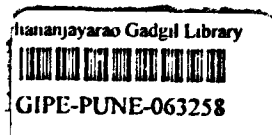


**CONFIDENTIAL.**



No. 5-PUBLIC WORKS.

GOVERNMENT OF INDIA.

DEPARTMENT OF INDUSTRIES AND LABOUR.

CIVIL WORKS—MISCELLANEOUS.

To

THE RIGHT HON'BLE THE EARL OF BIRKENHEAD,  
*His Majesty's Secretary of State for India.*

*Simla, the 7th July 1927.*

SUBJECT :—*Comments of the Government of Bombay on the report of the Committee appointed by the Government of India to enquire into the Bombay Back Bay Reclamation Scheme.*

MY LORD,

IN continuation of our Industries and Labour Department letter No. Mis.-81, dated the 4th May 1927, we have the honour to forward herewith a copy of the papers noted in the annexed schedule, and to invite your attention to the letter from the Bombay Government No. S.B.-68/Confl., dated the 26th May 1927, in which they communicate their comments on the findings of the Bombay Back Bay Enquiry Committee in regard to the inception and conduct of that scheme.

2. We do not propose in this despatch to deal in detail with the local Government's contentions as it seems to us that it would be inadvisable, even were it possible, for us to adopt the attitude of judges as between the Committee and the Government of Bombay. The Committee, with a Chief Justice as Chairman, had the complete evidence before them, and we have every reason to believe that their Report embodies such conclusions as may fairly be drawn from that evidence, regarded as a whole. The local Government desire that different conclusions should be drawn, but before there could be any question of our challenging the Committee's findings it would be necessary for us, firstly, to re-examine the whole evidence which accompanies the Report, in order to see how far it supports or refutes the case which the Bombay Government are now trying to establish, and, secondly, to take further evidence on various aspects of the question in regard to which they suggest that the Committee were not in possession of adequate information. In other words, it would be necessary for us to re-open the enquiry *ab initio*.

3. Any such action on our part would, in our opinion, be most undesirable, nor, having in view the composition of the Committee and the extraordinary thoroughness with which the enquiry was conducted, as evidenced in the examination of the various witnesses, would any useful object be likely to be attained thereby. The position of a *quasi-judicial* Committee of this nature, charged to record findings, is very different from that of one which is merely asked to make recommendations for action, which recommendations may be either accepted or rejected by Government. It may, we think, be safely assumed that their findings follow the weight of the evidence.

4. For this reason, we merely forward the local Government's letter for Your Lordship's information. Unless Your Lordship holds a contrary view, we do not, however, propose to place any obstacle in the way of the local Government, should they desire to give publicity to the points brought out in their letter either in the local Press or in a statement to their Legislative Council. At the same time, we propose to inform the local Government that such action would, in our opinion, be undesirable, though we must leave the decision entirely to them. We shall be glad to learn Your Lordship's views on this point.

We have the honour to be,

MY LORD,

Your Lordship's most obedient, humble Servants,

(Signed) IRWIN.

„ W. R. BIRDWOOD.

„ B. P. BLACKETT.

„ A. P. MUDDIMAN.

„ B. N. MITRA.

„ MD. HABIBULLAH.

„ S. R. DAS.

„ G. RAINY.

*Schedule of enclosures.*

1. Letter No. Mis.-81, dated the 2nd February 1927, from the Government of India to the Government of Bombay.
2. Letter No. S. B. 68/Confl., dated the 26th May 1927, from the Government of Bombay to the Government of India.

*Duplicate*

GOVERNMENT OF INDIA.

DEPARTMENT OF INDUSTRIES  
LABOUR.

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CIVIL WORKS—MISCELLANEOUS.

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1927.

NO. 5-PUBLIC WORKS, DATED SIMLA, THE  
JULY 1927.

LETTER TO HIS MAJESTY'S SECRETARY OF S  
FOR INDIA.

SUBJECT.

Comments of the Government of Bombay on  
report of the Committee appointed by the Gov  
ment of India to enquire into the Bombay I  
Bay Reclamation Scheme.

M C45DIL—2.7.27—80—GIPS

Enclosure 1 to despatch No. 5-P.W. of 1927.

COPY OF LETTER NO. MIS.-81, DATED THE 2ND FEBRUARY 1927, FROM THE SECRETARY TO THE GOVERNMENT OF INDIA, DEPARTMENT OF INDUSTRIES AND LABOUR, PUBLIC WORKS BRANCH, TO THE SECRETARY TO THE GOVERNMENT OF BOMBAY, DEVELOPMENT DEPARTMENT, BOMBAY.

*Report of the Committee appointed by the Government of India to enquire into the Bombay Back Bay Reclamation Scheme.*

The Report of the Committee appointed by the Government of India to enquire into the Bombay Back Bay Reclamation Scheme was published on the 17th January 1927. The publication was accompanied by a brief resolution expressing the Government of India's appreciation of the services of the Chairman and Members of the Committee.

2. In regard to future operations, the Government of India must leave it to the Bombay Government to take such action as they may desire on the recommendations summarised in paragraph 197 of the Committee's Report, subject to the provision of funds in the local Government's budget and to proper sanction being obtained in regard to any expenditure which is beyond the powers of sanction of the local Government. They would, however, like to be informed in due course of the action which the local Government may decide to take on the Committee's recommendations.

3. In regard to the findings of the Committee on the inception and conduct of the scheme, I am to ask whether the local Government have any comments to make on the Committee's findings which they think desirable or proper to bring to the notice of the Government of India.

Enclosure 2 to despatch No. 5 P.W. of 1927.

Confidential.

No. S. B.—68  
(Conf.)

DEVELOPMENT DEPARTMENT :  
Bombay Castle, 26th May 1927.

From

R. D. BELL, ESQUIRE, C.I.E., I.C.S.,  
Secretary to the Government of Bombay,  
Development Department,  
Bombay ;

To

THE SECRETARY TO THE GOVERNMENT OF INDIA,  
Department of Industries and Labour,  
(Public Works Branch).

Subject:—*Report of the Committee appointed by the Government of India to enquire into the Bombay Back Bay Reclamation Scheme.*

SIR,

I am directed to reply to the letter from the Government of India No. Mis.—81, dated the 2nd February 1927, regarding the Report of the Committee appointed by them to enquire into the Bombay Back Bay Reclamation Scheme. The Government of Bombay have already communicated, in their letter No. S. B.—724, dated the 25th April 1927, the action which they have decided to take in regard to future operations. The present letter contains their comments, which the Government of India have invited in paragraph 3 of their letter under reply, on the findings of the Enquiry Committee in regard to the inception and conduct of the scheme.

2. The two most important criticisms of the Enquiry Committee in regard to the inception of the scheme are those relating to the acceptance of Sir George Buchanan's estimate, in 1919, of Rs. 367·61 lakhs and the failure to detect that the specification of the dredger "Sir George Lloyd" was inadequate for the material, as described by Mr. Kidd and Sir George Buchanan, in which it had to work.

*The 1912 and 1919 estimates.*

(Report paragraphs 44, 46 and 205.)

3. The Enquiry Committee in discussing the acceptance of the 1919 estimate have noted that the Government of Bombay and the Government of India had each expressed approval of Mr. Kidd's estimate of Rs. 325·23 lakhs in 1912. They then state that in 1919 "prices of material and plant had risen by about 275 per cent. and of labour by nearly 100 per cent. over the pre-war rates" (paragraph 44) and that "it was common knowledge that prices of plant, material and labour, when taken collectively, had gone up at least 2½ times in the period between 1912 and 1919" (paragraph 205). "Even when full account is taken of the course of exchange and its effect on the rupee cost of plant purchased in England," it appeared to the Committee "astonishing that the responsible officers of the Governments of India and of Bombay were not struck by the very slight increase of Sir George Buchanan's estimate over that of Mr. Kidd" (paragraph 44.). "Rs. 367·61 lakhs was a manifest underestimate and proper scrutiny would infallibly have demonstrated it" (paragraph 205). In paragraph 200 the Committee express surprise that Lord Lloyd, who was then Governor of Bombay, "overlooked the apparent inadequacy of Sir George Buchanan's figures".

4. The Committee's conclusion that prices of plant, material and labour, when taken collectively, had gone up 2½ times in the period between 1912 and 1919 appears to be based entirely on evidence recorded in London, principally from Lieutenant Colonel Paddon, Director General of Stores, when he was re-examined on 14th October 1926. Colonel Paddon's evidence related to prices, in England, of materials and plant such as pig-iron, cement, rails, plates, wagons, locomotives, cranes, stonebreakers and even coal. It is to be noted, however, that for the most expensive part of the plant—that required for dredging—Sir George Buchanan

was able to quote a definite price and that, while he had converted this price into rupees on the basis of £1 = Rs. 12, exchange was even more favourable than this over the whole period during which the estimate was under the consideration of the Government of Bombay, the Government of India and the Secretary of State. Actually between November 1919 when Sir George Buchanan's report was received by the Government of Bombay and May 1920 when the scheme received the approval of the Secretary of State, the rupee did not fall below 2/1 (monthly average). The Committee also appear not to have taken account of the important fact that early in 1920 the Secretary of State declared his policy of pegging the rupee at two shillings on a *gold* basis. The order for the dredger plant was not placed as soon as the Government of Bombay in 1919 desired but, while this delay involved an increased price in sterling, the Government of Bombay appeared, at the time, to be amply protected by the course of exchange which rose in February 1920 as high as 2/11 and seemed likely, under the decision of the Secretary of State, to remain above 2/ for a considerable period and unlikely ever to fall below this level. Sir George Buchanan's estimate was thus under consideration at a time when the sterling value of the rupee was passing the peak, while the sterling payments in 1921-22 for the dredging and other plant were made when the rupee touched its lowest value. The Committee seem not to have taken sufficient account of these circumstances nor to have made any exact estimate of the effects of the fluctuations in exchange (See appendix "A").

5. The Committee also made no enquiry into the course of local rates in Bombay between 1912 and 1919. Their method of contrasting Sir George Buchanan's 1919 estimate with Mr. Kidd's 1912 estimate entirely on the basis of the course of prices in England, with only a general reference to exchange, has left the impression that Mr. Kidd's estimate of 1912 should have been multiplied by  $2\frac{1}{2}$  in order to conform to the conditions prevailing in Bombay in 1919. In these circumstances it is desirable that the Government of India should have a more exact analysis of Sir George Buchanan's 1919 estimate than was attempted by the Enquiry Committee.

6. The Committee's criticisms of the estimate are based on a comparison of Sir George Buchanan's 1919 estimate with Mr. Kidd's 1912 estimate and it is pertinent to note the circumstances in which Mr. Kidd prepared his estimate, *viz.*, that his firm, Messrs. Lowther Kidd and Company, should carry out the work at an inclusive cost of 5 per cent. on the outlay, subject to a maximum of 5 per cent. on the estimate as finally accepted by the Government of Bombay, after careful scrutiny, and with a bonus of one-fifth on any saving that might be achieved (*vide* letter No. C.W.—133, dated 21st January 1911, from the Government of Bombay, Public Works Department, to the Government of India, Public Works Department—quoted at page 455 of the London evidence). In 1914, the Government of Bombay confirmed their intention to give the work to Messrs. Lowther Kidd and Company on these terms (London evidence, page 462 paragraph 21). Mr. Kidd's estimate was therefore framed to protect the interests of his firm. Without examining the estimate in detail, and quite apart from the circumstance that Mr. Kidd's rates both for wet and dry filling in the estimate which he tendered in 1919 on behalf of Sir William Armstrong Whitworth and Company were undoubtedly excessive, it seems that any comparison between the 1919 estimate of Sir George Buchanan and the 1912 estimate of Mr. Kidd must be made with caution, as there is reason now to consider that the earlier estimate was a generous one. The Government of Bombay in 1919 indeed accepted Sir George Buchanan's estimate of Rs. 367 lakhs plus 10 per cent. increase on the basis that the pre-war price in 1912 was not Mr. Kidd's estimate of Rs. 325 lakhs but Sir George Buchanan's revised figure of Rs. 241.90 lakhs (Sir George Buchanan's report, paragraph 39). On this basis there was nothing astonishing in the belief that the work could be carried out in 1919 for the revised and accepted estimate of Rs. 400 lakhs when regard is had to the course of local prices and the exchange value of the rupee.

7. The other basis of the Committee's comparison is that between 1912 and 1919 the cost of plant, material and labour had risen to  $2\frac{1}{2}$  or  $2\frac{3}{4}$  times the earlier rates. This also requires examination. According to the tender rates received by the Public Works Department in 1912 and 1919, respectively, the increase in the

cost of building during that period was 90 per cent. Building work is, however, not strictly comparable with a reclamation scheme, which comprised virtually only a sea-wall, with a large quantity of dredged filling and a smaller quantity of murum. It is interesting that in the Public Works Department tenders, just referred to, the rate for earth filling was the same both in 1912 and 1919.

8. The records of the Public Works Department, the Bombay City Improvement Trust and the Bombay Port Trust all show that the increase in the cost of labour between 1912 and 1919 was only 50 per cent. and not 100 per cent. as the Enquiry Committee state in paragraph 44 of their Report. This was the allowance made also by Sir George Buchanan in his 1919 estimate (see his report, pages 30-31), Mr. Kidd allowed for 20 per cent. of this increase in his 1912 estimate.

9. The Improvement Trust's cost of road-making, including storm-water drains, sewers, tree-planting, lighting, contingencies and supervision rose from Rs. 27.03 per r.ft. (40 feet wide) in 1912 to Rs. 41.62 in 1919—an increase of 54 per cent. (appendix B). This figure has a definite bearing on a part of Sir George Buchanan's estimate.

10. According to Port Trust records their average rate for rubble masonry in 1911-12 was Rs. 23 per brass and in 1919 Rs. 33 per brass—an increase of 70 per cent. Murum was supplied for the Mazgaon-Sewri Reclamation at various times at the following rates :—

					Per brass.	
					Rs.	a. p.
1916	..	..	..	..	..	3 8 0
1918	..	..	..	..	..	4 8 0
1919	..	..	..	..	..	4 10 0
1920	..	..	..	..	..	3 8 0
1921	..	..	..	..	..	4 8 0

In 1912 murum was obtained for another work at Rs. 2-8-0 per brass. It is difficult to compare these rates strictly owing to varying circumstances, but it is at least clear that the rise in the cost of this class of work was much below the Enquiry Committee's estimate and might reasonably be fixed at about 60 per cent.

11. Taking all the facts into consideration, it is safe to conclude that the increase in the cost of public works in Bombay between 1912 and 1919 was certainly less than 100 per cent. and for a work of the nature of the reclamation the increase was probably much less.

12. An important point to which the Enquiry Committee made no reference is the rise in prices in Bombay after 1919. The following are the percentage increases in some typical items by the end of 1921 :—

					Per cent.
Labour	..	..	..	..	38
Bricks	..	..	..	..	85
Lime	..	..	..	..	32
Cement	..	..	..	..	100 (maximum.)
Oil fuel (for dredgers)	..	..	..	..	117
Broken stone (for road metal or concrete)	..	..	..	..	43
Rubble stone	..	..	..	..	92

13. The conclusion of the Government of Bombay is that, as they recorded no evidence on these matters in Bombay, the Enquiry Committee did not realise that local prices in 1919 had not increased over pre-war prices by anything like the amount of the rise in England nor did they realise how very considerable the rise was in local prices after 1919.

14. The Enquiry Committee's method of converting rupee values into sterling on the basis of one rupee being equal to one shilling and six pence also distorted the facts in favour of their criticism. In paragraph 51 of their Report, Mr. Kidd's 1912



estimate of Rs. 325 lakhs is taken as the equivalent of £2,437,000, whereas its sterling value in 1912 was only £2,167,000 (Re. 1=1/4). Similarly, Sir George Buchanan's estimate of Rs. 367 lakhs should have been converted into sterling at the exchange rate of £1 = Rs. 12, while the estimate of Rs. 400 lakhs, as finally accepted by the Government of Bombay and the Government of India, should have been converted into sterling at an exchange rate of not less than 2/ per rupee. Thus the comparison in sterling between Mr. Kidd's estimate of Rs. 325 lakhs in 1912 and the figure of Rs. 400 lakhs accepted by the Government of Bombay and the Government of India in 1919-20 should be between £2,167,000 and a sum not less than £4,000,000, instead of £2,437,000 and £3,000,000 quoted in paragraph 51 of the Report.

15. In view of these criticisms of the Enquiry Committee's finding regarding the inadequacy of the 1919 estimate, an examination of the 1919 figures is made below in order to ascertain whether, in the light of the subsequent rise in local prices and the heavy fall in exchange, the estimate of Rs. 400 lakhs accepted by the Government of Bombay and the Government of India may now be considered to have been reasonable.

16. The first item which may be considered in the estimate is for "roads, drains and lighting—Rs. 75 lakhs". This was based on a lump sum estimate of Rs. 59·45 lakhs described as made by the Public Works Department and incorporated by Mr. Kidd in his estimate in 1912. According to the experience of the Improvement Trust, the corresponding figure in 1919 should have been 54 per cent. higher, *viz.*, Rs. 91·55 lakhs. Sir George Buchanan's estimate of Rs. 75 lakhs and the increase of 10 per cent. made on it by the Government of Bombay were therefore too low. But the difference on the estimate as accepted by the Government of Bombay was only Rs. 9 lakhs.

17. There are, however, obscure points regarding both Mr. Kidd's and Sir George Buchanan's estimates for this item. The Public Works Department estimate in 1912 for roads, lighting and drains was Rs. 55·54 lakhs and it is not apparent how Mr. Kidd adopted Rs. 59·45 lakhs. It was believed that Sir George Buchanan in his original estimate had overlooked the provision required for storm-water drains and he was informed by the Chairman of the Enquiry Committee that there was no provision for storm-water drains in the Public Works Department estimate (London evidence, page 574 lines 62-63). The Public Works Department estimate did, however, provide for storm-water drains and other items as follows:—

- (1) metalling and pitching (the latter being meant to be "rubble packing" under the metal).
- (2) pavements,
- (3) trees and grass strip,
- (4) lighting, and
- (5) storm-water drains with manholes and water gullies including outfall heads, etc.

There was a separate Public Works Department estimate in 1912 for sewerage amounting to Rs. 53·41 lakhs subsequently reduced to Rs. 40 lakhs.

The total of the Public Works Department estimates for development was, therefore:—

Roads, lights and storm-water drains	Rs. 55·54 lakhs.
Sewerage	40 "
	95·54 "

This is apparently the origin of the Chairman's suggestion at page 827, lines 5—14, of the London evidence that Mr. Kidd's estimate of Rs. 59 lakhs was a transposition of the figures 95.

18. It seems, therefore, that in 1912 Mr. Kidd's estimate of Rs. 59·45 lakhs was either an error or he omitted the provision for sewerage. Sir George Buchanan seems to have based his estimate of Rs. 75 lakhs on the figure adopted by Mr. Kidd without ascertaining exactly what it covered. (London evidence, page 574 line

44 to page 575 line 2). He was aware, however, that the item did not include sewerage (London evidence, page 575 lines 13—16). It may be accepted, therefore, that Sir George Buchanan did intend to provide the storm-water drains but to omit the sewerage in his 1919 estimate.

19. The cost of development in the project estimate of 1922 is as follows :—

	Rs. lakhs.
Roads .. .. .	119·96
Drains (i.e., sewers) .. .. .	27·67
Storm-water drains .. .. .	64·28
Total ..	211·91

This item has been greatly increased because of the higher standards in road construction now required by the Municipality. Since 1919 there has been a similar increase in the cost of road-making and lighting by the Improvement Trust owing to the higher standards to which that body now works.

20. It should be added that it was subsequently decided that, as Sir George Buchanan had made no independent estimate of the cost of development, his firm should not receive commission on the cost of roads, lighting and sewerage but only on the cost of reclamation proper including storm-water drains.

21. Deducting for roads, drains and lighting Rs. 75 lakhs *plus* overhead charges at 5 per cent. from Rs. 367·61 lakhs, Sir George Buchanan's estimate is reduced to Rs. 288·86 lakhs for the other items, *viz.* :—

	Rs. lakhs.
(1) Sea-wall .. .. .	118·11
(2) Reclamation .. .. .	166·52
(3) Engineering charges at 5 per cent. on (1) and (2) ..	14·23
	298·86
Allow for value of plant .. .. .	10
	288·86

This figure was raised by 10 per cent. by the Government of Bombay and the Government of India. It is to be seen how far this was adequate for the items specified.

22. The estimate for the sea-wall as accepted by the Government of Bombay was :—

	Rs. lakhs.
Works .. .. .	118·11
Overhead charges at 5 per cent. .. .. .	5·91
Sir George Buchanan's estimate .. .. .	124·02
Add 10 per cent. .. .. .	12·40
	136·42

23. In paragraph 99 of their Report the Committee have stated that the cost of the sea-wall up to date exceeds Rs. 200 lakhs. This figure appears to have been calculated as follows :—

	Rs. lakhs.
(1) Direct expenditure on sea-wall .. .. .	62·74
(2) Expenditure on temporary works .. .. .	127·52
(3) Establishment charges .. .. .	14·96
	205·22

These figures include expenditure up to the end of November 1926. The cost of temporary works should, however, be spread over other items than the sea-wall, and I am to attach a statement (appendix C) showing that up to the end of November 1926 the total cost of the sea-wall, inclusive of all charges, was Rs. 157.50 lakhs. The cost of completing the existing gap of 1,850 feet in the sea-wall is Rs. 8.39 lakhs, so that the estimated total cost of the sea-wall when completed is Rs. 165.89 lakhs. The excess over Sir George Buchanan's figure is Rs. 41.87 lakhs or 34 per cent. and over the figure accepted by the Government of Bombay is Rs. 29.47 lakhs or 22 per cent. Having regard to the rise in costs after 1919 (*vide* paragraph 12) and the unfavourable exchange (paragraph 4), it does not appear that the estimate for the sea-wall was in 1919 a "manifest underestimate".

24. The second item in paragraph 21 is "Reclamation Rs. 166.52 lakhs". Rs. 125 lakhs of this amount is on account of wet filling (mud and clay) and will be discussed later. Practically the whole of the balance is on account of murum at Rs. 2 per cubic yard. It seems sufficient to state that the Committee presided over by Mr. Neilson in Bombay accepted Rs. 1.57 per cubic yard as the rate at which murum filling had actually been done by the Development Department.

25. It is convenient to refer here to the increase in the cost of plant, *other than the dredging plant*, caused by the collapse of the rupee after February 1920. This increase affects the cost of the sea-wall, dry-filling and murum-topping, and storm-water drains (appendix C). From the commencement of the work to the end of December 1926 the payments made by the High Commissioner for plant, *other than the dredger, booster and pipe line* amounted to £546,030, the rupee equivalent of which, at the average rate of exchange from time to time, appears in the scheme accounts as Rs. 81,41,888. If the average rate of exchange had been £1 = Rs. 12, as adopted by Sir George Buchanan, the rupee payment for this plant would have been reduced by Rs. 15.9 lakhs, and if exchange had been pegged at Re. 1 = 2/-, as was the prospect in 1920, the reduction would have been Rs. 26.82 lakhs. Taking these figures and those in paragraph 12 into account with the excess cost of the sea-wall and the reduced cost of murum, the Government of Bombay cannot agree that Sir George Buchanan's estimate as finally accepted by the Government of Bombay and the Government of India was, as regards the cost of the sea-wall and of reclamation by murum, a "manifest underestimate" and that "this fact could have been demonstrated in 1919 at Bombay or Delhi by a few simple questions".

26. There remains for discussion the last item in Sir George Buchanan's estimate, *viz.*, filling (clay and mud) 25,000,000 cubic yards at 8 annas per cubic yard; total cost Rs. 125 lakhs *plus* engineering charges at 5 per cent. This brings the discussion to what has been regarded from the outset as the crux of the scheme. When the Back Bay Reclamation Scheme was submitted to the Government of India in December 1919, it was stated that, on its technical aspects, the Governor in Council offered no opinion (letter No. 10550, dated the 4th December 1919, from the Government of Bombay, General Department, to the Government of India.) As regards the prospects of successful dredging, the Government of Bombay were peculiarly in the hands of Sir George Buchanan. Nevertheless it is proper to point out now that there was nothing unreasonable on the face of Sir George Buchanan's estimates under this head and that they broke down on account of his failure to appreciate correctly the nature of the material in the bed of the harbour, his advice that the rubble wall should not be sealed, and his failure to advise the working of two shifts for 24 hours a day from the very outset of dredging operations.

27. Sir George Buchanan's estimate of 8 annas per cubic yard for wet filling was based on the figure of 7.04 annas given in the table at page 30 of his report. It may be divided approximately into 4 annas per cubic yard for plant (as this corresponds to the definite price (£499,000) at which the dredging plant was offered by Messrs. Simons and Company and the exchange rate of £1 = Rs. 12 assumed by Sir George Buchanan) This leaves 4 annas per cubic yard for working expenses. The estimate for the dredging plant may be taken, therefore, as  $4 \times 25,000,000$  annas = Rs. 62.25 lakhs. Whatever the course of prices for plant in London was between 1912 and 1919, this did not affect the fact that the Government of Bombay had a definite price as the basis of this estimate. It is alleged that the dredging plant was inadequate to its task, but this is another matter which will

be discussed later. By adding 10 per cent. to this item of the estimate and allowing for the increasingly favourable rate of exchange, the Government of Bombay had no reason to fear in 1919-20 that the item would be exceeded. The delay in placing the order for the dredging plant, for which the Government of Bombay cannot be held responsible, resulted in an increased price in sterling, and the collapse of the rupee further added to this excess over the original estimate. The total cost of the dredging plant has been £640,592 which appears in the accounts as a sum of Rs. 89,45,147. A two-shilling rupee, on which the Government of Bombay had reason to count, would have reduced the rupee payment to Rs. 64·06 lakhs as against Rs. 68·47 lakhs (Rs. 62·25 lakhs *plus* 10 per cent.) accepted by the Government of Bombay in 1919. Again, there was no reason for the Government of Bombay to consider that the rate of 4 annas per cubic yard was inadequate for working expenses. Indeed experience has shown that, provided always that Sir George Buchanan's appreciation of the material in the bed of the harbour had been correct, the work might have been done in the neighbourhood of this rate. The rate has been exceeded to a small extent on account of the increased cost of labour and oil fuel, and to a very large extent because output has been low. Nevertheless, the average rate for dredging by the "Sir George Lloyd" over the whole period has been 8 annas per cubic yard dredged in the harbour. Over the nine weeks of the current season during which the dredger "Sir George Lloyd" was in commission before the breakdown of her pumping engine, the output per hour was 1556 cubic yards as compared with the specified output of 2000 cubic yards, and on the basis of this output the cost fell to 6 annas per cubic yard.

28. There was nothing, therefore, on the face of Sir George Buchanan's estimate in 1919 to suggest to the Government of Bombay that it was an underestimate. Its further examination in the light of *local* experience shows that the Committee are not correct in stating that the fact that it was an underestimate "could have been demonstrated in 1919 at Bombay or Delhi by a few simple questions" (Report paragraph 46). The quotations by which the Committee support this statement are not to the point. They are based entirely on the assumptions that Mr. Kidd's estimate of 1912 was in all respects satisfactory, and that the cost of work *in Bombay* had risen  $2\frac{1}{2}$  times between 1912 and 1919. No evidence whatever was recorded to justify the latter assumption which is simply not correct. The Committee failed to take adequate account of the course of local prices, and did not realise that, during and after the war, fluctuations in prices in India lagged considerably behind the corresponding changes in prices in England. They also took inadequate account of the exchange outlook between November 1919 and May 1920.

*The varying descriptions of clay.*

(Report paragraphs 42, 43, 54, 201, 202, and 206.)

29. The other important criticism of the Enquiry Committee in regard to the inception of the Back Bay Reclamation Scheme relates to the failure to detect that the specification of the dredger "Sir George Lloyd" did not provide for a plant sufficiently powerful for working in the material of the harbour as this material was described by Mr. Kidd and Sir George Buchanan.

30. The Committee state that two outstanding circumstances, *viz.*, the description of the clay by Mr. Kidd as "stiff" and by Sir George Buchanan as "hard" and the specification of Messrs. Simons and Company for a dredger designed to give the required output not in "stiff" or "hard" clay but in "soft" clay—were patent on the documents and "ought to have been queried, discussed and elucidated by everyone whose duty it was to study the documents". They consider it to be an "amazing fact" that "no one, either in the Government of Bombay or in the Government of India, engineer or layman, ever noticed this point, which stood out in the documents before them."

31. The Government of Bombay doubt even now whether the apparent contradiction between the character of the clay as described by Sir George Buchanan and Messrs. Simons and Company was, *in its technical significance*, so obvious from the documents in 1919 as the Committee believed it to be. The Committee seem to concede this point when in paragraph 202 they do not agree with Lord

Lloyd that this was a technical point but agree that the explanation was a technical one. In this matter the Committee in 1926 had an advantage over the Government of Bombay in 1919 in as much as their attention was drawn to it at the very outset of the enquiry in the written statement submitted to them by the Director of Development (Bombay evidence, pages 503—511 paragraphs 7—12). But the conclusions stated by the Director were reached only after a somewhat bitter experience had shown that much of the material in the bed of the harbour was such that an output of 2,000 cubic yards an hour could not be obtained by the dredger "Sir George Lloyd" when working in it. The mere fact that many able officials, engineers and laymen, perused the documents in 1919 and for several years thereafter without the circumstances mentioned by the Enquiry Committee being patent to them suggests that the Committee have judged the capacity, diligence and care of these officials in the light of subsequent events rather than with a full regard for the circumstances in which, the Government of Bombay and the Government of India had to examine and consider the documents in 1919-20. The facts briefly are as follows.

32. In his report on the Back Bay Reclamation Scheme, dated September 1919, Sir George Buchanan described the clay in the harbour as "hard" in only one passage which is as follows (report of Sir George Buchanan, page 9 paragraph 29(3)) :—

"The fact that the dredgings will be deposited in the first instance on the inside of the area to be reclaimed and thence pushed forward to the outside retaining wall is advantageous as the soft mud will form the bottom layer of filling and the hard clay which lies below the mud over the area to be dredged will be superimposed on the mud."

Reading these words even in the light of subsequent events the Government of Bombay cannot admit that they were such a sufficient description of the material in the harbour bed to enable anyone to suggest, in 1919-20, that the specification of the dredger by Messrs. Simons and Company required discussion and elucidation. The Enquiry Committee were unable to accept Sir George Buchanan's explanation in this matter (Report paragraphs 121 and 221). It appears, however, to the Government of Bombay, after full consideration of the recorded evidence, that in paragraph 29(3) of his report Sir George Buchanan used the term "hard" in reference to the clay merely to distinguish it from the soft mud. He certainly did not appreciate the essential difference, for the purposes of dredging, between the clay described by Mr. Kidd as "stiff" and "unctuous" and the "soft clay" for which the dredger "Sir George Lloyd" was designed to give an output of 2,000 cubic yards per hour. It seems to the Government of Bombay that the casual use of the expression "hard" clay, in a not very definite sense, in paragraph 29(3) of Sir George Buchanan's report could hardly arrest attention even on an intelligent and careful study of the documents. If the facts were not fully understood by Sir George Buchanan himself and if he was, therefore, unable, as seems to have been the actual case, to appreciate in 1919 the essential importance of the words "stiff" and "unctuous" as describing the clay, in so far as this description affected the specification of the dredger, it is difficult to understand how the point would stand out in the documents submitted to the Government of Bombay and be patent to them and their advisers.

33. The word "hard" employed to describe the clay in the harbour only once in the whole of his report appears to have been used by Sir George Buchanan casually and indefinitely. It was not used with a full understanding of its import, as a description of the clay in contradistinction to the words "soft clay" occurring in the specification of the dredger. This is evident from the statement in Sir George Buchanan's report in 1919 that the hard clay would, in the reclaimed area, be superimposed on the mud. It is a fact that the mud flows away from the discharge end of the pipe line and settles at considerable and even long distances from the discharge end, while the hard clay settles at once immediately in front of the discharge end. When hard clay is dredged, the pipe line has to be extended daily, sometimes by three or four pipe lengths, over the hard material which forms rapidly in front of it, while mud can be and is discharged for considerable periods—a week or more at a time—without the need of extending the pipe line. The hard clay from the harbour can only be superimposed in the reclaimed area on the

soft mud by dredging the soft mud first from the harbour, allowing it to dry out in the reclamation, and then dredging again over the area in the harbour from which the mud has been taken in order to obtain the clay. Between the operation of dredging the mud and dredging the clay, the mud must be allowed to dry out on the reclamation since the hard clay deposited on undried mud would simply fall through it and ultimately settle below it. The superimposing of the "hard clay" on the soft mud is, therefore, not a practical dredging proposition. These facts are now known as the results of actual experience and they show that in paragraph 29 (3) of his report Sir George Buchanan had no conception of the "hard" clay as a material which was essentially different from that in which the dredger Sir George Lloyd was designed by Messrs. Simons and Company to excavate. It is difficult to see, therefore, how "everyone" in 1919 or 1920 could query Sir George Buchanan's casual use of the expression "hard clay" in this single passage of his report and elucidate the fact that the specification of the dredger was unsuitable. Sir George Buchanan could not necessarily make patent to others a point which he himself did not clearly appreciate.

34. There are other indications that Sir George Buchanan did not import into the words "hard clay" as used in paragraph 29 (3) of his report the meaning attributed to them by the Committee. Sir George Buchanan in his letter dated 25th July 1919 to Messrs. Simons and Company describes the clay as "clay" *simpliciter* (Report paragraph 116, clause 3), clearly showing that he did not realise the significance of Mr. Kidd's description of the clay as "stiff" and "unctuous" and had not imported a corresponding meaning into the words "hard clay" in paragraph 29 (3) of his report. It is significant also that Sir George Buchanan's partner Mr. Meik, in his letter dated 22nd January 1920 to Messrs. Lobnitz, described the character of the material in which the dredger was to give the specified output as "soft clay" (Report paragraphs 57 and 116). This shows that the firm had not correctly interpreted Mr. Kidd's description of the material and had failed to grasp the essentials of the dredging problem.

35. In this respect the findings of the Committee appear to be self-contradictory. In the first sentence of paragraph 121 of their Report they state: "In our opinion when Sir George Buchanan accepted Mr. Kidd's description of the stiff clay he must have known that it referred to a material denser and more resistant than soft clay." But a few lines further down they make this statement: "The probability is that he believed the clay in the harbour to be of precisely the same character as that at Sewri and there is some ground for believing this to be so" (see also Report paragraph 213). The truth appears to be that Sir George Buchanan did not fully gauge the dredging problem for himself but relied on Messrs. Simons and Company, who had knowledge and experience of the conditions at Sewri, to provide him with a dredger suitable for his purposes. He seems to have placed himself entirely in their hands and they were more concerned in protecting their own interests than in solving Sir George Buchanan's problems. This seems to explain—although not to the Committee (Report paragraph 121, sub-paragraph 2)—how he was content to allow Messrs. Simons and Company to limit their liability by the word of restriction "soft". This perhaps explains also his uncertainty, even after the scheme was put in hand, regarding the nature of the material in the harbour (*vide* extracts quoted in Committee's Report paragraph 132). The Government of Bombay agree with the opinion of the Committee in paragraph 132 of their Report that Sir George Buchanan had not at the outset, or even as late as 1922, sufficient knowledge of the material in the harbour to be able to pronounce on a dredger of proper design. This opinion is, however, at variance with the Committee's suggestion that everyone who perused Sir George Buchanan's report in 1919 should have at once recognised a special significance in the description of the clay by Sir George Buchanan as "hard" and the offer by Messrs. Simons and Company of a "soft clay" dredger.

36. The Committee have suggested in paragraphs 108 and 213 of their Report that Messrs. Simons and Company were well aware that hard clay existed in Bombay harbour and safeguarded themselves accordingly in their specification for the "Sir George Lloyd". The Committee put the matter more emphatically when they state in their paragraph 145 (iii):—Mr. McMurray's "evidence shows that if Sir George Buchanan had stood out for a contract to supply a dredger capable of the desired output in respect of the material to be found

in that harbour (i.e., Bombay harbour), his firm, if they tendered for a dredger at all, would either have proposed a "totally different" dredger "at a totally different price," or have suggested the acquisition of two dredgers, each of the capacity of the "Sir George Lloyd".

37. Admittedly the Government of Bombay had placed themselves in 1919 in the hands of Sir George Buchanan. The Committee realised this (Report paragraph 45) and appear to have approved this course in the circumstances of the time (Report paragraph 198). Sir George Buchanan was appointed, after consultation with the Government of India, chiefly because it was understood that he had the requisite knowledge and experience of dredging operations. He was accepted by the local officials as a fully qualified expert whose selection had been approved by the Government of India. The most important engineer who discussed the scheme with Sir George Buchanan in India was Sir Sydney Cruickshank, whose recommendation of the scheme caused it to be supported by the Government of India (Report paragraph 49). It is true that he was not prepared to accept the expert opinion of Sir George Buchanan in the matter of dredging without reference to other specialist engineers (Report paragraph 48) but his opinion does not appear to have been communicated to the Government of Bombay.

38. The Government of Bombay, therefore, do not accept the statement of the Committee that the points to which they have drawn attention in paragraphs 42 and 43 of their Report regarding the various descriptions of the clay demanded no technical knowledge. On the contrary, it seems to the Government of Bombay, in the light of subsequent events, that all their later difficulties and disappointments in carrying out the dredging programme have arisen because the points did require both technical knowledge and experience for their proper appreciation. Sir George Buchanan did not appreciate them and was perhaps unable to appreciate them, and the Government of Bombay consider that it reflects no grave discredit on their officers, engineers and laymen, that they failed to detect that the dredger designed by Messrs. Simons was incapable of dredging 2,000 cubic yards per hour in the material in the harbour.

39. Other matters connected with the inception of the scheme will be discussed briefly. They relate chiefly to the dredging proposals—the crux of the scheme.

*Inadequacy of the original investigation.*

(Report paragraphs 132, 145 (i), 192, 209, and 217.)

40. The Government of Bombay agree with the Committee that Sir George Buchanan's local investigations in 1919 were insufficient and lacking in care, at least as regards the dredging operations. They agree that he should have ascertained by personal inspection and by practical test the precise nature of the material in the harbour. In his report of 1919 he treated Mr. Kidd's brief description as sufficient; in practice he appears to have relied entirely on Messrs. Simons and Company for the design of the dredger.

*Omission to consult the Royal Indian Marine authorities and the Port Trust.*

(Report paragraphs 34, 65, 66 and 208.)

41. The Government of Bombay in 1919 evidently relied on Sir George Buchanan to study every aspect of the problem for which purpose he was offered every facility. In doing so they also decided beforehand to accept his opinion—whether for or against the scheme (Committee's Report paragraph 30)—without further enquiry and did in fact do so.

*Results of "Kalu" and "Jinga".*

(Report paragraphs 34, 66, 67, 68, 121, 210, and 211.)

42. In paragraph 68 of the Report the Committee state that "it might have occurred to him (Sir George Buchanan) that if the 'Sir George Lloyd', also guaranteed for 2,000 cubic yards an hour (like the 'Kalu' and 'Jinga'), gave the same average of 1,126 cubic yards per hour, and a loss of 24.48 per cent. of material was

also sustained, the reclamation of Back Bay would take about twelve years instead of five and would be an unwise adventure." This is not an entirely fair statement of the case. The figure of 1,480 cubic yards per hour quoted in paragraph 122 of the Report as "the very best performance at any time" is also not correct. The main facts are, therefore, given briefly.

43. The dredging results of the "Kalu" and "Jinga" are reprinted at page 3 of the Evidence, part III. They show that the output of the "Kalu" improved steadily throughout and rose to 346 brass (1,281 cubic yards) per hour over the last 900½ pumping hours. The "Jinga" averaged 1,390 cubic yards per hour over 5,841 pumping hours and from April 1911 to July 1913 (3,767 pumping hours) it averaged 1,548 cubic yards per hour. Its maximum output was not 1,480 cubic yards per hour "supposed to have been done on some occasion in clay" (Report paragraph 122) but 464 brass = 1,718 cubic yards per hour over 480 pumping hours.

44. It is only fair to Messrs. Simons and Company to assume that they made full use of these results in designing the "Sir George Lloyd" which is a bigger dredger than either the "Kalu" or the "Jinga". The comparison in paragraph 128 of the Report which gives the horse-power of the "Kalu" and "Jinga" as 2,700 and of the "Lloyd" as 3,000 is not correct. The indicated horse-powers which can be attained by the "Kalu" and "Sir George Lloyd" are 2,800 and 3,800, respectively. The diameters of their pipes are 39" and 42", respectively. On these data it is not unreasonable to estimate the output of the "Sir George Lloyd" as one-third more than that of the "Kalu" or "Jinga". The Committee's reference in paragraph 68 to the guaranteed output of all three dredgers being the same is misleading. Even had the results of the "Kalu" and "Jinga" been brought to the notice of the Government of Bombay in 1919, the natural assumption to make was that the new dredger would be designed of the requisite increased capacity to get the specified output. The new dredger failed because the assumption that the material at the mouth of the harbour was of the same character as at Sewri and that this character persisted to the greater depth at which the "Sir George Lloyd" could work was wrong (see Report paragraphs 121 and 213).

45. So far as the Government of Bombay could take experience of the reclamation at Sewri into account in 1919, the important fact for them was that financially it had been a success. The Committee have met the statement that the cost of the reclamation at Sewri was carried out at a price just above the estimate with the facile but somewhat astonishing argument that this fact "is not of any real importance, as the original estimate, if all the circumstances were known, might prove to have been very much on the safe side" (Report paragraph 121.)

*Alternative methods of filling.*

(Report paragraphs 84, 164, 165 and 192.)

46. The Government of Bombay do not attach importance to the Committee's remarks on this matter. There was no point in Sir George Buchanan investigating in detail the alternative method of dry filling when he believed that wet filling could be done at 8 annas per cubic yard while murum filling cost Rs. 2. The Committee state (Report paragraph 165) that the cost of dry filling, including plant, should be little more than one rupee per cubic yard. It is a fact, however, that the best tender received last year for the dry filling of block 2 (26 lakhs cubic yards) was Rs. 4-8-0 per brass = Rs. 1.2 per cubic yard on the basis that Government placed at the disposal of the contractor their entire resources at the quarry, and all their plant including all the required rolling-stock, locomotives, workshops, etc. The rate in 1919 would have been much higher, while adequate rail transport was not then available.

The remainder of this letter deals with the Committee's remarks and criticisms of the conduct of the scheme. The most important of these relate to the dredging operations.

*Tenders for the dredger.*

(Report paragraph 57.)

47. The Government of Bombay consider that the methods adopted by Messrs. Meik and Buchanan were unsatisfactory. The firm evidently pinned their faith to Messrs. Simons and Company on account of their experience at Sewri.



*Order for the dredger.*

(Report paragraphs 145 (iii), 211-213 and 218.)

48. The Government of Bombay doubt whether a detailed study of the results of the "Kalu" and "Jinga" would have affected Sir George Buchanan's decision. The "Sir George Lloyd" was apparently designed to give an output based on actual results at Sewri. It failed because the Back Bay Reclamation was not in all respects the same problem as at Sewri. Messrs. Simons and Company were probably aware that difficulties would arise which Sir George Buchanan did not foresee, and the Government of Bombay agree with the Enquiry Committee in thinking that the firm were more concerned in protecting themselves than in solving the dredging problem in actual practice.

*Decision to begin wall at both ends simultaneously.*

(Report paragraphs 98, 99 and 219.)

49. The following passages are quoted from the Enquiry Committee's Report paragraphs 98-99 :—

"The underlying reasons for this inquiry (dated 7th July 1920) whether it would be possible to begin work at both ends simultaneously was that the military authorities had undertaken to buy an area of 265 acres at the Colaba end and therefore wanted that part of the reclamation pushed on."

"On the 29th July 1920 the Government of Bombay cabled 'work may start from both ends'."

"This was a disastrous decision."

"The expediency of concentrating upon block 8 to the exclusion of everything else was so elementary that it is amazing to us that no intensive effort was made to construct the railway from Marine Lines to Colaba."

Whatever may now be said, in the light of subsequent experience, against the decision to begin the wall at both ends simultaneously, the judgments of the Committee in the matter are founded upon a misapprehension of the facts of the case. The apparent inference in the passage last quoted that the commencement of the work at both ends delayed the commencement of pumping at Colaba is also not correct.

50. At the time the decision to commence the wall at both ends was taken, no agreement for the sale of land to the military authorities had been reached, and the statement in paragraph 98 of the Report that the sale of 265 acres of land to the military had been concluded prior to July 1920 is incorrect. Reference to the correspondence beginning with letter No. 11218, dated 30th December 1919, from the Government of Bombay (General Department) to the Government of India (Army Department) and ending with letter No. S. A.—1061, dated 11th March 1921, from the Government of Bombay (Development Department) to the Government of India (Army Department) will show the stage which the proposal had reached in July 1920. The questions asked by Sir Frederick Hopkinson at page 661 of the London evidence (line 18 onwards) were based on a misunderstanding of the position when Sir George Buchanan's advice was asked at the date in question.

51. Again the commencement of the wall at Marine Lines did not delay the progress of the wall at Colaba to which preference was subsequently given (see the note of the Director of Development quoted at foot of page 565 of the London evidence). The questions and answers of Sir George Buchanan which follow this quotation are of interest.

Q.—Apart from the agreement with the military there was another reason why Colaba should have been reclaimed first, was there not? The fact that the land at the Colaba end is far more valuable than the Marine Lines?

A.—Yes.

Q. Therefore, as it was part of the scheme to get a return on the money as soon as they could, obviously it was better to begin at the Colaba end and carry the reclamation along the part which would sell at a higher rate than the Marine Lines ?

A. Yes. \* \* \*

This is an entire misconception of the position as it has never been disputed, except in this instance before the Committee, that land in blocks 1 and 2 (near Marine Lines) is likely to be far more valuable than land further south ; and had it not been for the sale of block 8 to the military authorities, it would have been better to push on with the Marine Lines end in the first place. It was indeed Sir George Buchanan's first intention to begin work at this end in preference to Colaba on account of the railway facilities and the open space available nearby as a yard. This intention was in accord with the requirements of the public and the wishes of the Government of Bombay. Subsequently, Sir George Buchanan altered his plan and arranged to begin work from the Colaba, i.e., the southern end. There is nothing on record to show definitely why he altered his first intention but it was understood that, despite the immediate lack of railway and yard facilities at Colaba, a beginning at Colaba was preferable on technical engineering considerations. Land, however, was likely in 1920 to be in immediate demand by the public at the other end and to fetch much higher prices than at Colaba, and this was the reason which induced the Government of Bombay in July 1920 to consult Sir George Buchanan regarding the feasibility of starting work from both ends. All this was prior to the undertaking by the military authorities to purchase block 8.

52. Sir George Buchanan apparently gave the proposal due consideration, expressed his satisfaction that work on the construction of the wall could proceed from both ends simultaneously and asked for early orders which were given. It is not correct, therefore, to say, as the Enquiry Committee state in paragraph 194 of their Report, that this was an unwise decision taken "because nobody believed him self responsible for the due execution of the work". There was at this time no question of a possible divided responsibility between Sir George Buchanan and Sir Lawless Hepper. The Development Department had not come into existence and Sir Lawless Hepper had not been appointed. The proposal was put forward on business grounds by the Government of Bombay who were responsible for initiating it, and it was referred for the technical opinion of Sir George Buchanan who expressed himself as satisfied. As the Committee state in their paragraph 219, the Government of Bombay are responsible for the ultimate decision which was based on Sir George Buchanan's opinion.

53. Before considering whether the decision was disastrous and, if so, why it was disastrous, it is important to emphasise that in 1919-20, much more than at the present time, the urgent demand for land was likely to be in blocks 1 and 2 and not at the Colaba end. Even at the present time, in circumstances of depression, the public demand is for land in blocks 1 and 2. The local committee presided over by Sir Joseph Kay last year definitely recommended that blocks 1 and 2 should be proceeded with and that further reclamation at the other end should not be attempted. The Enquiry Committee ultimately reached the same conclusion : "The evidence before us is conclusive that blocks 1 and 2 are the most valuable in the whole project and we recommend that they should be completed as early as possible" (paragraph 177). The circumstances in favour of such a course were very much stronger in 1920 than they were in 1926, and the submission of the proposal in 1920 by the Government of Bombay to Sir George Buchanan seemed justified on business grounds. The reclamation of block 2 will not commence till 1928-29, yet, while the Legislative Council were at the last budget session overwhelmingly against further reclamation at the Colaba end, suggestions for not proceeding with blocks 1 and 2 have received very little support. The decision of the Government of Bombay was disastrous only because the whole dredging scheme broke down. If the Committee intended to imply in their paragraph 99 that the work at Colaba was delayed because work on the sea-wall was simultaneously started at Marine Lines, then the Government of Bombay doubt whether the inference is justified. The delay in the construction of the sea-wall at Colaba, which postponed the beginning of dredging till December 1923, was due to two factors (a) the delay in completing the Marine Lines—Colaba Railway and (b) the type of construction adopted by Sir George Buchanan for the first 2,000 lineal feet of the sea-wall at Colaba.

54. As regards the delay in constructing the railway, there were numerous points regarding the alignment and other questions raised by vested interests, the settlement of which proved far more tedious than was expected. There were difficulties also in obtaining the necessary material. Assuming, however, that the Chief Engineer should have foreseen the difficulties better and pushed on faster the construction of the railway, the delay was not caused by work proceeding simultaneously at Marine Lines. The Government of Bombay believe that the more important cause of the delay in building the sea-wall at Colaba was the type of wall adopted by Sir George Buchanan for the first 2,000 feet. This was a monolith concrete structure built directly on the reef with foundations excavated in the rock which were covered by the sea at high water. The foundations had to be pumped out each tide and only a few hours each day were available for actual work. The result was that, in spite of all that the engineer in charge could do, the construction was extremely slow and costly. The records of the rate of construction and cost compared with the wall on rubble mound prove these statements. It is not now clear to the Government of Bombay why this section of the sea-wall was not built on a rubble mound as the rest of the sea-wall was. The reef at this point is high and the rubble mound would have been comparatively low, while sufficient rubble could have been quarried on the site as was done for the banks carrying the narrow gauge construction railway. The adoption of a concrete wall for the first 2,000 feet was the main cause of the delay in pumping at Colaba. Now that the dredging has been a failure, the starting of the sea-wall at both ends is declared to be a mistake. But if the dredging had been completed in five years, as was at the time anticipated, the work would not have been much in advance of actual requirements.

The Committee's estimate, in paragraph 99 of their Report, of the cost of the sea-wall to date as exceeding Rs. 200 lakhs has already been dealt with (paragraph 23).

#### *Restriction of dredging area.*

(Report paragraph 69.)

55. The Government of Bombay consider that the restriction of the dredging area did not greatly affect the prospects of the scheme. Sir George Buchanan accepted without protest or criticism the decision of the Royal Indian Marine and the Port Trust. The following extract from the written statement of the Director of Development adequately summarises the position (Bombay evidence, page 509 lines 45—62):—

“To obtain the material from the northern portion of the original dredging area (the area which has been given up), it would have been necessary to lay a pipeline across the Island, either through the B. B. & C. I. Railway yard at Colaba, or down Ormiston Road. Sir George Buchanan appears to have underestimated the difficulty and cost of laying a pipe line in either position. In paragraph 14 (2) of his report, dated 15th December 1924, he records certain conclusions arrived at at a conference held by him in the Chief Engineer's Office on 9th January 1924, as follows:—

*‘The proposed pipe line through the B. B. & C. I. Railway yard near Wodehouse Bridge, or alternately down Ormiston Street, involves such an unusual amount of costly and difficult work that all idea of a pipe line in that vicinity should be abandoned. Ample material for the reclamation can be obtained from the harbour and Back Bay combined, without dredging from the northern side of the harbour.’*

From this it would appear to be doubtful whether it would have been a practical proposition to dredge the material from the northern area in the harbour in any case. But the fact remains that the restriction of the area in the harbour from one cause or another, unforeseen by Sir George Buchanan, must have the effect of enhancing the cost of the scheme.”

#### *Dredging results.*

56. The dredging scheme broke down, first, because Sir George Buchanan failed to appreciate correctly the precise nature of the material in the bed of the harbour and, secondly, because in this part of the work he also failed properly and sufficiently to advise and assist the Government of Bombay as well as to supervise the work closely (Report paragraph 82.) The Government of Bombay were

almost completely in Sir George Buchanan's hands as regards this part of the scheme. They had no previous experience of their own and no independent experts to whom they might have referred for advice.

*Leakage of pumped material.*

57. The first mistake was Sir George Buchanan's failure to seal with murum the rubble wall [Report paragraphs 100-102 and 145 (v)]. In paragraph 194 of their Report the Committee cite this as another instance of the results which ensued because nobody believed himself responsible for the due execution of the work. The general question of responsibility will be discussed later but in the case of the sealing of the rubble wall there is no doubt about the responsibility. The matter was definitely brought to the notice of Sir George Buchanan at the very start of the dredging operations and the precaution was taken of making a written reference to him. He advised against it and his advice was followed till February 1925, when the Director, with the previous sanction of Government, took independent action to seal the rubble wall (Bombay evidence, page 508 paragraph 17, cf. London evidence, page 554 line 36, page 555 line 41, and correspondence in appendix VIII, pages 856-7). These facts are important as this is the sole instance in which the Government of Bombay accepted advice from the Director in opposition to that of Sir George Buchanan for the technical conduct of the scheme. The Committee have stated categorically in paragraph 102 of their Report that Sir George Buchanan cannot shift his responsibility for the loss of dredged material due to this neglect, but the matter is referred to because they later suggest (paragraph 194) that there was a doubt as to who was responsible for orders in this matter. There was never any such doubt. The matter was definitely referred to Sir George Buchanan who gave definite advice which was followed for a time but finally abandoned on the responsibility of the Government of Bombay.

In his evidence Sir George Buchanan first suggested that the sea-wall was sealed on the initiative of his own firm and then blamed the local engineers, but the fact remains that up to the date of his final visit, October 1924 to January 1925, he had not offered any advice to the effect that the rubble wall should be sealed although he was aware that the leakage of pumped material was the cause of serious concern to the Government of Bombay.

*First season's dredging.*

58. The second mistake in the dredging programme was to treat the first year as experimental [Report paragraphs 92, 111 and 145 (iv)]. It is still not clear why Sir George Buchanan did not draw the attention of the local Government to the omission to work two shifts in the first season.

*The bonus.*

59. Reference has been made in paragraph 161 of the Report to the stimulating effect of a bonus on the work. Messrs. Meik and Buchanan first suggested the grant of a bonus in a letter dated 26th February 1925 (London evidence, appendix XVIII, page 870) which reached Bombay on 13th March 1925 when the second dredging season was near its close. The bonus was introduced for the following season but the quantity of material dredged per pumping hour in that season did not reach the figure of the first or "experimental" season, though it showed an improvement on the second season (Bombay evidence, page 505, table and report paragraph 113). In any event, the time that elapsed between Sir George Buchanan's suggestion of a bonus and its actual introduction was practically covered by the off season. The bonus was, therefore, introduced after it was suggested, practically as soon as it could operate.

*Latest dredging results.*

60. The dredging results of the "Sir George Lloyd" since the Committee visited Bombay may here be referred to. They have a bearing on paragraphs 85, 113, 114, 115, 141 and 215 of the Committee's Report. Over the nine weeks before the accident to her pumping engine in December the "Sir George Lloyd" had dredged

14,29,406 cubic yards of material in the harbour. Her average hours of pumping were  $17\frac{1}{2}$  hours per day in a  $5\frac{1}{2}$  day's week, so that her output was equivalent to 1,556 cubic yards per hour. In two weeks she exceeded 2,000 cubic yards per hour, the maximum output in one week being 2,273 cubic yards per hour for an average of 18 hours 24 minutes per day. The increased output per hour appears to be entirely due to the fact that the dredger has been working in fairly uniform soft material. Another important fact is that the average pumping hours per day during the nine weeks were  $17\frac{1}{2}$  as compared with 6 hours 55 minutes in the first season, 11 hours 5 minutes in the second season, and 11 hours 24 minutes in the third season. It was possible, therefore, to have worked the dredger more intensively during the first three seasons, but in this important matter no suggestion was ever made by Sir George Buchanan. As late as December 1924 he held the opinion that the dredging department personnel had done all that was humanly possible to get on with the work (Evidence, part III, page 34 lines 8-9), yet it has now been found practicable to work the dredger for 24 instead of 18 hours a day and to increase the pumping hours by about 55 per cent. over those of the second and third seasons, and 150 per cent. over those of the first.

61. Even allowing for the fact that the dredger could not have got a better output per pumping hour than it did during the first three seasons, it is clear that it was quite practicable to extend the output over 15 or more pumping hours per day. Had this been done and the rubble wall sealed at the outset, the position would have been considerably better than it was when the Committee visited Bombay. Appendix D shows clearly how the Government of Bombay were left to buy results at the price of their own experience, instead of attaining them almost immediately through the knowledge and experience of a capable engineer.

62. The dredging operations in the harbour during the season which has just closed were directed towards completing the reclamation of the southern portion of the partial reclamation scheme to which the Government of Bombay have, for the present, restricted themselves. They showed what the "Sir George Lloyd" was capable of doing in fairly uniform soft material. It would not be possible to obtain such material in the quantities requisite for the whole of the original scheme. As the Enquiry Committee have noted in paragraph 141 of their Report a certain proportion of the clay in the harbour bed cannot fairly be described as soft, and this harder material must be taken along with the soft material if the quantity required for the whole scheme had to be obtained. As the material varies from soft to hard, the output is gradually reduced. The latest results of the "Sir George Lloyd", therefore, confirm the Enquiry Committee's conclusions in paragraph 141 of their Report. There is nothing wrong with the dredger; its output depends on the material dredged. The average quality of the material in the bed of the harbour that is required for the whole reclamation is such that the capacity of the "Sir George Lloyd" is insufficient to deal with it, on the average, at the guaranteed rate of 2,000 cubic yards per hour.

*Progress reports on dredging.*

(Report paragraphs 110 and 161).

63. In paragraph 110 of their Report, the Back Bay Enquiry Committee have made the following remarks:—

"The 'Sir George Lloyd' and the 'Colaba' began work on 8th December 1923 pumping into block 8.

"It was the practice to take soundings so as to ascertain as nearly as might be the material removed day by day from the sea-bed. These soundings were sent to the offices of the Development Directorate, but no calculations appear to have been made from them. The dredger indeed went on working week by week without anyone knowing what output was being given. Calculations from soundings are a recognised method of ascertaining approximately the amount of daily work, and we cannot understand why Mr. Lewis and Sir Lawless Hepper did not have the figures worked out, nor why Sir George Buchanan did not enquire whether soundings were being taken and the results shown by them. Indeed, it was not until July 1924 that the result of the dredging was known by measurement of material deposited on the site under reclamation."

In paragraph 161 the Committee also remark : "*No contractor would have gone on throughout a whole dredging season without ascertaining the result of the daily soundings.*"

The statements which are italicised in these extracts have been made by the Committee under an apparent misapprehension of the facts which are as follows :—

64. It is true that the *net* result of the first season's dredging as ascertained by measurement of material deposited on the site under reclamation was not known till July 1924, but the amount of material removed from the sea-bed was ascertained weekly by calculations from daily soundings. Of the amount of material thus removed from the sea-bed, it was known that a considerable portion escaped through the porous sea-wall. It was not practicable during the course of the working season to ascertain how much of the material was lost in this way and how much was retained on the site under reclamation. The Committee do not suggest that the difficulty of measuring, during the course of the working season, the amount of material actually retained in the reclaimed area could have been overcome ; they allege, however, negligence in failing to ascertain the total amount of material dredged from the bed of the sea and to calculate progress on the basis of the daily soundings in the harbour.

65. Calculations were, however, made weekly from the daily soundings taken in the harbour from the very commencement of the dredging operations and the results of these calculations, showing the quantity of material removed by the dredger from the sea-bed, were embodied in the weekly progress reports of the whole work which were submitted to Messrs. Meik and Buchanan. In the report for the week ending 13th December 1923 Messrs. Meik and Buchanan were informed that the "Sir George Lloyd" had commenced pumping. The quantity of material pumped was first embodied in the report for the week ending 3rd January 1924. It was omitted from the report of the following week but thereafter shown weekly. The report for the week ending 14th February 1924 was elaborated to give, in addition to general information, the following details :—

- (1) Position of the dredger.
- (2) Shore discharge pipe line extended by.
- (3) Material dredged.
- (4) Approximate depth of material.
- (5) Total hours of pumping during the week.
- (6) Total hours of pumping to date.
- (7) Total hours of work during the week.
- (8) Total hours of work to date.
- (9) Average time of pumping per day during the week.
- (10) *Quantity of material dredged during the week.*
- (11) *Average quantity dredged per hour during the week.*
- (12) *Approximate total quantity dredged to date.*
- (13) *Approximate quantity dredged per hour to date.*

This statement was subsequently made more detailed and was usually supplemented by a narrative account but the important point, with reference to the statements made by the Committee in paragraphs 110 and 161 of their Report, is that *the quantity of material dredged was ascertained weekly from the daily soundings* and weekly reports giving this information were submitted to Messrs. Meik and Buchanan through the Director of Development.

66. It is not known how the Committee were under any misapprehension as to the facts. Copies of the form in which the weekly reports were prepared were in their possession and the reports themselves were available for their inspection. The Committee were informed of their existence by Sir Lawless Hepper on 4th August 1926, the second day of the enquiry (Bombay evidence, page 25 lines 22—28). References to these weekly reports were also made by Mr. H. A. Elgee, the Chief Engineer (Bombay evidence, page 189 lines 61-63, page 196 line 65, page 263 lines 29—34 and page 287 lines 5—8).

67. In his evidence given in London on 28th October 1926 Sir George Buchanan said that he had not previously heard of soundings being taken and that he could not accept a statement that the staff took soundings and calculations every day and he gave evidence to the same effect on 2nd November 1926 (London evidence, page 536 lines 17-54, page 652 line 14, and page 653 line 15). Sir Frederick Hopkinson evidently knew that weekly reports were available (London evidence, page 652 line 58). It was made clear by Sir George Buchanan's partner Mr. Halcrow on 3rd November that these weekly reports were received by the firm of Messrs. Meik and Buchanan (London evidence, page 708 line 47/page 709 line 24).

68. The dredging reports were seen weekly by the Director of Development and were intended to be studied by the firm of Messrs. Meik and Buchanan and especially Sir George Buchanan by whom it is believed their form was originally prescribed. It is evident that they were not seen by Sir George Buchanan but were dealt with by his partner Mr. Halcrow. Sir George Buchanan seems to have forgotten their very existence. The receipts of the reports were acknowledged regularly by Messrs. Meik and Buchanan.

The nature of the firm's consideration of these reports partly accounts for their failure to notice that the work of sealing the rubble-wall had been undertaken early in 1925 as mentioned by the Committee at the end of paragraph 101 of their Report.

In the narrative account attached to the report despatched from Bombay on 13th February 1925 and acknowledged by Messrs. Meik and Buchanan in a letter dated 3rd March 1925, attempts to blind the rubble-wall first by means of bamboo matting and afterwards by means of mud in bags were mentioned and it was stated that, although the second method was proving effective, the whole question was still under discussion. In the weekly report despatched from Bombay on 6th March 1925 and acknowledged by Messrs. Meik and Buchanan under letter dated 24th March 1925, the firm was informed that the work of blinding the rubble-wall with quarry refuse and murum had been undertaken during the week under report.

*Radius of operation of the " Sir George Lloyd ".*

(Report paragraph 104.)

69. The plan at the end of the Committee's Report may create a misapprehension. Apart from the fact that clay (but not sand) can be pumped in actual practice to a distance of nearly 7,000 feet from the booster, it is to be noted that the soft clay flows to considerable distances from the discharge end of the pipe line. Blocks 7 and 8 have been already filled with dredged filling, although a large part of their area is outside the red circles shown on the Committee's plan.

*The booster " Colaba ".*

(Report paragraph 216.)

70. The Enquiry Committee were of the opinion that the " Colaba " did not conform to the building contract and was structurally weak. The Government of Bombay have under consideration whether, in view of this opinion, further steps should be taken in the matter.

*The quarry and useless plant.*

(Report paragraphs 94—95).

71. The Committee have criticised the purchase of the Bucyrus shovel and three Whittaker shovels.

The first was purchased under the sole advice of Sir George Buchanan and was ordered by Messrs. Meik and Buchanan through the Director General of Stores on 17th August 1920. It proved unsuitable. The Director of Development had not been appointed at the time of this purchase and was not responsible for it.

The Whittaker shovels were purchased with the intention of using them at the quarry face as cranes and later ~~to be used~~ as shovels in obtaining murum. They were used as cranes, as intended, but later their use as shovels proved impracticable.

72. In paragraph 95 the Committee note that Sir George Buchanan "expressed marked disapproval of other plant of which the three Whittaker shovels formed a part, and in a letter of 11th April 1922, he warned the Development Directorate that 'in addition to the actual capital cost of the plant, interest for many years has to be paid and it is desirable to economise wherever it is possible to do so without interfering with efficiency or with the speedy execution.'" Sir Lawless Hepper and Mr. Lewis, however, decided that "the bulk of this plant was necessary".

The Committee have not stated whether the "marked disapproval" of Sir George Buchanan was justified but the passage quoted leaves the impression that this was their opinion. The Government of Bombay, therefore, append copies of Messrs. Meik and Buchanan's letters dated 11th and 12th April 1922 and of the replies of the Chief Engineer Nos. 1285 and 1297, dated 3/5th May 1922, as well as an extract from a note No. 1304, dated 3rd May 1926, by the Chief Engineer (Mr. Elgee) (appendix E). This note was prepared in connection with a statement published by Sir George Buchanan in the press, after the termination of his agreement, as follows: "In April 1922 I protested against the purchase of a quantity of expensive plant and machinery, much of which had never been used when I was last in Bombay."

It will be seen that the "marked disapproval" of Messrs. Meik and Buchanan in April 1922 was not justified by the facts of the case of which the firm had not, at the time, a correct apprehension. The order for rolling-stock which they criticised is an outstanding instance. As the firm offered no remarks on the Chief Engineer's replies, it was understood that his explanation had been accepted. All the plant ordered on this occasion was used except the Whittaker shovels which were, however, *all*—not "some" as the Committee state—used as cranes. For their purchase the Chief Engineer and the Director are responsible but, in all the circumstances, it is pressing criticism rather far to describe the purchase as, "to a considerable extent, a waste of public money". Sir George Buchanan's statement in the press in 1926 is untrue. The whole of the plant was actually in use at the time of Sir George Buchanan's last visit to Bombay.

73. It may be stated here that the only items of plant in the whole scheme which have proved unsuitable are the Bucyrus shovel, a concrete mixing plant costing £8,257, and 48 concrete skips or hoppers costing £3,216. There is no correspondence in the Development Directorate dealing with the last two items but from the specification papers they appear to have been purchased in 1920 at the instance of Messrs. Meik and Buchanan before the appointment of the Director of Development but in consultation with Mr. Lewis.

#### *The costing system.*

(Report paragraphs 161 and 193.)

74. The following are extracts from the Enquiry Committee's Report:—

Paragraph 161:—"A contractor is intensely concerned in daily cost and daily progress."

"The Department had no costs accounting clerk. Sir George Buchanan pointed out its absolute necessity—the Government at first decided against it but ultimately acquiesced."

Paragraph 193:—"There was *no* costing system, without which it was impossible properly to control expenditure."

75. Sir George Buchanan raised the question of a costing system in paragraphs 33 to 35 of his report dated 11th February 1922 (Evidence, part III, pages 19—20). The Chief Engineer agreed with him but the Audit and Accounts Officer criticised the proposal which was resisted by the Financial Adviser. The Government of



Bombay thereupon addressed the Government of India (Finance Department) in their letter dated 30th August 1922 and requested that a senior officer of the Accounts and Audit Department should be deputed to Bombay to investigate the matter on the spot in consultation with the Development Directorate and Sir George Buchanan as well as with the Audit and Accounts Officer and to submit proposals either for improving the present system or introducing a new system. Captain E. Price of the Indian Audit Department was deputed by the Government of India for the purpose. His report was accepted by the Chief Engineer and Sir George Buchanan. The latter in a note dated 11th January 1923 stated :—" I have no proposals to make as Mr. E. Price's proposals precisely meet my views." Previous to this, however, in October 1922 a separate assistant for account and costing purposes at the quarry had been sanctioned and on the acceptance of Captain Price's proposals two more assistants for the same work were sanctioned for the Marine Lines and Colaba Sections, respectively. Subsequently, when the Dredging Section was constituted, a cost clerk was also sanctioned with the approval of Messrs. Meik and Buchanan.

76. Previous to these arrangements, a costing system was in operation in each section of the work but the necessary information was scattered and took time to compile. The following extracts from Captain Price's report describe the arrangements in force at the time of his visit :—

" I visited each of the sections Kandivli, Marine Lines and Colaba, and found in each place that a system was in use, but the necessary information was so scattered that it would have taken time to compile.

" The Kandivli office now has an assistant whose whole work is to collect and tabulate the various costs under the various processes, effect comparisons, and to report fluctuations at once to the Deputy Chief Engineer and himself to visit the workshops or site and go thoroughly into the matter and ascertain the reason for the fluctuations.

" In the other two sections this work is carried out by the Deputy Chief Engineers themselves ; it is a whole-time job, and as I have already stated in paragraph 5 the information is there but cannot owing to lack of time be collected. If these sections had each an assistant similar to the one at Kandivli, the strain on the Deputy Chief Engineers would be lessened, the costing would be properly collected and tabulated, and the deputies would have more time to thoroughly investigate fluctuations and so effect economy."

77. It will be seen that the criticisms of Sir George Buchanan at the end of paragraph 102 of his written evidence (London evidence, page 486 lines 24—27) were unfounded and that the remarks of the Enquiry Committee scarcely give a fair description of actual conditions. The accounts arrangements were originally on the usual lines of public works accounts in India but the actual working was somewhat above the average efficiency as there was a special Audit and Accounts Officer and a system of pre-audit. Sir George Buchanan's criticism is that his proposal was not adopted in practice as soon as made. The proposal had, however, to be examined in the Accounts and Audit Department of the Government of India as well as the Development Department and the Finance Department of the local Government. There was no unnecessary delay in introducing it, as further personal discussion with Sir George Buchanan had to await his return to Bombay.

78. The Enquiry Committee in paragraph 161 of their Report noted that Government had acquiesced in Sir George Buchanan's proposal and their statement in paragraph 193 that " there was no costing system " must be intended to refer only to operations at the outset. As it stands, it is, however, misleading, while even as regards the early period, it is not wholly accurate.

*Reports of the Development Directorate.*

(Report paragraphs 145(vi), 156, 157 and 226.)

79. When the report of the Development Directorate for the year ending 31st March 1924 was prepared, the full results of the first season's dredging were not available and subsequently Sir George Buchanan pressed Government to treat this season's working as experimental. Before he arrived in Bombay (24th October

1924), the Government of Bombay had already, in September, combined the two Advisory Committees of the Development Department and had invited additional members to join them for the purpose of reviewing the whole range of the Department's activities. As regards the Back Bay Reclamation Scheme, this Special Committee submitted, on 17th February 1925, an *ad interim* report in which they stated their intention to appoint a sub-committee to examine the financial prospects of the scheme in detail, and recommended that, pending the submission of their final report, the work should be proceeded with. At this stage the annual report of the Development Directorate for the year 1924-25 (1st April-31st March) was prepared by the Director. The period covered by the report did not include the latter part of the dredging season (1st April-15th May 1925) and when the report was sent to the press for printing on 6th July, the results of the whole season's dredging, as measured by the actual amount of reclamation, had not been ascertained. These results were available on 18th July 1925 and were communicated to the sub-committee on 21st July. The annual report for 1924-25 was formally published on 27th August 1925.

80. It is important, therefore, to note that, between the dates of printing and issuing the Director's annual report for 1924-25, the complete results of the previous dredging season had been communicated to the sub-committee which was then considering the financial prospects of the scheme. This disposes of any suggestion that there was intentional concealment of facts. It must be recollected also that till February 1925 the loss of material through the rubble mound was a matter for serious concern and that the effect of sealing the rubble mound, contrary to the written advice of Sir George Buchanan, could not be ascertained for some time after the close of the dredging season.

81. Sir Lawless Hepper, in omitting at the time of preparing the annual report for 1924-25 to deal critically with the dredging results, so far as these were then known to him from the weekly dredging reports, was thus influenced by three circumstances. First, the results of dredging, as measured by soundings in the harbour, were incomplete and also required to be checked by measurement of the material actually deposited and retained in the area under control; secondly, Sir George Buchanan had still to review the final results and advise Government regarding them; and, thirdly, the whole scheme was under the investigation of a Special Committee, of which a sub-committee was waiting for the final dredging results in order to investigate their financial effects. This investigation was more difficult and prolonged than was anticipated. The sub-committee did not report till November 1925 and the Committee's report was not signed till 21st January 1926. The Director, who was chairman both of the Special Advisory Committee and of the sub-committee, could not easily take independent action after the publication of his annual report in anticipation of their conclusions and the Government of Bombay were themselves in a similar position. This prolonged delay in ascertaining and publishing the results of this special investigation created, however, an unfavourable impression on the minds of the public, who lost sight of the facts that the scheme had been under the investigation of the Special Advisory Committee since September 1924 and that all the facts were placed before this Committee or its sub-committee from time to time as they became available.

*Control by Development Directorate or Public Works Department.*

(Report paragraph 175.)

82. The special features of the organisation of the Development Department which distinguished it hitherto from the Public Works Department were that the Chief Engineer of the Back Bay Reclamation Scheme was responsible, not directly to Government, but to the Director of Development and that the latter's Deputy was the Secretary to Government in the Development Department. The organisation was subject, however, to all the ordinary codes and rules, including the Public Works Department Code and the Public Works Account Code. Financial control was exercised through a Financial Adviser, a system which has recently been extended to the Public Works Department. The Development Directorate as an executive organisation has now been abolished and the Chief Engineer, Back Bay Reclamation Scheme, is now directly responsible to Government. The Secretary to Government in the Development Department has now no administrative or executive duties in connection with the scheme and as regards it he is now in the same position as any other Secretary to Government.

*The case of Mr. Lewis.*

(Report paragraphs 86 and 228.)

83. The Enquiry Committee have recorded the following opinions with reference to Mr. Lewis :—

“ We cannot estimate precisely the original fitness of Mr. Lewis for the post (of Resident Engineer) because he has been ill almost continuously since 1922, and was a man in most broken health when he appeared before us ” (Report paragraph 86).

“ Very shortly after he became Resident Engineer, we are satisfied that he (Mr. Lewis) was in ill-health which became manifest and disabling in 1922. It is most regrettable that he was allowed (contrary to Sir George Buchanan's advice) to remain at his post till July 1924 ” (Report paragraph 228).

84. It is true that by 1922 Mr. Lewis was not in good health and that Sir George Buchanan brought the matter to the notice of Government. At the same time the personal relations between Sir George Buchanan and the Chief Engineer, who was his nominee, became strained; in this matter it was believed there were faults on both sides. The difficulties of removing from his post a high officer in the permanent employment of Government will be readily appreciated by the Government of India. It was arranged that Mr. Lewis should go before a medical board before proceeding on leave, so as to ensure that he would be passed fit before his return. Mr. Lewis' health seemed to be restored and he returned to duty in October 1922 apparently fit and well. After his return it was arranged in January 1923 that, in order to remove one cause of Sir George Buchanan's complaints, the correspondence between Messrs. Meik and Buchanan and the Chief Engineer should be conducted through the Director of Development. The personal relations between Sir George Buchanan and Mr. Lewis continued, however, to be unfriendly and matters came to a head after Sir George Buchanan's visit to Bombay during the monsoon season of 1923. In September Messrs. Meik and Buchanan recommended that Mr. Lewis' services should be replaced at the disposal of the Government of Burma. The Government of Bombay considered very carefully at this time the relationship between their Chief Engineer and Sir George Buchanan and were of the opinion that the causes of friction were to be found rather in the temperaments of the two individuals concerned than in defects in Mr. Lewis' work. The position was discussed with Mr. Lewis who offered to take eight months' leave preparatory to retirement in June 1924. The Government of Bombay on 19th November 1923 cabled this proposal to Messrs. Meik and Buchanan and informed them that, after full consideration, Government were of opinion that it was desirable to accept this proposal as a settlement of the question. On the following day Messrs. Meik and Buchanan cabled that they concurred. The Government of Bombay thereupon addressed Messrs. Meik and Buchanan in their letter No. S.C.—78-(Conf.), dated the 30th November 1923, and I am to quote the following passage from this letter :—

“ It appears to Government that the real cause of the trouble has to do with conditions indicated in the note attached to your letter, conditions partly attributable perhaps to Mr. Lewis' state of health, and in any case connected with matters of personal idiosyncrasy not easily susceptible of treatment.”

The last words were intended to refer to both parties. In short, there were, in the opinion of the Government of Bombay, faults on both sides which gave rise to this unfortunate situation. They did their best in the circumstances to meet the wishes of Messrs. Meik and Buchanan and the settlement made was understood at the time to meet their requirements.

The Government of Bombay desire to place on record that, as Chief Engineer of the Reclamation Scheme, Mr. Lewis bore the brunt of the difficult preliminary operations, that his work was of a very high order, and that they were justified in terminating his services in a way which cast no stigma on a public servant with a distinguished record.

85. The preceding comments deal with all the most important matters mentioned in the Enquiry Committee's Report, except the question of responsibility,

on which the Government of Bombay wish to offer remarks. Before discussing the question of responsibility, they desire to state that the method of the enquiry, which was begun in Bombay and completed in London, placed the Government of Bombay, as well as the Enquiry Committee, at a disadvantage. Much more evidence was recorded in London than in Bombay. Evidence was taken there on matters which were not enquired into in Bombay and the Government of Bombay had no opportunity of offering their own evidence in these matters. In other instances, matters which were barely discussed in Bombay were investigated at great length in London, new points were raised and a new emphasis laid on old points. The Government of Bombay were unrepresented at the enquiry and had no opportunity of offering evidence in correction of statements either of fact or opinion which were either entirely wrong or ill founded. The Committee have thus made statements purporting to be facts and criticisms of the acts of the Government of India, of the Government of Bombay and of the officers of both Governments, which, in the opinion of Government, are not always justified. The emphasis has often, in the opinion of the Government of Bombay, been wrongly laid. In offering these criticisms, the Government of Bombay recognise that the Enquiry Committee worked under a disadvantage corresponding to that of the Government of Bombay.

86. It is only fair also to those individuals, official and non-official, whose conduct has come under investigation, to bring to the notice of the Government of India that no witness examined by the Committee enjoyed opportunities or facilities equal to those given by the Committee to Sir George Buchanan and the members of his firm. No other evidence but theirs was recorded from the 28th October to the 15th November. Their evidence is in bulk almost exactly equal to the whole of the rest of the evidence recorded in London and is little short of the whole of the evidence recorded in Bombay. The firm of Messrs. Meik and Buchanan and Sir George Buchanan, in particular, had the advantage of knowing the whole of the evidence laid before the Committee, while Sir George Buchanan was placed in an exceptionally favourable position as regards the time of his examination and was allowed the exceptional privilege of assistance by Counsel. Neither the Government of Bombay nor their officers had even the opportunity before the Committee of dealing with the evidence recorded in London and published at the time in the press. As the Government of India are aware, the publication of a subsequent contradiction even on a matter of fact, such as the existence of the dredging reports referred to in paragraphs 63 to 66 of this letter, may be deprecated. The full facts may thus ultimately be withheld from the public. It is, therefore, all the more necessary that they should be fully explained in this letter.

*The question of responsibility.*

87. The reference of the Back Bay Reclamation Scheme in 1919 to Sir George Buchanan was the last stage of many years' investigation and consideration of the scheme. It was indicated to Sir George Buchanan at the time that the Government of Bombay intended to abide by his recommendation, whether for or against the scheme, and would not, in either event, again refer the matter to another expert. Investigation by experts must conclude some time and it was well understood in 1919 that Sir George Buchanan's opinion would be treated as final (Report paragraph 30). In these circumstances, the Government of Bombay in forwarding the scheme to the Government of India under their letter No. 10550, dated the 4th December 1919, stated as follows:—

“On the technical aspect of the new scheme the Governor in Council offers no opinion. He is fully prepared to accept Sir George Buchanan's carefully considered views on the practicability of the scheme from an engineering point of view.”

The Enquiry Committee's judgment on this action is contained in paragraph 198 of their Report:—

“We think that Lord Lloyd and the Government of Bombay were justified in accepting Sir George Buchanan as an expert to report on Mr. Kidd's scheme and that, having taken the man recommended by the Government of India, the proper and prudent course was to treat his opinion as final and authoritative.”

This conclusion applies apparently not only to the acceptance of Sir George Buchanan's report of 1919 but to the acceptance of his advice subsequently as the engineer of the scheme under the terms of his agreement with the Secretary of State.

88. The Committee's conclusion in paragraph 198 of their Report, therefore, profoundly modifies their criticisms of the Government of Bombay and Lord Lloyd in connection with the acceptance of the original estimate of Rs. 400 lakhs and with the failure to detect the significance of the words "hard clay" in paragraph 29 of Sir George Buchanan's report, even if it is assumed that these criticisms are better-founded than the Government of Bombay are now willing to admit. This applies also to other critical remarks of the Committee.

89. Apart from the Government of Bombay, two individuals were responsible for the execution and carrying out of the Back Bay Reclamation Scheme, viz., Sir George Buchanan as Engineer under the terms of his agreement and Sir Lawless Hepper as Director of Development.

The following are extracts from the agreement with the firm of Messrs. Meik and Buchanan :-

"The firm agree to act as the engineers of the Secretary of State in carrying out the said scheme and in the construction and execution of all works connected therewith (hereinafter referred to as 'the works') until the final completion thereof and the firm shall at all times assist and advise the Government of Bombay in all matters relating to the execution of the works and shall supervise the same and undertake and perform all work and duties devolving upon engineers of large works.

"During the whole period of execution the works shall be closely supervised by the firm and Sir George Cunningham Buchanan shall devote the greater part of his time to this particular work, and shall, unless the Bombay Government shall agree otherwise, visit Bombay this year and in every year after the monsoon when the working season begins and remain in Bombay for such period during the working season as he or the Government of Bombay may consider necessary to ensure the complete and satisfactory supervision of the works, and shall also, if necessary in his own opinion or in the opinion of the Government of Bombay, make additional visits during any monsoon."

90. In paragraph 79 of their Report the Committee have discussed whether Sir George Buchanan was responsible for the *actual* execution of the works.

The following are extracts from paragraph 80 of the Report :-

"The argument that they (i.e., Messrs. Meik and Buchanan) were responsible for the *actual* execution of the works is based principally upon clause 3 of the agreement.

"We do not, however, think that clause on a true construction of the agreement made the firm responsible for the *due* execution of the work. That was the duty of Mr. Lewis and of Sir Lawless Hepper."

Paragraph 76 of the Report is as follows :-

"As regards Back Bay, Sir Lawless Hepper appears to have regarded himself as the 'administrative head'.

"He did not consider himself in any degree responsible for the execution of the works. He seems to have thought that to be the concern of Sir George Buchanan and Mr. Lewis."

Again in paragraph 82 it is stated that "as regards Sir Lawless Hepper he did not regard himself as responsible for the execution of the work, etc."

These passages show a misapprehension of the whole position, created possibly by the suggestions of Sir George Buchanan at the final sittings of the Committee that the Government of Bombay had endeavoured to fix an undue degree of responsibility on him.

91. The first sentence quoted from paragraph 80 gives the impression that the Government of Bombay or Sir Lawless Hepper have advanced the argument that the firm of Meik and Buchanan were responsible for the *actual* execution of the work. No such argument was ever advanced.

As regards paragraph 76 of the Report, Sir Lawless Hepper actually was the administrative head in charge of the Back Bay Reclamation Scheme. As relevant to this matter, I am to quote the following extracts from a question asked by Mr. K. F. Nariman in the Bombay Legislative Council on 4th March 1926 and the answers given thereto by the Government of Bombay :—

Question :—Will Government be pleased to state :—

(d) Whether it is a fact that the Reclamation Scheme is in charge of engineers who are supposed to be experts in such work ;

(e) Whether the present Director of Development has any special qualification or knowledge of similar reclamation works ;

(f) Whether he was ever engaged in similar work before ;

(g) What are the special duties of the Director of Development so far as the Reclamation is concerned.

Answer :—

(d) Yes. Messrs. Meik and Buchanan were the engineers for the Back Bay Reclamation Scheme and the Chief Engineer in Bombay, who is in immediate charge of the project, was nominated by them.

(e), (f) and (g). The duties of the Director of Development, so far as the Reclamation is concerned, are of a purely administrative nature. The present Director has had no previous experience of reclamation work which is the speciality of the expert officers of the Reclamation Branch of the Directorate.

Sir Lawless Hepper did not argue that he was not "in any degree responsible for the execution of the works" (Report paragraph 76) or that "the practical carrying out of the scheme was a matter for the Resident Engineer and the firm of Messrs. Meik and Buchanan".

The phrases "the construction and execution of all works", "the execution of the works", "the complete and satisfactory supervision of the works", occur in the agreement with Messrs. Meik and Buchanan. But the Government of Bombay have not contended that, because the firm agreed "to act as the engineers of the scheme and in the construction and execution of all works connected therewith", they were responsible for what the Committee have described as "actual execution" and "due execution", i.e., in the sense of a day-to-day control over the staff.

92. Sir Lawless Hepper contended that the firm of Messrs. Meik and Buchanan were responsible for technical advice and assistance and that the Chief Engineer had to "carry out the details of the works in accordance with the firm's instructions" (agreement clause 3). In his evidence he has not used the phrase "execution of the works" in limiting his responsibility. Only at one point in his evidence did he give a doubtful answer, viz., "Meik and Buchanan are to carry out the work" (Bombay evidence, page 62 line 58). It is mentioned here because it was quoted by Sir H. Courthope Munroe (London evidence, page 796 line 26). This is an isolated passage of a kind which may easily occur in the course of oral examination of a witness desirous of escaping a responsibility which was not his. If pages 31-32 of the Bombay evidence are referred to, it is clear that Sir Lawless Hepper only urged that the responsibility for the requisite technical advice and assistance (including the designs, specifications, schedules, etc., which the firm were required to provide under their agreement) resided with Messrs. Meik and Buchanan. Subject to this responsibility of Messrs. Meik and Buchanan and the facts that they were required at all times to assist and advise the Government of Bombay, that the works were to be closely supervised by Sir George Buchanan himself, and that he was to devote the greater part of his time to this particular work, Sir Lawless Hepper accepted responsibility for seeing that the work was carried out, e.g., Bombay evidence, page 32 lines 48-50.

Q.—You are in fact responsible for the whole carrying out of the work particularly as Director.

A.—Yes, subject to Meik and Buchanan being the responsible engineers.

Again in his answer on page 60 line 38, he stated :—"My business has always been from the beginning to try and get the work done."

93. The following conclusions of the Committee in paragraph 80 of their Report correctly represent the division of responsibility:—

“It was . . . the duty of the firm (of Messrs. Meik and Buchanan) to make out a programme and to give all necessary details as to method and type of work necessary. It was . . . equally the duty of the Resident Engineer to carry out the work in accordance with the firm's instructions. We do not, however, think that clause (i.e., clause 3) . . . made the firm responsible for the due execution of the work. That was the duty of Mr. Lewis and of Sir Lawless Hepper.”

94. That there was never any misunderstanding by the Government of Bombay in this matter is clear from paragraph 80 of the Report where the Committee state that they were “of opinion that Lord Lloyd rightly described the respective functions of Sir Lawless Hepper and Sir George Buchanan”. In paragraph 82 the Committee continue “As regards Sir Lawless Hepper, he did not regard himself as responsible for the execution of the work . . .” Some confusion seems to have been created in the minds of the Committee owing to the circumstances that, first, Messrs. Meik and Buchanan were required under the terms of their agreement “to act as the engineers . . . in the construction and *execution* of all works . . .” and to “assist and advise . . . in all matters relating to the *execution* of the works”, and, secondly, the Committee's use of the phrases “actual execution” and “due execution” in the sense of “practical carrying out of the work”. In paragraph 224, the Committee state that “clause 3 gave Sir Lawless Hepper the opportunity of saying that as the Resident Engineer had to carry out the details of the work in accordance with the firm's instructions, that therefore the firm were responsible for the *due* execution of the works”. The phrase “execution of the work” does not occur at all in Sir Lawless Hepper's oral evidence, where he made it clear that he accepted the responsibility for the carrying out of the work, subject to the duties and responsibilities of Messrs. Meik and Buchanan under their agreement. Again there is no passage in Sir Lawless Hepper's evidence to support a later statement of the Committee in paragraph 224 that he, “when giving evidence, insisted before us that Sir George Buchanan was *entirely* responsible for the *due* execution of the works, as if he were, in fact, a contractor who had undertaken them.” These impressions of Sir Lawless Hepper's views of his responsibilities seem to rest partly on statements made to this effect by Sir George Buchanan in London.

95. In paragraph 224 of their Report, the Enquiry Committee state: “Thus from the outset neither Sir George Buchanan nor Sir Lawless Hepper seemed to have a very clearly defined idea of their respective duties.” The Government of Bombay would emphasise that there was no misunderstanding in this matter prior to the appointment of the Committee. The Committee's conclusions in this matter seem to have been formed on their interpretation of the words “execution of the works” used in the agreement. These words were not used in the agreement in the sense attributed to them by the Committee and neither the Government of Bombay nor Sir Lawless Hepper nor Sir George Buchanan ever interpreted them to mean that Sir George Buchanan was in a position of administrative or executive control. Before the appointment of the Enquiry Committee, Sir George Buchanan never suggested on the one hand that his responsibilities were less than the Government of Bombay and Sir Lawless Hepper believed them to be, nor on the other hand did he ever suggest that he was being treated as in the position of a contractor. The last suggestion was made for the first time in his written statement (London evidence, page 499 line 13 *et seq.*). Sir George Buchanan was, prior to the appointment of the Enquiry Committee, fully conscious of his responsibilities as the passages quoted on page 604 of the London evidence from his letters show:—

“We are not only the engineers for the machinery, but for the execution of the entire work” (letter dated 22nd June 1921). “We are the engineers responsible to the Government of Bombay and the Secretary of State” (letter dated 3rd June 1922). “We are the actual responsible engineers” (letter dated 22nd July 1922).

These are probably the passages to which the Enquiry Committee refer at the end of their paragraph 224:—“There are statements of his (i.e., Sir George Buchanan's) to be found in his correspondence which would bear the interpretation that he did regard his firm as responsible for the actual carrying out of

the works." The Government of Bombay never placed such an interpretation on these passages and they have no reason to think that Sir Lawless Hepper did so. The Government of Bombay looked to Sir George Buchanan for instructions; the Chief Engineer (Resident Engineer) was required to carry out the works in accordance with the firm's instructions; and the Director of Development was responsible for seeing that the Chief Engineer did so and for this reason it was ultimately arranged that correspondence between Messrs. Meik and Buchanan and the Chief Engineer should pass through the Director. The Director never interfered or gave any instruction to the engineers contrary to Sir George Buchanan's advice except in the case of the sealing of the rubble mound in block 8. The contention of the Government of Bombay is that, if it is proved that things went wrong because Sir George Buchanan's designs (as in the case of the dredger) were faulty, or because his advice was wrong, or because he omitted to give advice or instructions which the Government of Bombay had the right to expect from him, then the real responsibility for failure lies with Sir George Buchanan and his firm.

96. In paragraph 225, the Committee say :—

" If the Government of Bombay intended to make Sir George Buchanan's firm responsible for the execution of the works, nothing was easier than to say so in plain and simple words."

Lord Lloyd made it perfectly clear that the Government of Bombay never intended to make Sir George Buchanan's firm responsible for the " execution of the works " in the sense in which the words are used in this passage. The Committee have accepted Lord Lloyd's evidence as rightly describing the respective functions of Sir Lawless Hepper and Sir George Buchanan. He was the Governor when the agreement with Messrs. Meik and Buchanan was settled. It is singular that after accepting his evidence on this point the Committee should appear to suggest in paragraph 225 that there was any doubt about the intentions of the Government of Bombay in the matter. Sir George Buchanan in his written statement (London evidence, page 499 line 13 *et seq*) seems to suggest that he was treated as in the position of a contractor but the suggestion is based only on statements in leading questions asked by Sir Frederick Hopkinson. No evidence was tendered by the Director or the Government of Bombay suggesting that they considered that the firm of Messrs. Meik and Buchanan were in the position of contractors and responsible as such for the actual carrying out of the work.

97. The division of responsibility may be illustrated from actual practice. Sir George Buchanan specified the type of sea-wall and he also laid down the method of constructing the northern portion of it by means of a gantry. The Committee seemed disposed at one time to question the need of a gantry but, in any event, Sir George Buchanan, having specified this method of work, became responsible for it. This case is mentioned because in course of time (June 1923) it was settled that under clause 1(a) of their agreement the drawings, specifications, etc., for which the firm were responsible were those relating to permanent works, while the Chief Engineer was responsible for the designing of temporary works (London evidence, page 478 lines 36—43). This gives one indication of the actual division of responsibility. It does not indicate, however, that it was not proper for Sir George Buchanan to give advice regarding temporary works, or that the Government of Bombay were not entitled to rely on him for unsolicited assistance and advice in this and " all matters relating to the execution of the works " (*vide* the agreement).

The actual division of responsibility is seen also in the ordering of plant. In virtue of his responsibility for carrying out the work, the Director, with the advice of the Chief Engineer, decided what plant was necessary to enable him to discharge his responsibility. Messrs. Meik and Buchanan were entitled to advise in this matter and to criticise the Director's indents and they did so (paragraph 72 above). If the Director accepted the criticisms, a degree of responsibility for the adequacy and suitability of the plant was thrown on the firm. But the Director was entitled to exercise his discretion and decide whether he could adequately discharge his responsibilities if he accepted the advice of Messrs. Meik and Buchanan. The firm, on their part, recognised in their letter of 11th April 1922, quoted by the Committee in paragraph 95 of their Report, that " great weight must be attached to the wishes of the engineer on the spot in the matter of plant ".



In the particular case discussed in paragraph 72, Messrs. Meik and Buchanan obviously miscalculated the requirements of rolling-stock, and the Chief Engineer, with the concurrence of the Director, stuck to his original demand. Having reached this decision, the responsibility for the adequacy and suitability of the plant lay specially on the Director.

98. It is an important fact that, except the sealing of the sea-wall and the immediate displacement of Mr. Lewis as Chief Engineer in 1922, there is no instance in which the Director of Development or the Government of Bombay interfered with the instructions or rejected the advice of the firm of Messrs. Meik and Buchanan (London evidence, page 811 lines 34—53). The firm's proposals were, naturally and properly, scrutinised and discussed before acceptance but Sir George Buchanan's suggestion that he had no power has no substance, although he repeatedly stated or suggested this as a reason for not tendering advice under the terms of his agreement (e. g., London evidence, page 517 line 49, page 524 lines 44—46, page 525 line 11, page 600 line 38, page 601 line 2, page 606 lines 25—52, and page 607 lines 31-32). These passages relate to instances where admittedly Sir George Buchanan's firm have not "assisted and advised in every possible way" as Sir George Buchanan urged in his written statement that they had done (London evidence, page 477 lines 30—31). The Government of Bombay do not accept Sir George Buchanan's statement that he "was always faced with a *non-possumus*". Even if there were truth in the statement, it is a most improper reason to put forward for withholding the advice and assistance due from the firm under their agreement.

99. The Committee in their paragraph 194 have given instance of "unwise decisions" and "mistakes made because nobody believed himself responsible for the due execution of the work", viz. :—

- (1) commencing the construction of the sea-wall from both ends ;
- (2) delay in sealing the rubble mound ;
- (3) undertaking dredging operations in Back Bay without consideration of cost ;
- (4) absence of preconcerted programmes to regulate operations.

The first instance has already been discussed in paragraphs 49—54. The commencement of the sea-wall from both ends was decided by the Government of Bombay after the proposal had been referred to Sir George Buchanan and approved by him at a date before the Development Directorate had been created or Sir Lawless Hepper had been appointed as Director. There was no question of divided responsibility at this date and it is not clear how the Committee concluded that the decision was made "because nobody believed himself responsible for the due execution of the work."

100. The second instance, the delay in sealing the rubble mound, has also been discussed in paragraph 57. Again there was never any doubt about responsibility. The sealing of the sea-wall was a feature of the scheme as described in Sir George Buchanan's report of 1919, and the matter was specially referred to Sir George Buchanan for his instructions. His advice that it should not be done was accepted. As the Committee suggest in paragraph 101 of their Report, it was understood at the time that he thought it preferable not to retain in the reclaimed area the lightest portions of the mud and clay. This attitude might have been reasonable. Sir Alexander Gibb in his report in 1926 indicated that he thought much of the material dredged from the harbour would not "provide satisfactory filling for the purpose of reclamation". When the local Government decided in 1925 to seal the rubble wall on their own responsibility, they were aware that such fears were an argument against this course. But Sir George Buchanan does not now defend his advice against sealing the wall or his subsequent omission to modify this advice by reference to the unsatisfactory nature of the filling. He agrees that the rubble mound should have been sealed earlier despite his advice in 1924 to the contrary.

In any event the delay in sealing was not due, as the Enquiry Committee state, "because nobody believed himself responsible for the due execution of the work". The Director and the Chief Engineer, in the first instance, carried out Sir George Buchanan's instructions. In the long run—but not till the outlook had become bad and confidence in Sir George Buchanan had weakened—the Director, on the

advice of the Chief Engineer, recommended to the Government of Bombay that the rubble mound should be sealed and the Government of Bombay accepted this recommendation.

101. The third instance, *viz.*, the undertaking of dredging operations in Back Bay, is bound up with the decision to begin the sea-wall at both ends simultaneously. The following is quoted from the text of the cable which the firm of Messrs. Meik and Buchanan suggested on 10th July 1920 that the India Office should send to the Government of Bombay :—

“To begin building the wall in two places will not materially advance matters unless reclamation can also be proceeded with and Buchanan is considering whether the new dredger (i.e., ‘Sir George Lloyd’) and the ‘Jinga’ (*sic.*, but ‘Kalu’ meant) can work simultaneously at eastern and western areas” (Report paragraph 98.)

It is unfortunate that Sir George Buchanan was not asked to explain his reference to the eastern and western areas in view of his subsequent explanation of his proposed scheme of operations (London evidence, page 566 lines 25—27). There was no question of divided responsibility at this date. The Government of Bombay involved themselves in dredging in Back Bay on the sole advice of Sir George Buchanan. The suggestion of the Committee seems to have its origin in the contradictory evidence of Sir George Buchanan. After agreeing that he approved of the “Kalu” going into Back Bay (London evidence, page 542 line 9) he almost immediately afterwards ascribed the proposal to Sir Lawless Hepper and added “we did not want to go into Back Bay” (London evidence, page 544 lines 35—37).

102. The fourth instance of the result of divided responsibility is the “absence of preconceived programmes to regulate operations”. There were, however, programmes to regulate operations as the reports of Sir George Buchanan and the letters from his firm show. The Enquiry Committee apparently agree in paragraph 222 of their Report that the responsibility here lay with the firm of Messrs. Meik and Buchanan.

103. The criticism of the Enquiry Committee in paragraph 194 of their Report amounts, in fact, to this, that in certain instances the advice of Sir George Buchanan was bad or, in the case of programmes to regulate operations, inadequate, and it really raises the question whether, and in what circumstances, the advice of Sir George Buchanan should have been rejected. It is admitted that the Government of Bombay relied heavily on him. This is brought out in paragraph 145 (vi) where the Enquiry Committee have stated :—

“The division of responsibility between Sir George Buchanan and his firm on the one hand, and the Development Directorate and Sir Lawless Hepper on the other, led to slowness in appreciating and delay in acting upon facts which should have been glaringly apparent after the first year’s working.”

The Committee are here referring to the first year’s working of the dredger and the meaning can only be that after the first year’s dredging the Development Directorate and Sir Lawless Hepper should have taken independent action to get better results. This was a serious responsibility.

104. The Enquiry Committee’s apparent suggestion that, after the first year’s working, the Government of Bombay should have discarded the advice and assistance of Sir George Buchanan raises a very difficult question. It is easy to be wise after the event. In their paragraph 198 the Committee have declared “that Lord Lloyd and the Government of Bombay were justified in accepting Sir George Buchanan as an expert . . . and that, having taken the man recommended by the Government of India, the proper and *prudent* course was to treat his opinion as final and authoritative”.

In paragraph 82 they say that “Sir George Buchanan did not sufficiently assist and advise the Government of Bombay nor did he completely or satisfactorily supervise the work.” The question arises when this should have been recognised to the extent of disregarding his advice and assistance, and possibly to the extent of terminating the agreement in terms of which he tendered advice and assistance and was responsible for supervision. In paragraph 145 (vi) the Committee indicate that the crisis came after the first year’s working of the dredger, and that from this stage there was no good reason for not issuing reports, the contents of which would directly or indirectly implicate the firm. The Government of Bombay agree to this extent with the Committee that with the dredging

operations came the crisis. The Committee in paragraph 195 state that "the inability of the dredger to give the required output has been the chief cause of failure and has had a disastrous effect on the financial prospects of the scheme". The Government of Bombay would not limit the chief cause of failure to the inability of the dredger to give the required output but would broaden the conclusion so as to include the dredging operations in all their aspects. The issue as to responsibility here is vital. Since the date of Sir George Buchanan's letter of 23rd May 1919, quoted on page 14 of the Report, to Lord Lloyd, it has been recognised that "the crux of the whole scheme lay in the provision and successful working of the dredger or dredgers". This can hardly be emphasised too often. The actual share of the dredging operations in the partial failure of the scheme is shown in the following paragraphs.

105. Although the Back Bay Scheme was accepted by the Government of Bombay in December 1919 at an estimated cost of Rs. 400 lakhs, it was known in 1921 that the cost would be Rs. 702 lakhs. The project estimate for this amount was not officially sanctioned till the following year. But this fact was made public by the Governor, Lord Lloyd, in a speech to the Indian Merchants' Chamber in August 1921 and in correspondence which was published in full in the press. The rise in the estimate did not alarm the Government of Bombay who would have been well satisfied had the estimate been realised in practice. A reference to appendix A at page 512 of the Bombay evidence shows that, even after allowing for the increased cost of the dredging plant, the estimate was likely to be realised, on the whole, provided that the estimate for dredged filling proved to be correct. Now the estimate for the dredged filling in the project estimate was Rs. 82,03,125 and was calculated at 5 annas per cubic yard for 25,000,000 cubic yards plus 5 per cent. for contingencies. Sir George Buchanan's original estimate for dredged filling, including capital cost of plant, was Rs. 125 lakhs calculated at 8 annas per cubic yard for 25,000,000 cubic yards. The rate of 8 annas was based on the figures given at page 30 of his report, viz., plant 3.92 annas, working expenses 3.11, total 7.03 annas. The rate of 4 annas per cubic yard for plant coincided with the price £199,000 quoted for the dredging plant at page 17 of his report and with the rate of Rs. 12 = £1 which he assumed for exchange. It is, therefore, fair to him to assume that he had 4 annas per cubic yard available in his estimate for working expenses of the dredging plant instead of 3.11 annas shown on page 30 of his report. Therefore, in allowing in the project estimate 5 annas per cubic yard plus 5 per cent. for contingencies, the Chief Engineer provided a considerable margin over the rate of 4 annas per cubic yard, increased by 10 per cent., which the Government of Bombay had virtually accepted in 1919. The provision for dredged filling in the project estimate appeared, therefore, in 1922 to be sufficiently liberal.

106. The provision for dredging has proved inadequate for three reasons :—

- (1) the inability of the dredger to give the required output ;
- (2) the leakage of pumped material during the first two working seasons due to the acceptance of Sir George Buchanan's advice that the rubble mound should not be sealed and the consequent delay in doing so ;
- (3) the working of only one shift in the first season and the failure in the next two seasons to work two shifts for 24 hours a day.

107. In considering the respective responsibilities in these matters of Sir Lawless Hepper and Sir George Buchanan, it is pertinent to note that, while Sir Lawless Hepper's experience as an engineer was, "in a general sense, a qualification not very specific" (London evidence, page 406 lines 9-10) for his appointment by Lord Lloyd's Government as Director of Development and while the firm of Messrs. Meik and Buchanan were justified in paying regard to this fact in weighing his responsibilities for the "actual" or "due execution" or "carrying out of the scheme", all parties were well aware that Sir Lawless Hepper had no knowledge or experience of dredging operations. These were the crux of the scheme, and it was in virtue of his expert knowledge and experience of such operations—a knowledge and experience which Sir George Buchanan himself emphasised in his correspondence with Lord Lloyd in 1919—that Sir George Buchanan was appointed first to report on Mr. Kidd's scheme and then to advise, assist and supervise in the execution of his own scheme. The success of the dredging operations depended on the advice of his firm, on the efficiency of their nominee in the post of Deputy Chief Engineer in charge of the operations, on their assistance to him and on their supervision of the operations.

108. Sir George Buchanan's attitude in this matter is that his responsibility ended with designing the dredger. The responsibility for getting the output lay with Sir Lawless Hepper. This attitude is based on his assertions that "there is nothing the matter with the dredger and there is nothing the matter with the material" (London evidence, page 608 lines 18-19). He clinches his views when his Counsel examined him on evidence given by his partner Mr. Halcrow (London evidence, pages 712-713). A reference to the London evidence (page 820) will show that the following is a fair summary of Sir George Buchanan's views:—

There was nothing to supervise. There was no engineering at all. All that was to be done was to get the output. There was no substantial difference between excavation in the quarry and dredging in the harbour. Sir Lawless Hepper was responsible for putting the staff on double time and paying bonuses.

109. However, this statement may be regarded—and the first sentence at least cannot be accepted—it still remains true that the firm of Messrs. Meik and Buchanan were required under their agreement "at all times to assist and advise" and that the works were to be "closely supervised" by the firm and that Sir George Buchanan was to devote the greater part of his time to this particular work. It is a fact, also, that he did give advice on the dredging operations. It was on his initiative that a Deputy Chief Engineer in special charge of dredging operations—a post not originally contemplated—was appointed and the officer appointed was nominated by him, without any suggestion from the Government of Bombay, at the time he proposed the creation of the new appointment. He advised, when asked, that the sea-wall should not be sealed, though he apparently recognised ultimately that sealing was the proper course. He advised, when consulted, about the staff of the dredging section. He advised, but not till February-March 1925, that a bonus should be paid and his advice was accepted. He advised in 1925, on his own initiative, that a Deputy Dredging Master should be engaged and his advice was accepted. These instances are sufficiently illustrative.

110. Of the three important reasons for the failure of the dredging given in paragraph 106, Sir George Buchanan and not Sir Lawless Hepper is plainly responsible for (1) the inability of the dredger to give the required output and (2) the leakage of pumped material during the first two dredging seasons.

111. As regards (3), the working of only one shift in the first season and the failure in the next two seasons to work two shifts of 24 hours a day, Sir George Buchanan is also mainly responsible. Whatever may be said of the local arrangements made by his nominee, the Deputy Chief Engineer in charge of dredging operations, the firm of Messrs. Meik and Buchanan were responsible for advising and assisting the Government of Bombay in this matter and they failed to do so. Sir George Buchanan's instructions to Mr. Brims (London evidence, page 523 lines 59-62, page 625 lines 48-49, page 676 line 14 and lines 55-56, page 829 lines 16-20) were never at any time communicated to the Government of Bombay and it is singular that at the end of the first season's dredging he should not have criticised the local executive in this matter in his reports of 14th February 1924 and 15th December 1924 (Evidence, part III, pages 28 and 30). Admittedly, he pressed the Government of Bombay to regard the first season as experimental (London evidence, page 523 lines 23-25). His firm was well aware that dredgers were usually worked 24 hours a day (Mr. Halcrow's evidence, page 694 lines 5-25). Mr. Halcrow says that the giving of advice in this matter was left to Sir George Buchanan (London evidence, page 697 lines 4-12). The firm knew exactly the local arrangements because they had sent the men out from England (London evidence, page 757 lines 24-25) and they did not hesitate to communicate their anxiety about the arrangements for doubling the shifts in the second dredging season (London evidence, appendix VI, page 854). In face of this Sir George Buchanan's defence of himself for not advising a double-shift in the first working season (London evidence, page 759 line 61 to page 760 line 12) makes singular reading along with his admission that he pressed the Bombay Government to treat the first season's working as experimental.

112. Sir George Buchanan has now agreed that 24 hours a day should have been worked from the outset. His excuses for not tendering definite advice in the matter are that he "was always faced with a *non-possumus*" (London evidence, page 524 line 45), because he believed that Sir Lawless Hepper would have said "he could not get it" (i.e., a double shift) in the first season (London evidence, page 525 line 11), that he had no power to send out dredging masters and that without

control there was no possibility "of making them work 15 hours a day" (London evidence, page 761 lines 1—12). These reasons have no substance whatever. It was the duty of his firm "at all times" to "assist and advise the Government of Bombay" and it was the special duty of Sir George Buchanan "closely" to supervise the work and to "devote the greater part of his time to it". Let it be granted that a dredging engineer of greater initiative and driving power than Sir George Buchanan's nominee would have made better arrangements from the outset and that his failure to do so involves the Chief Engineer and the Director of Development in a measure of responsibility; the fact nevertheless remains that the firm of Messrs. Meik and Buchanan and Sir George Buchanan in particular were specially appointed by reason of their greater knowledge and experience of dredging operations to rectify such defects by their advice and assistance. In no part of the operations was their advice and assistance so essential as in the dredging operations. Up to the last Sir George Buchanan was pressed hard by Government for suggestions for improving the dredging output. It was pointed out to him by the Enquiry Committee that if he were dissatisfied with the attitude of Sir Lawless Hepper, he could have appealed to Government or the Governor personally. Sir George Buchanan usually, if not invariably, had official interviews with Government at the close of his visits to Bombay and on the occasion of his last visit, in particular, he was interviewed officially, on one occasion, by three members of the Government as well as separately by His Excellency the Governor and pressed hard for suggestions for getting a better output from the "Sir George Lloyd". He never on any of these occasions suggested that the system of working was defective and the Government of Bombay are not disposed to accept his suggestions that he made oral complaints in other quarters (London evidence, page 759 line 61, page 760 line 10).

113. When regard is had to the fact that Sir George Buchanan was in ignorance of the existence of the weekly dredging reports which were handled by other members of his firm (Messrs. Halcrow and Settle), one of whom at least professes that action on them was nevertheless left to Sir George Buchanan (London evidence, page 697 lines 4—7), it is easy to understand how the latter failed to tender the requisite advice. The division of responsibility which reduced the efficiency of the dredging operations was to be found in the office of Messrs. Meik and Buchanan.

114. The Committee in paragraph 82 of their Report have found that Sir George Buchanan did not sufficiently assist and advise the Government of Bombay and did not completely or satisfactorily supervise the work. It is obvious that, if this judgment is accepted, the Chief Engineer and the Director could not make a complete success of a work, when the technical advice and assistance on which they relied was defective. This is specially true of the dredging operations—the crux of the scheme—where in fact Sir George Buchanan's omissions in advice and assistance and his lack of supervision have been disastrous.

115. Lord Lloyd, whose Government was responsible for the initiation of the scheme and for the appointments of Sir George Buchanan and Sir Lawless Hepper, described, in his evidence, their responsibilities in general terms by saying that the former was responsible for the strategy and the latter for the tactics of the scheme. The analogy is satisfactory enough. No one expects a general to win, as a matter of course, a victory when the strategic plan to which he must conform is defective. If it is accepted that Sir George Buchanan was guilty of the errors and omissions for which the Committee find him responsible, then it follows that practically the whole blame for the comparative failure of the dredging operations must be laid on him. Their vastly increased cost over the project estimate, together with the heavy interest charges involved by the delay in getting the first reclaimed land ready for sale, are the principal reasons for the financial failure of the whole scheme.

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

R. D. BELL,  
Secretary to the Government of Bombay,  
Development Department.

## APPENDIX A.

(See paragraph 4.)

Rates of exchange for Calcutta Telegraphic Transfers on London (average of daily rates).

Month.	1919. (approx.)	1920.	1921.	1922.	1923.	1924.	1925.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
January	.. ....	2 3 $\frac{1}{2}$	1 5 $\frac{1}{2}$	1 3 $\frac{1}{2}$	1 4 $\frac{1}{2}$	1 5 $\frac{1}{2}$	1 5 $\frac{1}{2}$
February	.. ....	2 8 $\frac{1}{2}$	1 4 $\frac{1}{2}$	1 3 $\frac{1}{2}$	1 4 $\frac{1}{2}$	1 4 $\frac{1}{2}$	1 5 $\frac{1}{2}$
March	.. ....	2 4 $\frac{1}{2}$	1 3 $\frac{1}{2}$	1 3 $\frac{1}{2}$	1 4 $\frac{1}{2}$	1 4 $\frac{1}{2}$	1 5 $\frac{1}{2}$
April	.. ....	2 3 $\frac{1}{2}$	1 3 $\frac{1}{2}$	1 3 $\frac{1}{2}$	1 4 $\frac{1}{2}$	1 4 $\frac{1}{2}$	1 5 $\frac{1}{2}$
May	.. ....	2 1 $\frac{1}{2}$	1 3 $\frac{1}{2}$	1 3 $\frac{1}{2}$	1 4 $\frac{1}{2}$	1 4 $\frac{1}{2}$	1 5 $\frac{1}{2}$
June	.. ....	1 11	1 3 $\frac{1}{2}$	1 3 $\frac{1}{2}$	1 4 $\frac{1}{2}$	1 4 $\frac{1}{2}$	1 6 $\frac{1}{2}$
July	.. ....	1 10 $\frac{1}{2}$	1 3 $\frac{1}{2}$	1 3 $\frac{1}{2}$	1 4 $\frac{1}{2}$	1 5 $\frac{1}{2}$	1 6 $\frac{1}{2}$
August	.. ....	1 10 $\frac{1}{2}$	1 4 $\frac{1}{2}$	1 3 $\frac{1}{2}$	1 4	1 5 $\frac{1}{2}$	1 6 $\frac{1}{2}$
September	.. ....	1 10 $\frac{1}{2}$	1 5 $\frac{1}{2}$	1 3 $\frac{1}{2}$	1 4 $\frac{1}{2}$	1 5 $\frac{1}{2}$	1 6 $\frac{1}{2}$
October	.. 2 0	1 7 $\frac{1}{2}$	1 4 $\frac{1}{2}$	1 3 $\frac{1}{2}$	1 4 $\frac{1}{2}$	1 6	1 6 $\frac{1}{2}$
November	.. 2 1	1 7 $\frac{1}{2}$	1 4 $\frac{1}{2}$	1 3 $\frac{1}{2}$	1 4 $\frac{1}{2}$	1 5 $\frac{1}{2}$	1 6 $\frac{1}{2}$
December	.. 2 4 $\frac{1}{2}$	1 5 $\frac{1}{2}$	1 3 $\frac{1}{2}$	1 3 $\frac{1}{2}$	1 5 $\frac{1}{2}$	1 6 $\frac{1}{2}$	1 6 $\frac{1}{2}$

The approximate average rates for the months October-December 1919 were:—

	s.	d.
October 1919	..	0
November "	..	1
December "	..	4 $\frac{1}{2}$

## APPENDIX B.

(See paragraph 9.)

Rise in cost of public works between 1912 and 1919. Figures supplied by the Chief Officer, Bombay City Improvement Trust.

*Road construction.*

	Cost per r.ft. of a 40-ft. road.	
	1912.	1919.
	Rs.	Rs.
Road work including surfacing	.. 13.11	18.70
Storm-water drain	.. 5.89	9.23
Pipe sewer	.. 4.38	7.38
Tree plantation	.. 0.19	0.54
Lighting arrangements	.. 1.00	1.99
	<u>24.57</u>	<u>37.84</u>
Add 10% for supervision and contingencies	.. 2.46	3.78
Total cost of a 40-ft. road	.. 27.03	41.62
Increased cost	.. 54 per cent.	

## APPENDIX C.

(See paragraph 23)

The cost of the sea-wall to the end of November 1926, including proportionate expenditure of all items other than dredging and permanent works, is given below:—

## 1.—Direct expenditure on permanent works except dredging.—

	Rs.	Rs.
I. Gantry .. .. .	.. .. .	10,83,295
II. Sea-wall on rubble mound .. .. .	.. .. .	44,38,483
III. Mass concrete wall at Colaba .. .. .	.. .. .	7,52,950
		<hr/>
		62,74,728

## 2.—Items of permanent works other than dredging and sea-wall.—

	Rs.	
IV. Cross walls .. .. .	.. .. .	2,66,195
XII(3) Dry filling—Marine Lines .. .. .	.. .. .	10,60,756
XIII. Murum topping .. .. .	.. .. .	20,168
XVI. Storm-water drains—		
1. Marine Lines .. .. .	.. .. .	7,81,247
2. Colaba .. .. .	.. .. .	16,26,259
		<hr/>
Total .. .. .	37,54,625	37,54,625
		<hr/>
Total .. .. .		1,00,29,353

## 3.—Expenditure on temporary works, quarry, Marine Lines and Colaba: buildings and plant and machinery.—

	Rs.
V-A. Kandivli quarry acquisition .. .. .	5,70,847
V-B. Kandivli opening out quarry .. .. .	18,11,799
V-C. Kandivli quarry: machinery and buildings .. .. .	27,20,759
VI-A. Marine Lines: preparation of site and accommodation for staff .. .. .	8,82,399
VI-B. Marine Lines: machinery and buildings .. .. .	14,64,510
VII-A. Colaba: preparation and provision for accommodation .. .. .	3,18,932
VII-B. Colaba: machinery and buildings .. .. .	9,78,776
VIII. Marine Lines—Colaba Railway .. .. .	8,38,356
IX. Transportation and rolling-stock .. .. .	21,48,964
XII(4) Dry filling—Kandivli Section .. .. .	3,55,426
XVI(3) Storm-water drains (Kandivli) .. .. .	1,77,243
XX. Maintenance of works .. .. .	4,84,699
	<hr/>
Total of temporary works .. .. .	1,27,52,710

Proportionate amount to be borne by sea-wall of Rs. 1,27,52,710

$$= \frac{62,74,728}{1,00,29,353} \times 1,27,52,710 = 79,78,560$$

Therefore, total cost of sea-wall is—

(a) Direct expenditure on permanent works .. .. .	= 62,74,728
(b) Proportionate expenditure of temporary works .. .. .	= 79,78,560
	<hr/>
Total .. .. .	1,42,53,288

Add consultant's fees and establishment charges @ 10½ % of Rs. 1,42,53,288 .. .. .

14,96,595

Total cost of sea-wall .. .. .

= 1,57,49,883

Note.—Total expenditure on the whole work as per Audit and

Account Officer's statement is .. .. .	4,29,45,070
Less consultant's fees .. .. .	4,96,679
	<hr/>
	4,24,48,391

	Rs.
Consultant's fees .. .. .	4,96,679
Establishment .. .. .	39,60,584
	<hr/>
Total .. .. .	44,57,263

$$\frac{4,457 \times 100}{42,448} = 10\frac{1}{2} \%$$

## APPENDIX D.

Results of the operations of the dredger "Sir George Lloyd".

(See paragraph 61.)

Season.	Total pumping hours.	Average pumping hours per day.	Total output calculated from soundings taken in harbour.	Average output per pumping hour.	Number of shifts worked.	Average number of hours worked per day.
1923-24.	Hrs. m.	Hrs. m.	Cub. yds.	Cub. yds.		Hrs. m.
23 weeks	842 35	6 55	8,59,858	1,020	(Single) 122	11 3
1924-25.						
1½ weeks single	55 30 single shift.	7 56	12,61,986	856	7 single 128 double	12 4
21½ weeks double	1417 52 double	11 5				15 43
1925-26.						
30½ weeks	1904 50	11 24	18,28,303	960	203 double	14 4
1926-27.						
9½ weeks	918 25	17 30	14,29,406	1,556	66 double	18 45

## APPENDIX E.

(See paragraph 72)

Letter dated the 11th April 1922 from Messrs C. S. Meik and Buchanan :—

With reference to your letter No. 600, dated 17th March 1922, enclosing a list of additional plant required for the Back Bay Reclamation Scheme, we have as requested invited tenders for the various items but in connection with the necessity for making all these purchases at the present time we have the following remarks to make :—

2. *Rolling-stock.*—You have at present in use at Bombay No. 132 20-ton side tipping wagons which, at 48 wagons to the train, is equal to two full trains *plus* 36 spare wagons; you have now ordered No. 106 20-ton side tip wagons which will give you in all 4 trains and 46 spares or 2 wagons short of 5 trains. You have also ordered 50 end tipping wagons for work at Colaba. Presumably from these orders you anticipate during next season bringing down from the quarries 2 trains of stone a day for use at Colaba and 2 trains for use at Marine Lines, whilst at Marine Lines in addition to the rubble stone you will require ballast for concrete unless during the monsoon months you have accumulated there sufficient ballast for the season's work.

3. Now we believe we are right in saying that the whole of the work on the Colaba section, leaving out the large protection blocks (as to the necessity for which we will discuss later in this letter), is equivalent to 150 trains of stone or at say 45 trains per month, 3½ months work. The question then arises as to what you are going to do with all this rolling-stock, representing a large amount of capital, when the Colaba section is finished; moreover, on consideration we doubt very much if you will be able to utilize at Colaba so many as 45 trains a month in conjunction with 50 end tipping wagons because we believe you will find building the wall by the end tipping arrangement very much slower than by using a gantry as at Marine Lines: in fact to accelerate the work you may find it necessary to erect a staging along some portions of the line.

4. It therefore seems questionable to us whether you require so much additional rolling stock, more especially as it is understood that progress at Marine Lines is not so urgent as progress at Colaba, and if you get your railway communication between Colaba and Marine Lines finished by September, and have the end tipping wagons out by that date you will be able to start at Colaba well ahead of the season's work at Marine Lines.

As you have nothing to fear from the monsoon sea, we had indeed hoped that it might be possible to do a great deal of work during the coming monsoon.

5. You have asked for 2 more "Moss Bay" type locomotives and 2 of a heavier type. Are these all absolutely necessary? Or as the distance from Marine Lines to Colaba is only about 4 miles, could not a "Moss Bay" engine take half a full train at a time?

6. *6-ton 60 feet radius portal crane for Colaba.*—We understand this is required for laying the protection blocks on the Colaba section of the work. We have, however, discussed this proposal fully with Sir George Buchanan and we are not in favour in the first instance of placing any heavy protection blocks at Colaba, whilst in any case we are of opinion that 3 to



4 tons will be ample maximum weight. Our view is that the rubble mound up to H. W. O. S. T. should be built across the reef and fairly heavy stones tipped on the outside slope. We should then like the mound to remain over a monsoon period, the effect of the waves, if any being carefully watched and the bank made up from time to time if necessary. In the following season the concrete superstructure could be built and such heavy pitching placed as has been decided upon. This delay in finishing the work will be preferable from several points of view and will not hinder dredging operations which can be put in hand as soon as the rubble mound is up to high water mark and a cross wall built. Under these circumstances, we, therefore, suggest that the ordering of the heavier crane might be delayed for the present.

7. 3 "Ruston's" navvies for work at the quarry.—We note that you require more lifting power at the quarry to deal with the heavy protection stones and also require at a later period to deal with large quantities of moorum. That being the case, do you really think you require all three of these machines, estimated to cost £4,000 each, ordered at once? We suggest that you should order one now, and the others if necessary at a later date.

8. We shall be glad if you will discuss this letter with the Director and send us a cablegram at the earliest possible date. No time is being lost, as the Easter holidays begin this week and we do not expect to have received all the tenders before we receive a telegraphic reply to this letter.

We fully understand that as the work is being done without a contractor great weight must be attached to the wishes of the engineer on the spot in the matter of plant and plans for execution and we have no desire in any way to hamper you. On the other hand it must be remembered that, in addition to the actual capital cost of the plant, interest for many years has to be paid, and it is desirable to economise wherever it is possible to do so without interfering with efficiency or with the speedy execution.

Letter dated the 12th April 1922, from Messrs C. S. Meik and Buchanan.

*New plant—season 1922-23.*

In continuation of our letter to you of yesterday's date, paragraph 5, and with reference to paragraph 2 in your letter of the 17th March 1922. You state that a more powerful locomotive will be wanted for moving a whole rake between Marine Lines and Colaba, this rake consisting of 48 wagons, weighing  $28\frac{1}{2}$  tons each amounting to 1,368 tons. The locomotives quoted for by the Avonside Engine Company, to which you refer, is specified as hauling 1,168 tons on the level. We have asked the contractor to tender for locomotives to pull 1,400 tons and have received replies from several of them and they state that this is too large a load for the type of engine and would be bigger than standard. We could no doubt, however, obtain a standard type to pull 1,000 tons or rather more.

Would it not, however, be better to avoid this large type of engine by running a train in two parts and sticking to the size of engine of the "Moss Bay" type which you already have?

Letter from the Chief Engineer, Back Bay Reclamation Scheme, No. 1285, dated the 3rd May 1922, to Messrs. C. S. Meik and Buchanan, London.

With reference to your letter dated 11th April 1922 regarding rolling-stock, I am sending to-day a cable giving the result of discussion that I have had with Sir Lawless Hepper. I think when working out the number of trucks required, you have not realised that while two trains are being filled at the quarry, two trains are being emptied at the Bombay end. We therefore require 192 trucks for the trains, and allowing 20 wagons for spares and being under repairs, this makes 212. When we receive the 106 20-ton side tipping wagons now asked for, we shall have in all 238 wagons, leaving a balance of 26 for use at the quarry, Marine Lines and Colaba; allotting 10 to quarry, 10 to Marine Lines and 6 to Colaba, the whole number of wagons is accounted for.

In paragraph 5 you have queried the necessity for two more locomotives of the "Moss Bay" type and two of the heavier type. Working with end tipping wagons at Colaba, we shall certainly require 3 locomotives for that portion of the work. At Marine Lines, where the yard is much more convenient than we can make it at Colaba, the two locos that work there are kept fully employed, and a heavier locomotive is required to handle the trains between Marine Lines and Colaba and, possibly after that work is done, help in the Marine Lines Yard.

After going through paragraph 6 of your letter with Sir Lawless Hepper, we agreed that the 6-ton 60 feet radius portal crane for Colaba can be deferred this year.

I should not like to have to carry on dredging operations up to H. W. S. only such as the level of the top of the rubble mound. First of all the amount of work to be done would be comparatively small; secondly, it is liable to be flooded by any tide higher than 86.25 and would make work extremely sloppy all over the areas that would be filled to the lower level.

As regards your paragraph 7, Sir Lawless Hepper agrees with me that it is best to get the cranes at present. The crange at the quarry was originally allowed on the basis of 1,000 tons in a day. I have since re-allocated two 7-ton cranes, one each to Colaba and Marine Lines, and something more has to be got for the quarry. We have to handle large blocks as these have to be stored as they are obtained in the course of quarrying operations, and in order to do this we must have adequate crane power. These 3 navvies will also enable us to get out the moorum which will ultimately be required and it seems to me that as they will work as 20-ton cranes at a radius of 23' 6", they would be of more use than ordinary plain cranes. In the telegram I am asking you to proceed with the purchase of all the 3 cranes. ~

Letter from the Chief Engineer, Back Bay Reclamation Scheme, No. 1297, dated the 5th May 1922, to Messrs. C. S. Meik and Buchanan, London.

In continuation of my letter No. 1284 of 3rd May 1922, I sent the particulars and drawing of the Avonside Engineering Company's locomotives as it was the best among the many tenders that we received in 1920, but I had no idea of specifying that particular locomotive.

I have no predilection as to the type that should be obtained, but I think it would save time and trouble if we could move a whole train at once.

Before sending you the specifications, I took them to the Boiler Inspector unofficially to see whether the details of the boiler would meet with his approval, and after making a few calculations, he came to the conclusion that the Avonside engine would comply with the Bombay boiler regulations.

We certainly require a much heavier locomotive in the quarry than the "Moss Bay" type, and as we want to get to move as much trains as possible on the Marine Lines—Colaba Railway, I think we should do well to have a large locomotive for that work also.

A point which I am afraid I have not mentioned is that these locomotives will have to be provided with the central coupling as well as the ordinary standard B. B. & C. I. draw bar and buffing gear in the same manner as the "Moss Bay" engines which we have already.

Extract from a note No. 1304, dated the 3rd May 1926, from the Chief Engineer, Back Bay Reclamation Scheme.

I attach a list\* of plant referred to in Messrs. Meik and Buchanan's letter dated the 11th April 1922.

The whole of this plant had either been in use or was actually in use at the time of Sir George Buchanan's last visit to Bombay.

Items 1 and 2 :—Locomotives were very necessary, as after their purchase another 5 feet 6 inches gauge loco had to be purchased locally to keep the Colaba work going.

Item 3 :—Ruston (*sic*, Whittaker's) navvies were urgently required at the quarry as the large stone wanted for the mound could not be loaded up as fast as necessary with the result that during the monsoon of 1922 we had to dump a large quantity of small rubble at Marine Lines to prevent the wall being undermined, thus increasing the section of the mound and causing waste of stone.

Items 5 and 6 were also required and have been constantly used.

Item 7 :—5-ton cranes.—There was such a shortage of cranes that as Deputy Chief Engineer, Marine Lines, I had to protest to Mr. Lewis, against handing over a 5-ton crane to Colaba Section, but was made to do so and when he further ordered me to send a 7-ton crane to the quarry, I told him I would have to stop work at Marine Lines for want of plant and he therefore allowed me to retain it.

Item 8 :—Drills were required to increase the quarry output.

Item 9 :—The extra wagons have always been actively employed and we were so short of wagons after they had been delivered that Mr. Lewis purchased 8 old wagons specially for yard use from the B. B. & C. I. Railway so as to release side tip wagons.

Item 10 :—End-tip wagons were used throughout the construction of the rubble mound at Colaba.

Item 11 :—This motor trolley is the only item which has not paid for itself as it was always breaking down and never could be depended upon but Mr. Lewis constantly used it for inspection purposes.

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\* Printed at page 38 post.

List of plant to be obtained for year 1922-23 (*vide* extract from a note No. 1304, dated the 3rd May 1926, from the Chief Engineer, Back Bay Reclamation Scheme, at page 37 *ante*).

Item No.	Articles.	Remarks.
1	2 No. Four-wheeled locomotives, 5' 6" gauge with spares.	For work at Colaba.
2	2 No. Six-wheeled locomotives, 5' 6" with spares.	For handling whole trains between Marine Lines and Colaba and for heavy work in quarry.
*3	3 Rystons No. 20 crane navy with rock buckets.	For work in quarry.
†4	1 six-ton at 60' Hercules crane portal type gauge.	For laying protection blocks at Colaba end.
5	2 No. 3 Bernard grabs .. ..	For work at Marine Lines and Colaba. 1 each.
6	2 bogie trucks .. ..	For general work and conveying concrete at Colaba.
7	2 No. 5-ton cranes, 26' radius .. ..	For handling material, Marine Lines and Colaba.
8	4 drills with tripods .. ..	For quarry.
9	106 side-tipping waggons, 20 tons capacity.	For transport of material from quarry.
10	50 end-tipping waggons, 10 tons capacity.	For construction of rubble mound, Colaba end and East Colaba.
11	One trolley .. ..	For use on Marine Lines and Colaba Railway.

\* Whittakers were actually supplied.

† This crane was not ordered.