M.R.O. 1—10,006—28-2-50.

(1) Number of pages

(2) Date of repair

(3) Initials of the Referencer

# MADRAS RECORD OFFICE

## Government of Madras

Public Works DEPARTMENT

G.O. No. 1738 Press

B.P. No. Mis. -

Dated 19-6- ~~195~~ 1875.

***Not to be folded or roughly handled***

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

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.

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

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 :—

| | 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 :—

| | RS. | A. | P. | RS. |
|---|---|---|---|---|
| Pitching adjacent to rear return ... ... ... | 20,329 | 12 | 6 | |
| Do. do. to front do. ... ... ... | | | | |
| Front wing wall ... ... ... ... ... | | | | |
| Abutment ... ... ... ... ... ... | | | | |
| 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... ... | | 1,15,610 |
| Tools and Plant... ... | | 8,860 |
| Total of Estimate... ... | | 1,24,470 |
| Establishment Charges... ... | | 34,680 |

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 aske for and declined. Subsequently the Municipality or the Local Fund Board, 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.

About 1856.

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

*1st.*—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.

*2ndly.*—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.

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

40 feet wide and 6 feet thick.

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.

*4thly.*—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.

Proceedings, No. 1,237, dated 1st May 1875.

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—*1st*, up to September, when the freshes will temporarily nearly stop constructive work; and, *2ndly*, thereafter to the end of the official year.

OOTACAMUND,
*8th 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.

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 10/27 | 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. | |
| $252\frac{7}{9}$ | Cubic yards of rubble in chunam for foundation ... ... | 3 | 8 | 0 | 884 | 11 | 9 | |
| $265\frac{1}{2}$ | Do. of rubble in chunam above foundation | 3 | 8 | 0 | 929 | 4 | 0 | |
| $75\frac{25}{27}$ | 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.* | | | | | | | |
| $171\frac{1}{9}$ | Cubic yards of rubble in chunam for foundation ... ... | 3 | 8 | 0 | 598 | 14 | 2 | |
| $231\frac{1}{8}$ | Do. of rubble in chunam above foundation ... ... | 3 | 8 | 0 | 808 | 15 | 0 | |
| $77\frac{1}{12}$ | 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.* | | | | | | | |
| $173\frac{1}{3}$ | Cubic yards of rubble in chunam for foundation ... ... | 3 | 8 | 0 | 606 | 10 | 8 | |
| $234\frac{1}{8}$ | Do. of rubble in chunam above foundation ... ... | 3 | 8 | 0 | 819 | 7 | 0 | |
| $78\frac{1}{12}$ | 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.* | | | | | | | |
| $374\frac{2}{3}$ | Cubic yards of concrete for wells... | 2 | 3 | 0 | 819 | 9 | 4 | |
| $20864\frac{1}{6}$ | Cubic feet of brick in chunam wells. | 0 | 3 | 0 | 3,912 | 0 | 6 | |
| $330\frac{8}{9}$ | Cubic yards of rubble in chunam... | 3 | 8 | 0 | 1,158 | 1 | 9 | |
| $175\frac{1}{3}$ | 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.* | | | | | | | |
| $1377\frac{7}{9}$ | Cubic yards of rubble ... ... | 1 | 5 | 0 | 1,808 | 5 | 7 | |
| $1929\frac{3}{4}$ | 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.* | | | | | | | |
| $1062\frac{1}{2}$ | Cubic yards of rubble ... ... | 1 | 5 | 0 | 1,394 | 8 | 6 | |
| $1487\frac{1}{2}$ | Do. of Cyclopean rubble... ... | 1 | 8 | 0 | 2,231 | 4 | 0 | |
| $70\frac{5}{6}$ | Do. of concrete for filling in interstices ... ... ... | 2 | 3 | 0 | 154 | 15 | 2 | |
| | *Apron between 2nd and 3rd Binding Walls.* | | | | | | | |
| $1291\frac{2}{3}$ | Cubic yards of rubble ... ... | 1 | 5 | 0 | 1,695 | 5 | 0 | |
| $1808\frac{1}{3}$ | Do. of Cyclopean rubble ... | 1 | 8 | 0 | 2,712 | 8 | 0 | |
| $86\frac{1}{9}$ | Do. of concrete for filling in interstices ... ... ... | 2 | 3 | 0 | 188 | 6 | 3 | |

*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. | |
| $1259\frac{1}{3}$ | Cubic yards of rubble ... ... | 1 | 5 | 0 | 1,652 | 14 | 0 | |
| $1763\frac{1}{11}$ | 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.* | | | | | | | |
| $1396\frac{7}{9}$ | Cubic yards of rubble ... ... | 1 | 5 | 0 | 1,833 | 4 | 4 | |
| $2897\frac{7}{9}$ | Do. of Cyclopean rubble ... | 1 | 8 | 0 | 4,346 | 10 | 8 | |
| $121\frac{1}{2}$ | Do. of concrete for filling in interstices ... ... ... | 2 | 3 | 0 | 265 | 12 | 6 | |
| | *Apron beyond Retaining Wall, 2nd portion.* | | | | | | | |
| $4346\frac{2}{3}$ | Cubic yards of rubble ... ... | 1 | 5 | 0 | 5,705 | 0 | 0 | |
| | *Pitching adjacent to rear return.* | | | | | | | |
| $177\frac{7}{9}$ | Cubic yards of Cyclopean rubble for foundation ... ... ... | 1 | 8 | 0 | 266 | 10 | 8 | |
| $488\frac{8}{9}$ | Do. do. above foundation ... | 1 | 8 | 0 | 733 | 5 | 4 | |
| $218\frac{1}{2}$ | Do. of gravel backing ... ... | 0 | 8 | 0 | 109 | 4 | 0 | |
| | *Pitching adjacent to Front Wing.* | | | | | | | |
| $266\frac{2}{3}$ | Cubic yards of Cyclopean rubble for foundation ... ... ... | 1 | 8 | 0 | 400 | 0 | 0 | |
| $650\frac{2}{9}$ | Cubic yards of Cyclopean rubble above foundation ... ... | 1 | 8 | 0 | 975 | 5 | 4 | |
| $290\frac{2}{3}$ | Cubic yards of gravel backing ... | 0 | 8 | 0 | 145 | 5 | 4 | |
| | *Front Wing Wall.* | | | | | | | |
| $163\frac{1}{3}$ | Cubic yards of concrete for wells... | 2 | 3 | 0 | 357 | 4 | 8 | |
| $9097\frac{1}{4}$ | 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 | |
| $363\frac{1}{4}$ | 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.* | | | | | | | |
| $29\frac{1}{3}$ | 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 | |
| $37\frac{5}{6}$ | Cubic yards of rubble in chunam for foundation ... ... ... | 3 | 8 | 0 | 132 | 6 | 8 | |
| $78\frac{1}{2}$ | Cubic yards of rubble in chunam above foundation .. ... ... | 3 | 8 | 0 | 274 | 12 | 0 | |
| $90\frac{4}{15}$ | 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.* | | | | | | | |
| $121\frac{1}{2}$ | Cubic yards of concrete for wells... | 2 | 3 | 0 | 265 | 12 | 6 | |
| $6763\frac{1}{2}$ | Cubic feet of brick in mortar wells. | 0 | 3 | 0 | 1,268 | 2 | 6 | |
| $149\frac{1}{9}$ | Cubic yards of rubble in mortar for foundation ... ... ... | 3 | 8 | 0 | 521 | 14 | 3 | |
| $898\frac{1}{2}$ | 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 | | | |
| 1505$\frac{2}{9}$ | 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 | | | |
| 8$\frac{5}{9}$ | Do. of concrete under flooring ... | 2 | 3 | 0 | 18 | 11 | 5 | | | |
| 30 | Do. of packed rubble flooring ... | 1 | 5 | 0 | 39 | 6 | 0 | | | |
| 57$\frac{7}{9}$ | 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 | | | |
| 743$\frac{1}{9}$ | Do. of Cyclopean rubble above foundation ... ... ... | 1 | 8 | 0 | 1,114 | 10 | 7 | | | |
| 599½ | 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 ... | ...... | | | ......... | | | 1,15,610 | 0 | 0 |

*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,
*21st 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.* | | |
| 1 | Rope, hemp, coil, 7" ... ... ... ... ... ... | 245 | |
| 1 | Do., do., do., 4½" ... ... ... ... ... ... | 135 | |
| 1 | Do., do., do., 3" ... ... ... ... ... ... | 50 | |
| | | | 430 |
| | | ... | 8,559 |
| | Carriage, Contingencies, &c. ... | ... | 301 |
| | Total ... | ... | 8,860 |

NELLORE,
*21st 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 1½ 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

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 1½ 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 1½ 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 4½ inches less than that of the up-stream approach.

The surface of the roadway at the summit of the approach will be 4 feet 7½ 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 banghy.

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

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

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.

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 (21¼ 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 59,260.

---

No. 95

MEMORANDUM.

One plan sent by banghy.

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.

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.

7. Whatever Tools and Plant may be required should be included in the estimate before the total for works, and special superintendence should be similarly placed. It is supposed that the entry on account of this latter is for petty superintendence; if so, an entry of 20 per cent. for Executive Establishments and 5 per cent. for Direction and Control will have to be made as a final addition.

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

*23rd January* 1875.

No. 439. ORDER THEREON, 19th June 1875, No. [illegible].

IRRIGATION, No. 41.

WITH the foregoing note the Chief Engineer for Irrigation submits the following estimate of the cost of extending the Pennair Anicut at Nellore, a length of 450 feet, across the breach occasioned by the flood of October 1874 beyond its former northern end, by which the wings at that end and a small portion of the weir itself were destroyed:—

| | RS. |
|---|---|
| Works ... | 1,15,610 |
| Tools and Plant ... | 8,860 |
| | 1,24,470 |
| Establishment ... | 34,680 |
| Total ... | 1,59,150 |

2. In the approximate estimate reviewed in Public Works Proceedings, No. 198 of the 23rd January last, it was supposed that the cost of extending the anicut 360 feet would be about 75,000 Rupees, but that estimate did not include Tools and Plant or Establishment. This and other causes of difference have been fully explained, and due care appears to have been taken to design the extension as economically as possible, consistently with the future security of the anicut.

3. In paragraph 5 of the note it is brought to notice that a toll is levied at the anicut, part of which is due to the use of the anicut as a river crossing, and that the proceeds are appropriated to Local or Municipal funds; the Chief Engineer observes that the difference between the tolls here collected and those levied at other entrances of the town really appertain to the anicut, and should be credited thereto. It has been pointed out also that a special expenditure of Rupees 8,060 will now have to be incurred in the formation of a roadway to the crest of the anicut. In conformity with the Order of the 19th November 1874, No. 3,278, it will be necessary to determine what share of the tolls properly belongs to the anicut, and these Proceedings will be communicated to the Financial and Revenue Departments in order that the requisite settlement may be made.

See also G. O., Revenue Department, 9th April 1875, No. 619; Public Works Department, 19th April, No. 1,098.

4. The remarks in paragraph 6 of the note on the details of the work to be done, as described in the specification, will receive the District Engineer's careful attention, and he will report what additional cost, if any, the substitution of brick work for rubble masonry in certain parts of the work will occasion. Paragraph 7 on the alignment of the flood banks should also be attended to.

5. The regulation of the river bed, so as to do away with cross currents and make the approach of the water to and its passage from the anicut more direct is clearly of much importance, and, as soon as the survey submitted has been extended, the best available alignment should be laid down, and thereafter worked up to as rapidly as circumstances will allow.

6. The District Engineer will report as soon as possible what funds will be required for the extension works during the current year, both before and after the freshes, and it will then be determined whether it will be practicable to carry out the wishes of the Government of India as regards the provision for expenditure by transfers from the allotments of Budget Major Works under Ordinary, or whether a special grant will have to be applied for.

Paragraph 10 of Budget Orders. Proceedings of the Madras Government, 1st May 1875, No. 1,227.
Letter from Government of India, No. 108 A.I., 22nd March 1875.

(True Extract.)

Major, R.E.,
*Offg. Joint Secretary to Government.*

To the Financial Department.
,, Revenue ,,
,, Chief Engineer for Irrigation.
,, Controller of Public Works Accounts.
,, District Engineer, Nellore.

Exd E. C. Shunker.

Spare Copies

7. Whatever Tools and Plant ma
the total for works, and special superint
the entry on account of this latter is f
for Executive Establishments and 5 pe
a final addition.

(Signed

*23rd January 1875.*

No. 439. ORDER THER

IRRIGATION, No. 41.

the Pennair Anicut at Nellore, a l
the flood of October 1874 beyond t
end and a small portion of the weir

Works ...
Tools and Plant

Establishment ...

2. In the approximate estim
of the 23rd January last, it was s
feet would be about 75,000 Rupees
or Establishment. This and other
due care appears to have been t
possible, consistently with the futu

3. In paragraph 5 of the no
anicut, part of which is due to the
proceeds are appropriated to Local
that the difference between the toll
of the town really appertain to the
been pointed out also that a special
incurred in the formation of a roadw

See also G. O., Revenue Department, 9th
1875, No. 619; Public Works Depa
19th April, No. 1,098.

belongs to the anicut, and these P
and Revenue Departments in order

4. The remarks in paragraph
done, as described in the specificat
attention, and he will report what ad
for rubble masonry in certain parts
alignment of the flood banks should

---

# Nº 486 A.

## Note by the Chief Engineer for Irrigation

Progs: 23rd Jany: 1875
No. 198.

The approximate estimate submitted by the District Engineer, Nellore, for the extension of the Pennair Anicut amounted to Rupees 107,000 of which Rupees 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 Engineers 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 Engineers guidance.

with D.E. No. 46
of the 8th
To D.E. No. 95 - 23d Jany

D.E. No. 7 dated
22d April 1875.

2. The estimate now submitted amounts to Rupees 159,150 and provides for lengthening the Anicut 450 feet. This estimate makes the following provisions not included in the former

| | | |
|---|---|---|
| Executive Establishment | 25 per cent | 28,900 |
| Direction and Control | 5 " | 5,780 |
| Tools and Plant | | 8,860 |
| | | 43,540 |

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 para 2 of this office No 95 of the 31st January last and Mr R. Smith's views in designing the wings objected to are detailed in para 6 of his letter No 96 of the 8th January and in para 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, beyond this by reed 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; eddies 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 & damage might be apprehended.

The

4 The cross section of the Anicut extension is similar to that of the old one, 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 Govt. was asked for and declined. Subsequently the Municipality or the Local Fund Board — 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 [illegible]

about 1856
~~No. dated~~
[illegible]

As above shown the reformation of the North approach to the Anicut will cost Rupees 8060, 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 that 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.

1st. 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 [illegible] water level, and [illegible] little more expensive, for such [illegible] as would be used is shown in the estimate as costing Rs a p 1 5 6 a cubic yard and bricks for an equal quantity of work should not cost more than 1 10 0 while less chunam and less labour are needed for brickwork, and the work can be done more quickly. Similar remarks apply to the wing walls, which should be of brick work faced with laterite.

2ndly The packing of the apron is thus described

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 upstream, 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 stone 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 upstream the removal of a lower stone

at

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 lessening one i.e. the 2nd 3rd & 4th &c stones will be capable of less and less movement, if not carried away altogether.

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

40 feet wide and 1 feet thick

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.

4thly the weep holes in the revetment walls on either side of the ramp leading to the Anicut need not be larger than 2" x 3" (6 x 4 in the specification) and some quarry rubble 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 [illegible] one, [illegible] 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

allow of a proper alignment being laid down above and below and the District Engineer has been asked to extend it both ways.

Reg. No 1227
dated 1st May
1875.–

9. In passing orders on the Budget estimates the Govt 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 the work should not be carried out with Extraordinary funds, as it is as much a part of the Capital charge of the Penner Delta works as any to which Loan Funds have been allotted, and it is known that the returns in part direct [illegible] have been considerable, [illegible] 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 unfortunate

To the Secretary to Government

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 this 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 Govt of India, and in order that appropriations may be made for expenditure in excess of the sum of Rupees 35000 already placed at the District Engineer's disposal this Office should report as soon as possible what the outlay will be 1st up to September when the freshes will temporarily nearly stop constructive work, and 2ndly thereafter to the end of the official year

Mullins Lt Col R.E.
Chief Engineer for Irrigation

Ootacamund
28 May 1875

To The Secretary to Government
P.W.D.

G.O. 1st May/75 No 21-22
" 23 Jany/ " " 411-412
" 19th Octr/ " " 488-489
" 19 Novr/74 " 337-340
Min No 1808 26th Octr/71
G.O. 5 June 62 No 89-90
" 18 Feby/ " " 278-279
" 11 Septr/68 " 84-85

P. W. 1875 Dept.
No. 9242

No. 486 A.

From
The Chief Engineer
for Irrigation

To The Secretary to Govt.
P.W.D.

Dated 8th
Received 14th } May 1875.
G.O. 19 June/75 No 1738
Enclosures 9

Note on the Estimate
for the extension of the
Pennair Anicut Nellore
Nellore District.

No 438.

Cir. 26/5/75 Rt. 8/6/75

Despd to Secy 20-5-75

No 1738 d/19th June/75

igation

---

Br. D

Proceedings of the Madras Govt.

Read the following:-

Note by the Chief Engr. for Irrigation } H.E. No 486 A. d/8 May 1875/

1738

2 plans wanting

Upon the foregoing Note the Chief Engineer for Irrigation submits the plans and estimate of the cost of extending the Pennair Anicut at Nellore a length of 40 yards across the breach formed by the flood of October 1874 round its former northern end, by which the wings at that end and a small portion of the work to [illegible]

destroyed.

| | |
|---|---|
| Works | 15,411 |
| Tools and Plant | 3,816 |
| | 12,4[illegible] |
| Establishment | 3,0[illegible] |
| Total Rupees | [illegible] |

2. In the approximate Estimate received in Public Works Proceedings No 193 of the 23rd January last, it was supposed that the cost of extending the Anicut 300 feet would be about 15,000 Rupees, but that that estimate did not include Tools and Plant or Establishment. This and other causes of difference have been fully explained, and the case appears to have

been

been [illegible] upon the extension as economically as practicable, consistently with the future security of the Anicut.

3. In para 5 of the Note it is remarked that a toll is levied at the Anicut, part of which is due to the use of the Anicut as a river crossing, and that the proceeds are appropriated to Local or Municipal funds, the Chief Engineer observes that the difference between the tolls here collected and those levied at other [illegible] appertain to the Anicut, and should be credited to it. It has been pointed out also that a special expenditure

alignment should be laid down, and thereafter worked up to as rapidly as circumstances will allow.

6. The District Engineer will report as soon as possible what funds will be required for the extension works during the current year, both before and after the freshes and it will then be determined whether it will be practicable to carry out the wishes of the Govt. of India as regards the provision for expenditure by transfers from the allotments of Budget Major works under Ordinary, or whether a special grant will have to be applied for.

para 10 of Budget orders Mly
1 May 1875 No. 1227
letter from G of I No. 108 A.I
22 March 1875

Wg 10/6/75

To Finl. Dept
" Revenue "
" Chief Engr Irr.
" Contr. P.W. A/c
D.E. Nellore
with 7 enclo. ×

S C Desp'd
29-6-75

2 plans with Mr.
Hawkins
6 July/75

× given to Mr. Hawkins Wg 26/5

324

Govt. of (1875) Madras

PUBLIC WORKS.

Me Trib. Dept.

17 June 1738

Nos. 438-439

438–39

Pennair Anicut, Nellore.

Passing orders on the note by the Chief Engineer for Irrigation on the estimate of the cost of extending the