

MARINE DEPARTMENT.

FROM

THE CHAIRMAN,

HARBOUR TRUST BOARD,

MADRAS.

TO

THE CHIEF SECRETARY TO GOVERNMENT,

Marine Department.

DATED 29th May 1895

DESPATCHED 31st May 1895.

RECEIVED

enclosed Plans (2)
four photographs under
separate cover

No. 871

SUBJECT.

MADRAS HARBOUR.

Submitting Report upon Progress made in the
reconstruction of the ——— for the quarter ending
31st March 1895.

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MADRAS HARBOUR TRUST,
SECRETARY'S OFFICE,
29th May 1895.

No. 871

From

W. J. H. LEFANU, Esq., I. C. S.,
CHAIRMAN, HARBOUR TRUST BOARD,
Madras.

To

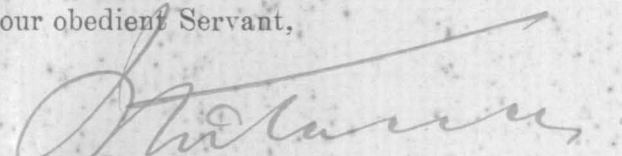
THE HON'BLE MR. J. F. PRICE, C.S.I., I.C.S.,
Chief Secretary to Government,
Marine Department.

SIR,

As directed in G. O., Public Works, No. 2920 W., dated 15th November 1894, I have the honour to submit herewith a separate report upon the progress made in the reconstruction of the Madras Harbour, during the quarter ending 31st March 1895.

I have the honour to be,

Sir,
Your obedient Servant,


Chairman, Harbour Trust Board.

Extract of Proceedings of the Trustees of the Harbour of
Madras, at a Meeting held at the Offices of the Board on
Friday, the 17th day of May 1895,

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12. Read Progress Report of the Board's Engineer upon the re-construction
of the Harbour, for the quarter ending 31st March 1895.

Recorded, and resolved that this report be submitted to Government.

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True Extract.

C. PINSENT,
Secretary, Harbour Trust Board.

MADRAS HARBOUR WORKS

Report of Progress on the Madras Harbour Works for the Quarter ending 31st March 1895.

Accompanying this report are the following plans and statements :—

No. 39. (a) A plan of the Harbour to a scale of 200 feet to an inch, showing in red the position and quantity of work done during the quarter. The contours in half fathoms, shown on this plan inside and outside the Harbour, are those of the last complete Marine Survey made in 1893.

2. The positions of the High Water Marks of 31st March 1895, and that of the previous twelve months, both to the north of the revetment and the south of the Harbour, are shown for comparison.

No. 39. (b) A revised plan showing in detail the advance made during the quarter at the Pier Heads as now constructed, and the positions of the Caissons at the Pier Heads of the Harbour, with a completed Eastern Entrance having a width of 515' 6" and deep water alongside each Pier Head.

No. 40. (c) A statement comparing the expenditure on different sub-heads of work up to end of quarter, with the provisions of the Sanctioned Estimate.

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4. **North Pier Head.**—Work at the North Pier consisted of extending the capping towards shore, and the building of the South Pier Caisson, and lining it with concrete, previous to placing it in position at the South Pier Head.

5. The North Pier Head capping was proceeded with during the quarter, whenever any extra concrete could be turned out, more than was required for the Caisson lining and ballasting; and therefore there were only 47 days in the quarter when the capping could be proceeded with, and during this time 573½ feet of the North Pier capping was completed, by building large blocks in mass concrete along the bonded wall, uniting and covering four courses of block-work by each block; and 23 such blocks were completed during the quarter amounting to an out-turn of 3,093¾ cubic yards of concrete.

6. The total length of the North Pier as completed, from the end of the Caisson to the first block set on shore in 1876, is 3,816 feet, 9 inches.

7. **South Pier Head.**—Until the 12th January, nothing could be done at the South Pier Head to further the preparations for setting the Caisson in position in March, owing to a heavy swell continuously washing over the old wrecked Pier.

8. On the 14th January the sea was calm, and four of the old blocks,

which had fallen from the old wall and which had prevented dredging, were raised by Divers, and from this date and until 23rd January, 22 blocks were raised and much rubble moved by dredging. A few days later, a further slip of the old blocks took place while dredging, which disabled the large Priestman's Grab, and this delayed all progress until the sea was calm enough for the Divers to work between the new and old walls.

9. By the 2nd March, 9 of these blocks had been recovered and by working from daylight till 10 and 12 P.M. daily, the Pier Head Base was got ready to receive the Caisson on the evening of the 10th March, by which date 243 blocks had been raised, of which 24 were re-set, and at 8 A.M. on the 11th March the South Pier Head Caisson was successfully set in its correct position.

10. Much credit is due to the Foreman Diver, Mr. McDonald, and his men, in carrying out instructions, and the more difficult work the Diving Staff met with, due to the dangerous state of the old work, and the rough sea they had to work in. There was no difficulty in charging the second Caisson with concrete while afloat, as the coolies knew their work; but the Foreman Mechanic, Mr. Gunther, met with the same difficulties in building and making both Caissons watertight, and it required 12 hours work daily for two months, in the sun; but the result proved what could be done with unskilled labour, when the Caisson floated with its enormous weight, and was perfectly watertight. The floating into position, and sinking of both Caissons, I did myself; and the filling in with concrete and completion of the Caisson has been in the hands of the Foreman Diver, who on the 30th March, completed the filling of the Caisson up to 7 feet short of its full height of 53 feet, into which $2,410\frac{1}{4}$ cubic yards of concrete had been placed.

11. On the 27th March, all the special pipes running through the Caisson to the rubble base were carefully grouted, and $5\frac{1}{2}$ tons of cement, mixed with half that quantity of sand, passed through them, consolidating the base beneath the Caisson. The grouting was forced through each pipe until no more cement would pass, and the bottom of the Caisson was carefully watched, and no free cement found its way to the open sea.

12. The backing, or filling in of mass concrete, between the Caisson and the block-work, was commenced as soon as the side walls forming the mould had been set, and the joints caulked by Divers. The space so enclosed, was then built up with concrete, and all the blocks removed before the end of April.

13. The completed length of the South Pier from the end of the Caisson to the first block set on shore in 1877, is 3,931 feet, $1\frac{1}{2}$ inches.

14. **Pallavaram Quarries and Concrete-making Machinery.**—The concrete-making machinery was running steadily throughout the quarter, and the out-turn of concrete delivered at the North Pier Capping and the South Pier Caisson, was 5,504 cubic yards.

15. The out-turn of stone from the quarries was 24 train loads, which conveyed to the Works $5,073\frac{1}{4}$ tons of clean stone for concrete.

16. **Protective Works North of the Harbour.**—The line of revetment protecting the foreshore to the north of the Harbour, has shown no further settlement above water-level during the quarter.

17. The High Water Mark at the close of the quarter had not advanced, and there was no accumulation of sand along the line of revetment, but a quantity of sand had been arrested by the bay at the extreme end of the new revetment which advanced the High Water Mark seawards by 160 feet, or returned the foreshore to the same position of the water line of the preceding 12 months.

18. **Sea Bottom within the Harbour.**—The High Water Mark inside the Harbour shows an average advance of foreshore during the quarter of 50 feet, but this temporary change is due to there being no swell inside the Harbour during the quarter, to wash down and flatten the slope of the sand.

19. The High Water Mark of March 1895 near the South Pier was 40 feet inshore of the High Water Mark, recorded in March 1894, but the water line along the northern half of the Harbour showed no advance in the past 12 months.

20. **Foreshore South of the Harbour.**—Upon the plan attached to this report, are shown the High Water Marks of the 31st December 1894 and 31st March 1895, and there has been a loss of foreshore of about 60 feet during the quarter.

21. **Surveys.**—The cross sections of the advancing foreshore to the south of the Harbour referred to in G.O., No. 584 W., dated 12th March 1895, will be taken as soon as the state of the sea will admit of accurate soundings being taken, but nothing could have been done since the receipt of the G.O. on the 22nd March 1895, meanwhile the soundings of all previous surveys taken over the same area are being collected and plotted, and will be forwarded with newly taken sections, as soon as completed, when the growth of sand for years past below water level will be shown.

22. The annual surveys of the inside of the Harbour and every four years of the roadstead, Vide G.O. No., 34, W., dated 9th January 1895, will be repeated in July—September each year, being the same dates, or time of the year for a fair comparison with all former surveys.

23. The half fathom contour lines shown upon the plan accompanying this report, are those of the Survey of 1893, but I have withheld this survey awaiting the receipt of the results of another survey, which was directed to be made, a copy of which, not having been forwarded to me, I have no comparisons to make, beyond those with my own former complete surveys, which show little or no change in the depth of water in the roadstead than would occur, due to the rough seas at the change of the Monsoons.

24. **Summary of Progress.**—The following statement is the Summary of Progress made on the Harbour Works during the quarter under review.

25. **Supply of Portland Cement.**—The S.S. "Linlithgow" arrived with 8,383 casks of Portland cement from England, containing Tons 1,496-19-1-4, and a further Indent for a supply of Tons 2500 was forwarded to the India Office.

26. The balance of cement in store on 31st December 1894 was 6,045 $\frac{1}{4}$ casks containing Tons 1,079-11-3-7 of cement.

27. The issues during the quarter ending 31st March 1895, was 5,124 casks containing Tons 915-1-0-2.

MADRAS HARBOUR WORKS.

COMPARISON OF EXPENDITURE TO DATE WITH SANCTIONED ESTIMATE FOR THE QUARTER ENDING 31st MARCH 1895.

AS PER ESTIMATE SANCTIONED IN SECRETARY OF STATE'S DESPATCH, No. 1, DATED 7TH JANUARY 1892.															
Sub-head of Work.		AS EXECUTED.													
		Quantity.	Rate.	Per.	Cost.	Total.	Quantity.	Rate.	Expenditure.			Arrears not paid.	Value of work done up to date, columns 11 and 12.	REMARKS.	
									Total up to end of last Quarter.	During the Quarter.	Up to date.				
1		2	3	4	5	6	7	8	9	10	11	12	13	14	
EXPENDITURE UP TO 31ST DECEMBER 1884.															
1	Works	...	...	...	55,09,324	...	...	...	55,09,324	810	...	...	...	55,09,324	810
2	Establishment	...	...	...	5,29,904	...	...	...	5,29,904	0	...	...	...	5,29,904	0
3	Tools and Plant	...	...	...	5,16,262	...	...	...	5,16,262	6	...	...	...	5,16,262	6
	Total	...	...	...	...	65,54,490	...	...	65,54,490	14	10	...	...	65,54,490	14
REVISED ESTIMATE.															
4	Alteration and extension of block ground ... Preliminary	...	...	...	5,892	5,892	...	...	5,892	0	11	...	...	5,892	0
NORTH PIER.															
5	Ordinary rubble deposited from breakwater. Tons	13,930	1 12 0	Ton	24,378	...	13,930	1 12 0	24,378	9	0	...	...	24,378	9
6	Do. from boats	2,06,866	2 0 5	"	4,19,218	...	2,06,866	2 0 8	4,15,132	8	0	...	...	4,15,132	8
7	Concrete blocks for building	51,320	11 8 0	"	5,90,110	...	51,320	11 8 0	5,90,110	0	0	...	...	5,90,110	0
8	Setting blocks at commencement of new work	2,615	2 1 1	"	5,414	...	2,615	2 1 1	5,414	11	2	...	...	5,414	11
9	Do. from 2,200 to 3,600 feet	36,520	2 14 3	"	1,05,569	...	36,520	2 14 3	1,05,569	0	0	...	...	1,05,569	0
10	Do. at Pierhead	12,185	9 8 11	"	1,16,424	...	12,185	9 8 11	1,16,415	4	0	...	...	1,16,415	4
11	Concrete in mass for filling	263	4 8 3	"	1,188	...	263	4 8 3	1,188	0	7	...	...	1,188	0
12	Wavebreaker blocks	288	9 5 7	"	2,692	...	288	9 5 7	2,692	0	0	...	...	2,692	0
13	Do. concrete blocks	77,355	10 14 11	"	8,45,591	...	77,355	12 1 8	8,45,459	12	4	...	...	8,45,459	12
14	Depositing do.	77,932	1 0 0	"	77,932	...	77,932	1 1 8	77,918	8	4	...	...	77,918	8
15	Concrete in protection to Rubble Base	1,986	10 4 1	"	20,353	...	1,986	10 4 0	20,358	0	0	...	...	20,358	0
16	Cramps, Iron	313	9 10 1	"	3,188	...	313	10 3 0	3,188	0	0	...	...	3,188	0
17	Cost of North Pier Caisson and setting in position and filling same as items 26, 27, 33 and 34	16,352	11 3 10	"	1,83,798	...	16,352	...	67,209	8	5	...	...	1,14,954	4
	Total for North Pier	...	...	...	...	24,80,407	...	...	84,727	1	9	...	...	1,00,457	10
SOUTH PIER.															
19	Ordinary rubble deposited from breakwater. Tons	1,75,078	2 9 0	Ton	4,49,052	...	1,73,659	2 9 4	4,44,126	1	4	...	...	4,49,052	0
20	Large do. deposited from breakwater	8,615	1 12 0	"	15,075	...	8,615	1 12 0	15,075	13	0	...	...	15,075	13
21	Concrete blocks for building	45,006	11 3 1	"	5,04,510	...	43,341	11 10 3	5,04,510	0	0	...	...	5,04,510	0
22	Setting blocks at commencement	2,556	3 1 6	"	7,911	...	2,556	3 1 6	7,911	13	3	...	...	7,911	13
23	Do. from 2,550 to 3,700 feet	30,160	3 7 11	"	1,05,461	...	28,160	3 7 11	1,05,461	0	0	...	...	1,05,461	0
24	Do. at Pierhead	12,350	11 0 10	"	1,36,476	...	12,350	11 0 10	1,36,476	7	6	...	...	1,36,476	7
25	Concrete in mass for filling	602	7 9 1	"	4,555	...	602	7 9 1	4,554	14	4	...	...	4,555	14
26	Do. in Cylindrical Pierhead	2,355	15 0 0	"	35,323	...	2,355	...	12,974	11	10	...	...	35,323	8
27	Do. in filling in between Coursed Block-work and Caisson	184	15 0 0	"	2,760	...	184	...	11,503	11	6	...	...	38,454	14
28	Wavebreaker concrete blocks	47,231	11 1 6	"	5,24,070	...	42,589	12 3 0	5,14,063	0	0	...	...	5,19,240	8
29	Depositing do.	47,714	1 1 5	"	61,708	...	41,073	13 7 0	61,260	3	9	...	...	64,260	8
30	Concrete in protection to Rubble Base	1,700	9 10 6	"	16,420	...	1,108	13 8 1	14,332	9	1	...	...	11,332	9
31	Cramps, Iron	259	11 7 7	"	2,972	...	220	13 7 1	2,972	0	0	...	...	2,972	0
32	Concrete capping	16,247	11 5 8	"	1,84,493	...	669	...	8,457	8	6	...	...	26,157	11
33	Iron Caisson	1	...	"	18,000	...	...	...	18,000	0	0	...	...	18,000	0
34	Preparing Base for and setting Cylindrical Pierhead...	...	...	...	...	...	...	...	28,403	2	10	...	...	38,454	14
	Total for South Pier	...	...	...	28,665	21,00,826	...	...	18,88,831	8	11	...	...	19,40,146	1
EXTENDING THE RUBBLE REVENEMENT PROTECTING THE FORESHORE NORTH OF HARBOUR.															
35	Rubble Stone Revetment	70,600	2 1 0	Ton	1,45,613	...	91,051	1 8 8	1,40,093	13	2	...	...	1,40,093	13
36	Railway Lines	...	...	...	9,849	...	...	...	11,665	7	10	...	...	11,665	7
	Total	...	...	...	...	1,55,462	...	...	1,51,759	5	0	...	...	1,51,759	5
37	Tools and Plant	...	...	...	6,11,556	...	...	...	6,11,541	9	10	...	...	6,11,541	9
38	Contingencies	...	...	...	2,17,415	...	...	...	2,22,509	2	7	...	...	2,25,984	4
39	Establishment	...	...	...	5,34,369	...	...	...	5,37,851	0	2	...	...	6,13,568	10
40	Materials at site (Concrete blocks in yards) ... C. yds.	...	...	...	...	...	2,807	14 6 4	44,072	2	11	...	...	40,426	13
41	Advances to Work-people	...	...	...	...	...	...	...	34	3	2	...	...	34	3
	Total of Estimate and value of work done	...	...	...	61,06,227	...	...	...	58,82,251	1	11	...	...	60,16,623	4
	Deduct Probable recoveries due to sales of Tools and Plant	...	...	...	2,77,331	...	...	...	29,775	12	7	...	...	29,799	11
	Total	...	...	...	58,28,896	...	...	...	58,52,475	5	4	...	...	59,86,823	8
Total of revised Estimate sanctioned in Secretary of State's Despatch, plus expenditure before 31st December 1884															
	Total sanctioned Cost for completion of works	...	...	...	1,23,83,386	...	...	...	1,24,06,906	4	2	...	...	1,25,11,921	5
	Add recovery on Tools and Plant	...	...	...	2,77,331	...	...	...	...	...	...	...	...	...	...
	Deduct Total Expenditure as per column 11	...	...	...	1,25,11,921	...	...	...	...	...	...	...	...	1,25,41,314	7
Total amount available for completing Works after Quarter ending 31st March 1895															
	...	...	...	...	...	...	...	...	...	...	...	...	...	1,48,796	...

MADRAS,

11th May 1895.

G. MOOTHOSAWMY NAIDU,

Accountant.

M. H. Works Office.

A. LEE POGSON,
Engineer, Harbour Trust Board

Expenditure up to 31st March 1894 from commencement of Works ... Rs. 1,21,92,104-7-4
Do. during current official year from 1st April 1894 to 31st March 1895 ... Rs. 8,19,816-14-8
Total outlay to 31st March 1895 ... Rs. 1,25,11,921-5-7

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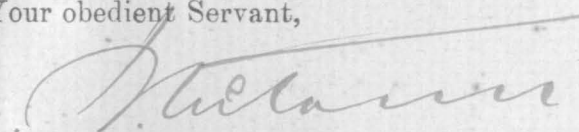
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15. The out-turn of stone from the quarries was 24 train loads, which conveyed to the Works 5,073 $\frac{1}{4}$ tons of clean stone for concrete.

16. **Protective Works North of the Harbour.**—The line of revetment protecting the foreshore to the north of the Harbour, has shown no further settlement above water-level during the quarter.

17. The High Water Mark at the close of the quarter had not advanced, and there was no accumulation of sand along the line of revetment, but a quantity of sand had been arrested by the bay at the extreme end of the new revetment which advanced the High Water Mark seawards by 160 feet, or returned the foreshore to the same position of the water line of the preceding 12 months.

18. **Sea Bottom within the Harbour.**—The High Water Mark inside the Harbour shows an average advance of foreshore during the quarter of 50 feet, but this temporary change is due to there being no swell inside the Harbour during the quarter, to wash down and flatten the slope of the sand.

19. The High Water Mark of March 1895 near the South Pier was 40 feet inshore of the High Water Mark, recorded in March 1894, but the water line along the northern half of the Harbour showed no advance in the past 12 months.

20. **Foreshore South of the Harbour.**—Upon the plan attached to this report, are shown the High Water Marks of the 31st December 1894 and 31st March 1895, and there has been a loss of foreshore of about 60 feet during the quarter.

21. **Surveys.**—The cross sections of the advancing foreshore to the south of the Harbour referred to in G.O., No. 584 W., dated 12th March 1895, will be taken as soon as the state of the sea will admit of accurate soundings being taken, but nothing could have been done since the receipt of the G.O. on the 22nd March 1895, meanwhile the soundings of all previous surveys taken over the same area are being collected and plotted, and will be forwarded with newly taken sections, as soon as completed, when the growth of sand for years past below water level will be shown.

22. The annual surveys of the inside of the Harbour and every four years of the roadstead, Vide G.O. No., 34, W, dated 9th January 1895, will be repeated in July—September each year, being the same dates, or time of the year for a fair comparison with all former surveys.

23. The half fathom contour lines shown upon the plan accompanying this report, are those of the Survey of 1893, but I have withheld this survey awaiting the receipt of the results of another survey, which was directed to be made, a copy of which, not having been forwarded to me, I have no comparisons to make, beyond those with my own former complete surveys, which show little or no change in the depth of water in the roadstead than would occur, due to the rough seas at the change of the Monsoons.

24. **Summary of Progress.**—The following statement is the Summary of Progress made on the Harbour Works during the quarter under review.

25. **Supply of Portland Cement.**—The S.S. "Linlithgow" arrived with 8,383 casks of Portland cement from England, containing Tons 1,496-19-1-4, and a further Indent for a supply of Tons 2500 was forwarded to the India Office.

26. The balance of cement in store on 31st December 1894 was 6,045 $\frac{1}{4}$ casks containing Tons 1,079-11-3-7 of cement.

27. The issues during the quarter ending 31st March 1895, was 5,124 casks containing Tons 915-1-0-2.

28. The balance of cement in store on the 31st March 1895, including the delivery by the S.S. "Linlithgow" was 9,304½ casks containing Tons 1,661-10-0-9.

29. **Expenditure.**—The expenditure upon the works during the quarter was Rs. 1,04,955, including Establishment, &c., and the quarter closed with a Cash balance upon the Sanctioned Estimate of Rs. 68,616 for the completion of the Works, and a balance of Rs. 80,180 in material, cement and stores, already upon the Works, or a total unexpended balance upon the Sanctioned Estimate of Rs. 1,48,796 on the 31st March 1895.

30. Due to the works taking longer to complete and the consequent maintenance of staff, increased proportions of cement, and additional work having been carried out, not anticipated or included in the Original Estimate, a supplemental or completion Estimate has been framed and forwarded under a separate report, applying for Rs. 3,69,122 for the completion of the works, to cover all extras, &c., and if all such charges are finally decided to belong to Construction proper, the total cost of the Madras Harbour from commencement to completion will be Rs. 1,27,52,508.

31. **Miscellaneous.**—The usual repairs and the upkeep of all machinery, cranes, Railway lines, &c., and all haulage of coal and other traffic was done by the Harbour Works locomotives for the Traffic Department as usual.

HARBOUR WORKS OFFICE,
9th May 1895.

A. LEE POGSON,
Engineer, Harbour Trust Board.

Progress Statement 40 (d).

MADRAS HARBOUR WORKS.

Statement showing Progress during Quarter ending 31st March 1895 as shown on accompanying Lithographed Plan No. 39.

Particulars and Quantity of Work done during Quarter ending 31st March 1895.		Sub-heads of Work.	North Pier Concrete Capping.	South Pier Head	South Pier Head 1st March 1895.	Pallavaram Quarries Out-turn.	Concrete made for Works.	Railway lines at Works.	Total Expenditure.
		Column.	A.	B.	C.	D.	E.	F.	G.
1	Rubble Stone deposited from boats	Tons...	...	...	...	...	...	...	...
2	Do. do. from wagons	...	...	...	...	...	...	...	...
3	Total quantity blasted chips received on works.	...	...	...	...	5,073½	...	...	...
4	Concrete blocks set by divers	... No...	...	24	...	...	...	...	...
5	Do. do. raised by divers	...	...	243	...	...	...	...	...
6	Do. do. made in situ, capping...	...	23	...	...	...	...	...	...
7	Total out-turn of concrete	c. yds...	3,093½	...	2,410½	...	5,504	...	...
8	Advance or progress of completed work Ry. ft.	...	573½	52½	...	...	...	...	...
9	Rubble base protected with concrete	...	...	...	...	...	...	...	...
10	Approximate Expenditure under sub-heads of work	Rs...	51,235	33,884		6,690	...	...	91,809

Tons. Cwt. Qrs. lbs. Quantity due on Indents Tons. Cwt. Qrs. lbs.

8,383 Casks of cement received on works during quarter ending 31st March 1895 containing 1,496 19 1 4 Dated February 1895 ... 2,500 0 0 0.
5,124 Do. do. issued for do. do. 915 1 0 2
9,304½ Do. do. balance in store at end of do. do. 1,661 10 0 9

MADRAS HARBOUR WORKS OFFICE,
9th May 1895.

A. LEE POGSON,
Engineer, Harbour Trust Board.

MADRAS HARBOUR WORKS.

COMPARISON OF EXPENDITURE TO DATE WITH SANCTIONED ESTIMATE FOR THE QUARTER ENDING 31st MARCH 1893.

AS PER ESTIMATE SANCTIONED IN SECRETARY OF STATE'S DESPATCH, NO. 1, DATED 7TH JANUARY 1892.										AS EXECUTED.				REMARKS.											
Sub-head of Work.										Quantity.		Rate.		Total up to end of last Quarter.		Expenditure.		Arrears not paid.		Value of work done up to date, columns 11 and 12.					
										7		8		9		10		11		12		13		14	
										Rs.		A. P.		Rs.		A. P.		Rs.		A. P.		Rs.		A. P.	
										Rs.		A. P.		Rs.		A. P.		Rs.		A. P.		Rs.		A. P.	
										Rs.		A. P.		Rs.		A. P.		Rs.		A. P.		Rs.		A. P.	
										Rs.		A. P.		Rs.		A. P.		Rs.		A. P.		Rs.		A. P.	
										Rs.		A. P.		Rs.		A. P.		Rs.		A. P.		Rs.		A. P.	
										Rs.		A. P.		Rs.		A. P.		Rs.		A. P.		Rs.		A. P.	
										Rs.		A. P.		Rs.		A. P.		Rs.		A. P.		Rs.		A. P.	
										Rs.		A. P.		Rs.		A. P.		Rs.		A. P.		Rs.		A. P.	
										Rs.		A. P.		Rs.		A. P.		Rs.		A. P.		Rs.		A. P.	
										Rs.		A. P.		Rs.		A. P.		Rs.		A. P.		Rs.		A. P.	
										Rs.		A. P.		Rs.		A. P.		Rs.		A. P.		Rs.		A. P.	
										Rs.		A. P.		Rs.		A. P.		Rs.		A. P.		Rs.		A. P.	
										Rs.		A. P.		Rs.		A. P.		Rs.		A. P.		Rs.		A. P.	
										Rs.		A. P.		Rs.		A. P.		Rs.		A. P.		Rs.		A. P.	
										Rs.		A. P.		Rs.		A. P.		Rs.		A. P.		Rs.		A. P.	
										Rs.		A. P.		Rs.		A. P.		Rs.		A. P.		Rs.		A. P.	
										Rs.		A. P.		Rs.		A. P.		Rs.		A. P.		Rs.		A. P.	
										Rs.		A. P.		Rs.		A. P.		Rs.		A. P.		Rs.		A. P.	
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										Rs.		A. P.		Rs.		A. P.		Rs.		A. P.		Rs.		A. P.	
										Rs.		A. P.		Rs.		A. P.		Rs.		A. P.		Rs.		A. P.	
										Rs.		A. P.		Rs.		A. P.		Rs.		A. P.		Rs.		A. P.	
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										Rs.		A. P.		Rs.		A. P.		Rs.		A. P.		Rs.		A. P.	
										Rs.		A. P.		Rs.		A. P.		Rs.		A. P.		Rs.		A. P.	
										Rs.		A. P.		Rs.		A. P.		Rs.		A. P.		Rs.		A. P.	
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										Rs.		A. P.		Rs.		A. P.		Rs.		A. P.		Rs.		A. P.	
										Rs.		A. P.		Rs.		A. P.		Rs.		A. P.		Rs.		A. P.	
										Rs.		A. P.		Rs.		A. P.		Rs.		A. P.		Rs.		A. P.	
										Rs.		A. P.		Rs.		A. P.		Rs.		A. P.		Rs.		A. P.	
										Rs.		A. P.		Rs.		A. P.		Rs.		A. P.		Rs.		A. P.	
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										Rs.		A. P.		Rs.		A. P.		Rs.		A. P.		Rs.		A. P.	
										Rs.		A. P.		Rs.		A. P.		Rs.		A. P.		Rs.		A. P.	
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										Rs.		A. P.		Rs.		A. P.		Rs.		A. P.		Rs.		A. P.	
										Rs.		A. P.		Rs.											

G. MOOTHOSAWMY NAIDU,

11th May 1895.

Accountant,
M. H. Works Office.

A. LEE POGSON,
Engineer, Harbour Trust Board.

G.O. No 1553-h-W of
26th June 1895-

The 4 Photographs
belonging to this order
had better be kept in
the Library, as they
are likely to be damaged
if packed away in the
records. This slip should
be attached to the original
G.O.

J.P. h-7-95-

GOVERNMENT OF MADRAS.

PUBLIC WORKS DEPARTMENT.

Buildings and Roads.
Civil Works.

READ—the following paper :—

From W. J. H. LE FANU, Esq., I.C.S., Chairman, Harbour Trust Board, Madras,
to the Chief Secretary to Government, dated 29th May 1895, No. 871.

As directed in G.O., Public Works, No. 2920 W., dated 15th November 1894,
I have the honour to submit herewith a separate report upon the progress made in
the reconstruction of the Madras Harbour, during the quarter ending 31st March 1895.

ENCLOSURES.

EXTRACT of Proceedings of the Trustees of the Harbour of Madras, at a Meeting held at the
offices of the Board on Friday, the 17th day of May 1895.

12. Read Progress Report of the Board's Engineer upon the reconstruction of the
Harbour, for the quarter ending 31st March 1895.

Recorded, and resolved that this report be submitted to Government.

(True Extract.)

(Signed) C. PINSENT,
Secretary, Harbour Trust Board.

REPORT of Progress on the Madras Harbour Works for the quarter ending 31st March 1895.

Accompanying this report are the following plans and statements :—

No. 39 (a). A plan of the harbour to a scale of 200 feet to an inch, showing in red the
position and quantity of work done during the quarter. The contours in half fathoms, shown
on this plan inside and outside the harbour, are those of the last complete marine survey made
in 1893.

2. The positions of the high water marks of 31st March 1895, and that of the previous
twelve months, both to the north of the revetment and the south of the harbour, are shown for
comparison.

No. 39 (b). A revised plan showing in detail the advance made during the quarter at the pier
heads as now constructed, and the positions of the caissons at the pier heads of the harbour,
with a completed eastern entrance having a width of 515' 6" and deep water alongside each pier
head.

No. 40 (c). A statement comparing the expenditure on different sub-heads of work up to
end of quarter, with the provisions of the sanctioned estimate.

No. 40 (d). A statement showing work done under different sub-heads and particulars of
cement received and issued.

3. Photographs.—Four photographs accompany this report, taken by the undersigned, at
stated points, as noted upon each plate, with descriptions, showing the completed portions of
the north pier head in detail.

4. North pier head.—Work at the north pier consisted of extending the capping towards
shore, and the building of the south pier caisson, and lining it with concrete, previous to
placing it in position at the south pier head.

5. The north pier head capping was proceeded with during the quarter, whenever any
extra concrete could be turned out, more than was required for the caisson lining and ballasting ;
and therefore there were only 47 days in the quarter when the capping could be proceeded
with, and during this time 573½ feet of the north pier capping was completed, by building
large blocks in mass concrete along the bonded wall, uniting and covering four courses of block-
work by each block ; and 23 such blocks were completed during a quarter amounting to an
outturn of 3,093½ cubic yards of concrete.

6. The total length of the north pier as completed, from the end of the caisson to the first block set on shore in 1876, is 3,816 feet 9 inches.

7. *South pier head.*—Until the 12th January, nothing could be done at the south pier head to further the preparations for setting the caisson in position in March, owing to a heavy swell continuously washing over the old wrecked pier.

8. On the 14th January the sea was calm, and four of the old blocks, which had fallen from the old wall and which had prevented dredging, were raised by divers, and from this date and until 23rd January, 22 blocks were raised and much rubble moved by dredging. A few days later, a further slip of the old blocks took place while dredging, which disabled the large Priestman's grab, and this delayed all progress until the sea was calm enough for the divers to work between the new and old walls.

9. By the 2nd March, nine of these blocks had been recovered and by working from daylight till 10 and 12 P.M. daily, the pier head base was got ready to receive the caisson on the evening of the 10th March, by which date 243 blocks had been raised, of which 24 were re-set, and at 8 A.M. on the 11th March the south pier head caisson was successfully set in its correct position.

10. Much credit is due to the Foreman Diver, Mr. McDonald, and his men, in carrying out instructions, and the more difficult work the diving staff met with, due to the dangerous state of the old work, and the rough sea they had to work in. There was no difficulty in charging the second caisson with concrete while afloat, as the coolies knew their work; but the Foreman Mechanic, Mr. Gunther, met with the same difficulties in building and making both caissons water-tight, and it required 12 hours' work daily for two months, in the sun; but the result proved what could be done with unskilled labour, when the caisson floated with its enormous weight, and was perfectly water-tight. The floating into position, and sinking of both caissons, I did myself; and the filling in with concrete and completion of the caisson has been in the hands of the Foreman Diver who, on the 30th March, completed the filling of the caisson up to 7 feet short of its full height of 53 feet, into which 2,410½ cubic yards of concrete had been placed.

11. On the 27th March, all the special pipes running through the caisson to the rubble base were carefully grouted, and 5½ tons of cement, mixed with half that quantity of sand, passed through them, consolidating the base beneath the caisson. The grouting was forced through each pipe until no more cement would pass, and the bottom of the caisson was carefully watched, and no free cement found its way to the open sea.

12. The backing, or filling in of mass concrete, between the caisson and the block-work, was commenced as soon as the side walls forming the mould had been set, and the joints caulked by divers. The space so enclosed was then built up with concrete, and all the blocks removed before the end of April.

13. The completed length of the south pier from the end of the caisson to the first block set on shore in 1877, is 3,931 feet 1½ inches.

14. *Pallavaram quarries and concrete-making machinery.*—The concrete-making machinery was running steadily throughout the quarter, and the outturn of concrete delivered at the north pier capping and the south pier caisson, was 5,504 cubic yards.

15. The outturn of stone from the quarries was 24 train loads, which conveyed to the works, 5,073½ tons of clean stone for concrete.

16. *Protective works north of the harbour.*—The line of revetment protecting the foreshore to the north of the harbour has shown no further settlement above water-level during the quarter.

17. The high water mark at the close of the quarter had not advanced, and there was no accumulation of sand along the line of revetment, but a quantity of sand had been arrested by the bay at the extreme end of the new revetment which advanced the high water mark seawards by 160 feet, or returned the foreshore to the same position of the water line of the preceding 12 months.

18. *Sea bottom within the harbour.*—The high water mark inside the harbour shows an average advance of foreshore during the quarter of 50 feet, but this temporary change is due to there being no swell inside the harbour during the quarter, to wash down and flatten the slope of the sand.

19. The high water mark of March 1895 near the south pier was 40 feet inshore of the high water mark, recorded in March 1894, but the water line along the northern half of the harbour showed no advance in the past 12 months.

20. *Foreshore south of the harbour.*—Upon the plan attached to this report, are shown the high water marks of the 31st December 1894 and 31st March 1895, and there has been a loss of foreshore of about 60 feet during the quarter.

21. *Surveys.*—The cross sections of the advancing foreshore to the south of the harbour referred to in G.O. No. 584 W., dated 12th March 1895, will be taken as soon as the state of the sea will admit of accurate soundings being taken, but nothing could have been done since the receipt of the G.O. on the 22nd March 1895; meanwhile, the soundings of all previous surveys

taken over the same area are being collected and plotted, and will be forwarded with newly taken sections, as soon as completed, when the growth of sand for years past below water level will be shown.

22. The annual surveys of the inside of the harbour and every four years of the roadstead (*vide* G.O. No. 34 W., dated 9th January 1895) will be repeated in July—September each year being the same dates or time of the year for a fair comparison with all former surveys.

23. The half fathom contour lines shown upon the plan accompanying this report, are those of the survey of 1893, but I have withheld this survey awaiting the receipt of the results of another survey, which was directed to be made, a copy of which not having been forwarded to me, I have no comparisons to make, beyond those with my own former complete surveys, which show little or no change in the depth of water in the roadstead than would occur, due to the rough seas at the change of the monsoons.

24. *Summary of progress.*—The following statement is the summary of progress made on the harbour works during the quarter under review.

25. *Supply of Portland cement.*—The S.S. *Linlithgow* arrived with 8,383 casks of Portland cement from England, containing Tons 1,496-19-1-4, and a further indent for a supply of Tons 2,500 was forwarded to the India Office.

26. The balance of cement in store on 31st December 1894 was 6,045½ casks containing Tons 1,079-11-3-7 of cement.

27. The issues during the quarter ending 31st March 1895 was 5,124 casks containing Tons 915-1-0-2.

28. The balance of cement in store on the 31st March 1895, including the delivery by the S.S. *Linlithgow* was 9,304½ casks containing Tons 1,661-10-0-9.

29. *Expenditure.*—The expenditure upon the works during the quarter was Rs. 1,04,955, including establishment &c., and the quarter closed with a cash balance upon the sanctioned estimate of Rs. 68,616 for the completion of the works, and a balance of Rs. 80,180 in material, cement and stores, already upon the works, or a total unexpended balance upon the sanctioned estimate of Rs. 1,48,796 on the 31st March 1895.

30. Due to the works taking longer to complete and the consequent maintenance of staff, increased proportions of cement, and additional work having been carried out, not anticipated or included in the original estimate, a supplemental or completion estimate has been framed and forwarded under a separate report, applying for Rs. 3,69,122 for the completion of the works, to cover all extras, &c., and if all such charges are finally decided to belong to construction proper, the total cost of the Madras harbour from commencement to completion will be Rs. 1,27,52,508.

31. *Miscellaneous.*—The usual repairs and the upkeep of all machinery, cranes, railway lines, &c., and all haulage of coal and other traffic was done by the Harbour Works locomotives for the Traffic Department as usual.

STATEMENT showing progress during quarter ending 31st March 1895 as shown on accompanying Lithographed Plan No. 39.

Item number.	Particulars and quantity of work done during quarter ending 31st March 1895.	Sub-heads of work.	North pier concrete capping.	South pier head.	South pier head caisson set 11th March 1895.	Pallavaram quarries outturn.	Concrete made for works.	Railway lines at works.	Total expenditure.
		Column.	A	B	C	D	E	F	G
1	Rubble stone deposited from boats. Tons.	..	..	..	..	..	..	..	..
2	" " from wagons "	..	..	..	..	..	..	..	..
3	Total quantity blasted chips received on works "	..	..	..	..	5,073½	..	..	..
4	Concrete blocks set by divers " No.	..	..	24	..	..	..	..	..
5	" " raised by divers "	..	..	243	..	..	..	..	..
6	" " made <i>in situ</i> , capping "	..	23	..	..	..	..	..	..
7	Total outturn of concrete " C.yds.	..	3,093½	..	2,410½	..	5,504	..	..
8	Advance or progress of completed work "								

		Tons. Cwt. Qr. lb. Quantity due on indents				Tons. Cwt. Qr. lb.			
8,383	Casks of cement received on works during quarter ending 31st March 1895 containing ..	1,496	19	1	4	Dated February 1895 ..	2,500	0	0
5,124	Casks of cement issued for works during quarter ending 31st March 1895 containing ..	915	1	0	2	..	..	..	..
9,304½	Casks of cement, balance in store at end of quarter ending 31st March 1895 containing ..	1,661	10	0	9	..	..	..	..

COMPARISON of expenditure to date with sanctioned estimate for the quarter ending 31st March 1895.

Sub-head of work.		As per estimate sanctioned in Secretary of State's despatch No. 1, dated 7th January 1892.					As executed.					Arrears not paid.	Value of work done up to date, columns 11 and 12.
		Quantity.	Rate.	Per	Cost.	Total.	Quantity.	Rate.	Expenditure.				
									Total up to end of last quarter.	During the quarter.	Up to date.		
1		2	3	4	5	6	7	8	9	10	11	12	13
<i>Expenditure up to 31st Dec. 1894.</i>													
1. Works	..	..	..	..	55,09,324	..	..	..	55,09,324 8 10	..	55,09,324 8 10	..	55,09,324 8 10
2. Establishment	..	..	..	..	5,29,904	..	..	..	5,29,904 0 0	..	5,29,904 0 0	..	5,29,904 0 0
3. Tools and plant	..	..	..	..	5,15,262	..	..	..	5,15,262 6 0	..	5,15,262 6 0	..	5,15,262 6 0
Total	..	..	..	..	65,54,490	..	..	..	65,54,490 14 10	..	65,54,490 14 10	..	65,54,490 14 10
<i>Revised Estimate.</i>													
4. Alteration and extension of block ground	..	..	..	..	5,892	..	..	..	5,892 0 11	..	5,892 0 11	..	5,892 0 11
<i>North Pier.</i>													
5. Ordinary rubble deposited from breakwater	Tons.	13,930	1 12 0	Ton.	24,378	..	13,930	1 12 0	24,377 9 0	..	24,377 9 0	..	24,377 9 0
6. Ordinary rubble deposited from boats	..	205,396	2 0 5	..	4,19,218	..	205,477	2 0 8	4,15,132 8 10	..	4,15,132 8 10	4,085 7 2	4,19,218 0 0
7. Concrete blocks for building	Cyds.	51,320	11 8 0	Cyds.	5,90,110	..	51,320	11 8 0	5,90,110 0 0	..	5,90,110 0 0	..	5,90,110 0 0
8. Setting blocks at commencement of new work	..	2,615	2 1 1	..	5,415	..	2,615	2 1 1	5,414 11 2	..	5,414 11 2	..	5,414 11 2
9. Setting blocks from 2,200 to 3,600 feet	..	36,520	2 14 3	..	1,05,569	..	36,520	2 14 3	1,05,569 0 0	..	1,05,569 0 0	..	1,05,569 0 0
10. Setting blocks at pier head	..	12,185	9 8 11	..	1,16,424	..	12,185	9 8 10	1,16,415 4 0	..	1,16,415 4 0	..	1,16,415 4 0
11. Concrete in mass for filling	..	263	4 8 3	..	1,188	..	263	4 8 3	1,188 0 7	..	1,188 0 7	..	1,188 0 7
12. Wave-breaker blocks	..	288	9 5 7	..	2,692	..	288	9 5 7	2,692 0 0	..	2,692 0 0	..	2,692 0 0
13. Wave-breaker concrete blocks	..	77,355	10 14 11	..	8,45,591	..	69,863	12 1 8	8,45,459 12 4	..	8,45,459 12 4	9 7 8	8,45,459 12 4
14. Depositing concrete blocks	..	77,932	1 0 0	..	77,928	..	70,457	1 1 8	77,918 8 4	..	77,918 8 4	..	77,928 0 0
15. Concrete in protection to rubble base	..	1,986	10 4 1	..	20,358	..	1,986	10 4 0	20,358 0 0	..	20,358 0 0	..	20,358 0 0
16. Cramps, iron	..	331	9 10 1	Each.	3,188	..	313	10 3 0	3,188 0 0	..	3,188 0 0	..	3,188 0 0
17. Concrete capping	..	16,352	11 3 10	Cyds.	1,83,798	..	6,397½	..	67,206 8 5	39,336 5 8	1,06,542 14 1	8,411 6 2	1,14,964 4 3
18. Cost of north pier caisson and setting in position and filling same as items 26, 27, 33 and 34	..	..	..	..	84,750	24,80,607	..	..	84,727 1 9	15,730 8 7	1,00,457 10 4	..	1,00,457 10 4
Total for North Pier	..	..	..	..	..	..	..	..	28,59,757 0 5	55,068 14 3	24,14,823 14 8	12,506 5 0	24,27,330 8 8

South Pier.												
	175,078	2 9 0		4,49,052		173,659	2 9 4	4,44,126 1 4	..	4,44,126 1 4	4,925 14 8	
19. Ordinary rubble deposited from boats ..			Tons.									4,49,052 0 0
20. Large rubble deposited from breakwater ..	8,615	1 12 0	"	15,076		8,615	1 12 0	15,075 13 0	..	15,075 13 0	..	15,075 13 0
21. Concrete blocks for building ..	45,066	11 3 1	C. yd.	5,04,510		43,341	11 10 3	5,04,510 0 0	..	5,04,510 0 0	..	5,04,510 0 0
22. Setting blocks at commencement ..	2,556	3 1 6	"	7,912		2,556	3 1 6	7,911 13 3	..	7,911 13 3	..	7,911 13 3
23. Setting blocks from 2,550 to 3,700 feet ..	30,160	3 7 11	"	1,05,461		30,160	3 7 11	1,05,461 0 0	..	1,05,461 0 0	..	1,05,461 0 0
24. Setting blocks at pier head ..	12,350	11 1 3	"	1,36,845		12,350	11 0 10	1,36,468 7 6	7 10 0	1,36,476 1 6	..	1,36,476 1 6
25. Concrete in mass for filling ..	602	7 9 1	"	4,555		602	7 9 1	4,554 14 4	..	4,554 14 4	..	4,554 14 4
26. Concrete in cylindrical pier head ..	2,355	15 0 0	"	35,325		..	..	12,904 11 10	20,047 7 9	32,952 3 7	142 15 7	33,095 3 2
27. Concrete in filling between coirous block-work and caisson ..	184	15 0 0	"	2,760		..	..	..	11 5 0	11 5 0	..	11 5 0
28. Wave-breaker concrete blocks ..	47,231	11 1 6	"	5,24,070		42,589	12 3 0	5,14,062 0 0	5,178 8 7	5,19,240 8 7	..	5,19,240 8 7
29. Depositing .. concrete blocks ..	47,714	1 5 8	"	64,708		41,073	1 9 0	64,260 3 9	..	64,260 3 9	..	64,260 3 9
30. Concrete in protection to rubble base ..	1,700	9 10 6	"	16,420		1,108	13 7 7	14,932 9 1	..	14,932 9 1	..	14,932 9 1
31. Cramps, iron ..	259	11 7 7	Each.	2,972		220	13 8 1	2,972 0 0	..	2,972 0 0	..	2,972 0 0
32. Concrete capping ..	16,247	11 5 8	Cyds.	1,84,495		669	..	15,188 12 0	8,457 8 6	23,646 4 6	2,511 7 0	26,157 11 6
33. Iron caisson ..	..	..	"	18,000		..	..	18,000 0 0	..	18,000 0 0	..	18,000 0 0
34. Preparing base for and setting cylindrical pier head ..	..	..	"	28,665	21,00,826	..	..	28,403 2 10	10,031 11 6	38,434 14 4	..	38,434 14 4
Total for South Pier ..	..	..	..	..	..	..	..	18,88,831 8 11	43,734 3 4	19,32,565 12 3	7,580 5 3	19,40,146 1 6
Extending the Rubble Revetment protecting the Foreshore north of Harbour.												
35. Rubble stone revetment. Tons.	70,600	2 1 0	Ton.	1,45,613		91,051	1 8 8	1,40,093 13 2	..	1,40,093 13 2	..	1,40,093 13 2
36. Railway lines ..	..	..	..	9,849	1,55,462	..	..	11,665 7 10	..	11,665 7 10	..	11,665 7 10
37. Tools and plant ..	..	..	..	..	6,11,656	..	..	6,11,541 9 10	..	6,11,541 9 10	..	6,11,541 9 10
38. Contingencies ..	..	..	..	..	2,17,415	..	..	2,22,509 2 7	3,475 1 7	2,25,984 4 2	..	2,25,984 4 2
39. Establishment ..	..	..	..	..	5,34,369	..	..	5,97,854 0 2	10,990 15 9	6,08,444 15 11	5,063 10 2	6,13,908 10 1
40. Materials at site (concrete blocks in yards). Cyds.	..	..	..	..	..	2,807	14 6 4	44,072 2 11	7,888 2 4	36,184 0 7	4,242 13 1	40,426 13 8
41. Advances to work-pe pie ..	..	..	..	..	..	..	..	34 3 2	..	34 3 2	..	34 3 2
Total of estimate and value of work done ..	..	..	..	..	61,06,227	..	..	58,82,251 1 11	1,04,979 0 7	59,87,230 2 6	29,393 1 6	60,16,623 4 0
Deduct probable recoveries due to sales of tools and plant ..	..	..	..	..	2,77,231	..	..	29,775 12 7	23 15 2	29,799 11 9	..	29,799 11 9
Total ..	..	..	..	..	58,28,896	..	..	58,52,475 5 4	1,04,955 1 5	59,57,430 6 9	29,393 1 6	59,86,823 8 3

Comparison of expenditure to date with sanctioned estimate for the quarter ending 31st March 1895—cont.

Sub-head of work.	As per estimate sanctioned in Secretary of State's despatch No. 1, dated 7th January 1892.						As executed.				Arrears not paid.	Value of work done up to date, columns 11 and 12.
	Quantity.	Rate.	Per	Cost.	Total.	Quantity.	Rate.	Expenditure.				
								Total up to end of last quarter.	During the quarter.	Up to date.		
1	2	3	4	5	6	7	8	9	10	11	12	13
<i>Extending the Public Revetment protecting the Foreshore north of Harbour—cont.</i>		RS. A. P.		RS.	RS.		RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.	RS. A. P.
Total of revised estimate sanctioned in Secretary of State's despatch plus expenditure before 31st Dec. 1894	..	..	..	..	1,23,83,386	..	..	1,24,06,966 4 2	1,04,955 1 5	1,25,11,921 5 7	29,393 1 6	1,25,41,314 7 1
Total sanctioned cost for completion of works	..	..	..	..	1,23,83,386	..	..	..	..	..	..	..
Add recovery on tools and plant	..	..	..	..	2,77,331	1,25,60,717	..	..	..	..	..	..
Deduct total expenditure as per column 11	..	..	..	..	1,25,11,921	1,25,11,921	..	..	..	..	..	..
Total amount available for completing work after quarter ending 31st Mar. 1894	..	..	..	..	..	1,48,796	..	..	..	..	..	..

Expenditure up to 31st March 1894 from commencement of works
 " during current official year from 1st April 1894 to 31st March 1895

RS. A. P.
 1,21,92,104 7 4
 3,19,816 14 3
 1,25,11,921 5 7

Grant for 1894-95, Rs. 1,50,000.

Total outlay to 31st March 1895

MADRAS,
 11th May 1895.

(Signed) A. LIFE POGSON,
 Engineer, Harbour Trust Board.

No. 1228.

Transferred to the Public Works Department.

OOTACAMUND,
 10th June 1895.

(Signed) C. G. TODHUNTER,
 Acting Assistant Secretary.

ORDER—dated 26th June 1895, No. 1553 W., Public Works.

Ordered that the report be forwarded for the information of the Secretary of State and the Government of India.

[Here enter No. 1554 W., dated 26th June 1895.]

(True Extract.)

(Signed) J. PENNYCUICK, Colonel, R.E.,
 Secretary to Govt., P.W.D.

To the Chairman, Harbour Trust Board.
 „ Marine Department.

ENDORSEMENT—dated 26th June 1895, No. 1554 W., Public Works.

Copy of the above with two plans showing the progress of the work, forwarded to the Government of India.

(By Order.)

(Signed) J. PENNYCUICK, Colonel, R.E.,
 Secretary to Govt., P.W.D.

Exd. T. K. Narayana Aiyangar,
 Spare Copies

BUILDINGS AND ROADS.
CIVIL WORKS.

Gobt. of {1895} Madras.
PUBLIC WORKS.

Dated June, 26th.

Recd.

Encl.

G.O., 26th June 1895, Nos. 1553,
1554 W.

JUNE.

Madras Harbour Works

Forwarding the progress report of the
— for the quarter ending 31st March 1895.

26TH JUNE 1895, No. $\frac{7}{1553}$ W., PUBLIC WORKS.

PUBLIC WORKS DEPARTMENT.

LETTER—to

THE RIGHT HONOURABLE THE SECRETARY OF STATE FOR INDIA.

RIGHT HONOURABLE SIR,

In continuation of our despatch No. $\frac{3}{1108}$ W., dated 9th May 1895, we have the honour to forward the progress report of the Madras Harbour Works for the quarter ending 31st March 1895.

2. The report is accompanied by two plans showing the position and quantity of work done during the quarter.

We have the honour to be,

Right Honourable Sir,

Your most obedient, humble servants,

(Signed) WENLOCK.

(„) H. W. BLISS.

(„) J. GROSE.

OOTACAMUND,
26th June 1895.

Exd. T. K. Narayana Aiyangar.

GOVT. OF MADRAS.

PUBLIC WORKS DEPARTMENT.

(Copy.)

LETTER to the Right Honourable
the Secretary of State for
India.

No. $\frac{7}{1553}$ W., dated 26th June 1895.

FORWARDING the progress report of the Madras
Harbour Works for the quarter ending 31st
March 1895.

CURRENT No. 47

MARINE DEPARTMENT.

FROM

THE CHAIRMAN,

HARBOUR TRUST BOARD,

MADRAS.

2 JUN 1895

TO

THE CHIEF SECRETARY TO GOVERNMENT,

Marine Department.

DATED

DESPATCHED 31 May 1895.

RECEIVED

2 June
Rpt. 5-11
Enclosures Plans (2)

Four photographs under
separate cover

No. 871

SUBJECT.

MADRAS HARBOUR.

Submitting Report upon Progress made in the
reconstruction of the ——— for the quarter ending
31st March 1895.

MADRAS HARBOUR TRUST,
SECRETARY'S OFFICE,
29th May 1895.

No. 871

From

W. J. H. LEFANU, Esq., I. C. S.,
CHAIRMAN, HARBOUR TRUST BOARD,
Madras.

To

THE HON'BLE MR. J. F. PRICE, C.S.I., I.C.S.,
Chief Secretary to Government,
Marine Department.

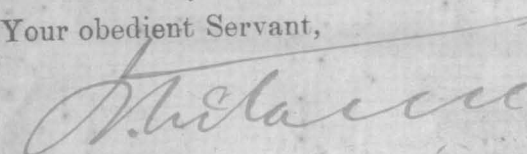
SIR,

As directed in G. O., Public Works, No. 2920 W., dated 15th November 1894, I have the honour to submit herewith a separate report upon the progress made in the reconstruction of the Madras Harbour, during the quarter ending 31st March 1895.

I have the honour to be,

Sir,

Your obedient Servant,



Chairman, Harbour Trust Board.

Extract of Proceedings of the Trustees of the Harbour of
Madras, at a Meeting held at the Offices of the Board on
Friday, the 17th day of May 1895,

* * * * *

12. Read Progress Report of the Board's Engineer upon the re-construction
of the Harbour, for the quarter ending 31st March 1895.

Recorded, and resolved that this report be submitted to Government.

* * * * *

True Extract.

C. PINSENT,

Secretary, Harbour Trust Board.

MADRAS HARBOUR WORKS

Report of Progress on the Madras Harbour Works for the Quarter ending 31st March 1895.

Accompanying this report are the following plans and statements :—

No. 39. (a) A plan of the Harbour to a scale of 200 feet to an inch, showing in red the position and quantity of work done during the quarter. The contours in half fathoms, shown on this plan inside and outside the Harbour, are those of the last complete Marine Survey made in 1893.

2. The positions of the High Water Marks of 31st March 1895, and that of the previous twelve months, both to the north of the revetment and the south of the Harbour, are shown for comparison.

No. 39. (b) A revised plan showing in detail the advance made during the quarter at the Pier Heads as now constructed, and the positions of the Caissons at the Pier Heads of the Harbour, with a completed Eastern Entrance having a width of 515' 6" and deep water alongside each Pier Head.

No. 40. (c) A statement comparing the expenditure on different sub-heads of work up to end of quarter, with the provisions of the Sanctioned Estimate.

No. 40. (d) A statement showing work done under different sub-heads and particulars of cement received and issued.

3. **Photographs.**—Four photographs accompany this report, taken by the undersigned, at stated points, as noted upon each plate, with descriptions, showing the completed portions of the North Pier Head in detail.

4. **North Pier Head.**—Work at the North Pier consisted of extending the capping towards shore, and the building of the South Pier Caisson, and lining it with concrete, previous to placing it in position at the South Pier Head.

5. The North Pier Head capping was proceeded with during the quarter, whenever any extra concrete could be turned out, more than was required for the Caisson lining and ballasting; and therefore there were only 47 days in the quarter when the capping could be proceeded with, and during this time 573½ feet of the North Pier capping was completed, by building large blocks in mass concrete along the bonded wall, uniting and covering four courses of block-work by each block; and 23 such blocks were completed during the quarter amounting to an out-turn of 3,093¾ cubic yards of concrete.

6. The total length of the North Pier as completed, from the end of the Caisson to the first block set on shore in 1876, is 3,816 feet, 9 inches.

7. **South Pier Head.**—Until the 12th January, nothing could be done at the South Pier Head to further the preparations for setting the Caisson in position in March, owing to a heavy swell continuously washing over the old wrecked Pier.

8. On the 14th January the sea was calm, and four of the old blocks,

which had fallen from the old wall and which had prevented dredging, were raised by Divers, and from this date and until 23rd January, 22 blocks were raised and much rubble moved by dredging. A few days later, a further slip of the old blocks took place while dredging, which disabled the large Priestman's Grab, and this delayed all progress until the sea was calm enough for the Divers to work between the new and old walls.

9. By the 2nd March, 9 of these blocks had been recovered and by working from daylight till 10 and 12 P.M. daily, the Pier Head Base was got ready to receive the Caisson on the evening of the 10th March, by which date 243 blocks had been raised, of which 24 were re-set, and at 8 A.M. on the 11th March the South Pier Head Caisson was successfully set in its correct position.

10. Much credit is due to the Foreman Diver, Mr. McDonald, and his men, in carrying out instructions, and the more difficult work the Diving Staff met with, due to the dangerous state of the old work, and the rough sea they had to work in. There was no difficulty in charging the second Caisson with concrete while afloat, as the coolies knew their work; but the Foreman Mechanic, Mr. Gunther, met with the same difficulties in building and making both Caissons watertight, and it required 12 hours work daily for two months, in the sun; but the result proved what could be done with unskilled labour, when the Caisson floated with its enormous weight, and was perfectly watertight. The floating into position, and sinking of both Caissons, I did myself; and the filling in with concrete and completion of the Caisson has been in the hands of the Foreman Diver, who on the 30th March, completed the filling of the Caisson up to 7 feet short of its full height of 53 feet, into which $2,410\frac{1}{4}$ cubic yards of concrete had been placed.

11. On the 27th March, all the special pipes running through the Caisson to the rubble base were carefully grouted, and $5\frac{1}{2}$ tons of cement, mixed with half that quantity of sand, passed through them, consolidating the base beneath the Caisson. The grouting was forced through each pipe until no more cement would pass, and the bottom of the Caisson was carefully watched, and no free cement found its way to the open sea.

12. The backing, or filling in of mass concrete, between the Caisson and the block-work, was commenced as soon as the side walls forming the mould had been set, and the joints caulked by Divers. The space so enclosed, was then built up with concrete, and all the blocks removed before the end of April.

13. The completed length of the South Pier from the end of the Caisson to the first block set on shore in 1877, is 3,931 feet, $1\frac{1}{2}$ inches.

14. **Pallavaram Quarries and Concrete-making Machinery.**—The concrete-making machinery was running steadily throughout the quarter, and the out-turn of concrete delivered at the North Pier Capping and the South Pier Caisson, was 5,504 cubic yards.

15. The out-turn of stone from the quarries was 24 train loads, which conveyed to the Works $5,073\frac{1}{4}$ tons of clean stone for concrete.

16. **Protective Works North of the Harbour.**—The line of revetment protecting the foreshore to the north of the Harbour, has shown no further settlement above water-level during the quarter.

17. The High Water Mark at the close of the quarter had not advanced, and there was no accumulation of sand along the line of revetment, but a quantity of sand had been arrested by the bay at the extreme end of the new revetment which advanced the High Water Mark seawards by 160 feet, or returned the foreshore to the same position of the water line of the preceding 12 months.

18. **Sea Bottom within the Harbour.**—The High Water Mark inside the Harbour shows an average advance of foreshore during the quarter of 50 feet, but this temporary change is due to there being no swell inside the Harbour during the quarter, to wash down and flatten the slope of the sand.

19. The High Water Mark of March 1895 near the South Pier was 40 feet inshore of the High Water Mark, recorded in March 1894, but the waterline along the northern half of the Harbour showed no advance in the past 12 months.

20. **Foreshore South of the Harbour.**—Upon the plan attached to this report, are shown the High Water Marks of the 31st December 1894 and 31st March 1895, and there has been a loss of foreshore of about 60 feet during the quarter.

21. **Surveys.**—The cross sections of the advancing foreshore to the south of the Harbour referred to in G.O., No. 584 W., dated 12th March 1895, will be taken as soon as the state of the sea will admit of accurate soundings being taken, but nothing could have been done since the receipt of the G.O. on the 22nd March 1895, meanwhile the soundings of all previous surveys taken over the same area are being collected and plotted, and will be forwarded with newly taken sections, as soon as completed, when the growth of sand for years past below water level will be shown.

22. The annual surveys of the inside of the Harbour and every four years of the roadstead, Vide G.O. No., 34, W., dated 9th January 1895, will be repeated in July—September each year, being the same dates, or time of the year for a fair comparison with all former surveys.

23. The half fathom contour lines shown upon the plan accompanying this report, are those of the Survey of 1893, but I have withheld this survey awaiting the receipt of the results of another survey, which was directed to be made, a copy of which, not having been forwarded to me, I have no comparisons to make, beyond those with my own former complete surveys, which show little or no change in the depth of water in the roadstead than would occur, due to the rough seas at the change of the Monsoons.

24. **Summary of Progress.**—The following statement is the Summary of Progress made on the Harbour Works during the quarter under review.

25. **Supply of Portland Cement.**—The S.S. "Linlithgow" arrived with 8,383 casks of Portland cement from England, containing Tons 1,496-19-1-4, and a further Indent for a supply of Tons 2500 was forwarded to the India Office.

26. The balance of cement in store on 31st December 1894 was 6,045 $\frac{1}{4}$ casks containing Tons 1,079-11-3-7 of cement.

27. The issues during the quarter ending 31st March 1895, was 5,124 casks containing Tons 915-1-0-2.

28. The balance of cement in store on the 31st March 1895, including the delivery by the S.S. "Linlithgow" was 9,304½ casks containing Tons 1,661-10-0-9.

29. **Expenditure.**—The expenditure upon the works during the quarter was Rs. 1,04,955, including Establishment, &c., and the quarter closed with a Cash balance upon the Sanctioned Estimate of Rs. 68,616 for the completion of the Works, and a balance of Rs. 80,180 in material, cement and stores, already upon the Works, or a total unexpended balance upon the Sanctioned Estimate of Rs. 1,48,796 on the 31st March 1895.

30. Due to the works taking longer to complete and the consequent maintenance of staff, increased proportions of cement, and additional work having been carried out, not anticipated or included in the Original Estimate, a supplemental or completion Estimate has been framed and forwarded under a separate report, applying for Rs. 3,69,122 for the completion of the works, to cover all extras, &c., and if all such charges are finally decided to belong to Construction proper, the total cost of the Madras Harbour from commencement to completion will be Rs. 1,27,52,508.

31. **Miscellaneous.**—The usual repairs and the upkeep of all machinery, cranes, Railway lines, &c., and all haulage of coal and other traffic was done by the Harbour Works locomotives for the Traffic Department as usual.

HARBOUR WORKS OFFICE,
9th May 1895.

A. LEE POGSON,
Engineer, Harbour Trust Board.

Progress Statement 40 (d).

MADRAS HARBOUR WORKS.

Statement showing Progress during Quarter ending 31st March 1895 as shown on accompanying Lithographed Plan No. 39.

Particulars and Quantity of Work done during Quarter ending 31st March 1895.	Sub-heads of Work.	Column.	North Pier Concrete Capping.	South Pier Head.	C.	D.	Concrete made for Works.	Railway lines at Works.	Total Expenditure.
1 Rubble Stone deposited from boats	Tons...	...	...	...	...	...	...	...	...
2 Do. do. from wagens	" "	...	...	...	...	...	...	...	...
3 Total quantity blasted chips received on works.	No...	...	...	...	...	5,073½	...	...	...
4 Concrete blocks set by divers	" "	...	...	...	...	...	...	...	...
5 Do. do. raised by divers	" "	...	...	24	...	...	...	...	...
6 Do. do. made in situ, capping...	" "	...	...	243	...	...	...	...	...
7 Total out-turn of concrete	c. yds...	...	3,093½	...	2,410½	...	5,504	...	...
8 Advance or progress of completed work Ry. ft.	" "	...	573½	...	...	...	...	...	...
9 Rubble base protected with concrete	" "	...	...	...	...	...	...	...	...
10 Approximate Expenditure under sub-heads of work	Rs...	...	51,235	33,884	...	6,690	...	...	91,809

Tons. Cwt. Qrs. lbs. Quantity due on Indents Tons. Cwt. Qrs. lbs.

8,383 Casks of cement received on works during quarter ending 31st March 1895 containing: 1,496-19-1-4 Dated February 1895 ... 2,500 0 0 0.
5,124 Do. do. issued for do. do. 915 1 0 2
9,304½ Do. do. balance in store at end of do. do. 1,661 10 0 9

MADRAS HARBOUR WORKS OFFICE,
9th May 1895.

A. LEE-POGSON,
Engineer, Harbour Trust Board.

A. LEE POGSON.
Engineer, Harbour Trust Board

G. MOOTHOSA WMY NAIDU,
Accountant,
M. H. Works Office.

MADRAS,
11th May 1895.

[$\frac{G}{9}$]
2,000-23-1-25.

Current No. 417

Public Works DEPARTMENT.

From Mr. Harman H.T. 18.
Madras

No. 871

Dated 29 May

Received 2 June 1895
By 5 ..

Enclosures 2 plans & 4 photos under
Separate Cover.

SUBJECT.

Madras Harbour. Submitting Report
upon Progress made in the reconstruction
of the — for the quarter ending 31 March 95

Recd 10 June 95
H/o

Transferred.

P. W. CURRENT No. 46/8

Indk No. 1228

Transferred to the Public
Works Department.

Godhumbes
Ag. Asstt Secretary.
8-VI-95.

7.8.13.
8/6/95.

Ootacamund } 2 S.C.
10 June 1895 }
Acco. 15-6-95
Encls 6 (2 plans & 4
photographs)

125/1

MARINE DEPARTMENT.

FROM
THE CHAIRMAN,
HARBOUR TRUST BOARD,
MADRAS.

To
THE CHIEF SECRETARY TO GOVERNMENT,
Marine Department.

DATED 29th May 1895

DESPATCHED 31st May 1895.

RECEIVED

Enclosures Plans (2)
Four photographs under
separate cover

No. 871

SUBJECT.

MADRAS HARBOUR.

Submitting Report upon Progress made in the
reconstruction of the ——— for the quarter ending
31st March 1895.

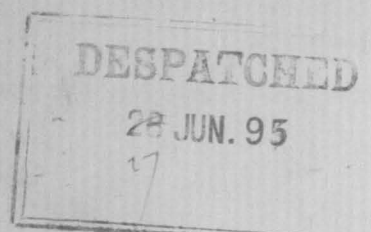
LAWRENCE ASTLUM PRESS, MADRAS.

PUBLIC WORKS DEPARTMENT.

No. 1553 W. dated 26th June 1895

PROCEEDINGS OF THE MADRAS GOVERNMENT.

Endorsement in the Marine
Dept on letter from the
Chairman Harbour Trust
Board, Madras, No. 871 of
29th May 1895 ———



To
The Chairman H.T. Board
" Marine Dept

Read the following

Ordered that the report
be forwarded for the
information of the Secretary
of State and the Government
of India.

(H.E. No. 1554 W. d/26th June 1895)

Copy of the above with
two plans shewing the
progress of the work forwarded
to the Govt of India.

(H.E. No. 7/1553 W. d/26th June 1895)

To
The Right Honble
The Secretary of State for
India.

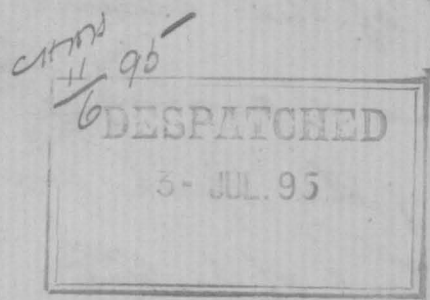
Right

St. Hable Sir,

In continuation of
our despatch No. 3 dated
1108W
9 May 1895 we have the
honour to forward the Progress
report of the Madras Harbour
Works for the quarter ending
31 March 1895.

2. The report is accom-
panied by two plans —
showing the position and
quantity of work done during
the quarter.

S
1/6



~~1/3~~ urgent

The Progress Report of the
Madras Harbour Works for
the quarter ending 31st
March 1895.

13

4662
Govt. of Madras.

PUBLIC WORKS.

Dated

Recd.

27/6/1

G.O. 76/1000 1895 No. 153 W.

1534

7

1534

Madras Harbour Works

The progress report of the
for the quarter ending
31st March 1895, Order
the forwarded to the
Secretary of State and
the Govt of India.

Letter. Forwarding
the progress report of the
for the quarter ending
31st March 1895

Forwarding the progress
Report of the Madras
Harbour Works for the
quarter ending 31st March
1895

22/7