MADRAS RECORD OFFICE.

Government of Madras.

DEPARTMENT.

G.O. No.	Press Mis.
	91-92-A
Dated	18

13/14

Not to be folded or roughly handled.

Tolls on Pennair Anicut.

Read the following papers :—

No. 91. Proceedings of the Madras Government in the Public Works Department, dated 19th June 1875, No. 1738.

ABSTRACT.—Passing orders on the note by the Chief Engineer for Irrigation on the estimate of the cost of extending the Pennair Anicut, Nellore.

Referred to the Collector of Nellore for report on paragraph 3 of the order.

OOTACAMUND,
28th June 1875.

(Signed) D. F. CARMICHAEL,
Officiating Chief Secretary.

No. 92. From G. VANSAGNEW, Esq., Collector of Nellore, to the Hon. D. F. CARMICHAEL, Officiating Chief Secretary to Government, Fort St. George, dated Nellore, 2nd July 1875, No. 1785.

In returning, as directed, the copy of G.O., Public Works Department, dated 19th June 1875, No. 1738, I have the honor to state, with reference to paragraph 3 thereof, that the Chief Engineer for Irrigation is under a complete misconception in respect to the tolls at Nellore.

2. No toll whatever is levied either by the Local Fund Board or the Municipality for "the use of the anicut as a river crossing." The Local Fund Board and the Municipality each have a toll, where half the maximum rates are levied, on the south bank of the Pennair in the line of the Great Northern road.

3. It is quite immaterial to either of these bodies, as far as their tolls are concerned, whether the traffic crosses the river in boats, fords its bed, or comes over the anicut. Their toll-houses are so situated (incidentally near the anicut) as to catch the traffic whichever way it comes.

4. The Local Fund Board does but exercise its right, under the sanction of Government, to toll the Great Northern road, and the Municipality to levy toll on the traffic entering its limits at this point, quite irrespective in either case of the existence of the anicut.

5. It is true that it is a convenience to the traffic to cross by the anicut, and, when the Irrigation Department allow this to be done, the Local Fund Board go to the expense of gravelling a road-way over it. The gravel is washed away by each flood, and last year this item cost the Local Fund Board Rupees 1,100, an expenditure of which the Irrigation and all other Imperial Departments reap the full benefit without being called upon to contribute thereto.

No. 92-A. ORDER THEREON, 13th July 1875, No. 1470.

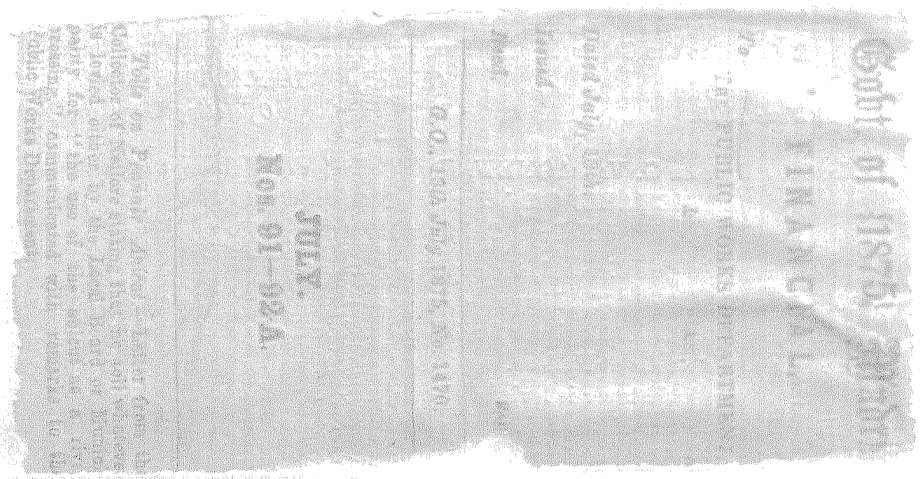
Communicated to the Public Works Department, with the remark that there is no ground for interference with the arrangements made by the Local Fund and Municipal Boards for the levy of tolls.

(True Extract.)

D. F. CARMICHAEL,
Officiating Chief Secretary.

To the Public Works Department.
" Collector of Nellore.
" Revenue Department.

Exd. T. O'Connor.



No. 438. Read the following papers :—

No. 486-A.

Note by the Chief Engineer for Irrigation.

Proceedings, 23rd January 1875, No. 198.

THE approximate estimate submitted by the District Engineer, Nellore, for the extension of the Pennair Anicut amounted to Rupees 1,07,000, of which Rs. 53,800 were for the northern wing walls. The extension was then to measure 360 feet. It was, in reviewing this estimate, supposed that the northern wings need not be as costly as in the design upon which the District Engineer's estimate was based, and on the receipt of the regular estimate in January it was considered that the arrangement of these wings required radical alteration, and the form adopted in the revised design was sketched out for the District Engineer's guidance.

With District Engineer's No. 96 of the 8th. To District Engineer, No. 95, 23rd January.

2. The estimate now submitted amounts to Rupees 1,59,150, and provides for lengthening the anicut 450 feet. This estimate makes the following provisions not included in the former :—

District Engineer's No. 7, dated 22nd April 1875.

		Rs.
Executive Establishment, 25 per cent.		28,900
Direction and Control 5 „		5,780
Tools and Plant		8,860
Total...		43,540

The items for works, including petty establishment, come to Rupees 1,15,610.

The extension of the anicut for a length of 450 is estimated to cost as follows :—

	Rs.	A.	P.	Rs.
Body or crest wall and wells	12,436	10	2	
Binding walls, retaining wall, with wells and aprons	44,473	3	8	
Groynes	497	9	6	
Part of excavation, say one-third	2,000	0	0	
Filling in	1,500	0	0	
Quarry rubbish in front of anicut...	250	0	0	
Repair and extension of tramway	6,500	0	0	
Baling water	3,000	0	0	
Petty Superintendence, 7 per cent.	4,942	8	8	
				75,600

which amounts to Rupees 168 the foot run.

The provision in the estimate for wings is as follows :—

Pitching adjacent to rear return				
Do. do. to front do.				
Front wing wall				
Abutment	20,329	12	6	
Rear wing wall				
Rear return...				
Wells				
Part of excavation, say two thirds	4,000	0	0	
Petty Superintendence	1,700	3	6	
				26,030
The formation of a roadway through the north abutment to the crest of the anicut will cost	7,530			
Sundries, &c., 7 per cent.	530			
				8,060

		Rs.	Rs.
And the remaining items are pitching on the face of western connecting bank (called up-stream approach)...		1,644	
Do. do. eastern	do.	1,069	
	Sundries, &c....	167	
			2,880
Compensation for land		3,000	
	Fractions...	40	
			3,040
	Total Works... ...		1,15,010
	Tools and Plant... ...		8,860
	Total of Estimate... ...		1,24,470
	Establishment Charges... ...		34,080

The foregoing details explain the difference between the rough estimate of cost given in the note printed in the Proceedings above-mentioned tolerably fully. That estimate was... ... ... Rupees 75,000

Add :—

	Rs.	
Establishment	34,680	
Tools and Plant	8,860	
Extra length of anicut (60 feet)	10,080	
		53,620
Total... ...		1,28,620

And there is an increase of charge under land compensation as well. The revision of arrangements which has been effected has resulted in some economy as regards the wings.

The former estimate was returned and the details are not known.

3. The reasons for the alterations made in the arrangement of the north wings are given in paragraph 2 of this office No. 95, of the 23rd January last, and Mr. R. Smith's views in designing the wings objected to are detailed in paragraph 6 of his letter, No. 96, of the 8th January, and in paragraph 3 of that of the 22nd April, No. 7. Erosion of the river bank can without much difficulty be prevented near the anicut by revetments, and beyond this by nanel planting or wild cane. Water running parallel, or nearly parallel, to a bank exerts very little force, which little can be rendered harmless by simple and inexpensive arrangements; sets and oblique currents do the mischief, and as far as possible these are to be done away with by training the river for some distance above and below the anicut. It is water opposed, as it would be by projecting walls, from which risk and damage might be apprehended.

4. The cross section of the anicut extension is similar to that of the old weir, except that the lower retaining wall is to be founded more substantially and at a greater depth. Mr. R. Smith strongly advocates this improvement, the advantage of which is considerable.

5. Originally the crest of the anicut was opened for traffic as an accommodation before and after working hours, and when the work-people were absent from the anicut in the middle of the day; afterwards it was made optional with carts to pay a toll for this convenience, or to cross the river at the ford below the weir. After this arrangement had been for some time in force, the formal approval of Government was asked for and declined. Subsequently the Municipality or the Local Fund Board,

About 1856.

which is not known by the undersigned, was allowed to establish a toll gate at the south end of the anicut and to levy a considerable toll for the use of this river crossing. As above shown, the reformation of the north approach to the anicut will cost Rs. 8,060, and whatever revenue may be derivable from the use of the anicut as a roadway ought, it is thought, in justice to be placed to the credit of Irrigation, and to it no Local Fund can have any claim, though by way of assisting local institutions on their first creation many miscellaneous items of revenue were appropriated for their benefit. It would not be convenient to have two toll gates in close proximity, and it will be desirable, therefore, to leave the collection of tolls as at present, the receipts being divided so as to give the Local Fund the amount corresponding to the rates of toll levied at other entrances to the town, the balance being paid through the District Engineer into the treasury to the credit of Revenue, Irrigation, Miscellaneous.

6. With regard to the specification of work to be done in carrying out the estimate, several modifications are considered desirable :—

1*st.*—The original body or crest wall of the anicut was built of laterite, but this material is becoming somewhat scarce, and it is not necessary to use it except for the exposed faces of the walls. The specification provides for building the crest wall below the coping of random rubble masonry, but brick masonry will be better above the foundation level, and probably very little more expensive; for such rubble as would be used is shown in the estimate as costing Rupees 1-5-0 a cubic yard, and bricks for an equal quantity of work should not cost more than Rs. 1-10-0, while less chunam and less labor are needed for brick work, and the work can be done more quickly. Similar remarks apply to the wing wall, which should be of brick work faced with laterite.

2*ndly.*—The packing of the apron is thus described: "The stones in the top course must not be less than 3 feet in length, and they will in all cases be packed with their greatest lengths in the direction of the bed of the river. In arranging these stones they should be slightly inclined up-stream, instead of laying them exactly at right angles to the bed of the river or to the slope of the apron." The stones should be packed inclining if anything slightly down-stream, but at any rate they should form considerably less than a right angle on the lower or down-stream face of the stones with the bed of the river. In the section the joints are shown nearly vertical. At right angles to the slope of the apron would be much better, and a slight inclination down-stream will be still better. The reason is this: damage to rubble aprons generally extends from below upwards. If the stones be inclined up-stream the removal of a lower stone at once leads to the upsetting of the next and so on; whereas, if the inclination be the other way, the resulting disturbance is much less, and is a gradually decreasing one, *i.e.*, the 2nd, 3rd, and 4th, &c., stones will be capable of less and less movement, if not carried away altogether.

3*rdly.*—The filling of the interstices of the first part of the horizontal apron with concrete is thought to be unnecessary.

40 feet wide and 6 feet thick.

It should take its bearing, for it is nearly sure to settle somewhat, so that at first the concrete will be nearly, if not quite, useless, and afterwards it will not be wanted. The District Engineer may try 100

feet of length with concrete, and note the result. All the work provided for in the estimate cannot be done this year or season, and this part, except for the experimental length mentioned, may very well be, at any rate, postponed.

4*thly*.—The weepholes in the revetment walls on either side of the ramp leading to the anicut need not be larger than 2″×3″ (6 × 4 in the specification), and some quarry rubbish should be filled in behind the walls to prevent the soil washing through. The ramped roadway should have some gravel over both the laterite and rubble flooring.

7. The alignment of the connecting bank between the north upper wing return and the river embankment is not a desirable one; flood-water would stand abnormally high in the corner of the junction. The way in which the main embankment should be brought up to and join the wing return has been shown on the survey, dated 24th April 1875, and the subsidiary banks to prevent overflow by way of the roadway ramp have also been noted.

8. The survey just referred to indicates the general circumstances of river close to the anicut, but it is too limited to allow of a proper alignment being laid down above and below, and the District Engineer has been asked to extend it both ways.

9. In passing orders on the Budget Estimates the Government of India intimated that Loan Funds could not be provided for the anicut extension, and funds have been made available by transfer from the Madras Water Works and Chembrumbaukum Tank Projects. It is not clear on what grounds it has been considered that this work should not be carried out under Extraordinary, for it is as much a part of the capital charge of the Pennair Delta Works as any to which Loan Funds have been allotted, and it is known that the returns on past direct outlay have been considerable, though until the Capital and Revenue Accounts shall have been made up the exact financial position of this system of irrigation will not be known. It would be very immaterial whether the charge were deemed to be Ordinary or Extraordinary had funds under the former been specially granted, but it is evident that from the very small grant for Major Works, Ordinary, of this Presidency, the abstraction of the large amount of this estimate must be very inconvenient. Indeed it will probably be impracticable to find the money required by transfer from Budget works for which allotments have been made by the Government of India, and in order that appropriations may be made for expenditure in excess of the sum of Rupees 35,000 already placed at the District Engineer's disposal, this officer should report as soon as possible what the outlay will be—1*st*, up to September, when the freshes will temporarily nearly stop constructive work; and, 2*ndly*, thereafter to the end of the official year.

Proceedings, No. 1,227, dated 1st May 1875.

OOTACAMUND,
8*th May* 1875.

(Signed) JOHN MULLINS, Lieut.-Colonel, R.E.,
Chief Engineer for Irrigation.

No. 438-A. From R. SMITH, Esq., District Engineer, Nellore, to Lieutenant-Colonel J. MULLINS, R.E., Chief Engineer for Irrigation, dated Camp at Gudur, 22nd April 1875, No. 7.

I HAVE the honor to forward the plan,* estimate and specification for lengthening the body of the Nellore Anicut 450 feet and for constructing an approach from the northern extremity of this extension to the Great Northern Road.

* By banghy.

Proceedings of the Madras Government, Public Works Department,
19*th June* 1875.

2. The approach has been designed in accordance with the views you were so good as to communicate to me regarding it during your recent tour of inspection. I have adopted the open, in preference to the arched, approach, as it is the cheaper arrangement of the two.

3. Adverting to the remarks conveyed in paragraph 2 of your memorandum, No. 95, dated 23rd January 1875, on my design for the wings, I have to explain that my object in planning them, to project into the river 60 feet at the level of the crest of the anicut, was to insure comparatively still water, close to the bank of the Pennair, for some distance above that structure, and to present as little masonry as possible, to the direct action of the current, at the junction of the crest with the wings. The still water referred to would offer very little resistance to the stream approaching the anicut, and altogether I thought the arrangement would materially tend to the safety of the northern flank of the anicut, as the bank of the river adjoining it very often suffers from erosion even in ordinary floods. To check this, rubble pitching was constructed from time to time, and it occurred to me, when planning the addition to the anicut, that if the wings were arranged so as to protect a certain length of the bank above and below them, a decided advantage would be gained over the original alignment. As my views are, apparently, opposed to the experience gained on the Godavery Works, I will merely add that they were formed after careful consideration of what I observed during the recent great flood, and it is possible that details of similar design would not produce the same effect on both rivers—Godavery and Pennair—as the sections of the weirs are different, and there is a vast difference between the falls in their respective beds.

4. The sums required for Tools and Plant and for Direction and Control have been included in the estimate, as directed in paragraph 7 of your memorandum, No. 95, dated 23rd January 1875.

ABSTRACT ESTIMATE.

NELLORE DISTRICT.

Work.—Lengthening the Nellore Anicut and constructing a suitable approach on the Northern Flank of that structure.

Quantities.	Description of Work.	Rate.	Amount.	Total
	Body Wall.	RS. A. P.	RS. A. P.	RS. A. P.
469⅛	Cubic yards of concrete for wells under body wall	2 3 0	1,026 3 4½	
26,125½	Do. feet of brick in chunam wells	0 3 0	4,898 8 6	
523½	Do. yards of rubble in chunam for foundation of body wall ...	3 8 0	1,832 4 0	
653½	Do. yards of rubble in chunam for body wall above foundation...	3 8 0	2,287 4 0	
170 1⅞	Do. yards of laterite on edge in chunam for top of body wall ...	6 12 0	1,150 0 0	
61·2	Squares of pointing front face and top of body wall...	2 0 0	122 6 4	
141⅔	Cubic yards of rubble stone for foundations of groynes	1 5 0	185 15 0	
237½	Do. yards of rubble stone for groynes above foundation ...	1 5 0	311 11 6	

Work.—Lengthening the Nellore Anicut, &c.—(Continued.)

Quantities.	Description of Work.	Rate.	Amount.	Total.
	1st Binding Wall.	RS. A. P.	RS. A. P.	
252⅔	Cubic yards of rubble in chunam for foundation	3 8 0	884 11 9	
265½	Do. of rubble in chunam above foundation	3 8 0	929 4 0	
75¾	Do. of laterite on edge in chunam for top of binding wall...	6 12 0	512 8 0	
13·67	Squares of pointing top of binding wall	2 0 0	27 5 5	
	2nd Binding Wall.			
171⅓	Cubic yards of rubble in chunam for foundation	3 8 0	598 14 2	
231⅛	Do. of rubble in chunam above foundation	3 8 0	808 15 0	
77	Do. of laterite on edge in chunam for top of binding wall ...	6 12 0	520 5 0	
13·9	Squares of pointing top of binding wall	2 0 0	27 12 9	
	3rd Binding Wall.			
173⅓	Cubic yards of rubble in chunam for foundation	3 8 0	606 10 8	
234⅛	Do. of rubble in chunam above foundation	3 8 0	819 7 0	
78	Do. of laterite on edge in chunam for top of binding wall	6 12 0	527 1 0	
14·00	Squares of pointing top of do. ...	2 0 0	28 0 0	
	Retaining Wall.			
374⅔	Cubic yards of concrete for wells...	2 3 0	819 9 4	
20864	Cubic feet of brick in chunam wells.	0 3 0	3,912 0 6	
330⅜	Cubic yards of rubble in chunam...	3 8 0	1,158 1 9	
175½	Do. of laterite on edge in chunam.	6 12 0	1,183 8 0	
23·5	Squares of pointing top of retaining wall	2 0 0	47 0 0	
	Apron between Body and 1st Binding Wall.			
1377⅞	Cubic yards of rubble	1 5 0	1,808 5 7	
1929⅜	Do. of Cyclopean rubble ...	1 8 0	2,893 8 0	
92	Do. of concrete for filling in interstices	2 3 0	201 4 0	
	Apron between 1st and 2nd Binding Walls.			
1062½	Cubic yards of rubble	1 5 0	1,394 8 6	
1487½	Do. of Cyclopean rubble.. ...	1 8 0	2,231 4 0	
70⅙	Do. of concrete for filling in interstices	2 3 0	154 15 2	
	Apron between 2nd and 3rd Binding Walls.			
1291⅔	Cubic yards of rubble	1 5 0	1,695 5 0	
1808⅓	Do. of Cyclopean rubble ...	1 8 0	2,712 8 0	
86⅙	Do. of concrete for filling in interstices	2 3 0	188 6 3	

Proceedings of the Madras Government, Public Works Department,
19*th June* 1875.

Work.—Lengthening the Nellore Anicut, &c.—(Continued.)

Quantities.	Description of Work.	Rate.	Amount.	Total.
	Apron between the 3rd Binding Wall and Retaining Wall.	RS. A. P.	RS. A. P.	
1259⅓	Cubic yards of rubble	1 5 0	1,652 14 0	
1763	Do. of Cyclopean rubble ...	1 8 0	2,644 10 4	
84	Do. of concrete for filling in interstices	2 3 0	183 12 0	
	Apron beyond Retaining Wall.			
1396⅔	Cubic yards of rubble	1 5 0	1,833 4 4	
2897½	Do. of Cyclopean rubble ...	1 8 0	4,346 10 8	
121½	Do. of concrete for filling in interstices	2 3 0	265 12 6	
	Apron beyond Retaining Wall, 2nd portion.			
4346⅔	Cubic yards of rubble	1 5 0	5,705 0 0	
	Pitching adjacent to rear return.			
177½	Cubic yards of Cyclopean rubble for foundation	1 8 0	266 10 8	
488⅔	Do. do. above foundation ...	1 8 0	733 5 4	
218½	Do. of gravel backing	0 8 0	109 4 0	
	Pitching adjacent to Front Wing.			
266⅔	Cubic yards of Cyclopean rubble for foundation	1 8 0	400 0 0	
650⅔	Cubic yards of Cyclopean rubble above foundation	1 8 0	975 5 4	
290⅔	Cubic yards of gravel backing ...	0 8 0	145 5 4	
	Front Wing Wall.			
163½	Cubic yards of concrete for wells...	2 3 0	357 4 8	
9097½	Cubic feet of brick in mortar wells.	0 3 0	1,705 11 9	
176	Cubic yards of rubble masonry for foundation	3 8 0	616 0 0	
363¼	Cubic yards of rubble masonry above foundation	3 8 0	1,271 6 0	
803	Cubic yards of laterite in chunam.	5 0 0	4,015 0 0	
30·00	Squares of pointing	2 0 0	60 0 0	
	Abutment.			
29⅓	Cubic yards of concrete for wells ..	2 3 0	64 2 8	
1633	Cubic feet of brick in mortar wells.	0 3 0	306 3 0	
37⅝	Cubic yards of rubble in chunam for foundation	3 8 0	132 6 8	
78½	Cubic yards of rubble in chunam above foundation	3 8 0	274 12 0	
90⅔	Cubic yards of laterite in chunam.	5 0 0	451 5 4	
8·7	Squares of pointing	2 0 0	17 6 4	
	Rear Wing Wall.			
121½	Cubic yards of concrete for wells...	2 3 0	265 12 6	
6763½	Cubic feet of brick in mortar wells.	0 3 0	1,268 2 6	
149	Cubic yards of rubble in mortar for foundation	3 8 0	521 14 3	
898½	Cubic yards of rubble in mortar above foundation	3 8 0	3,144 12 0	
30·00	Squares of pointing	2 0 0	60 0 0	

Work.—Lengthening the Nellore Anicut, &c.—(Continued.)

Quantities.	Description of Work.	Rate.	Amount.	Total.
	Rear Return.	RS. A. P.	RS. A. P.	RS. A. P.
54½	Cubic yards of concrete for wells...	2 3 0	119 3 6	
3032	Cubic feet of brick in mortar wells.	0 3 0	568 8 0	
64⅓	Cubic yards of rubble in mortar for foundation	3 8 0	225 2 8	
356½	Do. of rubble in mortar above foundation	3 8 0	1,247 12 0	
13½	Squares of pointing	2 0 0	27 0 0	
	Revetment Walls.			
364	Cubic yards of concrete	2 3 0	796 4 0	
308⅓	Do. of rubble in mortar for foundation	3 8 0	1,079 2 8	
1505⅔	Do. of do. above foundation ...	3 8 0	5,268 4 5	
21⅔	Do. of laterite flooring on edge ...	5 0 0	108 5 4	
8⅔	Do. of concrete under flooring ...	2 3 0	18 11 5	
30	Do. of packed rubble flooring ...	1 5 0	39 6 0	
57⅓	Do. of packed rubble	1 5 0	75 13 4	
72	Squares of pointing	2 0 0	144 0 0	
	Pitching of outer face of Up-stream Approach.			
153	Cubic yards of Cyclopean rubble for foundation	1 8 0	229 8 0	
743⅓	Do. of Cyclopean rubble above foundation	1 8 0	1,114 10 7	
599⅓	Do. of gravel backing	0 8 0	299 12 0	
	Pitching of outer slope of Down-stream Approach.			
121	Cubic yards of Cyclopean rubble for foundation	1 8 0	181 8 0	
478	Do. of do. above foundation ...	1 8 0	717 0 0	
340⅔	Do. of gravel backing	0 8 0	170 5 4	
	Earthwork.			
...	Excavating foundations and filling in...	.....	6,000 0 0	
...	Filling in pool in line of body and retaining walls to water level for wells	.....	1,500 0 0	
	Sinking Wells.			
112	Under body wall each	10 0 0	1,120 0 0	
115	Do. last retaining wall each ...	10 0 0	1,150 0 0	
39	Do. front wing wall each	10 0 0	390 0 0	
7	Do. abutment each	10 0 0	70 0 0	
29	Do. rear wing each	10 0 0	290 0 0	
13	Do. rear return each	10 0 0	130 0 0	
3,800	Squares of turfing	0 0 6	118 12 0	
...	Quarry rubbish and clay for front of anicut	.....	250 0 0	
...	Repair and extension of tramway.	.....	6,500 0 0	
...	Baling water	.....	3,000 0 0	
...	Special, petty superintendence, scaffolding, and sundries about 7 per cent.	.....	7,361 5 1	
...	Compensation for land	.....	3,000 0 0	
	Total ...	.....	.....	1,15,1

Proceedings of the Madras Government, Public Works Department,
19*th June* 1875.

Work.—Lengthening the Nellore Anicut, &c.—(Concluded.)

Quantities.	Description of Work.	Rate.	Amount.	Total.
	Superintendence.	RS. A. P.	RS. A. P.	RS. A. P.
...	Executive Establishment at 25 per cent.	.....	.....	28,900 0 0
...	Direction and Control	.....	.....	5,780 0 0
	Total...	.....	.....	1,50,290 0 0
...	Tools and Plant, *vide* separate estimate	.....	.....	8,860 0 0
	Grand Total ...	.....	.....	1,59,150 0 0

NELLORE,
21*st April* 1875.

(Signed) R. SMITH,
District Engineer, Nellore.

NELLORE DISTRICT.

Abstract Estimate of the probable cost of the Tools and Plant required for the Nellore Anicut Works.

Quantities.	Description of Articles.	Amount.	Total.
	Machinery.	RS.	RS.
2	3-Ton cranes from Public Works Department Stores ...	2,500	2,500
	Tools and Plant.		
50	Axes, pick, 7 lbs.	45	
100	Do., felling, 5 lbs.	107	
4	Blocks, iron, galvanized with sheaves 6″, double	60	
4	Do., do. do 6″, treble	90	
4	Do., wooden, 12″, double	90	
20	Do., iron, single, 8″, for 3½″ rope	240	
4	Bars, tamping, brass, 1½″, 4 feet in length	25	
25	Crow-bars, 24 lbs.	55	
25	Do., 16 ,, ...	45	
25	Do., 14 ,, ...	35	
400	Running feet chain, iron, ½″	100	
20	Hooks, bill, Europe, 2½ lbs.	20	
30	Jumpers, 5′ 1½″ bore	100	
30	Do., hand′	40	
50	Troughs, mortar...	300	
10	Wagons complete	3,000	
2	Stones grinding, about 24″ × 4″ in diameter...	15	
1	Do. do. do.	12	
10	Bulls, smallest size, dredgers, at 75 Rupees each	750	
5	Bulls, second size, dredgers, at 100 Rupees each	500	
			5,629
	Cordage.		
	Rope, hemp, coil, 7″	245	
1	Do., do., do., 4½″	135	
1	Do., do., do., 3″	50	
1			430
		...	8,559
	Carriage, Contingencies, &c. ...	...	301
	Total ...	...	8,860

NELLORE,
21*st April* 1875.

(Signed) R. SMITH,
District Engineer, Nellore.

Specification to accompany the Plan and Estimate for lengthening the Nellore Anicut.

The body wall of the proposed addition will be 450 feet in length. It will rest on 112 brick in mortar wells of 4 feet internal diameter. The walls of these wells to be 1 foot 6 inches in thickness, and, after they have been sunk to a depth of 12 feet below the deep bed of the river, they will be carefully filled in with hydraulic concrete. When this has been done the masonry will be proceeded with according to the section noted on the drawing. The upper course of the body wall to consist of first-class laterite on edge 2 feet in thickness. The laterite to be well dressed, and to be built with close joints in hydraulic mortar. The body wall, with the exception of the laterite course, will consist of random rubble in hydraulic mortar. The rear retaining wall will rest on brick in mortar wells filled in with hydraulic concrete, but where stiff clay is met with, at 7 or 8 feet below the deep bed of the Pennair, the wells will be dispensed with and the retaining wall will be built on a bed of hydraulic concrete 1 foot in thickness. The sand between the bed of the river and the clay to be removed before putting in the concrete. Where wells are used they will be of the dimensions shown on the drawing, and they will be sunk to a depth of 12 feet below the deep bed of the Pennair, if stiff clay is not found before that level is reached.

The retaining wall for a height of 3 feet above the wells will consist of random rubble in hydraulic mortar; the upper course of 2 feet to be of dressed laterite on edge in hydraulic mortar. All stones in this course to be laid carefully with close joints. Between the body and retaining walls there will be three binding walls of the dimensions shown on the Section A B. These walls, with the exception of the laterite on edge masonry, will consist of random rubble in hydraulic mortar. The upper or laterite courses to be $1\frac{1}{2}$ feet in thickness. All the stones in these courses to be carefully laid on edge in hydraulic mortar. The body of the anicut between the retaining walls will consist of Cyclopean and ordinary rubble carefully packed, the total thickness being 6 feet. The stones in the top course must not be less than 3 feet in length, and they will in all cases be packed with their greatest lengths in the direction of the bed of the river. In arranging these stones they should be slightly inclined up-stream, instead of laying them exactly at right angles, to the bed of the river, or to the slope of the apron. After these stones have been packed as closely as possible, the interstices will be filled in with small stones to within 6 inches of the general surface of the apron, and in doing this great care must be taken to tamp the stones until they are quite compact and well jammed between the Cyclopean rubble. The holes or spaces that will then remain will be carefully filled in, with hydraulic concrete, to the general surface level of the apron, but on no account above that level, as all slight unequalities in the upper course of stones should be allowed to project beyond the ordinary level of the apron. In rear of the down-stream retaining wall there will be a horizontal rubble apron 100 feet in breadth. For a breadth of 40 feet from the retaining wall this apron will be 6 feet in thickness. It will be constructed with Cyclopean rubble, and with small stones and hydraulic concrete in the interstices, as detailed for the body of the anicut. The second reach of the apron to be loose rubble 60 feet in breadth and 4 feet in thickness. Sixty-six per cent. of this reach to consist of stones of 2 cubic feet each and upwards. The balance to be made up with ordinary rubble. In constructing this part of the apron great care must be taken to distribute the large stones throughout

Proceedings of the Madras Government, Public Works Department,
19*th June* 1875.

its entire length and breadth. The smaller stones to be distributed so as to secure the formation of as compact a mass as possible.

The front wing to be 100 feet in length from the face of the abutment. It will be set out with a radius of 60 feet, as shown on the drawing. This wall to be built according to the dimensions noted on the plan; it will rest on brick in mortar wells filled in with hydraulic concrete. These will be sunk to 12 feet below the deep bed of the Pennair or until stiff clay is met with.

The rear wing and return to be built as shown on the drawing. The former will be set out with a radius of 312 feet. These walls will also rest on wells as detailed for the front wings. The roadway to the anicut will be carefully revetted on both sides for a length of 460 feet from the face of the abutment. The revetment to rest on beds of concrete $1\frac{1}{2}$ feet in thickness. The revetment will be built with a batter of one in four on the outer faces, and all the stones will be laid at right angles to those faces. Weepholes 6″ × 4″ to be left in these walls at 6 feet apart. The flooring between the revetment walls will, for a length of 30 feet from the abutment, consist of a course of laterite on edge $1\frac{1}{2}$ feet in thickness, and a bed of concrete 1 foot in thickness. From 30 to 60 feet from the abutment the flooring will be formed of packed rubble 2 feet in thickness, and from 60 to 180 feet from that point it will consist of packed rubble 1 foot in thickness.

The outer slope of the up-stream approach will be pitched with rubble from the end of the front wing to its junction with the river embankments. Provision has also been made in this estimate for pitching 30 feet of the latter. The pitching of the up-stream approach will be carried up to the level of the top of the embankment, or to 6 feet above the level of the great flood of October last.

The outer slope of the down-stream approach will be pitched with rubble from the end of the rear return to the river embankment. The height of this pitching will be 5 feet $4\frac{1}{2}$ inches less than that of the up-stream approach.

The surface of the roadway at the summit of the approach will be 4 feet $7\frac{1}{2}$ inches above the maximum flood mark of 1874, or 13 feet above the general level of the country there. This difference of level will be overcome, towards the north, in the line of the Great Northern Road by a gradient of 1 in 30. The gradient towards the anicut from the summit of the approach will be 1 in 20.

The labor and materials to be of the best description procurable.

NELLORE,
21*st April* 1875.

(Signed) R. SMITH,
District Engineer.

From R. SMITH, Esq., District Engineer, Nellore, to Lieutenant-Colonel J. MULLINS, R.E., Chief Engineer for Irrigation, dated Camp at Naidoopet, 24th April 1875, extra No. 1.

In continuation of my letter, No. 7, dated 22nd instant, submitting the plan and estimate for the extension of the Nellore Anicut, I have the honor to forward a survey* of the Pennair in the vicinity of that structure.

* By bangby.

From the same officer, dated Nellore, 8th January 1875, No. 96.

I HAVE the honor to forward the documents marginally noted, and to solicit permission to commence the lengthening of the Nellore Anicut and the construction of the necessary subsidiary works without delay.

1 Plan.
1 Estimate.
1 Specification.
1 Section.

2. The estimate now submitted provides for lengthening the body wall of the anicut 360 feet, *or, in other words, for* increasing the waterway from 28,747 to 35,362 square feet in a flood similar to that of 1874. This increased water section will, I think, afford the relief that is so much wanted during floods, and I am convinced it will materially tend to reduce the cost of keeping the anicut and head works in repair.

3. The section I have allowed for the proposed addition to the anicut differs but little from that decided on after the flood of 1870. The principal modification, it will be observed, is in the extra depth given to the rear retaining wall. I decided on this alteration after carefully considering the effects of the recent flood on the anicut apron, and I must, therefore, strongly recommend the modified section for approval and sanction.

4. The new approach is necessarily an expensive work in consequence of the difference of level (21½ feet) to be overcome, by the traffic, between the crest of the anicut and the proposed surface of the Great Northern Road in the immediate vicinity of that work.

5. A portion of the cost of the new approach might fairly be charged to the Great Northern Road, but I must add that the long wing walls are very desirable in connection with the safety of the northern flank of the anicut.

6. I have designed the wings to project 60 feet into the river, as I believe it to be an important point to prevent any discharge over the Nellore Anicut close to the northern margin of the river.

7. Brick in mortar wells have been allowed throughout for the foundations of the wings, but if suitable soil is met with beyond the limits of the river hydraulic concrete will be used instead of wells.

8. I have not included the cost of repairing the damaged portions of the existing anicut in the accompanying estimate, as I hope to be able to meet this expenditure from savings on the estimate,* sanctioned for the improvement and repair of that structure in G. O., No. 544, dated 24th February 1871.

* Amount Rupees 59,500.

No. 95.

MEMORANDUM.

THE undersigned has the honor, in reply to the letter, No. 96, of the 8th instant, from the District Engineer, Nellore, to state that the cross section of the extension of the Pennair Anicut is approved and may be gone on with. It appears, however, to be doubtful whether the design of the wells for the rear retaining wall is a good one, the interior being cylindrical and the exterior square; such wells will, it is thought, be difficult to sink, and may, therefore, seriously delay the completion of the work. Ordinary circular wells would be about as efficacious, for it must be remembered that in either case undermining would occasion their fall with practically equal facility.

One plan sent by banghy.

2. With regard to the proposed arrangement of wing walls at the north end, the undersigned regrets that he must ask the District Engineer to revise it entirely; not only is its expense very great, but it is considered that this outlay would be without any corresponding advantage,

while this arrangement has some very grave disadvantages. The projection of the high wings 60 feet into the river as is mentioned in the letter, or more than 75 feet as would appear from the plan, would not answer at all, and would tend to greatly intensify the action of the tail water on the river bank below—a result which it would seem the District Engineer is particularly anxious to avoid. Such a projection would be in the nature of a groyne at right angles to the current, and of the effect of this there are unfortunately many notable examples. Moreover, there is evidence of the effect under precisely similar circumstances at the Godavery Anicut, where such wings were believed to be the cause of extensive erosions and deep holes below the dam. Again it is desirable to get as much waterway as possible, and had the breach beyond the old wings been 600 or 700 feet, it would not have been a matter of regret. As it is the extension should be carried up to the present left bank, which appears to give a length of 360 + 75 = 435 feet. On the plan the form of abutment, with front and rear wings and returns considered to be preferable, has been sketched in pencil; what is wanted is the leading of the water with as little disturbance as possible up to the line of the crest wall, and a convex curve is the best for this; then its guidance after passing the crest in a direction as nearly parallel to the axis of the river as may be, and experience has demonstrated that wings with a flat convex curve struck from the line of the lowest retaining wall are best, those of the form shown on the plan having a tendency to create eddies and return currents which do mischief. The abutment and front wing should be 4 feet above the maximum flood level, or 22½ feet above the crest of the anicut. The rear wing return may be 5 feet lower, and from 5 feet below the roadway the wing may slope from the higher to the lower level. The length of the front wing and its return from the face of the abutment has been noted as 90 feet, which appears to be ample; similarly the rear wing return will be 62 feet.

3. The roadway should be carried as before through an arched opening in the abutment. The flood bank should be 6 feet above M. F. L. everywhere except where the road crosses it, and here 4 feet will suffice, as the little raising required, in the event of an extreme flood, would be readily effected by the anicut establishment. The roadway ramp should be carefully revetted with laterite as before. The flood bank should be carried up to the front and rear wing returns and then curved round to the point at which the road, with the gradient desired, will cross its line, *viz.*, at $x \times 22\frac{1}{2}$ feet from, say, the rear face of the abutment wall. There is practically no need to make the gradient x as steep as 1 in 15, as the only additional cost from flattening it will be a little additional revetment, and even this is not a necessity after ordinary ground level has been reached and the line of the ends of the wings passed.

4. The security of this flank of the anicut will depend not upon the length of the wing returns, provided, of course, they are long enough to obtain a firm connection with the river bank and embankment, but upon the spill of the river being kept at a suitable distance, so that no channel may be found thereby anywhere near the anicut. How this may best be effected will depend upon the decision at which Government may arrive on the subject of embanking the north side of the river.

5. It is requested that the abstract estimate may be made out so as to show the work of each description for each part of the anicut and wings, &c., thus—

Wells for body or crest wall.
Foundation above.
Crest wall above. ———
First retaining wall foundation.
Do. above. ———
And so on.

this is useful in many ways, and especially so to the officer making measurements and payments.

6. As soon as the revised abutment and wing and the arrangements connected therewith have been drawn out, it is requested that the plan may be forwarded for approval, so that the necessary authority for commencing the work may be given.

Financial Department

Govt. of (1875) Madras.

PUBLIC WORKS.

To

THE FINANCIAL DEPARTMENT

&c. &c. &c.

Reported 19/7

Dated June 19th

Issued

Recd. 26 June /75

Encl. 6 pcs.

G. O. 19th June 1875, No. 1,738.

Referred to the Collr. of Nellore for report on para. 3 of the order.

Offg Chief Secy

No. 1527

JUNE

Nos. 438-439

To The Collector of Nellore

Ootacamund 28 June /75

Pennair Anicut, Nellore.—Passing orders on the note by the Chief Engineer for Irrigation on the estimate of the cost of extending the —

Referred.

No. 1785
Enc: 1.

Nellore,
Collector's Office,
2nd July 1875.

From G. Vans Agnew Esqre.,
Collector of Nellore,

To The Hon'ble D. F. Carmichael,
Officiating Chief Secretary
to Government,
Financial Department,
Fort Saint George.

Sir,

In returning, as directed, the copy of Government Order Public Works dated 19th June 1875 No. 1738 I have the honor to state with reference to Para 3 thereof that the Chief Engineer for Irrigation is under a complete misconception in respect to the tolls at Nellore.

2. No toll whatever is levied either by the Local Fund Board or the Municipality for "the use of the anicut as a river crossing." The Local Fund Board and the Municipality

each have a toll, where half the maximum rates are levied, on the south bank of the Penrair in the line of the Great Northern Road.

3. It is quite immaterial to either of these bodies, as far as their tolls are concerned, whether the traffic crosses the river in boats, fords if dredged or comes over the anicut. Their toll houses are so situated as fortuitously (near the anicut) as to catch the traffic whether it comes over it comes.

4. The Local Fund Board does not exercise its right, under the sanction of Government, to toll the Great Northern Road, and the Municipality to levy toll on the traffic entering its limits at this point, quite irrespective in either case of the existence of the anicut.

5. It is true that it is a convenience to the traffic to cross by the anicut, and

and, when the Irrigation Department allow this to be done, the Local Fund Board go to the expense of gravelling a roadway over it. The gravel is washed away by each flood, and last year the sum borne by the Local Fund Board Rs. 1100— on the Local Fund Board Rs. 1100— an expenditure of which the Irrigation and all other Imperial Departments reap the full benefit without being called upon to contribute thereto.

I have the honor to be,

Your most obedient servant,

Collector.

Read No 1837 ... 1598

Returned 13 July 1875 No 1470.

Communicated to the Public Works Department with the remark that there is no ground for interference with the arrangements made by the Local Fund & Municipal Boards for the levy of tolls.

To the Public Works Department

" " - Commr. of Nellore -

remarks to the
Public Works Dept.

Govt. of 1875 Madras.

Financial

G.O. 13 July, 1875, No. 1170

Nos. 915-922

Tolbert Pennair
Contract. Letter
from the Collector
stating that no old
roboliers or bullocks
other by the Local
Board or Municipal
City for the use
of the Contractor
a river crossing
Con[illegible]