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MADRAS RECORD OFFICE.

Government of Madras.

Public works DEPARTMENT.

G.O. No. 3624 Press ~~Mis.~~

288-289

Dated 4-11- 1866.

Not to be folded or roughly handled

Proceedings of the Madras Government, Public Works Department,
14th November 1866.

No. 288. Read the following letter from the Consulting Engineer for Irrigation and Canal Company, to the Secretary to Government, Department Public Works, dated Madras, 31st October 1866, No. 84:—

1. I have the honor to submit, for the consideration of Government, a letter, No. 274 of the 15th instant, from the Agent and Manager Madras Irrigation and Canal Company, with its accompaniment* from the Chief Engineer, transmitting a revised estimate for the upper six miles, 73rd to 78th, of the 6th Section, Main Canal.

1 Letter in original, General No. 432.
11 Estimates.
2 Plans.

* No. 507, 3rd Instant.

2. The reason for the submission of a separate revised estimate for these six miles, instead of one for the whole section, is that this portion only of the section is to carry water for irrigation, the remaining thirteen miles being a still water navigation canal, and, on the resumption of work, it is intended first to arrange, as far as may be, for the completion of the works in the upper sections on which the development of irrigation is dependent, and afterwards to take up those connected with navigation.

3. The previous sanction for those miles is included in the estimate Rupees 3,02,000, sanctioned in the Order of Government No. 1,555, of the 3rd July 1862, and it amounted to Rupees 45,400. The revised estimate is Rupees 1,43,520, the increase being 98,120, or 216 per cent.

4. The Chief Engineer attributes the excess of the revised over the original estimate to—

(1.) Increase of top width of bank from 5 to 9 feet.

(2.) Increase of slopes from $1\frac{1}{2}$ to 1, to 2 to 1.

† The original estimate allows $1\frac{1}{4}$ Annas a cubic yard generally, with 4 to 6 Annas for rock-cutting.

(3.) Increase of rate from 13 cubic yards† to 5 cubic yards for 1 Rupee for work remaining to be done.

(4.) Catch-water drains not provided for in original estimate.

(5.) Revetment in 73rd mile do. do.

(6.) Increase of contingencies from five to ten per cent.

5. The Chief Engineer appears to have made a mistake in supposing the top width of the original arrangement to have been only five feet. The sheet of cross sections furnished to this office gives a width of nine feet, and the estimate corresponds thereto. I find, however, that the estimate was not correctly prepared, for the depths do not in all cases correspond with those obtainable from the longitudinal section. The information in this office does not enable me to check the 73rd mile, but the 74th is tolerably regular, and I find that where‡ the estimate shows a cutting of one and a half feet, the longitudinal section has the bed above ground, and the next part, 760 yards in length, is put as averaging $2\frac{3}{4}$ feet of cutting,

‡ For a length of $333\frac{1}{3}$ yards.

whereas the section gives 1½ feet as the maximum cutting. I have had the 74th to 78th miles checked, and the differences are :—

	Estimate.	Calculated in this Office.	
74th mile C. Yd. ...	84,146	1,04,707	
75th ,, ,, ...	80,512	1,09,833	
76th ,, ,, ...	72,992	81,527	
77th ,, ,, ...	58,694	89,959	
78th ,, ,, ...	66,261	73,085	
	3,62,605	4,59,111	96,506

or more than 25 per cent. less in the estimate than the section would seem to require.

6. The present estimate provides for slopes both inside and outside of 2 to 1, in lieu of 1½ to 1. The flatter slope on the inside or water slope will in some parts be advantageous, though it is not really necessary where the cuttings furnish shale ; but the increase of slope is not required outside, and it would not be wise to incur extra expense without good cause. I think also that a top width of bank of six feet is ample for a canal of such comparatively small section,* and, as I find that if the banks be formed with such a top width and with inside slopes at 2 to 1 and outside 1½ to 1, upwards of a lac of cubic yards will be saved on the 74th to 78th miles, which quantity, at the rate entered in this estimate, five cubic yards the Rupee, makes a difference of 20,000 Rupees, it is certainly worth while to make this alteration. No doubt the extra section of banks would in some degree compensate for an indifferent execution of the work, and, as I have already had occasion to notice,† there is room for improvement in that already done ; what is wanted, however, is ordinary care and judgment in the formation of the banks, and a fair margin of excess of strength in their cross section, but not a very wide margin as a compensation for inefficient work.

* Depth of water five feet, surface width sixty feet.

† Letter No. 70, dated 1st instant, paragraph 31.

7. With regard to the increase of rates from Anna 1 Pice 2, allowed in the original estimate, to Annas 2 Pice 7 for the work done, and to the allowance of Annas 3 Pice 2⅝ for that remaining to be done, it appears to me equally evident that the first rate was too low, and that the last is unnecessarily high. It must be remarked, however, that the sanctioned estimate allowed a separate rate for rock cutting. 6 Annas for the work of this kind in the 73rd mile, and 4 Annas a cubic yard for that in the other miles, and the Anna 1 Pice 2 rate was entered for all the other earthwork. The present estimate itself contains evidence, I think, that the work already done has cost more than was necessary. In the 76th mile there is the most considerable cutting, and the shale there is more compact than that at any other part, except in the 73rd mile, and yet the average rate for the work done in the 76th mile is Annas 2 Pice 2 a cubic yard, while in other miles, under more favorable circumstances, it is higher, being greatest in the 74th mile Annas 3 Pice 2⅛, Annas 3 Pice 0⅛ in the 73rd mile, which perhaps might have been expected to have been the highest, Annas 2 Pice 10-⅞ in the 75th mile, Annas 2 Pice 2⅛ in the 77th mile, and 2 Pice 3 in the 78th mile.

8. My opinion is that the work already done could have been executed in a thoroughly efficient manner for an average of 2 Annas a cubic yard, whereby

Rupees 12,417 would have been saved, and that for the work remaining to be done a like rate should suffice ; but, taking into account that the earth for the finishing work will have to be carried somewhat further, it may be proper to allow seven, instead of eight, yards for the Rupee, and this rate, it may be again noticed, has proved sufficient where the work is of more than average difficulty.

9. The fourth cause of increase is the catch-water drain, an item not before provided. The ground has a transverse slope, and such drainage is necessary ; but I believe the rates, 12 Annas a cubic yard in the 73rd and 74th miles, are more than double what are necessary, and the 4 Annas in the other miles are about thirty per cent. in excess. Even were the whole cutting in compact shale in the former miles, about 6 Annas would suffice, but everywhere there is some surface soil, and this tends to lower the average. The estimate, Rupees 3,891-3-10, for this work is about 1,250 Rupees higher than it need be.

10. The fifth cause of increase is the provision of 7,810$\frac{1}{27}$ cubic yards of revetment for the 73rd mile, and, as I suppose, for that part of the mile above the regulating lock. A good deal of work of this kind has been done, and, if forming part of the quantity estimated for, it should have been shown in the column for work executed in the comparative Statement. The details of the estimate are not very comprehensible, for the longitudinal section shows no part of the canal bed above ground, and the maximum height of the revetment would be where the bed and ground are on the same level, and that height would be 14 feet, whereas 20·28 feet are the average height allowed for the left bank, and 17·02 for the right bank. If, on the other hand, the depth or height is measured on the slope, an average thickness of two and a half feet is unnecessary. Supposing the lengths to be correct, the maximum quantity of revetment necessary would appear to be 4,504 × 2 × 14 = 1,26,112 cubic feet = 4,671 cubic yards, instead of 7,800 cubic yards, and admitting 6 Annas as the rate, and it is certainly high enough, as the material is most abundant from the Metacondal cutting close by, the cost would be Rs. 1,751-10-0.

11. The last of the enumerated causes of increase is the allowance of ten instead of five per cent. for contingencies. The higher rate is that which has generally been allowed in recent estimates, and, although it should seldom be reached, it is perhaps as well that it should form part of the sanction. It may be remarked, however, that if ten per cent. be sufficient, there must have been a want of proper supervision and management hitherto, for the actual per-centage of contingencies on the past expenditure of the 6th Section is 20·89.

12. The above remarks on the several parts of the revised estimate will show why I consider that the full amount of supplementary sanction asked for should not be given. I beg to recommend, therefore, that additional sanction be granted as follows :—

			Rs.	A.	P.
Expenditure already incurred on 3,41,483⅔ cubic yards of earthwork	... ...		55,102	11	8
Work required to complete as per estimate, cubic yards	3,42,742⅔				
Deduct on account of reduction of section of banks to 6 feet top width with 2 to 1 inside and 1½ to 1 outside slopes	1,00,000				
Cubic yds.	2,42,742⅔	at 7 C. Y. per 1 R.	34,677	8	7

Catch-water drains.

				RS.	A.	P.
1,500⅝ Cub. yds. at 6 Annas	562	13	4			
7,789¾ ,, ,, 3 ,,	1,460	9	5			
Revetment 4,671 Cub. yds., at 6 As.				2,023	6	9
				1,751	10	0
Contingencies, 10. per cent.				93,555	5	0
				9,354	11	0
Deduct amount already sanctioned in original estimate				1,02,910	0	0
Balance requiring sanction				45,400	0	0
				57,510	0	0

13. I should add that no alteration has been made in the cross section of the embankments in the 73rd mile, as estimated for the Chief Engineer. Above the regulating lock the depth of water will be ten feet, or double that of the lower parts, and it will be well to allow there the stronger section of bank. For the 33 chains below the lock, the section of the banks may be reduced, and the Chief Engineer can, if he thinks it advisable, use the earthwork so saved for giving an extra foot of width to the lower embankment wherever bed level is more than two feet above the surface of the ground, or the total depth of water greater than seven feet, which is the case in the neighbourhood of the drainage culverts.

From the Agent and Manager Madras Irrigation and Canal Company, to the Consulting Engineer for Madras Irrigation and Canal Company, dated Madras, 15th October 1866, No. 274.

I have the honor to transmit, for the sanction of Government, the undermentioned revised plans and estimates for earthwork in the Bowanassy Division, together with copy of the Provisional Chief Engineer's letter No. 507 of 3rd October 1866 :—

PLANS.

1 Sheet cross sections in 73rd, 74th, and 75th miles
1 do. do. 76th, 77th, and 78th ,,

ESTIMATES.

6 Estimates of 73rd, 74th, 75th, 76th, 77th, and 78th miles.
1 do. Revetment, 73rd mile.
1 do. Earthwork in catch-water drains from 73rd to 78th miles.
1 Abstract Estimate.
1 Statement showing differences between original and revised estimates.
1 Comparative Statement.

From the Officer in charge to the Agent and Manager Madras, dated Kurnool, 3rd October 1866, No. 507.

1. I have the honor to forward, by Book post, for the sanction of the Board and Government, plans and estimates of the 6th Section, Bowanassay Division, for earthwork.

The enclosures to this letter are :—

ESTIMATES.

Estimate of 73rd mile.
Do. 74th ,,
Do. 75th ,,
Do. 76th ,,
Do. 77th ,,
Do. 78th ,,
2 Abstract Estimates,
2 Statements,
2 Comparative Statements,
} Board and Government.

PLANS.

2 Drawings, } For Board and Government.
2 Tracings, }

2. I have to add that the excess of the revised estimates over the original estimate is due to
(1.) Increase of top width of bank from 5 to 9 feet.
(2.) Do. of slopes from 1½ : 1 to 2 : 1
(3.) Do. of rate from 13 cubic yards to 5 cubic yards for 1 Rupee for work remaining to be done.
(4.) Catch-water drains not provided for in original estimates.
(5.) Revetment in 73rd mile, not estimated for in original estimate.
(6.) Increase for contingencies from 5 to 10 per cent.

NOTE.—The average rate paid for work already completed is six cubic yards for 1 Rupee.

No. 289. ORDER THEREON, 14th November 1866, No. 3,624.

CIVIL WORKS, No. 63.

1. With this letter the Consulting Engineer for the Madras Irrigation and Canal Company submits a revised estimate of Rupees 1,43,520 for the upper six miles of the 6th Section of the Company's Canal. The original estimate for this portion of the project amounted to Rupees 45,400, and the excess is therefore Rupees 98,120, or 216 per cent.

2. The Chief Engineer of the Company explains this excess to be due to the following causes :—

First.—The necessity for increasing the top width of the bank and flattening the slopes.

Second.—The omission to provide for catch-water drains, and for revetments in the 73rd mile.

Third.—The insufficiency of rates, &c.

3. After a careful examination Captain Mullins reports that the original estimate was incorrectly prepared, and that the revised estimate is unnecessarily high. He explains that a top width of a bank of six feet, instead of nine as proposed by the Chief Engineer, with inside slopes of 2 to 1 and outside of 1½ to 1 will be ample for a canal of such a comparatively small section, and that the rates provided are susceptible of considerable reduction. He accordingly proposes that the revised estimate should be reduced as shown in paragraph 12 to Rupees 1,02,910, and the Government, fully concurring with the Consulting Engineer in his remarks, sanction the revised estimate as modified by him.

(True Extract.)

(Signed) CHARLES A. ORR, Colonel, R. E.,
Secretary to Government.

To the Consulting Engineer Madras Irrigation and Canal Company,
With two Plans and eleven Estimates.
,, Manager for do. do.

Exd S. T. Augustin.

No 274

Madras Irrn. & Canal Company

Madras 15th Oct 1866

From

The Agent and Manager
Irn. I & C Co.

To

The Consulting Engineer
Irn. I & C Co.

Sir

I have the honor to transmit for the sanction of Government the undermentioned Revised Plans and Estimates for Earthwork in the Bowanapey Division, together with Copy of the Revd. Chief Engineer's letter No 8070 of 30 October 1866.

Plans

1 Sheet Longl Sections in Ms. 74 & 75 Miles
1 do do do 76. 77 & 78 "

Estimates

6 Estimate of Ms. 74. 75. 76. 77. & 78 Miles
1 do Revetment Ms Mile
1 do Earthwork in Catch Water Drains from Ms 6 to 8 Miles
1 Abstract Estimate
1 Statement shewing differences between original & Revised Estimates
1 Comparative Statement

I have the honor to be
Sir
Your most Obed't Servt
Robert Nelson Love
Agent and Manager

No 507

H. M. P. W. Office
Chief Engineer's Office
Rangoon 2nd October 1866

To
The Hon'ble Col. Agnew
Agent for Irrigation
Madras

Sir,

I have the honor to forward by Bark Post, for the sanction of the Board & Government, Plans and Estimates of the 6th Section Bonwan Spur Diversion for Earthwork &c.

The enclosures to this letter are:-

Estimates

Estimate of 73 Mile
—— do —— " 74 — "
—— do —— " 75 — "
—— do —— " 76 — "
—— do —— " 77 — "
—— do —— " 78 — "
2. Abstract Estimates
2. Statements
2. Comparative Statements

Plans

2. Drawings
2. Tracings } for Board & Government

2. I have to add that the excess of the revised estimates over the original estimate is due to—

(1) Increase of top width of bank from 5 to 9 ft
(2) do of slopes from 1½ : 1 to 2 : 1
(3) do of rate from 18 Cuyds to 5 Cuyds for 1 Rupee for work remaining to be done.

Board of Revenue

(4)

(4) Catchwater drains not provided for in original estimates—

(5) Restrictment in 7½ Miles not estimated for in original estimate.—

(6) Increase for Contingencies from 6 per cent to 10 per cent.—

Note—

The average rate paid for work already completed is 6 cyds for 1 Rupee.—

I have &c

(True Copy) (Sd) C. B. Thornton
Officer in charge

To Hartwell Nightingale
Agent & Manager

No 1 Public Works Office 8-84

No 274

1866

From

To the Chief Engineer & Secretary to Government
Public Works Department

Agent & Manager Madras Irrigation & Canal Co
No 507 - 3rd inst.—

Consulting Engineer's Office
Irrigation & Canal Company.
Madras, 31st October 1866.

No 84.

From,

Captain, J. Mullins, R.E.
Consulting Engr for I. & C. Co.

To,

The Secretary to Government
Department of Public Works.—

Sir,

1. I have the honor to submit for the consideration of Government, a letter, No 274 of the 15th instant, from the Agent and Manager, Madras Irrigation and Canal Company, with its accompaniment from the Chief Engineer, transmitting a revised estimate for the upper 6 miles, 73 M. No 78 ch., of the 6th Section Main Canal.—

2. The reason for the submission of a separate revised estimate for these six miles, instead of one for the whole Section, is that this portion only of the Section is to carry water for irrigation, the remaining 13 miles being a still water navigation canal, and on the resumption of work, it is intended

intended first to arrange, as far as may be, for the completion of the works in the upper Sections on which the development of Irrigation is dependent, and afterwards to take up those connected with Navigation.—

3 The previous sanction for these miles is included in the Estimate Rupees 3,02,000, sanctioned in the order of Government No. 1555 of the 3rd July 1862, and amounted to Rupees 1,58,400.— The revised estimate is Rupees 1,43,520, the increase being 98,120, or 216 per cent.—

4 The Chief Engineer attributes the excess of the revised over the original estimate to

1. Increase of top width of bank from 5 to 9 feet.—
2. Increase of slopes from 1½ to 1 to 2 to 1
3. —— Do —— of Rate from 13 cubic yards* to 5 cubic yards for 1 Rupee for works remaining to be done.—
4. Catch water drains not provided for in original estimate.
5. Revetment in 73rd mile —do— —do—
6. Increase of Contingencies from 5 to 10 per cent.—

* The original estimate allows 6⅔ annas a Cubic Yard generally with 4 to 6 annas for rock-cutting

5. The Chief Engineer appears to have made a mistake in supposing the top width of the original arrangement to have been only 5 feet.— The sheet of cross sections furnished to this office gives a width of 9 feet, and the estimate corresponds thereto— I find however that the estimate was not correctly prepared, for the depths do not in all cases correspond with those obtainable from the Longitudinal Section— The information in this office does not enable me to check the 73rd mile, but the 74th to 78th

for a length of 333⅓ yards.

are tolerably regular, and I find that where the estimate exhibits a cutting of 1½ feet, the Longitudinal Section has the bed above ground, and the next part, 760 yards in length, as puts has averaging 2¾ feet of cutting, whereas the Section gives 1½ feet as the maximum cutting. I have had the 74th to 78th miles checked and the differences are

	Estimate C. Yds.	Calculated in this office	
74th mile	84,146	104,707	
75th ——	80,512	109,833	
76th ——	72,992	81,527	
77th ——	58,694	89,959	
78th ——	66,261	73,085	
	362,605	459,111	96,506

or

or more than 25 per cent less in the estimate than the Section would seem to require.—

6 The present estimate provides for slopes both inside and outside of 2 to 1, in lieu of 1½ to 1.— The flatter slope on the inside or water slope will in some parts be advantageous, though it is not really necessary where the cutting is of rock; but the increase of slope is not required outside, and it would not be wise to incur extra expense without good cause. I think also that a top width of bank of 6 feet is ample for a canal of such comparatively small section, and as I find that, if the banks be formed with such a top width, and with inside slopes at 2 to 1 and outside 1½ to 1, upwards of a lac of cubic yards will be saved on the 74th to 78th miles, which quantity, at the rate entered in this estimate — 5 cubic yards the Rupee, makes a difference of 20,000 Rupees, it is certainly worth while to make this alteration.— No doubt the extra section of banks would in some degree compensate for an indifferent execution of the work, and, as I have already had occasion to

× depth of water 5 feet surface width 60 feet.

× Letter No. 70 of 1st instant para: 31.

notice, there is room for improvement in that respect already done; what is wanted however is ordinary care and judgment in the formation of the banks, and a fair margin of excess of strength in their cross section, but not a very wide margin as a compensation for inefficient work.—

7 With regard to the increase of rates from a-p 1-2 allowed in the original estimate, to a-p 2-7 for the work done, and to the allowance of a-p 3-2½ for that remaining to be done, it appears to me equally evident that the first rate was too low, and that the last is unnecessarily high.— It must be remarked however that the sanctioned estimate allowed a separate rate for rock cutting — Cannada for the work of this kind in the 73rd mile, and 4 annas a cubic yard for that in the other miles, and the a-p 1-2 rate was entered for all the other earthwork.— The present estimate itself contains evidence, I think, that the work already done has cost more than was necessary.— In the 76th mile there is the most considerable cutting, and the chalk there is more compact than that at any other part, except in the 73rd mile, and yet the

the average rate for the work done in the 76th mile is as 2-2 a cubic yard, while in other miles under more favorable circumstances it is higher, being greatest in the 74th mile as 3-2½, in the 73rd mile as 3-"6 which perhaps might have been expected to have been the highest, in the 75th mile, as 2-10/10 in the 77th mile, as 2-2 3/10 and in the 78th mile as 2-3.

8. My opinion is that the work already done could have been executed in a thoroughly efficient manner for an average of 2 annas a cubic yard, whereby Rupees 12,417 would have been saved, and that for the work remaining to be done a like rate should suffice; but, taking into account that the earth for the finishing work will have to be carried somewhat further, it may be proper to allow 7/ instead of 6/ yards for the Rupee, and this rate it may be again noticed has proved sufficient where the work is of more than average difficulty.—

9. The 4th cause of increase is the catch-water drain, an item not before provided. The ground has a transverse slope and such drainage is necessary, but I believe the rates 12 annas a cubic yard in the 73rd and 74th miles are more than double what are necessary, and the 6 annas in the other miles are about 30 per cent in excess. Even were the whole cutting in compact shale in the former miles, about 6 annas would suffice, but everywhere there is some surface soil and this tends to lower the average. The estimate Rupees 3,891-3-10 for this work is about 1250 Rupees higher than it need be.—

10. The 5th cause of increase is the provision of 7,810 27/27 cubic yards of revetment for the 73rd mile and, as I suppose, for that part of the mile above the regulating locks. A good deal of work of this kind has been done and, if forming part of the quantity estimated for, it should have been shewn in the column for work executed in the Comparative Statement. The details of the estimate are not very comprehensible, for the longitudinal section shews no part of the canal bed above ground, and the maximum height of revetment would be where the bed and ground are on the same level, and that height would be 14 feet, whereas 20.28 feet are the average height allowed for the left bank and

17.02

17.02 for the right bank. — If on the other hand the depth or height is measured on the slope, an average thickness of 2½ feet is unnecessary. Supposing the lengths to be correct, the maximum quantity of revetment necessary would appear to be 4,504 × 2 × 14 = 126,112 cubic feet = 4,671 cubic yards, instead of 7800 cubic yards, and admitting 6 annas as the rate, and it is certainly high enough as the material is most abundant from the Metacondal cutting close by, the cost would be Rupees 1751-10-—

11. The last of the enumerated causes of increase is the allowance of 10 instead of 5 per cent for contingencies. The higher rate is that which has generally been allowed in recent estimates, and, although it should seldom be reached, it is perhaps as well that it should form part of the sanction. It may be remarked however that, if 10 per cent be sufficient, there must have been a want of proper supervision and management hitherto, for the actual per centage of contingencies on the past expenditure of the 6th Section is 20.89.—

12. The above remarks on the several parts of the revised estimate will shew why I consider that the full amount of supplementary sanction asked for should not be given. — I beg to recommend therefore that additional sanction be granted as follows:

Expenditure already incurred on 3,41,483 2/9 cub: yards of earthwork	55,102-11-8
Work required to complete as per estimate cubic yards — 3,427 42/9	
D.D. on account of reduction of Section of banks to 6 feet top width with 2 to 1 inside —	
and 1½ to 1 outside slopes — 100,000 at 7 cy^ds = 1 Rup:	34,677-8-7
Cubic yards 242,742 9/9	
Catchwater drains.	
1,500 8/9 cub yards @ 6as	562-13-4
7,789 29/36 — " — " — 3as	1,460-9-5
	2,023-6-9
Revetment 4,671 cub yards @ 6as	1751-10-"
	93,555-5-"
Contingencies 10 per cent	9,354-11-"
	102,910-"
Deduct amount already sanctioned in original estimate	45,400-"
Balance requiring sanction	57,510-"

13. I should add that no alteration has been made in the cross Section of the Embankments in

in the 73rd mile as estimated for by the Chief Engineer.— Above the regulating locks the depth of water will be 10 feet or double that of the lower parts, and it will be well to allow there the stronger section of banks.— For the 33 chains below the locks the section of the banks may be reduced, and the Chief Engineer can, if he thinks it advisable, use the earthwork so saved for giving an extra foot of width to the lower embankments. Wherever bed level is more than two feet above the surface of the ground or the total depth of water greater than 7 feet, which is the case in the neighbourhood of the drainage culverts.—

I have the honor to be
Sir
Your most obedient servant,
Wm Hutchins Captain R.E.
Canal Engr for D.C. Company.—

Public Works Department.

No. 3624

PROCEEDINGS of the MADRAS GOVERNMENT.

Under date the 14th November 186 .

Read the following

From the Consulting Engineer
for Canal Company (Here enter No. 84 dated 31st October 1866.)

With this letter the Consulting Engineer for the Madras Irrigation and Canal Company submits a revised estimate of Rs 143520 for the upper 6 miles of the sixth section of the Company's Canal. The original estimate for this portion of the project amounted to Rs 45400, and the excess is therefore Rs 98,120, or 216 per Cent.

The Chief Engineer of the Company explains this excess to be due to the following causes:-

1. Necessity for increasing

City in Atlantic Engine
of 18th December 1866

No. 84 Consulting Engineer
Madras 31st October 1866.
To
The Secretary to Govt.
P.W.D.

Dated 31st October 1866
Rec'd 2nd Nov 1866
Enclosures 14.

Estimate for the construction
of Government
a Letter No 234 dated 15
Received from the Chief
with accompaniments
from the Chief Engineer
transmitting a revised
estimate for the upper
6 Miles 73 to 78 of the
Section Main Canal.

No. 3624 - 14 Nov 1866.

No. 3624
Dated 14th Nov 1866.

the top width of the banks (flattening and the slopes.

2. The omission to provide for catchwater drains, and for revetments in the 73rd Mile.

3. The insufficiency of Rates &c.

After a careful examination Capt. Drullens reports that the original estimate was incorrectly prepared, and that the revised estimate is unnecessarily high. He explains that a top width of banks of 6 feet, instead of 9 as proposed by the Chief Engineer, with inside slopes of 2 to 1 and outside of 1½ to 1 will be ample for a Canal of such a comparatively small section, and that the rates provided are susceptible of considerable reduction. He accordingly proposes that the revised estimate should be reduced as shewn in Para 12 to Rs 1,02,910, and the Govt. fully concurring with the Consulting Engineer in his remarks, sanction the revised estimate as modified by him.-

18

3

To
4
4

The Consulting Engr. G.I.P.C. Company with two plans & eleven notes ✓
" Manager for Do. ✓

Dept. 15th Nov.

Copy in a Letter to England
D/ 18th December No. 64 of 1866.

D/ N. 1866 Despr
Rec: of Govt for Power
Le 3824
Rec: of Govt for Power
D/ 14th Jany 1867

The revised Estimate
of £ 102,910 for the upper
Section Miles of Sixth Section
of the Irrigation Company's
Main Canal, sanctioned
with observations -

C/ 200. 289.
2 5th Nov 1866 62. 6m