

Public Works (1896) Department.

RAILWAY BRANCH.

G.O., No. 1064-68

DATED 31st

[Despatch Abstract.]

Capital accounts of Indian Guaranteed Companies. — Statement forwarded by the accountant-general, India office, showing state of the — on 30th June 1893, communicated to the Consulting Engineer and the Examiner, Guaranteed Railway accounts.

6. The effect of this notification, if approved, will be a slight increase in the revenue of the Buckingham canal (estimated at Rs. 54,000 for 1887-88), and also will prevent boats loading and unloading goods and passengers except at authorised places which can be kept clean and under inspection. It will also place all boats using the canal on the same footing as regards payment of wharfage fees.

7. As it is proposed to collect all wharfage fees at the north and south ends of the canal in Madras limits, there will be no difficulty in adding to the declared authorised loading and unloading places if required.

OOTACAMUND,
3rd August 1887.

(Signed) H. R. MEAD, Colonel, R.E.,
Chief Engineer for Irrigation.

To the Joint Secretary to Government,
Public Works Department, Irrigation Branch.

ORDER—dated 16th August 1887, No. 506 I., Public Works.

The notification declaring certain places on the Buckingham canal between the Shadayankuppam lock and the Adyar to be wharves under the Navigation Rules is approved as amended by Government and will be published in the *Fort St. George Gazette*.

2. The Superintending Engineer, II Circle, will report in three months, time if any additional wharves are required within these limits.

(True Extract.)

(Signed) H. R. MEAD, Colonel, R.E.,
Joint Secy. to Govt., P.W.D.,
Irrigation Branch.

To the Superintending Engineer, II Circle.
" Chief Engineer for Irrigation.
" Revenue Department.

Exd. J. Moses.

Spare Copies



Govt. of Madras.
PUBLIC WORKS.

Dated August, 16th.

Recd.

Encl.

G.O., 16th Aug. 1887, No. 506 I.

AUGUST.

Buckingham Canal

Ordering the publication of the notification declaring certain places on the — between the Shadayankuppam lock and the Adyar to be wharves.

REPORT ON THE BUCKINGHAM CANAL.

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REPORT ON THE BUCKINGHAM CANAL.

Fund.—Provincial.

Financial Head.—33, Irrigation and Navigation.

Budget Head.—Works for which Capital and Revenue Accounts are kept:
Capital Account.

Departmental Head.—Works.

Name of Work.—Buckingham Canal.

REFERENCES.

G.O., No. 2153-A, dated 17th August 1876.
Do. " 920, " 17th March 1877.
Do. " 1238, " 10th April "
Do. " 266 W., " 18th June "
Do. " 845 W., " 19th February 1878.
Do. " 283 W., " 6th " 1880.
Do. " 284 W., " 6th " "
Do. " 2080 W., " 3rd September "
Do. " 2081 W., " 3rd " "

REPORT.

THE Buckingham canal is a salt-water Canal (tidal to a great extent whenever the river bars are open) extending along the east coast of the Madras Presidency, southwards 66 miles, from Madras to Merkanam, and northwards 195 miles, from Madras to Pedda Ganjam, at which place communication is made (at the end of the high level Commamur channel) with the fresh-water canal system of the delta of the Kistna, which again communicates with the canal system of the delta of the Godávári.

2. The total length of main navigable canal to Cocanada and northwards thus made available is as below, viz. :—

				MILES.
Buckingham canal	...	...	...	261
High level canals (Commamur channel)	...	...	of the Kistna delta systems.	112
Do.	do.	...	of the Godávári do.	89
Total ...				462

this length being exclusive of any but the direct line of fresh-water canal from Pedda Ganjam to Sámalkót, viz., Bezváda, Ellore, Dowlaishweram, and Cocanada; though the branch canals of the Kistna and Godávári will, no doubt, acting as feeders, bring much traffic to the main line.

3. The canal runs within 3 miles of the sea-coast throughout its entire length and in many parts is within half-a-mile of it.

4. The general features of many parts of the east coast of the southern portion of India are briefly as follows :—
General nature of the country in which the canal is made. Close to the sea there is generally a line of sand dunes, between which and, frequently, a second line of dunes there is a hollow which may be taken as the result of the action of waves, currents and winds on the extension of the coast line eastward, due to the silt, &c., brought down by each river into the sea. These hollows, frequently forming backwaters, are filled with water, and are of sufficient depth in many places for navigation, being supplied with sea-water through the bars of the rivers with which they are in connection.

5. Early in this century (1801) the narrow strips of backwater found at the mouth of the river Kortalayár suggested to Mr. Heefke to obtain from Government permission to cut a canal, about 11 miles in length, from Madras to the southern end of the Ennore backwater; this permission was granted, and Mr. Basil Cochrane was the surety to Government for the terms being complied with.

The contractor, Mr. Heefke, and Mr. Cochrane ultimately obtained the whole control of the canal—completed the section of the canal from Madras to Ennore backwater in 1806. Some cuts were also made near Katupalli between the back-

waters so as to complete the communication with the Pulicat lake, 27 miles distant from Madras. Mr. Cochrane became sole proprietor of the canal for a period of 45 years, dating from 1st November 1802, with permission to levy tolls on it. In 1837,

he having left India, the canal got into bad order, and Government took it over, paying to him Rs. 14,061 a-year, which was the average amount he had been realising from the traffic, until 1847, when his lease expired.

6. Such was the commencement of the East Coast canal, and from the condition of the waterway, as shown in appendix II of the first report of the Madras Public Works Commissioners, there had, by 1852, been great silting up of the bed. The system followed in construction was merely that of joining the backwaters in the cheapest manner possible.

7. The Shadayankuppam lock, 7 miles from Madras, was commenced in 1854, with the object of keeping the level of the water in Cochrane's canal high during periods when the Kortalayár bar at Ennore is open. It was originally sanctioned at 16 feet wide and 105 feet long, but Captain Chambers, R.E., the then Superintendent, obtained permission during its construction to alter it to 20 feet wide and 150 feet long.

8. In the first report of the Public Works Commissioners, compiled in 1852, appendix II, paragraphs 27, 28, notice is taken of improvements to the canal by extending it to Dugarápatnam, 69 miles from Madras, from the northern end of the Pulicat lake; along this line strips of back-water more or less were found, so that the cutting was not heavy and the work was in progress in 1854, and is shown by the progress report for 1856-57 to have been "recently extended" to Dugarápatnam. In the same year improvements were also made to Cochrane's canal to the extent of Rs. 72,800, inclusive of the Shadayankuppam lock, estimated to cost Rs. 25,000.

9. In the same progress report mention is made of a proposed extension of the East Coast canal from Dugarápatnam to Kistnapatam backwater (the estimated cost being Rs. 1,13,665) as having been included in the budget of 1855-56, and the project was recommended to the Honorable Court of Directors in 1855; this estimate was framed by Captain Chambers, R.E., but was not carried out. As shown by G.O., No. 189, of the 20th January 1865, Mr. W. Fraser, C.E., was engaged about that time in a comparison between the merits of Captain Chambers' design of December 1854 and one proposed by Mr. Kennedy in November 1863, and estimated to cost Rs. 2,35,000. Government, however, were unable to provide funds for either.

10. Captain Hasted, R.E., in June 1870, submitted a revised estimate of Rs. 2,87,000 for this section of the canal, which was at the time being cut, following Captain Chambers' line in preference to Mr. Kennedy's; the estimate of Rs. 2,35,000 for the latter was, however, the one on which the work was executed—

					RS.
The expenditure in 1867-68 was	...	...	...	...	6,248
Do. 1868-69	...	...	...	...	64,796
Do. 1869-70	...	...	...	...	35,154
Do. 1870-71	...	...	...	...	29,827

when work was suspended under G.O., No. 274, of 28th January 1873. Funds were provided for the remainder of the work on Colonel Hasted's estimate, and orders were given to push on the work in 1873-74 from Provincial funds, and work to the extent of Rs. 67,000 was carried out in that year; Rs. 59,845 were expended in the year 1874-75, the section being completed in 1876-77 at a total cost of Rs. 2,85,532, thereby placing Nellore in easy communication (with a short length of road from Kistnapatam) by water with Madras. This section was reported open for traffic in May 1875, the portion up to Siddaveram having been made by Mr. Fraser, and from Siddaveram to the Kundalairu by Lieutenant C. B. Henderson, R.E.

11. The next section of the East Coast canal undertaken was that from the Kundalairu river, close to Kistnapatam, to the Pennér river. The work was sanctioned under G.O., No. 814, of the 23rd March 1875, and the line followed is for

the most part identical with that proposed by Captain Chambers nineteen years before; the estimate amounted to Rs. 2,74,000. In G.O., No. 266 W., of the 18th June 1877, certain modifications, including the Kistnapatam basin, were sanctioned, estimated by Mr. O'Shaughnessy to cause an addition of Rs. 14,100. This section was commenced by contract in 1875-76, in which year 25,000 rupees were spent on it, Rs. 1,71,658 being spent in 1876-77. Six miles were completed by November 1876. In the year 1877-78 this section was employed as a famine work for the distressed of the Nellore district, Rs. 1,06,755 being expended, and the work completed in 1878-79 at a total cost of Rs. 3,63,536. This section was open for traffic in May 1877; having been under Lieutenant C. B. Henderson, R.E., from 1873-75, under Lieutenant Cotter, R.E., in 1876, and, lastly, under Sub-Engineer Ottmann and Supervisor Stephens.

12. G.O., No. 1302, of 24th May 1876, shows the state of the work up to that date, and points to the anxiety of Government to complete at an early date the communication with the Godávári and Kistna systems of navigation. Lieutenant Cotter, R.E., in June 1875, had reported on the section from the Pennér to the Chippalairu, and had pointed out that the high floods of October 1874 in the Pennér had altered the features of that river since Captain Chambers had selected his line as being the most suitable one for the canal.

13. The pressure of famine being very severe in the districts to the west of Nellore, it was decided in G.O., No. 3060, of 15th November 1876, that this section of canal should be immediately proceeded with by famine labor imported from the Bellary, Kurnool, and Cuddapah districts. Under the orders of Mr. O'Shaughnessy, the District Engineer of Nellore, Lieutenant C. B. Henderson, R.E., was directed to lay out the section of canal between the Pennér and Chippalairu, and he did so, following, where practicable, Captain Chambers' line and giving a bed width of 30 feet with side slopes of $2\frac{1}{2}$ to 1. The bed of the canal was fixed at $3\frac{1}{2}$ feet below a mean of all low-tides recorded for six months, and 3 feet below the lowest recorded spring-tides. This section was ordered to be carried out by 10,000 coolies from Bellary and Kurnool. After laying out the portion to the Chippalairu, Lieutenant C. B. Henderson, R.E., was directed to survey and lay out the section to the north of the Chippalairu for the employment of a second batch of 10,000 coolies.

14. At the same time Lieutenant C. C. Rawson, R.E., was directed to commence at Pedda Ganjam and survey and set out work for the employment of 20,000 more coolies on 42 miles.

15. The surveys and estimates were pushed on as quickly as practicable, but in this case, as in all the famine works, it was primarily necessary to employ and pay or feed the coolies, and so the work of projection and estimation had necessarily to take a secondary place; however, Lieutenant Henderson, R.E., in the Pennér to Mannairu section, and Mr. deGroussillers, an Executive Engineer of the Bengal Public Works Department, in the Mannairu to Pedda Ganjam, nevertheless, pushed on the plans and estimates quickly, at the same time that they supervised the execution of the works.

16. In his original report on the Pennér-to-Pedda-Ganjam section of the canal, Mr. O'Shaughnessy states that the line is generally the same as that selected by Captain Chambers in 1855, but that certain deviations had to be made; in the first four miles a deviation to the westward was made, as Captain Chambers' line was too near the sea; in the 7th and 8th miles a deviation was made to avoid cutting through a high ridge; in the 10th to the 14th miles a deviation was made to obtain a sufficient cutting for towpaths and embankments; in the 15th mile a deviation to avoid a deep cutting was made. Between the Chippalairu (about the 20th mile) and the 52nd mile north of the Pennér no deviation was made from Captain Chambers' line; from the 52nd to the 56th miles a trifling deviation was also made to carry the line further from the sea. A considerable deviation was made from the Moosee river, near Ethamukala, to the Ongole road, between the

56th and 63rd miles, to avoid a very heavy cutting through sand, and also to keep clear of some valuable land.

17. In regard to the level of the bed, Mr. O'Shaughnessy writes:—"Hitherto 4½ feet below mean tide level has been the specified depth of the canal. It was supposed that the range of tides was about 3 feet, and that a depth of 4½ feet below M.S.L. would give a minimum depth of 3 feet for navigation at low-tide."

* * * It has been found, however, that the range of the tides is more than 3 feet at Kistnapatam; a gauge has registered a range of 3 feet 10 inches, and at the Mannairu, 71 miles further north of the gauge, has shown a difference of level between high and low water of spring-tides of over 4 feet; if the canal was cut to 4½ feet below mean tide in those reaches, there would be only 2 feet 6 inches or 2 feet 7 inches of water at low-tide, or about 6 inches less than the depth required."

18. Mr. O'Shaughnessy points out that this error has been carried through the section between Kistnapatam and the Pennér, but to the north of the latter river it has been avoided by fixing gauges at the open bars and cutting the canal out to a depth of 3 feet below the lowest readings on the gauges. The width at the bed was made 30 feet, with side slopes of 2, 2½ and 3 to 1, according to the nature of the soil.

19. Mr. O'Shaughnessy estimated that the whole excavation required for the canal from the Pennér to Pedda Ganjam would be 8,652,146 cubic yards at 1 anna 10 pies per yard, and his subsequent report shows that, in actual working, 7,959,708 cubic yards completed by the end of May 1878 had cost, on an average, 2 annas 2¾ pies per yard, an excess which he had attributed to the employment of famine labor.

20. The same officer reports that including 16¼ miles of the Kistnapatam-to-Pennér section and 16¾ miles of new canal along the margin of the Pulicat lake, a total length of 115½ miles of canal were open to traffic between December 1876 and January 1878, and gave employment to an average of 32,000 work-people daily, while the greatest number of people on the work at one time was 61,200 (or, including women and children, 100,000 persons were at one time on the work during the famine); and he concludes his report by an allusion to the fact that he had asked for and obtained permission from His Grace the Duke of Buckingham to name the canal after him. It may here be observed that the portion of the canal from Madras to Ennore appears to have been originally (*vide* atlas sheet No. 78) named after the great Lord Clive. The designation subsequently applied to the work, "East Coast Canal," so distinctly pointed to the position of the work on the map of India that it seems doubtful whether, looking also to the fact that Government did not take the initiative in the matter, His Grace did not permit it to be called after himself rather than wound the feelings of an energetic District Engineer, during whose charge of the Nellore division the junction with Kistna system of canals had been completed. That the work was no new design, but had been steadily prosecuted, at intervals, ever since the beginning of the century, especially in the years 1867 to 1870, and with even more vigor again in the years 1872 to 1875, will have been observed from the history as above narrated. The designation of the work as the Buckingham canal is, however, so far the accepted one, that there is now no sufficient reason for again altering it.

21. Turning to the Southern canal, Colonel Foord's memorandum, dated the 29th November 1878, printed with G.O., No. 1102, of the 20th May 1879, puts on

record, in paragraphs 26 to 47, the whole history of the work, which is quoted below for ready reference:—

"26. The project of excavating a canal along the eastern coast between the Adyar and the Pálár, with the view of perfecting the long line of inland water communication north and south of Madras, was brought forward for consideration in the year 1854. Two points in connection with this project particularly claimed attention—

- "(1) The possibility of keeping the canal navigable throughout the year; and
- "(2) The substitution of masonry bridges in lieu of ferries, recommended by the Chief Engineer, at each of the places where the road crossed the proposed water communication.

"27. The Chief Engineer, who made a personal examination of the canal, reported that it was quite possible to keep up an unfailing supply of water, averaging 4 feet 6 inches, in seasons of the greatest drought, by artificial cuttings of the bars at Covelong and at the mouth of the Pálár. This result, however, could only be attained by a proper system of locks with a sluice or culingulah at Covelong for the admission of tidal water. Bridges were also recommended at three places. The whole cost of the work was estimated at Rs. 2,21,800.

"28. The length of the canal was to be 40 miles. The first section extended from the river Adyar to the town of Sadras, a distance of 35 miles. This section was commenced in May 1855 and completed in the early part of March 1857, with a surface width of 45 feet and a depth varying from 3 feet 6 inches to 4 feet 6 inches. Boats drawing 1 foot 6 inches were, in March 1857, enabled to use this section throughout, and it was calculated that there would be sufficient water for passenger traffic and the transport of light goods even when the Adyar, Covelong, and Yeroor bars were closed.

"29. The expenditure on the canal amounted to Rs. 1,75,500, against the sanctioned estimate of Rs. 2,21,800.

"30. The extension to the river Pálár, 5 miles south of Sadras, was estimated to cost Rs. 54,750. The average cost of the 40 miles of canal between the rivers Pálár and Adyar, including five large bridges, each 60 feet span, was thus Rs. 7,000 per mile.

"31. In March 1857 an estimate, amounting to Rs. 7,800, was sanctioned for completion of a cut through pure sand, close to the sea, between Sadras and the Pálár, 1½ miles in length.

G.O., No. 414, of 4th March 1857.

The object of the work was to improve the alignment.

"32. In the same year a committee was appointed to consider the question of the existing navigation, and the measures necessary for its improvement and extension. As regards the Southern canal, the committee recommended the establishment of landing places in different parts of Madras, with the view of bringing the Cooum into use for purposes of traffic, the connection of the canal with the Cooum at its northern end and with the Pálár at its southern end, and the construction of feeder roads. The Government recognised the importance of the

G.O., No. 166, dated 29th January 1858.

proposed measures, and called for plans and estimates.

"33. The estimate of Rs. 7,800, sanctioned in March 1857, for the extension of the canal, from Sadras to the Pálár river, was, in December 1859, superseded in favor of an estimate of Rs. 21,000. This estimate provided for the alignment being taken further inland.

"34. In July 1861 the Government, on a representation of the Chief Engineer, urging the commencement of the work, remarked that they did not see sufficient prospect of its proving so remunerative as to then justify the proposed large outlay. It was intimated, however, that it was intended ultimately to connect the canal terminus at the Adyar with the Northern canal, the scheme would be considered as a whole.

"35. The estimate of Rs. 2,21,800 for the Sadras canal was subsequently reduced to Rs. 2,18,873, and of this sum Rs. 1,91,000 were spent, when further outlay was suspended for financial reasons, leaving the canal incomplete. In April 1862 the Government sanctioned a further expenditure of Rs. 29,000 for deepening and widening the canal between the Sadras river and Salan-cooum. This estimate provided for deepening the southern portion of the canal to 4½ feet below mean tide, and was designed to complete the canal as allowed for by the estimate of Rs. 2,18,873.

"36. One of the main considerations in sanctioning the Sadras canal was its capability of being prolonged to Cuddalore, to join there the canal from Porto Novo, which again is connected with the line of water communication between Coimbatore and the sea-coast through the district of Tanjore. This section of canal was sanctioned by the Government of India in July 1853 at an estimated cost of Rs. 40,000, and provided for connecting the ports of Porto Novo and Cuddalore by a cutting from the river Vellár, near Porto Novo, to the Paravanár or Cuddalore river. The canal was designed to give sea-outlet to the traffic carried by the navigation of the Coleroon and Vellár rivers, the former of which runs inland a distance of 150 miles through Tanjore and Trichinopoly into Coimbatore.

"37. There being through water communication along the coast from the Adyar to Sadras, and from Cuddalore to Porto Novo, it was proposed, in March 1856, to excavate a canal