearly five lakhs of rupees, and that some control should be exercised over its occupation. I would add that I am about to point out a mode of utilization of a portion of a site which would ultimately add materially to the value of the whole.

60. I would now beg to submit some remarks on the future utilization of the harbour, which, although they can only be followed up by definite recommendations for immediate action to a small extent, are, I think, especially called for at the present time, because the subject has been lately under discussion from another point of view. A proposal had been made to alter the position of the entrance, with the view of obtaining stiller water in the harbour, but as this proposal was not approved by Sir John Hawkshaw, Sir John Coode, and Professor Stokes, on reference to them by the Secretary of State, it may now be considered at an end. It is only necessary for me to say that I concur in their conclusion, and I only refer to it now as giving a suitable occasion for pointing out what may be done for improving the accommodation of the harbour with the entrance in its present position.

61. The main points to be kept in view are—

I.—The safety of ships

II.—The facility for loading and discharging cargo boats alongside the ships.

III.—The facility for loading and discharging cargo boats at the shore

IV.—The safety of cargo boats and other local craft in bad weather

62. With regard to the safety of ships, I think it is now generally understood, though it may be somewhat inconsistent with the popular ideas upon the subject, that a harbour may be very useful, even though it may not be a place of absolute safety in the heaviest storms. If Madras were a terminal port such as London or Liverpool, or even Calcutta or Bombay, the want of absolute safety would be a serious drawback, but Madras is essentially a port of call, where ships only remain for a day or two, and are never dismantled. A steamer's fire is never settled weather, without every facility being provided for her leaving at an hour's notice, and in any wind. To be caught in a cyclone at Madras, therefore, is no more than to be caught in a cyclone in mid ocean, provided always that the ship can get to sea. This then is the provision that is wanted, and not a safe mooring in the height of the storm.

Now, it must be remembered that the dangerous storms in the Bay of Bengal never come without notice, but occasionally, indeed frequently, the notice comes without the storm following. This is a source of inconvenience, because precautions have to be taken upon the actual advent of the storm, when they would be too late. Hence it happens that when ships are sent to sea they return without having met with the storm.

63. But this is an inconvenience which may fairly be expected to happen in a port of call. Traces of storms are better recorded, and the actual occurrence is traced. Even as it is, however, the inconvenience is not so great as it might be, as an infinitesimally small deduction from the total number of ships which pass the harbour years there have not been more than four or five which have been damaged. The only loss of a steamer has come into the harbour, and that at a time when it was not in the harbour.

66
12

64 It must be admitted that, in one respect, a ship is worse off in the harbour than anchored in the roads outside. She must put to sea at an earlier stage of the warning for bad weather, as the confined space increases the difficulty of manœuvring the ship with a strong wind and sea, setting probably from different quarters. I at this is an evil which will certainly diminish with more complete mooring and warping appliances and more local experience on the part of the marine officers, and it does not touch the question of the ultimate safety of the ship. It has sometimes been asserted that the harbour is a trap from which escape would be impossible. It might perhaps be so once in 10 years if the commander of the ship, and the whole staff of the Marine Department and the Meteorological Observatory, were simultaneously to neglect the most ordinary and well known means to us, but, under existing conditions, such an idea is inconceivable.

65 I submit, then, that the den and I absolutely safe berthage for ships in the height of a cyclone is based on her on an imortal than on practical grounds. The harbour introduces no new element of danger. All that can be said is that, while it gives many new advantages and removes many evils, it leaves one evil of very rare occurrence unaltered. It is right to add that I do not think even this one evil is irreducible at some future time, but at present the circumstances of the port would not warrant the necessary outlay.

66 With regard to the second point, the facility for loading and discharging cargo boats alongside the ship, the advantages of the present over the old system are obvious. Under the old system the ship was anchored at a mile or upwards from the shore to a single anchor, and rolled she swung with her head to the wind or the current whichever might be the stronger, and rolled to the swell which generally comes from a third quarter. A more "uncasy" position for a ship, even in ordinary weather, it is difficult to imagine, and all around her, while subject to these conflicting disturbances, the cargo boats had to crowd. These boats again were subjected to yet another disturbance, the wind waves, which would scarcely affect the ship except indirectly by constantly driving the boats against her sides. Under these circumstances cargo had to be transferred to and from the boats. Then the boats had to be rowed out and back by manual labor (11 men to a boat carrying two tons) over this mile, and through the surf. The whole operation was one of little danger but of great cost, both in the labor employed, the damage done to goods, and the detention of the ships.

67 Now compare this with the present system. The ship is now brought to within a quarter of a mile of the shore; she is completely out of the current, and, being moored head and stern, is not affected by the wind, her head faces the swell. The wind waves which tossed the boats outside the harbour are much reduced, so that the latter are far more manageable. I mention these details to show that the advantages afforded by the harbour are by no means confined to a reduction of the on-shore swell. Even if this were disregarded altogether, and even those who are loudest in their disparagement admit some reduction, the advantages which remain are sufficient to explain the reason of the notrious fact that ships are eager to enter the harbour. Of course it is fully admitted that the more the swell can be reduced the better, but to make this one object paramount is altogether to misrepresent the case.

68 With regard to the loading and discharging cargo boats at the shore, the advantage gained so far is simply that due to the reduction of the waves, whatever that may be. In itself it is not much, but the stiller water enables improvements to be made which would have more effect. The existing screw-pile pier was made for open sea work, and it has inconveniences which are inseparable from such work. The principal one of these is its great height (about 18 feet) above water. With constant smooth water a height of 6 feet would be sufficient, and obviously much more convenient.

69 A few months before the storm of November 1881 two new low level jetties were actually commenced, with the intent on that they should for a time supersede the screw pile pier, which was itself to be altered and adapted to the new circumstances, and again brought into action when required as an auxiliary to the new jetties. The storm put an entire stop to this scheme, at any rate till the harbour is restored, and if it is then revived it must be with considerable modifications. But this scheme was after all only the best under circumstances then existing. New circumstances have since arisen, and another scheme must be adapted to them.

70 Such a scheme may be found in the modification in the system of working the existing pier. The complaint first made was of the great height cargoes had to be lifted, but, in reply to the obvious suggestion that the employment of steam cranes would remedy this evil, the further complaint was started that, even if the goods were lifted more quickly, they could not be removed from the pier on the existing line of railway. Now the pier is 49 feet wide. It contains four lines of railway of 5 feet 6 inches gauge. Upon the same width six lines of metre gauge could be placed. These two additional lines of railway would relieve any conceivable amount of block. All that is wanted, therefore, to treble (I think I may safely say) the present accommodation of the pier is to expend fifty thousand rupees on three or four steam cranes with a quick motion, a sufficient stock of narrow gauge trucks, and materials for two extra lines of railway. It is no part of the present duty of the harbour works staff to work out the details of such a scheme, but I have no hesitation in saying that some such would be a perfect solution of any existing or probable difficulty in the loading and unloading of goods at the shore.

71 The last point which I named in paragraph 61, the safety of cargo boats and other local craft in bad weather, is, in my opinion, the most important of all. As I have already shown ships have a refuge at sea, but this is not available for local craft. If they cannot safely ride at anchor they must be hauled up on the beach. This necessity obviously limits the size of the craft to be employed. Masula boats carrying two tons can be beached even when loaded. The cargo boats carrying 12 tons, which were introduced after the screw-pile pier was built, can be beached empty, and were formerly so placed in safety during the two bad weather seasons of the year, but for lighters of 60 to 100 tons, which are essential to an economical system of landing and shipping cargo, for a steam tug, for a floating derrick for lifting heavy articles, and for other craft for which a demand is sure to arise, beaching for purposes of safety is not practicable, safe floating berths must be provided.

72 I had certainly formerly anticipated that craft of this description might have safely lain at anchor within the harbour even in the worst weather, but I am not prepared to resist the impression to the contrary which was produced by the effects of the late storm. It may be that that impression will be removed or modified by further experience of future storms, when the breakwaters are more efficient and the opening for the entrance of the waves reduced; but for the present I will assume that, on the threatening of a cyclone, the present area of the harbour must be cleared by the sea-going ships going to sea, and the local craft in another direction. What is this direction to be?

73 The 70 acres of land gained to the south of the harbour and described in paragraph 44 of this report seem to suggest an answer to the question. It will be seen from the plan that, in March of this year, the high water line outside the harbour was nearly continuous with the two-fathom contour inside. Two years hence it may be safely predicted that it will be something like 100 feet further out. Now, a dock or basin 1,000 feet long, 300 feet wide, and 10 feet deep at low water, with an opening through the pier into the harbour 60 feet wide, covered by a jetty of concrete blocks running northwards from the pier for 300 feet, would provide accommodation for the whole of the local craft, and would cost, including a stream dredger for the excavation, about 1½ lakh of rupees, and for an additional half lakh the area of the basin could be doubled.

74 I do not suggest this for immediate execution. Craft too large for hauling up on the beach should not be introduced till the harbour is somewhat more complete, but I point it out in general terms as the direction in which the harbour may be extended, and developed to a great extent. The basin would be, in the first instance, a mere place of shelter, but a boat wharf would soon be established on its landward side, and the frontage would become valuable. As the high-water mark advances seaward the basin would be widened, and in course of years its seaward margin would be so near the deep water in the harbour as to suggest the possibility of a ship entrance. With such capabilities in the site which has been added to the harbour property I submit that I am justified in anticipating advantages which will go far to compensate for some disappointment in the degree of stillness obtainable in the area of the harbour itself, and an equivalent for the five lakhs expended in protecting and purchasing land to the north.

75 It is right to state that the idea of the necessity of boat shelter is by no means new. It was urged years ago, and among others by the present Master Attendant, Captain Taylor, as the real want of Madras, and, in the visits I have paid to several other ports of India, I have found that the cost of landing and shipping cargoes is less dependent on the condition of the ship's anchorage, as to exposure or distance from shore, than upon the power of employing larger or smaller cargo boats, and this in its turn depends on the facilities for giving them shelter. But it must be remembered that at Madras a boat harbour would have been impracticable on account of the movement of sand along the shore until works had been carried out far enough into deep water to stop the sand and at the same time to form a ship harbour.

76 I may further suggest that this boat harbour would form the most convenient access to a line of water communication with the Buckingham Canal, and the extensive system of inland navigation in connection with it. The distance is about a mile, and the intermediate ground is almost entirely unoccupied.

77 As the foregoing report has dealt with a variety of subjects, it may be convenient if I conclude by a concise *resumé* of its contents.

Paragraphs 1 to 26 are devoted to a description of the proposed works of restoration. Paragraphs 27 to 32 contain an analysis of the expenditure especially since the storm of November 1881, and paragraph 37 contains my recommendation as to the apportionment of the items of expenditure to five several heads.

Paragraphs 43 to 59 deal with the question of gain and loss of land by the accumulation and erosion of the sand on the coast.

Paragraphs 60 to 75 deal with the utilization of the harbour, 62 to 65 having reference to the means for ensuring the safety of ships 66 and 67 to the transfer of cargo between the ships and the boats, 68 to 70 to the loading and discharging of boats at the shore, with a suggestion in paragraph 70 for an immediate improvement of the system of working on the screw-pile pier, 71 to 75 to the safety of cargo boats and other local craft in bad weather, with a suggestion in

73 and 74 for the future utilization of the land gained to the south of the harbour by the formation of a boat harbour.

Paragraph 76 suggests that a communication may ultimately be established between this harbour and the inland canals.

78 In the appendices will be found the following —

- A Mr Thorowgood's re-arrangement of the accounts of expenditure from October 1881 to April 1884
 B Abstract of expenditure from commencement of works to 30th April 1884
 C Estimate of restoration works as recommended, with statement of expenditure in respect thereof to 30th April 1884

I have, &c.,

(Signed) W. PARKES

APPENDIX A.

MADRAS HARBOUR.

Analysis of Expenditure between 31st October 1881 and 30th April 1884 by Mr Thorowgood

Total expenditure shown in accounts, 30th April 1884	Rs.
Add recovery on sale of plant and materials	67,69,036
	12,415

Total expenditure, as shown 31st October 1881	Total
Add for work done in November 1881, south pier rubble	68,72,083
	1,200

Add further for recoveries on "concrete blocks" in north and south piers (of which Rs 298 is accounted for)	58,73,283
	300
	58,73,583

Total difference to be accounted for ...	9,08,268
--	----------

Expenditure.

1. Additions to existing pier works —	
Concrete topping, clamping, and railways—	
North pier	41,088
South pier	27,080
Rubble for shore and repairs to surf banks—	
North pier	3,561
South pier	
	75,029
2 Recovery and destruction of hopper barges	16,455
3 Recovery and painting mooring gear, exclusive of cost of four pontoon boats (Rs 8,465)	18,003
4 Rubble stone revetment, north beach	1,14,618
5 Repairs to buildings, damages by sea	3,241
6 New concrete blocks	87,280
7 Repairs and renewals to machinery and plant, transferred from other heads as below —	
Concrete blocks	19,082
Setting blocks	8,819
Revetment, north beach	1,859
Mooring	2,000
North pier, repairs	2,459
South pier, do.	1,911
North pier, for shore	1,766
South pier, do	4,542
Pontoons (item 3)	8,105
	60,965

7a Actual charges under "General Tools" between November 1881 and 30th April 1884, as shown in accounts ...

Total to this point ...

8 Establishment taken at 7½ per cent. on the above total	28,010
9 Contingencies (including intercepting drain)	27,250
9a Police, conservancy, and lighting	3,307
10 Compensation paid for land washed away	52,181
11 Purchase of land north of harbour	2,05,894
12 Establishment on items 10 and 11, estimate at Rs. 350 a month for 19 months (nearly 2½ per cent.)	6,650
13 Taking total establishment charges, as shown in accounts, and adding charge for establishment during suspense, transferred as below, deduct from this total, items 8 and 12 and there remains establishment during suspense	1,68,074
Total charge to 30th April 1884	5,10,809
31st October 1881	3,51,004
	1,59,805

Add from—	
North pier rubble	1,766
Setting blocks	8,819
North pier, sea damage	4,918
South pier, rubble	4,552
South pier, sea damage	1,932
Concrete blocks	19,082
Revetment	1,860
	42,829
	2,02,734
Total	8,64,831

Add to this—	
Stone lying at quarry	4,659
Stores on hand	23,108
Payments for moorings in accounts of November and December	15,328
Item No 34 in account sheet	162
	43,257
	9,08,288

Note—The above is the basis of the statement forming appendix B, but the items have been further re-arranged to some extent, which accounts for some differences in the figures, though the total amounts will be found to agree

W PARKES.

APPENDIX B

MADRAS HARBOUR WORKS

Abstract of Expenditure from Commencement of Work to 30th April 1884

Estimates	Description of Work	Expenditure.
	(I) Original Design	RS.
	Expenditure to 31st October 1881	57,18,137
	Do in November	1,500
	Supplementary protection works	75,029
	Contingencies	27,412
	Recovery of wrecks and repairs of storm damage	21,706
	Establishment, 10 per cent on Rs. 1,24,147 ...	12,415

Abstract of Expenditure from Commencement of Work to 30th April 1884—cont

Estimates	Description of Work	Expenditure
		RS
	Deduct (transferred to IV and V)—	
	To IV, Revetment 91,009	
	" IV, Purchase of land 1,400	
	" V, Concrete blocks 40,281	
	" V, Stores 65,669	
	1,98,359	
Sanctioned, Rs 66,50,000	Net expenditure on original design	66,57,840
	(II) Moorings	
	Expenditure to 31st October 1881 1,53,915	
	Do in November 1881 15,328	
	Subsequent expenditure 18,003	
	Establishment, 10 per cent on Rs 33,133 3,313	
Sanctioned, Rs 2,00,000	Expenditure to 30th April 1884	1,90,589
	(III) Cost of Establishment	
Submitted for sanction, Rs 1,54,991	During suspension of works	1,51,994
	(IV) Gain and Loss of Land—	
	Gained, 88 acres, lost, 41 acres	
	Protection . Revetment previous to October 1881 91,009	
	Do do subsequent to do 1,13,618	
	Establishment, 10 per cent on Rs 1,13,618 11,362	
	Purchase of land and compensation 2,54,075	
	Do, transferred from I 1,400	
	Establishment expenses 6,650	
	4,82,114	
	Total to be carried to debit of account	
	(V) Expenditure to be charged against Restoration Works	
	Concrete blocks, transferred from I 40,281	
	New do made since October 1881 87,230	
	Repairs and renewals of plant and machinery 58,079	
	Consumable stores on hand October 1881, transferred from I 65,669	
	Do, balance of additions and issues since October 1881 27,767	
	Establishment, 10 per cent on Rs 1,73,076 17,308	
	2,96,334	
	Total to be carried to debit of account	
	Total expenditure to 30th April 1881, as per official return.	67,81,671

21st August 1884

W. PARKES

APPENDIX C

MADRAS HARBOUR

Estimate of Restoration Works.

	Amount	Amount	Expenditure to 30th April 1884
	RS	RS	RS.
<i>Preliminaries</i>			
New machinery from England	1,74,050		
Repairs and renewals of old machinery	72,479		58,079
Alteration and extension of block grounds	10,000		
Railway materials	71,000		
Total preliminaries		3,27,529	
<i>North Pier</i>			
Rubble stone in foreshores and base—			
Ordinary deposited from breakwater, 5,532 tons at Rs 1-8-0	8,297		
Do, from boats, 182,260 tons at Rs 2	3,61,520		
Large do. under wave-breaker from breakwater, 14,757 tons at Rs 1-12-0	25,812		
Concrete blocks for building—			
Making 58,116 cubic yards at	9 0 0	5,23,044	
Setting 2,062 " "	2 0 0	4,124	
Do 35,245 " "	2 8 0	88,112	
Do 20,809 " "	3 0 0	62,427	
Concrete in mass for filling 500 cubic yards at	10 0 0	5,000	
Wave-breaker—			
Built blocks, 288 cubic yards at	10 0 0	2,880	
Ordinary do 70,849 cubic yards at	9 0 0	6,37,641	
Depositing do 70,849 cubic yards at	1 0 0	70,849	63,756
Apron blocks, 1,667 do	9 0 0	15,003	
Setting do 1,667 cubic yards at	4 0 0	6,668	
Concrete in bags, 742 cubic yards at	12 0 0	8,904	
Cramps, 330 each	10 0 0	3,300	
Concrete capping, 22,400 cubic yards at	10 0 0	2,24,000	
Total for north pier		20,50,581	
<i>South Pier</i>			
Rubble stone in foreshores and base—			
Ordinary deposited from breakwater, 675 tons at Rs 1-8-0	1,013		
Do deposited from boats, 169,517 tons at Rs 2	3,39,034		
Large do. deposited from breakwater, 15,038 tons at Rs 1-12-0	26,317		
Concrete blocks for building—			
Making 52,113 cubic yards at	9 0 0	4,69,377	
Setting 2,062 " "	2 0 0	4,124	
Do 29,282 " "	2 8 0	73,205	
Do 20,809 " "	3 0 0	62,427	
Concrete in mass for filling, 500 cubic yards at		5,000	
Rs. 10			
Wave-breaker—			
Blocks, making 57,066 cubic yards at	9 0 0	5,13,594	
Depositing do 57,066 do at	1 0 0	57,066	63,755
Apron blocks, 1,667 do at	9 0 0	15,003	
Setting do 1,667 do at	4 0 0	6,668	
Concrete in bags, 742 cubic yards at	12 0 0	8,904	
Cramps, 275 each	10 0 0	2,750	
Concrete capping, 19,200 cubic yards at	10 0 0	1,92,000	
Total for south pier		17,76,482	

Estimate of Restoration Works—cont

	Amount.	Amount.	Expenditure to 31st April 1884
	Rs.	Rs.	Rs.
Materials in store to be debited to works during progress	...	3,11,594	93,436
Establishment, 7½ per cent	...	1,03,665	17,308
Contingencies, 2½ " " " " " " " "	...	20,000	..
Lighting entrance " " " " " " " "	...	..	..
Total ..	..	45,90,051	2,98,334

21st August 1884

W. PARKES

From the Officiating Under Secretary to the Government of India, dated Simla, 28th October 1884, No. 415 M.

Forwarded to the Government of Madras in the Public Works Department for report on the proposals and estimates

(By Order.)

(Signed) R. B. BUCKLEY,
Offg Under Secy. to the Govt. of India.

From JULAND DANVERS, Esq., Secretary, Public Works Department, to the Secretary to the Government of Madras, Public Works Department, dated India Office, S W., 25th September 1884, No. 1433 P.W..

I am directed to transmit herewith, for the information of the Government of Madras, copies of a despatch, No. 56 (together with its enclosures), which the Secretary of State for India has this day addressed to the Government of India relative to the Madras Harbour Works.

From JULAND DANVERS, Esq., Secretary, Public Works Department, to the Secretary to the Government of Madras, Public Works Department, dated India Office, S W., 10th October 1884, No. 1433/2 P.W.

With reference to my letter of 25th ultimo, No. 1433/1 P.W., I forward herewith the plans (2) referred to by Mr Parkes in his report on the restoration of the Madras Harbour Works, dated 21st August last.

Office Note from the Examiner of Public Works Accounts, to the Secretary to Government, Public Works Department, dated Madras, 13th November 1884, No. 589.

Your office note No. 1999 D, dated 10th November 1884

I do not see any objection to the proposed recasting of the heads of account under which the expenditure on the Madras Harbour Works has been recorded. If the re-arrangement be ordered the details can be settled by Mr. Thorowgood in communication with this office.

From J. H. TAYLOR, Esq., Lieut., R.N.R., Master Attendant, Administrative Department, Madras, to the Chief Secretary to Government, dated Madras, 17th November 1884, No. 10562.

With reference to your endorsement, No. 2532, dated 13th November 1884, I have the honor to state that, under the provisions of the Indian Ports Act XII of

1875, the beach is vested in the Marine Department and not the Harbour Works, and accordingly rent is being levied for the same, at the rate of Rs. 6 per ground per month for the storage of timber, the amount being credited to the harbour dues account in order to assist in meeting the interest on the construction of the harbour. The Railway Company alone pay Rs. 3 per ground per month for the ground held by them, as it is at a long distance from the landing place. Mr. Parkes is in error with regard to the value of the sand reclaimed. The principal portion of it is now a lake, and no building could be erected on it, even if other objections did not exist from a military point of view. The horse stockade has no sure existence. It is liable to be washed away in any storm, and the mule stables, which occupy a slightly higher ground, are erected by Government, and the Marine Department has not taken any rent or claimed any jurisdiction over it

From A. T. ARUNDEL, Esq., President of the Municipal Commission Madras, to the Chief Secretary to Government, dated Madras, 27th November 1884, No. 1595.

In reply to endorsement, No. 2593, Financial, dated 20th November 1884, I have the honor to report that the municipality does not occupy any part of the new foreshore gained by the harbour, nor does it collect rents from any of the timber merchants or other occupants. The collection of such ground rents by the municipality ceased in 1881 and was left to the proper officers of Government (G.O., No. 234 W., dated 28th January 1881).

No. 2704, Financial.

Transferred to the Public Works Department

(By Order)

(Signed) J. D. REES,
Ag Under Secy. to Govt.

FORT ST GEORGE,
5th December 1884

No. 2612, Marine

Transferred to the Public Works Department.

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

22nd November 1884.

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 Fort William, 28th November 1884, No. 450 M.

In compliance with the request contained in your letter, No. 2815 W., dated 10th November 1884, I am directed to forward the accompanying copy of a despatch to the Secretary of State, No. 32 P.W., dated 4th July 1884, regarding the restoration of the Madras Harbour

ENCLOSURE.

Despatch from the Government of India, Public Works Department (Civil Works—Miscellaneous), to the Right Honorable Her Majesty's Secretary of State for India, dated Simla, 4th July 1884, No. 32 Public Works

In continuation of our despatch, No. 59 P.W., dated 13th November 1883, and with reference to your Lordship's despatches, Nos. 23 and 24 P.W., dated 24th April and 15th May 1884, respectively, in connection with the Madras Harbour Works, we have the honor to forward,

for the information of Her Majesty's Government, copy of a further communication from the Government of Madras, and to state that we concur generally in the opinions therein expressed concerning the restoration of the harbour

G O, dated 6th December 1884, No. 6093, Military.

From the Controller of Military Accounts, to the Secretary to Government, Military Department, dated Fort St. George, 1st December 1884, A.

In forwarding the accompanying letter * from the Commissary-General, I have the honor to express my concurrence with the views held by him, and to attach a letter† from the Examiner of Public Works Accounts, to whose department the charge appertains.

* No. 2124 T B., of 22nd November 1884, stating that the Harbour authorities have no claim to rent for mule lines if it is not within their limits
† No. 57 C M A., of 28th November 1884

ENCLOSURES

From the Commissary-General, to the Secretary to Government, Military Department, dated Madras, 22nd November 1884, No. 2124 T B

I have the honor to acknowledge the receipt of Proceedings of Government in the Public Works Department, No. 2817 W., of the 10th instant, forwarded for report under your docket, No. 5627, of the 13th idem, and herewith returned as requested

2 Mr Parkes, Chief Engineer of the Madras Harbour Works, in paragraph 57 of his report claims rent for the site on which the commissariat mule stable now stand on the plea that five years ago this site was in the surf and that the beach on which the stables stand has been reclaimed in consequence of the construction of the harbour works

3 It seems open to question whether the reclaiming of this beach was a portion of the original harbour scheme, or whether this steady encroachment of the sand is not a danger which gives the authorities considerable anxiety for the future of the harbour

4 If this reclamation was not a portion of the original scheme, it appears doubtful whether the harbour authorities can claim rent for a site which they had no direct intention of forming

5 A question of fact also arises, viz., whether the site of the commissariat mule lines was five years ago in the surf as stated by Mr Parkes That officer may not be aware that to prevent the encroachment of the sea a number of stone groynes were many years ago thrown out by the Engineer Department of Government, the first being constructed opposite the office of Messrs Parry and Company as far back as 1853

6 These groynes reclaimed a considerable beach, and in default of accurate measurements of the foreshore for many years past I think some further proof is needed of Mr Parkes' statement that the site on which the mule stables stand has been reclaimed since the harbour works commenced

7 Moreover if, as I suppose, the commissariat mule sheds are beyond harbour limits the harbour authorities can, I imagine, have no claim to rent.

From the Examiner, Public Works Accounts, to the Controller of Military Accounts, Fort St. George, dated Madras, 28th November 1884, No. 57 C M A

In returning the papers received with your memorandum, No. 2644, dated 25th November 1884, I have the honor to state that this office has no remarks to offer on the question raised

Order—dated 6th December 1884, No. 6093, Military.

The replies of the Commissary-General and Controller of Military Accounts communicated to the Public Works Department

(True Extract)

(Signed) A. KENNEY-HERBERT, Lt.-Col.,
Offg Secy. to Govt, Mily. Dept

From F. N. THOROWGOOD, Esq., M. Inst. C.E., Superintendent, Madras Harbour Works, to the Secretary to Government, Public Works Department, dated Madras, 6th December 1884, No. 27 W.

I have the honor to acknowledge the receipt of your memorandum, No. 1996 C., of the 4th, asking my opinion as to the sufficiency of the estimates made by Mr Parkes for the restoration of the Madras Harbour and forwarded with the Secretary of State's despatch, No. 56, of September 25, 1884.

2 I have carefully examined all the details of the estimates, and indeed was in consultation with Mr. Parkes at Westminster when they were made, and I believe that they are perfectly sufficient for the work to be done.

3 I beg to be permitted to add that I hope the arrangement suggested in paragraph 37 of Mr. Parkes' report may be carried out, substituting for the date April 30, 1884, the date at which the *bona fide* work of restoration on the new design shall commence, and correcting the figures accordingly. An infinite deal of trouble and numerous petty disputes will be avoided if we can start *facto* on a new estimate, the detailed arrangements of which can be made between the Examiner of Public Works Accounts and myself.

4 I return the papers marginally noted, as I imagine you intend that I should do

1 Despatch
2 Plans

Order—dated 19th December 1884, No. 3127 W., Public Works.

In his despatch of the 25th September 1884, No. 56 P W., the Secretary of State communicates to the Government of India the conclusions at which he has arrived in respect to the restoration of the Madras Harbour Works. It is intimated that the plan of future operations proposed by Mr. Parkes should be followed generally; the eastern entrance being maintained, in the absence of any additional facts or arguments of sufficient weight to justify a further reference to engineering authority in England. The revised estimates framed by Mr. Parkes should, it is stated, be examined and reported on

2 His Excellency the Governor in Council observes that a decision having been come to in favor of the eastern entrance, there seems nothing to prevent the immediate prosecution of the work of restoration on the estimates framed by Mr. Parkes, the sufficiency of which for the object in view there seems no reason to doubt.

3 The Examiner, Public Works Accounts, reports that he sees no objection to the proposed recasting of the heads of account under which the expenditure on the works has been recorded. The details of the re-arrangement can now be undertaken on the lines suggested by the Superintendent in his letter, No. 27 W., dated 6th December 1884.

4 It is observed that the accretion to the south of the harbour is vested in the Marine Department under the provisions of the Indian Ports Act XII of 1875, and that the rents collected for occupation of the land are carried to the credit of the harbour dues account, to assist in meeting the interest on the capital cost of the harbour works

5 A copy of these Proceedings will be forwarded to the Government of India in reply to their endorsement, No. 415 M., dated 28th October 1884

(Here enter No. 3128 W, dated 19th December 1884)

(True Extract)

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

To the Superintendent, Madras Harbour Works
" Examiner, Public Works Accounts
" Marine Department

20

19TH DECEMBER 1884 No. 3128 W., PUBLIC WORKS.

ENDORSEMENT—dated 19th December 1884, No 3128 W., Public Works.

Copy of the above forwarded to the Government of India.

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

66
18

6

Edw C Howarth.
Spare Copies

BUILDINGS AND ROADS.
CIVIL WORKS

Govt. of Madras.
PUBLIC WORKS.

Dated December, 19th.

Recd

Encl

G.O., 19th Dec. 1884, No. 3128 W.

DECEMBER.

Madras Harbour Works
Forwarding copy of Proceedings on the
subject of the reconstruction of the —.

No 3217

FROM

THE SUPERINTENDENT,
MADRAS HARBOUR WORKS,

To The Secretary to Government
Public Works Department
Madras.

MADRAS, 7 January 1885.

Sir,

I have the honour to acknowledge
the receipt this day of G.O. No 3127 W
of December 19th 1884 passing orders
on recommencement of work on the
Harbour Pier.

2. I apprehend that orders will
shortly be passed sanctioning a
further grant of funds without
which I cannot push things forward
more rapidly than at present (vide
my letter No 3077 of December 26th 1884).

3. I am however at once framing the
estimate for Restoration in the re-
quired form and consult with the
Examiners Public Works Accounts on
the detailed arrangements of the
same. — I have the honour to be,
Sir,

Your most obedient servant

C. A. Mervin
Superintendent Madras

328, 10-12
 555, 12-12-12
 20-12-12
 20-12-12

Buildings and Road Branch
 From the Superintendent
 Madras Harbour Works



No 3212
 dated 7th } January 1885
 Recd

As Madras Harbour Works, Station
 he is in a position to frame
 the estimate in the required
 form for the consideration of
 the -

No 66. W

PUBLIC WORKS DEPARTMENT.

PROCEEDINGS OF THE MADRAS GOVERNMENT.

Under date the 9th January 1885

Read the following

From the Supdt. Madras
 Harbour Works

{ G.O. No. 3210. dt 7th Janry 1885

The Supdt. should
 at once take up the revision
 of the estimate, as directed
 in para 3 of G.O. 3127 dt
 19 Decr. 84.

Additional funds have
 been applied for (G.O. 3152 dt
 28th Decr. 84); Meanwhile
 expenditure must be limited
 to the sanctioned grant
 for the works.

To the Supdt. Madras Harbour
 Works.
 For P. M. Accounts
 Dated 15-1-85

CB
 5.1.85

W
 8.1.85

139

Govt. of Madras.

PUBLIC WORKS.

100

100

100

GO. P. W. No. 66.

100

The Government
intended to have
the revision
of the estimate on
the construction