(1) Number of pages 80 -

(2) Date of repair 27.11.86

(3) Initials of the Referencer

TAMIL NADU ARCHIVES

GOVERNMENT OF TAMIL NADU

Public Works. DEPARTMENT

G.O. No. ~~B.P. No.~~	854 - 5 (W)	Press. Mis.
Dated	3. 4. 1880	~~197~~.

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854-5
1

GOVERNMENT OF MADRAS.

PUBLIC WORKS DEPARTMENT.

3rd April 1880, No. 854 W.

Buildings and Roads.
Civil Works.

Read the following papers:—

No. 9. From W. PARKES, Esq., to the Secretary to the Government of Madras, Public Works Department, dated 23 Abingdon Street, 29th May 1879.

Madras Harbour Moorings.

In the G.O. No. 862 W., of 22nd March 1879, I am requested to submit a plan of moorings with only half the number of buoys originally proposed, but in such positions that the others can be added hereafter if required.

2. Referring to the letter of the Master Attendant on which the above order is founded, I find that he considers it desirable, in the first instance at any rate, to place the buoys at greater distances apart than was originally proposed, so as to give more room for working the ships to and from their berths. In this I entirely concur, and the system proposed lends itself very advantageously to such an arrangement, but it will, I think, be readily understood that if a greater distance is allowed between the berths, the cost of half the number of berths will be more than half that of the whole system.

3. I beg to submit herewith two charts, "No. 1 Close system," being with the exception of a slight modification identical with that which I originally proposed to Captain Taylor, and "No. 2 Open system," that which I now recommend as the first step towards the ultimate accomplishment of No. 1 in accordance with the instructions quoted above.

4. The modification of the original plan above alluded to consists in the suppression of the row of six buoys nearest the shore, which being in shallow water would only be available for light and small ships, and substituting for them twelve smaller buoys attached directly to the innermost row of screw moorings which would be equally useful for such vessels as steam tugs, native craft, large cargo boats, &c., which would have room to swing freely to the wind in the space between the buoys.

5. The total cost of this complete system would be £28,065 or, taking the rupee at 1/7½, rupees 3,45,415. The details are given in the accompanying estimate, and are based on information furnished by Mr. G. Wells, who having laid down the

screw moorings in the Hooghly, and also erected the screw pile pier at Madras, has had an exceptional amount of local experience in this class of work. The prices are those at which Mr. Wells would be prepared at the present time to supply the materials, but they are of course ruled by the market price of iron and the cost of labour.

6. The plan "No. 2, Open system," may be generally described as consisting of every alternate buoy of No. 1. The number of screws is the same as in No. 1 and the whole of them would be immediately required except six, viz., the outer ones in the rows C, D and E. These would lie idle until it becomes desirable to attach the ground chains and buoys to them, but I should recommend them to be fixed at the same time as the others, as the cost would be small, while the special screwing machinery and staff are at work, and I think the berths which would depend upon them would not improbably be among the first to be added when further accommodation is wanted.

7. The accommodation in the first instance afforded by this system would be as follows:—For ships up to 360 feet long there would be in rows B, C, D, E and F, fourteen free swinging berths, and for shorter ships five more besides the twelve inshore berths for small craft. Ships of greater length than 360 feet must be moored head and stern in ordinary times, and for these the combination of rows A and C with B and F respectively would provide fixed berths at the expense of course of an equal number of swinging berths.

8. The cost of this scheme would be £17,936 or Rs. 2,20,752 rather less than two-thirds of No. 1. Additions could be made at any time by merely attaching the ground chains and buoys to the screws already fixed, which can be done by an ordinary diver. The ultimate cost of completing the scheme would not be enhanced by deferring the attachment of the alternate buoys till they are required, as the whole of the work involving special machinery and skilled superintendence would have been completed as part of the open system first carried out.

9. It will be seen that the essential difference of these two schemes is that while in No. 1, the close system, every ship must be moored head and stern, in No. 2, the open system, all ships below a limit of length, which would at present include the great majority, may swing freely at all times. There are few harbours in which ships of exceptional length can lie at swinging berths, so that Madras will not be peculiar in requiring such ships to be moored head and stern under ordinary circumstances. In case of necessity however seven berths (B, 1, 5—C, 4—D, 2—E, 4—F, 1, 5) could, by the removal of such of the buoys as are within the radius of the ship's length, be made available for such ships to swing freely round them.

10. This would be provided for in the construction of the buoys, which could be instantly freed by driving out a steel key on the top of the buoy. By this means the bridle-chain would drop to the bottom, and the buoy could be floated away. The bridle-chain would have to be afterwards recovered by a diver.

11. The change from the system of swinging moorings to that of fixed moorings for ships of moderate length would be made gradually, as the requirement for it arises. In order to give the full amount of accommodation to such vessels however special arrangements for stern moorings will have to be made. The distances between the rows of buoys are 430 feet. The whole of this space would be occupied by a tier of very long ships, so that to maintain a free passage between their sterns and the heads of the next tier of ships the adjoining space of 430 feet must be left unoccupied. But in the case of shorter vessels there would be ample space for passage between their sterns and the next row of buoys if it be not obstructed by their stern moorings.

12. To obviate such obstruction I propose to attach to each screw, where suitably situated for the purpose, a light supplementary chain cable of 12 fathoms in length continued by a still lighter hand chain of 20 fathoms, the end of which when it is out of use would be hung on the neighbouring buoy. When in use this hand chain would be taken on board the ship, and the ship's own tackle made fast to the light chain cable on either side, thus securing her stern in any required direction. By this means a passage of 130 feet wide would be left between the stern of a ship 300 feet long and the heads of the ships secured to the buoys in the next row. Provision for 120 such supplementary stern chains is made in the estimate for Plan No. 1 at a cost of £1,244.

13. It may be desirable to give a few particulars of the construction of the proposed moorings. The ground attachments of each buoy will consist of four screws, 4 feet diameter, sunk 20 feet in the ground at the four corners of a square of 200 feet. To each screw will be attached 21 feet of open link $2\frac{1}{4}$-inch chain, the last link of which will therefore remain above the surface of the ground. To each of these last links will be attached by means of a suitable shackle the end of a "ground chain," a $2\frac{1}{4}$-inch stud link cable, $24\frac{1}{2}$ fathoms long, the other ends of which will meet in the centre of the square. To these four ends will be attached one end of a $2\frac{1}{2}$-inch stud link chain (the bridle) of a length one fathom less than the depth of water at mean tide, the other end being attached to a spindle of round iron $3\frac{1}{2}$-inches diameter, which will pass through the buoy and be secured on the top by a steel key, which will also connect it to a strong ring or eye to which the ship's tackle will be made fast. On this key being driven out, as described in paragraph 10, the buoy will be detached from its moorings.

14. The length allowed for the ground chains, $24\frac{1}{2}$ fathoms, is one fathom more than the actual distance from the angle to the centre of the square, so that there will be a fathom of slack in each of the four. This will allow the buoy to rise and fall with the tide or with such waves as there may be within the harbour. The strain of a ship upon the mooring will first lift this slack, and then lift the one or two of the ground chains which may lie to windward, off the ground, and ultimately under a force sufficient to lift the whole length of chain, the strain will be thrown upon the screw or divided between two screws some 30 fathoms distant and buried 20 feet in the ground. The result of the greatest possible strain upon the chains will be to allow the buoy to describe a circle of about 42 feet radius round the central point of the square which is its normal position. Thus 42 feet added to the length of the ship will give the radius of the circle which a ship can describe under the influence of a gale of wind veering all round the compass, though the actual attachment to the ground will never be at a less distance than 30 fathoms.

15. The strength given to every detail of the parts of these moorings which are liable to the greatest strain is in excess of that specified by Lloyd's rules for the tackle to be carried by the largest class of merchant ships, steamers of 5,000 and sailing vessels of 3,000 gross tonnage. Thus the weakest link in the chain of attachment will be that which is on board the ship itself and under constant authoritative inspection. For vessels of a size beyond the limits of the scale recognized by Lloyd's, if such should visit the port, exceptional arrangements will have to be made.

16. In the charts showing the proposed arrangement of the berths I have indicated the depths by the contours taken from the survey of February 1878. The disturbance of the bottom in the following south-west monsoon would affect a few of the berths for small vessels in the extreme south-west angle of the harbour, but as I anticipate further changes in this locality, and that the ultimate form of the bottom will probably be more like that shown by the contours of February 1878 than by those of more recent surveys, I have thought it would only complicate the question to show an exceptional state of things which will certainly change if it do not entirely pass away. It will of course be understood that the moorings should not be laid down till there is good evidence that no further important disturbance of the bottom is likely to occur, but I hope the present south-west monsoon will afford materials for a final settlement of that question.

17. I may be permitted to request that this matter should have early attention. Three months from the date of order will be required for the preparation and shipment of the materials required to commence operations, and if the moorings are

to be ready for use in November 1880 advantage should be taken of the favorable season of January and February next for laying them down.

ESTIMATE OF MOORINGS.

No. 1, *Close System.*

	£	s.	d.
134 screws 4 feet diameter with 21 feet of 2¼" open link chain at £22 each	2,948	0	0
180 lengths of 2¼" stud ground chain, each 24½ fathoms—560 tons at £17	9,520	0	0
36 lengths of 1½" stud ground chain for Harbour side moorings of lines A and C, each 24½ fathoms—52½ tons at £16 ...	840	0	0
54 lengths of 2½" stud bridle-chain, from 3 to 6½ fathoms—42 tons at £17	714	0	0
12 lengths of 1½" stud bridle-chain, each 4½ fathoms, for inner line of buoys—3¼ tons at £16	52	0	0
Shackles for connections—15½ tons at £35	542	10	0
54 wrought iron buoys 10′ × 9′—126 tons at £35	4,410	0	0
12 do. do. 6′ × 5′ 8¾ do. £40	350	0	0
120 lengths of 1¼" stud chain for stern moorings, each 12 fathoms, 1,440 fathoms at ¾ cwt.—54 tons at £16... ...	864	0	0
120 lengths of ⅝" hand chain for do., each 20 fathoms, 2,400 fathoms—24 tons at £15	360	0	0
Screwing machinery	600	0	0
Portable engine and boiler	290	0	0
Contingencies and extras 5 per cent.	1,074	10	0
Total cost of materials shipped f.o.b. in the Tyne ...	22,565	0	0
Freight for 1,000 tons at 60′	3,000	0	0
Local materials and labour, say	2,000	0	0
Special superintendence	500	0	0
	28,065	0	0

or Rs. at 1/7½, Rs. 3,45,415.

(Signed) W. PARKES.

No. 2, *Open System.*

	£	s.	d.
134 screws 4 feet diameter with 21 feet of 2¼" open link chain at £22 each	2,948	0	0
96 lengths of 2¼" stud ground chain, each 24½ fathoms—300 tons at £17	5,100	0	0
20 lengths of 1½" stud ground chain for Harbour side moorings of lines A and C, each 24½ fathoms—29½ tons at £16.	472	0	0
29 lengths of 2½" stud bridle-chains, from 3 to 6½ fathoms—22 tons at £17	374	0	0
12 lengths of 1½" stud bridle-chains each 4½ fathoms for inner line of buoys—3¼ tons at £16	52	0	0
Shackles for connections, 12 tons at £35	420	0	0
29 wrought iron boys 10′ × 9′ 68 tons at £35	2,380	0	0
12 „ „ 6′ × 5′ 8¾ „ at £40	350	0	0
Screwing machinery	600	0	0
Portable engine and boiler	290	0	0
Contingencies and extras 5 per cent.	650	0	0
Total cost of materials shipped f.o.b. in the Tyne ...	13,636	0	0
Freight for 600 tons at 60′	1,800	0	0
Local materials and labour, say	2,000	0	0
Special superintendence	500	0	0
	17,936	0	0

or Rs. at 1/7½, Rs. 2,20,752.

(Signed) W. PARKES.

No. 2,377.

REFERRED to the Harbour Committee for early remarks.

(By Order.)

(Signed) J. PENNYCUICK, Major, R.E.,
Under Secy. to Govt., P.W.D.

27th June 1879.

To the President, Harbour Committee.

No. 9-A. Proceedings of the Madras Harbour Works Committee in circulation, dated 10th July 1879.

Read letter from Mr. Marshall, Port Conservator, regarding Mr. Parkes' system of moorings suggesting certain modifications.

Letter referred to Captain Taylor and Mr. Thorowgood for careful consideration. On the explanation offered by these officers the Committee beg to *recommend that Mr. Parkes' open* system of moorings, "*vide* plan* and description," be adopted by Government as a commencement. If it should be found afterwards that a still more open style as advice by Mr. Marshall is necessary, the removal and return of the tier of buoys adjoining the harbour wall in either monsoon can be effected without assistance from England, and if the close system of Mr. Parkes is even brought into action the screws being already in position it will only be necessary to attach chains and buoys.

*B.

(Signed) P. MACFADYEN.
(„) J. H. TAYLOR.
(„) R. C. WALKER.
(„) J. PENNYCUICK.

No. 9-B. From F. N. THOROWGOOD, Esq., M. INST. C.E., Superintendent, Madras Harbour Works, to the Secretary to Government, Public Works Department, Buildings and Roads, dated Madras, 23rd March 1880, No. 68 W.

I HAVE the honor to submit the following reply to your memorandum No. 933, of yesterday's date, in which you ask me whether I believe the savings on the estimate of Rs. 58,50,790 for these works will be sufficient to cover the cost of the lesser scheme of moorings estimated by Mr. Parkes to cost Rs. 2,20,752, (*vide* his letter to the Madras Government, May 29th, paragraph 7.)

2. I have now gone carefully through the whole items of expenditure up to the end of February, and am able to estimate very fairly what the work will cost apart from serious accidents. I am able to show that the saving will be very nearly sufficient to cover the cost of the moorings.

3. The main heads under which excess or saving occur are as follow :—

Excesses.	RS.	*Savings.*	RS.
Preliminary works	68,258	Block-making	1,27,790
Rubble bases	1,00,000	Block setting	2,62,246
Establishment	1,36,077	Contingencies	1,34,472
Total Excesses ...	3,04,335	Total Savings ...	5,24,508

4. In all the above items I have estimated quite fairly, the calculations being based on what has gone before. The large excess estimated to occur in "Establishment" arises from my allowing for twenty-four months more to run at the present rates of pay, but Rs. 20,000 of the amount should by Mr. Parkes's estimate go to "*Works*" and not to *Establishment*. It is charged to the latter in obedience to G.O., 2,254 W., of 3rd September 1879.

5. In the items on which there are to be savings it will be observed that I have allowed Rs. 1,34,472 to be saved from "Contingencies." I arrive at this by taking the total amount now expended on contingencies and adding to it *twice as much* again, which I think to be giving a liberal margin.

6. It will be seen then the total probable excesses over estimate amount to Rs. 3,04,335, while the probable savings will be Rs. 5,24,508, giving a nett saving of Rs. 2,20,173 against Rs. 2,20,752, the estimated cost of the moorings allowing for exchange at 1s. 7½d. per rupee.

No. 10. ORDER THEREON, 3rd April 1880, No. 854 W.

ORDERED that the Government of India be addressed on the subject of the moorings, a copy of the letter being forwarded to the Secretary of State for information.

(Here enter No. 855 W., dated 3rd April 1880.)

(True Extract.)

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

Exd. S. T. Austin.
Spare Copies

BUILDINGS AND ROADS.
CIVIL WORKS.

Govt. of (1880) Madras.

PUBLIC WORKS.

To

Dated April, 3rd.

Issued

Recd. *Encl.*

G. O., 3rd April 1880, No. 854 W.

APRIL.
Nos. 9-10.

Moorings for the Madras Harbour Works.
— The Government of India addressed on the subject of the —.

PUBLIC WORKS DEPARTMENT.

Buildings and Roads.
Civil Works.

No. 855 W.

No. 11.

FROM

THE SECRETARY TO THE GOVERNMENT OF MADRAS,
Public Works Department,

To

THE SECRETARY TO THE GOVERNMENT OF INDIA,
Public Works Department.

SIR,—I am directed to forward correspondence relating to the provision of mooring apparatus for the Madras Harbour.

2. On the recommendation of the Madras Harbour Committee, this Government have resolved on the adoption, as a commencement, of the open system of mooring proposed by Mr. Parkes. It has been ascertained that the Calcutta and Bombay dockyards are unable to supply any of the requisite gear, and it will therefore be necessary that the Secretary of State invite tenders in the open market for the whole of the apparatus, such tenders being submitted for choice to the ordinary Engineering advisers of the India Office.

3. The cost of the moorings will amount to about £18,000; and as this Government are of opinion that the item might properly have been included in the general estimate for the Harbour Works, it appears desirable to adopt the suggestion made in the 29th paragraph of Mr. Parkes' report, dated 25th February last, and to provide for the mooring from the sanctioned estimate of £628,000.*

4. It is considered by the Superintendent that there is no reasonable ground for doubting that such provision may with safety be made. On this point I am directed to invite attention to his letter bearing date the 23rd March, No. 68 W.

5. His Grace the Governor in Council would be glad to have early sanction to this proposal communicated, and I am to request that, as the matter is very pressing, the Secretary of State, to whom a copy of this letter has been sent for information, may be advised by telegraph of the approval of His Excellency the Governor-General in Council to the proposal.

I have the honor to be,
Sir,
Your most obedient servant,

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

FORT ST. GEORGE,
3rd April 1880.

Exd. S. T. Austin.
Spare Copies

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* Inclusive of £43,000 for interest on loan.

BUILDINGS AND ROADS.
CIVIL WORKS.

Govt. of (1880) Madras.

PUBLIC WORKS.

To

The SECRETARY to the
GOVERNMENT of INDIA.

Dated April, 3rd.

Issued

Encl.

Recd.

G. O., 3rd April 1880, No. 855 W.

APRIL.
No. 11.

Mooring Apparatus for the Madras Harbour Works.

PUBLIC WORKS DEPARTMENT.

No. 19 A

TO THE RIGHT HONORABLE THE SECRETARY OF STATE FOR INDIA.

My Lord,—We have the honor to forward, for your Lordship's information, a copy of a letter that has been addressed by us to the Government of India.

2. We would request that, on receipt of the approval of the Government of India to our proposal in regard to the provision of funds for the moorings from the sanctioned estimate of £628,000, you will have tenders for the supply of the moorings invited and approved by the Engineering advisers of the India Office.

Including £43,000 for interest on loan.

3. It will be necessary that specially trained men be sent out to fix the moorings, and we presume, though the point is doubtful, that the sum named by Mr. Parkes (£18,000) will cover all expenses connected with such workmen, including their passage to and from Madras, and their pay while employed here.

We have the honor to be,
My Lord,
Your Lordship's most obedient, humble servants,

Fort St. George,
20th April 1880.

Exd. S. T. Austin.

FORT ST. GEORGE.

PUBLIC WORKS DEPARTMENT.

Letter to the Right Honorable the
Secretary of State for India.

Dated 20th *April.*
No. 194 *of* 1880.

MOORING APPARATUS FOR THE MADRAS HARBOUR WORKS.

G.Or 854 W 3 April/80

Dr. W

Tho' His Grace the Govr. has ruled that the despatch requesting the S of S to take measures to procure the preferred mooring apparatus is to stand over for the present I take it that this merely means that such further enquiry should at once be undertaken as will either confirm the Govmt in deciding finally on accepting the class of mooring — or abandoning this in favour of others so as to render the shipping more secure in bad weather

I should therefore be glad if you would take measures for having the point fully discussed. It ~~may~~ is possible that Government may wish to refer the point to the best nautical opinion in England and in this view the papers discussing the matter should be of such a character as will admit of this being done. I presume it should be drawn up by the Harbour Committee

Previous to the enquiry as to whether screw pile moorings

or wherever would be safest during a cyclone it would be necessary to settle the point as to whether the harbour as now being constructed would be safe during bad weather, or as apparently affirmed by some of the Captains, who have lately expressed their views on the subject, only a trap in which ships would at such times be caught with no possibility of escape from certain destruction

16/8/79

Public Works Department.

PROCEEDINGS OF THE MADRAS GOVERNMENT.

UNDER date the

Read the following:—

From Mr. Parkes
(H. E dated 29th May/79)

Extract of Pro. of Harbour Committee Meeting dated 7 July 1879.

Pro: of Harbour Committee on the 10 July/79

Cancelled

Ordered that the Secretary of State be requested to take measures for supplying such mooring apparatus as will be required for the Open System, which is recommended for adoption by the Madras Harbour Committee.

2. Mr. Parkes is thanked for the trouble he has taken in the matter.

To

The Secy of State
for India

My Lord,

With reference to the Correspondence on the subject of the provision of mooring apparatus for the Madras Harbour, which we learn from the second paragraph of Mr. Parkes letter bearing date the 29th May to the

Under Secy. of State has been laid before Your Lordship, we have the honour to state that, on the recommendation of the Madras Harbour Committee, we have resolved on the adoption, as a commencement, of the open system of moorings proposed by Mr. Parkes.

2. It has been ascertained that the Calcutta and Bombay Dockyards are unable to supply any of the requisite gear, and we have therefore to request that Your Lordship will obtain tenders in the open market for the whole of the apparatus, and that such tenders may be submitted

to the ordinary Engineering advisers of the India Office, that tender recommended by them being accepted.

3. We are advised that specially trained workmen will be required for fixing the moorings, and presume that the last item in the estimate (that of special superintendence) is intended to cover all expenses connected with such workmen, including the cost of their passages to and from Madras & pay while engaged in fixing the moorings. But as we are not a little doubtful on this point we would suggest that a reference

be made to Mr. Parkes.

~~[illegible]~~

4. To enable moorings to be used under the lee of the north pier in the North East monsoon of 1880-81, it is necessary that they should be fixed next January or February, so that we would request that no time may be lost in calling for tenders, and in ~~the~~ accepting ~~of~~ that most suitable.

5. We thought it best that, in the first instance, the ~~number of~~ moorings should be limited in number, and laid in such positions that others could be added afterwards, if required;

and the estimate prepared by Mr Parkes accordingly provides for only half the number originally proposed. The cost of these moorings amounts to about £ 18,000, and, looking to the present condition of the Harbour Works, we are inclined to think that there is no objection to the proposal made in the 29" paragraph of Mr Parke's letter of the 25" February last, No. 7 W, to meet the cost of the moorings, in the first instance, from the additional provision in the general estimate on account of the rubble surf banks.

14

It is now certain that this extra provision of £ 20,000 will not be spent, and the amount can ultimately be recovered by us in the manner proposed in the preceding paragraph of the same letter.

A.S.P.
31/7

To Stand over for the present by order of H E in C Robt
15/8/79

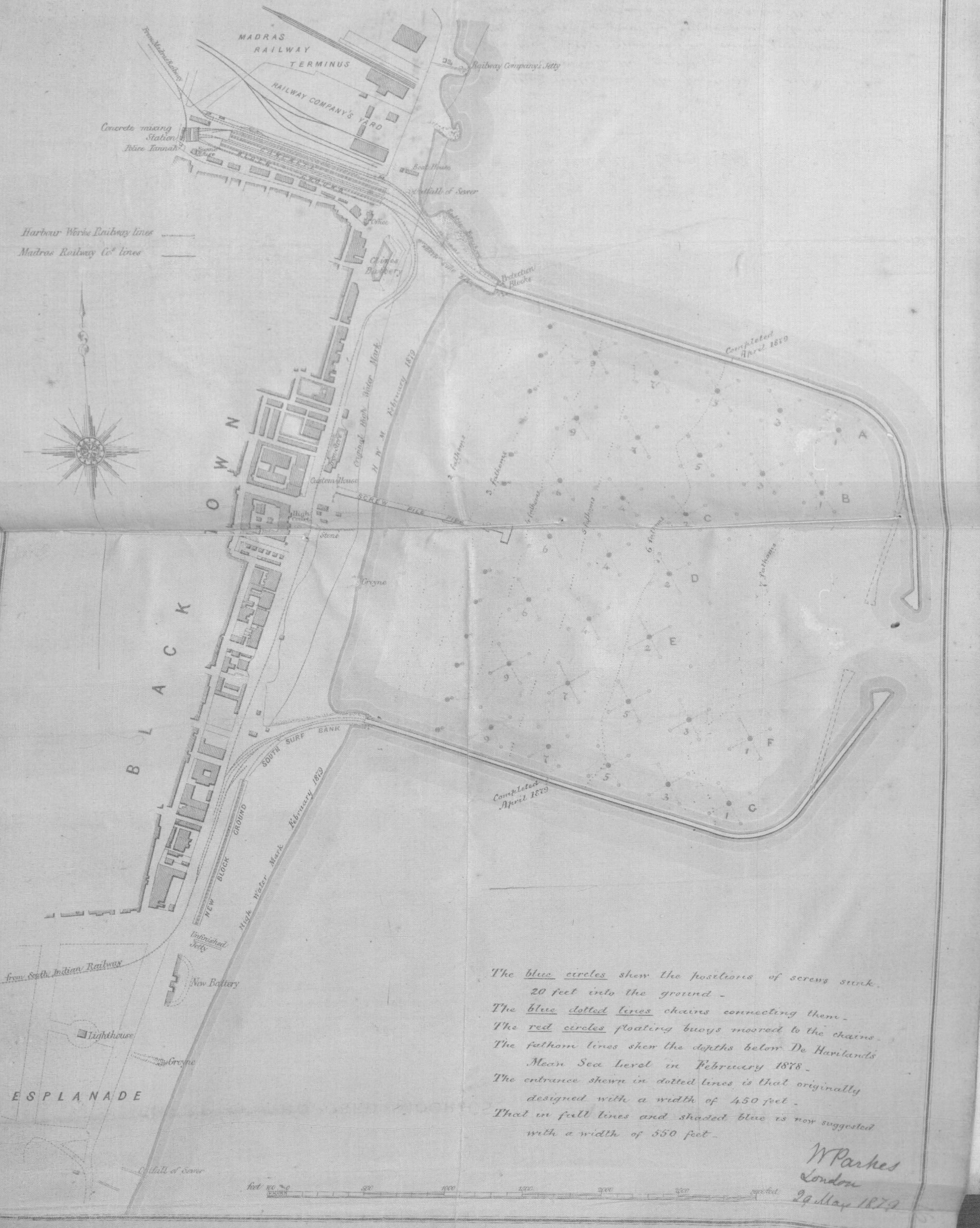
P. 4/1880/Dept

Procds 3 April 1880 No $\frac{852}{855}$ &c

B

MADRAS HARBOUR.

CHART OF PROPOSED MOORINGS. Nº 2. OPEN SYSTEM.



The blue circles shew the positions of screws sunk 20 feet into the ground -

The blue dotted lines chains connecting them -

The red circles floating buoys moored to the chains -

The fathom lines shew the depths below De Havilands Mean Sea Level in February 1878 -

The entrance shewn in dotted lines is that originally designed with a width of 450 feet -

That in full lines and shaded blue is now suggested with a width of 550 feet -

W Parkes
London
29 May 1879

VACHER & SONS, 29, PARLIAMENT ST. WESTMINSTER.

Madras Harbour Moorings.

23 Abingdon Street,
29th May 1879.

Sir,

In the Government Order No. 862 W of 22nd March 1879 I am requested to submit a plan of moorings with only half the number of buoys originally proposed, but in such positions that the others can be added hereafter if required.

2. Referring to the letter of the Master Attendant on which the above order is founded, I find that he considers it desirable, in the first instance at any rate to place the buoys at greater distances apart than was originally proposed, so as to give more room for working the ships to and from their berths. In this I entirely concur, and the system proposed

The Secretary to Government.
Public Works Department,
Madras.

lends itself very advantageously to such an arrangement, but it will I think be readily understood that if a greater distance is allowed between the berths, the cost of half the number of berths will be more than half that of the whole system -

3 - I beg to submit herewith two charts "No. 1 Close system" being with the exception of a slight modification identical with that which I originally proposed to Captain Taylor, and "No. 2 Open system", that which I now recommend as the first step towards the ultimate accomplishment of No. 1 in accordance with the instructions quoted above -

4 - The modification of the original plan above alluded to consists in the suppression of the row of 6 buoys nearest the shore which being in shallow water would only be available for light and small ships, and substituting for them 12 smaller buoys attached directly to the innermost row of screw moorings which would be equally useful for such vessels as steam tugs, native craft, large cargo boats &c which would

have room to swing freely to the wind in the space between the buoys.–

5.– The total cost of this complete system would be £ 28,065 or taking the rupee at 1/7½, Rupees 3,45,415.– The details are given in the accompanying estimate, and are based on information furnished by Mr. G. Wells, who having laid down the screw moorings in the Hooghly, and also erected the screw pile pier at Madras, has had an exceptional amount of local experience in this class of work.– The prices are those at which Mr. Wells would be prepared at the present time to supply the materials, but they are of course ruled by the market price of iron and the cost of labour.–

6.– The plan "No. 2 Open system" may be generally described as consisting of every alternate buoy of No. 1.– The number of screws is the same as in No. 1 and the whole of them would be immediately required except six, viz. the outer ones in the rows **C D** and **E** - These would lie idle until it becomes desirable to attach the ground chains and buoys to them, but I should recommend them to be fixed at the same time as the others as the cost would be small while the special screwing machinery and staff are at work, and I think the berths which would depend upon them would not improbably be among the first to be added when further accommodation is wanted -

7 - The accommodation in the first instance afforded by this system would be as follows :- For ships up to 360 feet long there would be in rows **B, C, D, E** and **F** fourteen free swinging berths and for shorter ships five more besides the 12 inshore berths for small craft - Ships of greater length than 360 feet must be moored head and stern in ordinary times, and for these the combination of rows **A** and **C** with **B** and **F** respectively would provide fixed berths at the expense of course of an equal number of swinging berths -

8 - The cost of this scheme would be £17,936 or Rs 2,20,752 rather less than two thirds of No. 1 - Additions could be made at any time by merely attaching the ground chains and buoys to the screws already fixed which can be done by an ordinary diver. The ultimate cost of completing the scheme would not be enhanced by deferring the attachment of the alternate buoys till they are required as the whole of the work involving special machinery and skilled superintendence would have been completed as part of the open system first carried out -

9 - It will be seen that the essential difference of these two schemes is that while in No. 1 - the close system - every ship must be moored head and stern, in No. 2 - the open system - all ships below a limit of length which would at present include the great majority, may swing freely at all times - There are few harbours in which ships of exceptional length can lie at swinging berths so that Madras will not be peculiar in requiring such ships

to be moored head and stern under ordinary circumstances - In case of necessity however seven berths (B, 1, 5 - C, 4 - D, 2 - E, 4 - F, 1, 5) could by the removal of such of the buoys as are within the radius of the ship's length be made available for such ships to swing freely round them -

10 - This would be provided for in the construction of the buoys which could be instantly freed by driving out a steel key on the top of the buoy - By this means the bridle chain would drop to the bottom, and the buoy could be floated away - The bridle chain would have to be afterwards recovered by a diver -

11 - The change from the system of swinging moorings to that of fixed moorings for ships of moderate length would be made gradually as the requirement for it arises - In order to give the full amount of accommodation to such vessels however special arrangements for stern moorings will have to be made - The distances between the rows of buoys are 430 feet -

The whole of this space would be occupied by a tier of very long ships, so that to maintain a free passage between their sterns and the heads of the next tier of ships the adjoining space of 430 feet must be left unoccupied - But in the case of shorter vessels there would be ample space for passage between their sterns and the next row of buoys if it be not obstructed by their stern moorings -

12 - To obviate such obstruction I propose to attach to each screw where suitably situated for the purpose, a light supplementary chain cable of 12 fathoms in length continued by a still lighter hand chain of 20 fathoms the end of which when it is out of use would be hung on the neighbouring buoy - When in use this hand chain would be taken on board the ship, and the ship's own tackle made fast to the light chain cable on either side, thus securing her stern in any required direction - By this means a passage of 130 feet wide would be left between the stern of a ship 300 feet long and the heads of the ships

secured to the buoys in the next row – Provision for 120 such supplementary stern chains is made in the estimate for Plan No. 1 – at a cost of £1244 –

13 – It may be desirable to give a few particulars of the construction of the proposed moorings – The ground attachments of each buoy will consist of four screws 4 feet diameter sunk 20 feet into the ground at the four corners of a square of 200 feet – To each screw will be attached 21 feet of open link 2¼ inch chain, the last link of which will therefore remain above the surface of the ground – To each of these last links will be attached by mean of a suitable shackle the end of a "ground chain", a 2¼" stud link cable, 24½ fathoms long, the other ends of which will meet in the centre of the square – To these four ends will be attached one end of a 2½" stud link chain (the bridle) of a length one fathom less than the depth of water at mean tide, the other end being attached to a spindle of round iron 3½ inches diameter which will pass through the buoy and be secured

on the top by a steel key, which will also connect it to a strong ring or eye to which the ship's tackle will be made fast. On this key being driven out as described in para: 10 the buoy will be detached from its moorings.

14. The length allowed for the ground chains 24½ fathoms is one fathom more than the actual distance from the angle to the centre of the squares, so that there will be a fathom of slack in each of the four. This will allow the buoy to rise and fall with the tide or with such waves as there may be within the harbour. The strain of a ship upon the mooring will first lift this slack, and then lift the one or two of the ground chains which may lie to windward, off the ground, and ultimately under a force sufficient to lift the whole length of chain," the strain will be thrown upon the screw or divided between two screws some 30 fathoms distant and buried 20 feet in the ground. The result of the greatest possible strain upon the chains will be

to allow the buoy to describe a circle of about 42 feet radius round the central point of the square which is it normal position - Thus 42 feet added to the length of the ship will give the radius of the circle which a ship can describe under the influence of a gale of wind veering all round the compass though the actual attachment to the ground will never be at a less distance than 30 fathoms -

15 - The strength given to every detail of the parts of these moorings which are liable to the greatest strain is in excess of that specified by Lloyd's Rules for the tackle to be carried by the largest class of merchant ships, steamers of 5000 and sailing vessels of 3000 gross tonnage - Thus the weakest link in the chain of attachment will be that which is on board the ship itself and under constant authoritative inspection - For vessels of a size beyond the limits of the scale recognized by Lloyd's, if such should visit the port, exceptional arrangements will have to be made -

16. In the charts showing the proposed arrangement of the berths I have indicated the depths by the contours taken from the survey of February 1878. The disturbance of the bottom in the following South West Monsoon would affect a few of the berths for small vessels in the extreme South West angle of the Harbour, but as I anticipate further changes in this locality and that the ultimate form of the bottom will probably be more like that shown by the contours of February 1878 than by those of more recent surveys I have thought it would only complicate the question to show an exceptional state of things which will certainly change if it do not entirely pass away. It will of course be understood that the moorings should not be laid down till there is good evidence that no further important disturbance of the bottom is likely to occur, but I hope the present South West Monsoon will afford materials for a final settlement of that question.

17. I may be permitted to request that

this matter should have early attention - Three months from the date of order will be required for the preparation and shipment of the materials required to commence operations, and if the moorings are to be ready for use in November 1880 advantage should be taken of the favorable season of January and February next for laying them down.

I have the honor to be
Sir,
Your most obedient servant

W Parkes

Estimate of Moorings – No. 1 – Close System –

134 screws 4 feet diameter with 21 feet of 2¼" open link chain at £ 22 each –	£ 2948. 0. 0
180 lengths of 2¼" stud ground chain each 24½ fathoms – 560 tons at £ 17 –	9520. 0. 0
36 lengths of 1½" stud ground chain for Harbour side moorings of Lines A and C each 24½ fathoms – 52½ tons at £ 16 –	840. 0. 0
54 lengths of 2½" stud bridle chain from 3 to 6½ fathoms – 42 tons at £ 17 –	714. 0. 0
12 lengths of 1½" stud bridle chain each 4½ fathoms for inner line of buoys ——— 3¼ tons at £ 16 –	52. 0. 0
Shackles for connections 15½ tons at £ 35 –	542. 10. 0
54 wrought iron buoys 10'×9' – 126 tons at £ 35 –	4410. 0. 0
12 " " " 6×5 – 8¾ " " £ 40 –	350. 0. 0
120 lengths of 1¼" stud chain for stern moorings each 12 fathoms 1440 fathoms at 3/4 cwt – 54 tons at £ 16 –	864. 0. 0
120 lengths of 5/8" hand chain for do each 20 fathoms – 2400 fathoms – 24 tons at £ 15 –	360. 0. 0
Screwing machinery ———	600. 0. 0
Portable Engine and Boiler ———	290. 0. 0
Contingencies and extras 5 per cent ———	1074. 10. 0
Total cost of Materials shipped F. O. B. in the Tyne	£ 22,565. 0. 0
Freight for 1000 tons at 60/- ———	3000. 0. 0
Local materials and labour say ———	2000. 0. 0
Special superintendence ———	500. 0. 0
	£ 28,065. 0. 0

or Rupees at 1/7½ – Rs 3,45,415 –

W Parkes

No. 2 - Open System -

134 screws 4 feet diameter with 21 feet of 2¼" open link chain at £22 each —	£	2948. 0. 0
96 lengths of 2¼" stud ground chain each 24½ fathoms - 300 tons at £17 —		5100. 0. 0
20 lengths of 1½" stud ground chain for Harbour side moorings of lines A and G each 24½ fathoms - 29½ tons at £16 —		472. 0. 0
29 lengths of 2½" stud bridle chains from 3 to 6½ fathoms - 22 tons at £17 —		374. 0. 0
12 lengths of 1½" stud bridle chains each 4½ fathoms for inner line of Buoys ——— 3¼ tons at £16 —		52. 0. 0
Shackles for connections - 12 tons at £35 —		420. 0. 0
29 wrought iron buoys 10×9 - 68 tons at £35 —		2380. 0. 0
12 " " " 6×5 - 8¾ " " £40 —		350. 0. 0
Screwing machinery ———		600. 0. 0
Portable Engine and Boiler ———		290. 0. 0
Contingencies and extras 5 per cent ———		650. 0. 0
Total cost of Materials shipped F.O.B. in the Tyne —		13,636. 0. 0
Freight for 600 tons at 60/- ———		1800. 0. 0
Local materials and labour say ———		2000. 0. 0
Special superintendence ———		500. 0. 0
	£	17,936. 0. 0

or Rupees at 1/7½ - Rs. 2,20,752

W Parkes -

G.O. No 862 H – 22-3-79

× 2
Plans

× one not returned
from Circulation
vide Mr Pringle's
note in the margin
of the Proceedings
of the Harbour
Works Committee
d/ 10-7-79.

re T.S. 21/11/82

a – one plan
given to
Librarian
17-8-80

P.W. Dept

P15

32

No. 2377

From Mr. W. Parkes, M.I.C.E.
dated 29 May 1879.

Referred to the Harbour
Committee for early remarks.
By order
John Pennycuick
Major R.E.
Under Secy to Govt Mad

27 June/79

To
the President
Harbour Committee

Proceedings of the Madras Harbour Works Committee in circulation dated 10th July 1879.

38

Read letter from Mr. Marshall Port Conservator, regarding Mr. Parkes system of moorings suggesting certain modifications

Letter referred to Captain Taylor and Mr. Thorowgood for careful consideration. On the explanation offered by these officers the Committee beg to recommend that Mr. Parkes open a system of moorings "Vide plan and description" be adopted by Government as a commencement. If it should be found afterwards that a still more open a style as advised by Mr. Marshall is necessary, the removal and return of the tier of buoys adjoining the Harbour wall in either monsoon

Est. returned from circulation. [illegible] [illegible] was [illegible] some days ago [illegible] but [illegible] not [illegible] so to date. [illegible] 16/8 can be effected without assistance from England, and if the close system of Mr. Parkes is ever brought into action the screws being already in position it will only be necessary to attach chains and buoys.

(Signed) P. Macfadyen
(") J. H. Taylor
(") R. C. Walker
(") J. Pennycuick

(True copy)

J H Taylor
Secretary

G.O. 657 W. 5.3.79.
— 862 W. 22.3.79.
C.R. 2377. 27.6.79
G.O. 608 W. 27.2.79
Desp. No 8 of 4.3.79

F

Harbour Moorings

Recd 14/7/79

E

Cir 15.7.79. Retd 16.8.79
v.L. Sheet 26 July [illegible] 12-

No. 68 W

P17

35

From

THE SUPERINTENDENT,
MADRAS HARBOUR WORKS,

To Colonel R. H. Sankey, C.B. R.E.
Secretary to Government P.W. Dept.
Buildings and Roads,
Fort Saint George

MADRAS, 23rd March 1879

SIR,

I have the honor to submit the following reply to your Memorandum No. 933, of yesterday's date, in which you ask me whether I believe the savings on the Estimate of Rs. 58,50,790 for these works will be sufficient to cover the cost of the lesser scheme of moorings estimated by Mr. Parkes to cost Rs. 2,20,752, (vide his letter to the Madras Government May 29th para 7.)—

2. I have now gone carefully through the whole items of expenditure up to the end of February and am able to estimate very fairly what the work will cost apart from serious accidents. I am able to show that the saving will be very nearly sufficient to cover the cost of the moorings.

= quite – only Rs. 777 short

3. The main heads under which excess or saving occur are as follow:-

Excesses	Rs	Savings	Rs
Preliminary Works	68,258	Blockmaking	1.27,790
Rubble Bases	1,00,000	Block setting	2,62,246
Establishment	1,36,077	Contingencies	1,34,472
Total Excesses Rs	3,04,335	Total savings Rs	5,24,508

4. In all the above items I have estimated quite fairly, the calculations being based on what has gone before. The large excess estimated to occur in "Establishment" arises from my allowing for 24 months more to run at the present rates of pay, but Rs 20,000 of the amount should by Mr. Parkes's estimate go to "Works" and not to Establishment. It is charged to the latter in obedience to G.O. 2254 W of 3rd September 1879.

5. In the items on which there are to be savings it will be observed that I have allowed Rs 1,34,472 to be saved from "Contingencies". I arrive at this by taking the total amount now expended on Contingencies and adding to it 36 twice as much again which I think to be giving a liberal margin.

6. It will be seen then the total probable excesses over estimate amount to Rs 3,04,335 while the probable savings will be Rs 5,24,508 giving a nett saving of Rs 2,20,173 against Rs 2,20,752 the estimated cost of the moorings allowing for exchange at $1^{s}\ 4\frac{1}{2}^{d}$ per Rupee.

I have the honor to be,
Sir,
Your most Obdt Servant

F. N. Harrowgood. M Inst C E.
Superintendent
M.H. Works

K.S

952
173
779

G.R.D.C

Memo. No. 433. 22-3-80

P.W.D.
24MAR80
No. 2073

38 854W

B & R Works

P. W. Department.

37

P. 19

PROCEEDINGS of the MADRAS GOVERNMENT.

Under date the 3rd April 1880

READ the following

From Mr. Parkes. print (H.E. dated 29th May /79)

Proc., Harbour Works Committee } print (" " 10th July ")

From Supdt Madras Harbour Works } print (" No. 68 W dd 23d Mar/80)

Enclosing the [illegible] letters No. 67 W. dated 3rd Apl/80 and 83 W of 23/3/80 in continuation of letter to Ch. Engr. [illegible] of 16/12/79 No. 3868 para 2 [illegible] 3/4/80

Ordered that the Government of India be addressed on the subject of the moorings, a copy of the letter being forwarded to the Secretary of State for information.

(H.E. No 855 W dd 3rd Apl 1880)

To
The Secretary to the Govt of India, P.W.D.

Sir,

I am directed to

Supdt M. H. Works

Despd 20-4-80

I daresay it is all right but I do not see it clearly stated that the drainage work forward correspondence relating to the provision of mooring apparatus for the Madras Harbour.

2. On the recommendation of the Madras Harbour Committee, this Government have resolved on the adoption, as a commencement, of the open system of mooring proposed by Mr Parkes. It has been ascertained that the Calcutta and Bombay Dockyards are unable to supply any of the requisite gear, and it will therefore be necessary that the Secretary of State invite open tenders in the market, for the whole of the apparatus, such tenders being submitted for choice to the ordinary Engineering advisers of the India Office.

3. The cost of the moorings will amount to about £18,000; and as this Government are of opinion that the item might properly have been included in the general estimate for the harbour works, it appears desirable to adopt the suggestion made in the 29th paragraph of Mr Parkes' report dated 25th Feby last, and to provide for the moorings from the sanctioned estimate of £628,000.[x]

4. It is considered by the Superintendent, that there is no reasonable

[x] inclusive of £43,000 for interest on loan

and the protection of the north shore are provided for and also the works that will inevitably be necessary to secure ~~the~~ outer ends of piers & of rubble base & extra depth of blocks or other protection

3/3

Note by the Secretary

As the explanation is clear and His Grace appears to think it all right — and also as the H.M. accepts the draft the order and letter may now issue

3/4/80

ground for doubting that such provision may with safety be made. On this point I am directed to invite attention to his letter bearing date the 23d March No. 68 W.

5. His Grace the Governor in Council would be glad to have early sanction to this proposal communicated, and I am to request that, as the matter is very pressing, the Secretary of State, to whom a copy of this letter has been sent for information, may be advised by telegraph of the approval of His Excellency the Governor General in Council to the proposal.

Despd 12-4-80

24/3/80

H.P. 24/3

C.263.

Urgent

Print.

3/4/80

Draft Letter

J.M.

Copy of Mr. Morrison's [illegible] this Govt. [illegible] I suppose [illegible] such [illegible] is [illegible]

including ~~of~~ £.43,000 for interest on loan

[illegible] of the letter to [illegible] the Govt. [illegible]

R. 21.

P. W. Dept

39

To

The Secretary of State for India.

My Lord,

We have the honor to forward for Your Lordship's information, a copy of a letter that has been addressed by us to the Government of India.

2. We would request that, on receipt of the approval of the Govt. of India to our proposal in regard to the provision of funds for the moorings from the sanctioned estimate of £ 628,000, you will have tenders for the supply of the moorings

invited and approved by the Engineering advisers of the India Office.

2. It will be necessary that specially trained men be sent out to fix the moorings, and we presume — though the point is doubtful — that the sum named by Mr Parkes, (£ 1800), will cover all expenses connected with such workmen, including their passage to and from Madras, and their pay while employed here.

24/3

24/3

Hon. M. Huddleston
[illegible] [illegible] [illegible]

1000 — 24/3

Harbour moorings

854-855 M

C. 24-3-80.

A2098

Govt. of (1880) Madras.
PUBLIC WORKS.

To

Dated

Issued

Recd.

Encl.

G. O., 3 April 1880, No. $\frac{854}{855}$

Nos. 9650

oorings for the Madras
arbour Works The Engr
ddressed on the subject of

ooring apparatus for
Madras Harbour Works

30

Ditto