

MADRAS RECORD OFFICE.

Government of Madras.

Revenue DEPARTMENT.

G.O. No.

493 A.

Press
Mis.454A, 454B, 454C.
Dated

21-2-1868.

Not to be folded or roughly handled

*Proceedings of the Madras Government, Revenue Department,
21st February 1868.*

Read the following papers:—

No. 454A. From the Sub-Collector of Tanjore, to the Chief Secretary to Government, Fort St. George, dated — February 1868.

I have the honor to request you will submit, to the favorable consideration of the Government, my application for a month's privilege leave in addition to, and in continuation of, the month's leave granted to me by the Board of Revenue in the "Fort St. George Gazette" of the 10th January 1868, page 47, and availed of by me on the 27th ultimo.

Referred to the Examiner of Claims, through the Board of Revenue, for the usual report.

(Signed) W. HUDLESTON,
Secretary to Government.

15th February 1868.

Re-submitted to Government, through the Examiner of Claims, with the Board's recommendation that the leave be granted.

(Signed) R. A. DALYELL,
Secretary to Board of Revenue.

17th February 1868.

No. 454B. Memorandum from F. LUSHINGTON, Esq., for Examiner of Claims, to the Secretary to Government, Revenue Department, dated Fort St. George, 19th February 1868, No. 10.

Ineligible to extension of privilege leave, as Mr. Vans Agnew was not twenty-two months uninterruptedly in service from date of his return from last similar leave. He overstaid his joining time from 31st December 1866 to 9th January 1867, and drew no pay or subsistence allowance for that period.

No. 454C. ORDER THEREON, 21st February 1868, No. 493 A.

Miscellaneous.

1. Mr. Vans Agnew applies for an extension of his privilege leave on the ground that he was, before the 27th

January last, entitled to two months' privilege leave. The Examiner of Claims considers Mr. Vans Agnew to be ineligible to extension of leave, on the ground that having broken his continuous service by overstaying the joining time allowed to him by the Rules in December 1866, when appointed Sub-Collector of Tanjore, he was entitled to one month's privilege leave only.

2. Mr. Vans Agnew exceeded the time allowed for joining under the mistaken supposition that the Christmas holidays, as *dies non*, were not included in that period, and as he has suffered for his mistake by loss of pay disallowed by the Audit Department, and has, irrespective of the break caused by this mistake completed twenty-two months' continuous service, the Government resolve, as a special case, to grant the extension of leave applied for.

3. It is observed that the application should have been submitted through the Collector of Tanjore.

(True Extract.)

(Signed) R. S. ELLIS,
Chief Secretary.

To the Board of Revenue.
,, the Examiner of Claims.

Exd. S. T. Augustin.

27

*Proceedings of the Madras Government, Public Works Department,
17th February 1868.*

No. 379. Read the following letter from the Superintending Engineer, 2nd Division, to the Chief Engineer for Irrigation, dated Nellore, 16th January 1868, No. 133 :—

2 Appendices A and B.
1 Section of Pennair Anicut.
1 Elevation of do.
1 Diagram of Pennair from 1861-62 to 1865-66.

1. As directed in paragraph 2 of G.O., No. 3,264, dated 21st October last, I have the honor to re-submit the project for extension of irrigation from the Pennair Anicut, with explanations which

I trust will be satisfactory to the Government of India.

* 37.49 feet above mean sea level.

2. The length of the Nellore Anicut is 1,581 feet, but the crest* is not quite level throughout, as will be seen by the section and elevation I forward. The Executive Engineer, Mr. R. Smith, has calculated with accuracy the quantity of water which passes the anicut with a

† Appendix A.

depth varying from 6 inches to 5 feet,†

but the present project is framed so as to be independent of any supply whatever beyond that obtainable when $2\frac{1}{2}$ inches are passing, or rather I should say are above the crest, for owing to inequalities in the rough-stone and metalled road, no water actually passes till there are nearly 6 inches above crest.

3. The floor of the present head sluice is 6 feet below the general crest of the anicut. It consists of nine vents of 6 feet each. It is now proposed to lower these vents 2 feet for 4 feet of their breadth, and to erect an auxiliary sluice of six vents of $3\frac{1}{2}$ feet each, the floor of the latter being 8 feet below crest. Using Neville's Formulæ, it will be found that there will then be a discharge of 256,933 cubic yards per hour, when the water is $2\frac{1}{2}$ inches over anicut crest, or in other words, when the channels flow 8 feet deep; $2\frac{1}{2}$ inches being the head that would be generated under the circumstances at the sluices.

† Total area of Pennair south delta land	Sq. M.
	324
<i>Deduct.</i>	
For existing tanks and villages ...	80
Pasture lands and high grounds ...	50
Unfit for cultivation ...	32
Roads, topes, channels, and Inam lands	62
	—
	224

Balance to be irrigated... .. 100
= 64,000 acres.

§ $\times 64,000 \times 2\frac{1}{2} \times 24 \times 150$.

|| Calculated on the new channel.

¶ Calculated on the old channel, as there will be only the same quantity available as formerly when the water is not flowing over the anicut.

4. The irrigable area under the anicut may be roughly taken as 64,000 acres† and the total quantity of water needed for this area, allowing 150 days at $2\frac{1}{4}$ cubic yards per hour per acre, is 518,400,000§ cubic yards.

5. That this water is available in an average year, may be shown by analyzing the synopsis accompanying the project, thus:—

Sixty-one days, water level with crest, discharging 256,933 cubic yards per hour	Cubic yards.
	376,149,912
Twelve days, water 6 inches below crest, discharging 141,000 cubic yards¶ per hour	
	40,608,000
Twenty days, water 12 inches below crest, discharging 128,190 cubic yards¶ per hour	
	85,531,200

502,289,112

6. When it is remembered that in the above calculation all the water passing when the river is 2, 3, 4, 5, or 6 feet below crest,* all the rain-fall, and all the local drainage is excluded, also the body of water passing through the under-sluices, but which can be made available; it must be admitted that the channels even in the worst years will be sufficient for the lands under them. The excess supply when heavy freshes are coming down the river, and the channels are allowed to run 10 or 11 feet deep, is likewise not to be forgotten. It will also, I think, be admitted that channels supplying less than 256,933 cubic yards per hour during the sixty-one days referred to, would not be advisable.

7. The 64,000 acres abovementioned, though carefully calculated, is of course still an approximate estimate. They may be sub-divided thus:—

	Acre.
Under Survapully Channel	30,000
Under Jaffer Saib's and Kistnapatam Channels	34,000

8. An abstract statement of results of Pennair system of irrigation (furnished by the Collector) for 1864-65, shows that the area cultivated under the anicut in that year was 40,345 acres, of which 6,623 acres, being under the Survapully Channel, a balance of acres 33,722 is left as the area cultivated under Jaffer Saib and Kistnapatam Canals. This is nearly the full acreage estimated for, but more water is required for storage in case of bad years, and to supply the wastage which is considerable, owing to the negligence of the ryots.

9. It is asked how the extra supply of 6,373 in Jaffer Saib's and 8,772 cubic yards per hour in the Kistnapatam Canal will be carried. In reply I have the honor to state that the Jaffer Saib's Canal is an old native duct, and too large for our wants. The dimensions of the branch channels from it will be increased, and thus the surface fall in the main duct augmented. In the Kistnapatam Canal the first drop has been lowered one foot, and the bed will be sloped to meet the new level of the sill, and thus the velocity and discharge will be increased.

10. The Executive Engineer allows 30,000 acres as the eventual area under Survapully Channel, which he carefully sub-divides thus:—

	Acre.
Under Survapully Reservoir	19,900
Between Kanupurtipaud and Anakapully	4,000
Under Vulluru branch Channel	6,100

and his channels are designed to carry in sixty-two days the total water needed for these areas, as may be proved by an examination of any of the sections given, and calculating the discharge according to Neville's Formulæ.

11. In reply to the question whether this project applies the whole of the available water supply now in excess of present wants, and why, if more water is available, the proposed new channels could not be carried further to the west, and made to command more ground, I beg to state that my reasons for not utilizing the water as proposed are given in paragraph 5 of my letter* to the Madras Government. The loss of valuable water during freshes has, however, occupied my

serious attention, and a project for irrigating the northern delta by enlarging and extending channels from Sungum (20 miles above Nellore) will, I trust, before long be submitted for the sanction of Government. It is perhaps desirable not to enter at present further into that scheme than to say that the Sungum Channels will draw off no more water than they do at present, excepting when the river is flowing over the Nellore Anicut, at which times they will secure all they can.*

* Vide Appendix A.

12. The Government of India remark on the feasibility of adapting the Pennair Channels for navigation. Such an important matter has of course met with my full consideration, and I beg to give my reasons for deciding on not thus utilizing them. It will be seen from the diagrams of the river's rise and fall, that the Pennair is a gigantic and irregular mountain torrent, and not unfrequently it would happen that navigation could only be carried on for a few days at a time, and boats on their voyage would frequently be left high and dry. In order to secure a large supply in a short time, the channels are made with considerable slope, and the generated velocity is such as would make navigation up-stream very difficult. There is only one channel which could, I think, be in any way recommended for navigation, viz., that to Kistnapatam sea-port, and if ever the Eastern Coast Canal is extended from Madras to Kistnapatam, this line would be desirable; but in such a case, I should certainly recommend that a still-water canal be made. Four locks with drops of 10 feet each would be necessary, and with still-water reaches filled from the river at intervals, or from the Nellore tank, the navigation might be made tolerably secure for perhaps seven months in the year, the only loss of water being from absorption, evaporation, lockage, and leakage.

13. With reference to Colonel Strachey's remarks concerning the capacity of the Survapully reservoir, I beg to state that the Executive Engineer took care to ascertain as accurately as was possible that capacity. I did not think it necessary to forward the calculations, as they were a little difficult for a person, who did not know the ground, to follow, but I now append a Memorandum† by Mr. Smith, explaining them as clearly as possible. It will be seen that the cubical capacity is 52,634,771 yards. Colonel Strachey remarks that the greatest accumulation of water does not seem likely ever to go to forty millions cubic yards, but this opinion is deduced from an analysis of the average results of five years. It will, I think, be admitted that the reservoir should be of a capacity to secure all, or nearly all, the water in an extraordinary year. If the year 1865 be taken, it will be observed that the number of days the water rose to, or above the crest of the anicut, was as follows:—

April.	May.	June	July.	August.	September.	October.	November.	December.
1	2	7	3	23	8	...	6	13

Following Colonel Strachey's plan of calculating, and allowing that irrigation begins in August and lasts till end of December (though the water secured in April and May would probably have evaporated), the following are the results:—

*Proceedings of the Madras Government, Public Works Department,
17th February 1868.*

To 1st August, thirteen days' full supply, at 131,125 cubic yards per hour	Cub. Yds. 40,911,000
Add twenty-three days in August, at 77,350 cubic yards per hour, or 1,856,400 cubic yards per diem	42,697,200
	83,608,200
Deduct for eight days, at 45,000 cubic yards per hour, or 1,080,000 cubic yards per diem	8,640,000
Tank balance 1st September	74,968,200
Add eight days in September	14,851,200
	89,819,400
Deduct twenty-two days	23,760,000
Tank balance 1st October	66,059,400
Deduct thirty-one days in October	33,480,000
Tank balance on 1st November	32,579,400
Add six days in November	11,138,400
	43,717,800
Deduct twenty-four days in November	25,920,000
Tank balance 1st December	17,797,800
Add thirteen days in December	24,133,200
	41,931,000
Deduct eighteen days in December	19,440,000
Tank balance 1st January	22,491,000

Thus the tank balance on first days of September and October appears much in excess of what the tank will hold. In practice about two millions of excess supply

would have been stored in Idagally tank,

G. O. No. 1,844, 20th June 1867.

(vide 8th division of paragraph 4 of my letter No. 17, dated 3rd May last,) and the supply of the three days given in April and May, or 16,441,000 cubic yards, would have been absorbed or evaporated. The calingulah which is 170 feet in length, and whose crest is two feet below surface of the future tank high-water mark, would prove ample to take off any excess should it be necessary to do so; but remembering the great power that will exist for regulating the supply by the various head sluices, no such emergency should ever occur. It is designed to carry off, when 4 feet flow over it, about 390,000 cubic yards per hour, or in other words, to meet the contingency of four inches of rain falling on 28 square-miles of country in twenty-four hours, and all draining into the Sarvapully tank, whilst the tank is full.

14. With reference to paragraph 32 of Colonel Strachey's Memorandum, wherein he alludes to this escape, I would beg to refer to the plan and specification connected with it, wherein I think all needful explanation is given. It will be noted that the calingulah is built on hard laterite soil.

15. In paragraph 26 objection is taken to the irregularity of slope of bed. The channel is generally excavated in hard laterite, capable of resisting almost any velocity of water, and it, therefore, is correct to suit the fall to slope of ground and avoid unnecessary expense in masonry falls, or needless excavation, or embankment. The ground throughout rises very quickly on the right bank of the channel,

*Proceedings of the Madras Government, Public Works Department,
17th February 1868.*

and is for the most part waste jungle land. In no place will more than 300 yards be swamped when the canals are full, and as the cost of a double embankment would be great, and the local drainage would be intercepted by it, the Executive Engineer was correct in estimating for only one bank. A road along the bank is not wanted, and if formed would not be used, as the laterite formation to the west of the canal affords excellent tracks for bandies which do not wind as the channel banks do. I do not think that the height of the banks should be reduced, as on extraordinary occasions, when 10 feet of water is admitted into the channel, the bank will be only 4 feet above water level, and being formed of the excavated laterite soil, would probable be eroded by the velocity of the current.

16. With reference to paragraph 28, I do not find that the Vulluru Channel is too large. The area to be cultivated under it is 6,100 acres, which for the season of 150 days would require 4,941,000 cubic yards. But this quantity has to be supplied on an average in sixty-two days. Taking section 3 of the canal as the most convenient one for demonstrating the case, and using the formulæ

$D = \frac{1}{2} \times 55 a \sqrt{2fd}$, where a = sectional area of channel f = fall in feet per mile, d = the hydraulic mean depth, I find that the discharge is 32,771 cubic yards per hour, or for sixty-two days 48,763, 228 cubic yards, which is very nearly what is required.

17. With reference to paragraph 34, the banking in the third mile of the Vulluru Channel might be reduced by building a fall towards the end of it, but this would make the bed of the channel lower than the Maderaz Goodoor tank, and the side slope of the former would in the particular soil to be met with there, suffer from percolation. The banking in the fourth and fifth miles might also be reduced: in the former instance by carrying the channel north of Maderaz Goodoor, but this would cut off the village from the main road, and entail the construction of a bridge; and in the latter, by changing the site of the fall to nearer the Maderaz Goodoor tank, but not much would be gained by this, and the eligible spot selected for the structure near the village of Appecherla would be lost. On the whole, I think Mr. Smith has designed the line with great judgment.

18. The land referred to (paragraph 29 of Colonel Strachey's Memorandum) could not be watered from the new canal, as it is on a much higher level. It is, and must continue to be, supplied from the Nellore tank. The thickness of the pier referred to can be reduced six inches, if desired.

19. The water-way under aqueduct near Kanupurtipaud will drain only two square miles of country, and is amply large considering the amount of head that may accumulate, without disadvantage, to carry off any rain-fall.

20. I have not found slopes of one of base, to one of height for revetments, answer in practice. The dash of the waves, or the settlement of the soil behind the stone-work, often injures such a

* N. B.—The Nellore tank revetment, which has within the last two years been built with this slope with excellent workmanship, has already in parts bulged. I could name many other instances.

revetment considerably,* and for such a work as the Sarvapilly Reservoir the slope and thickness of revetment proposed should, I think, be adopted. But

as the item is very expensive one, I have altered the thickness to one foot throughout,

*Proceedings of the Madras Government, Public Works Department,
17th February 1868.*

but I would beg to retain the slope of 2 to 1. This effects a saving of Rupees 20,409.

21. With reference to paragraph 33, I have to state that the soil referred to is hard laterite, and will bear any possible velocity without any injurious erosion.

22. I am not in a position at present to propose abandoning any of the small reservoirs in the delta beyond those mentioned in the 7th head of paragraph 4 of my former report, but I think it is possible I may be so hereafter. In the Sungum scheme, which is now actively in hand, the matter of reclamation of land by the abandonment of petty tanks, is meeting with full consideration.

23. It now only remains for me to notice the probable remunerative returns of the works under consideration. The returns admitted in the 26th paragraph of the letter of the Government of India, after allowing 12 Annas per acre for maintenance, so nearly correspond with those exhibited in paragraph 10 of my letter forwarding the project, that it seems unnecessary to dwell further on this particular portion of the project, but perhaps a notice of the profits to be expected from the whole works taken together would be interesting, and I therefore append the following memorandum:—

Probable expenditure.

	RS.
From 1856-57 to 1864-65	5,34,528
In 1866-67 and 1867-68	12,326
Amount of Survapully Project estimate, deducting 20,409 as saving on reduced revetment of tanks	3,92,591
Total probable expenditure	9,39,445

Probable revenue.

Wet sist on 64,000 acres at 4 Rupees per acre	2,56,000
Dry sist on 18,000 acres now lying waste at 2 Rupees per acre	36,000
	2,92,000
Deduct area cultivated as wet before commencement of works 24,754 acres yielding	1,04,934
Total Revenue	1,87,066
Deduct maintenance charges, interest of money, &c., at 12 Annas per acre on 64,000 acres	48,000
Total annual profit	1,39,066

Rate of profit on expenditure to be incurred... 14.8 per cent.

Cost of furnishing water per acre to 39,246 acres ... 23.94, say 24 Rs.

Had the anicut not been twice destroyed the returns would have been fully 18 per cent.

Proposed Reservoir.

The area of the side slopes, between existing and proposed contour lines, is 1,285 acres.

1,285 × 4,840 = 6,219,400 square yards. Of this area, 4,940,650 square yards will have an average depth of 3 feet (i. e., one-half of the height the surface level of the water is to be raised). The depth of water on the remainder 1,278,750 square yards will be 1½ feet only, as the

*Proceedings of the Madras Government, Public Works Department,
17th February 1868.*

slope of the country in two directions has to be considered in computing the capacity of this portion. The capacity of the reservoir will therefore be (say) 52½ million cubic yards, as annexed:—

Square yards.	Yards.
* 14,946,000 × 2	= 29,892,000
† 4,940,650 × 1	= 4,940,650
† 1,278,750 × ½	= 639,375

	35,472,025
Add capacity of existing tank ..	17,162,746
	52,634,771

(Signed) R. SMITH,
Executive Engineer.

NELLORE,
16th January 1868.

APPENDIX A.

Discharge per hour over the Nellore Anicut, with the following depths in crest.

Depth in Inches.	DISCHARGE IN CUBIC YARDS PER HOUR.				Total cubic yards per hour.
	Over crest.	Over sluices No. 1.	Over sluices No. 2.	Over sluices No. 3.	
6	214,630				214,630
8	331,470				331,470
12	610,870	+ 14,628	+ 2,046		= 627,544
15	834,710	+ 34,026	+ 5,742		= 894,478
18	1,124,680	+ 57,876	+ 21,186		= 1,201,742
21	1,414,780	+ 86,720	+ 36,333	+ 1,036	= 1,538,869
24	1,727,200	+ 118,400	+ 53,658	+ 2,560	= 1,901,818
27	2,062,480	+ 153,280	+ 73,260	+ 4,966	= 2,293,986
30	2,416,810	+ 191,200	+ 94,842	+ 8,352	= 2,711,204
33	2,788,920	+ 231,520	+ 118,305	+ 12,806	= 3,151,551
36	3,177,540	+ 274,700	+ 143,253	+ 18,612	= 3,614,125
39	3,582,670	+ 320,000	+ 169,983	+ 25,550	= 4,098,203
42	4,005,580	+ 367,520	+ 198,000	+ 31,460	= 4,602,560
45	4,439,920	+ 417,280	+ 227,403	+ 37,648	= 5,122,251
48	4,892,040	+ 469,120	+ 258,192	+ 53,820	= 5,673,172
51	5,360,670	+ 522,720	+ 290,268	+ 66,456	= 6,240,114
54	5,838,190	+ 578,560	+ 324,433	+ 79,768	= 6,819,951
57	6,332,220	+ 635,680	+ 357,984	+ 94,068	= 7,419,952
60	6,840,220	+ 695,202	+ 393,327	+ 109,044	= 8,037,791

NELLORE,
16th January 1868.

(Signed) G. V. WINSOM, Lieut.-Colonel, R. E.,
Superintending Engineer, 2nd Division.

APPENDIX B.

Memorandum.

The capacity of the Survapully tank was calculated from a section taken along the outer toe of the embankment and from the general slope of the country on the margin of the tank, as it was impossible to take the necessary transverse sections at the time, owing to the depth of water in the reservoir.

* Area of contour of existing tank.

† Area between present and proposed contour lines.

N. B.—The approximate capacity of the present tank and adjoining swamp is 19,270,000 cubic yards, but upwards of 2,000,000 cubic yards must be deducted from this quantity in calculating the capacity of the enlarged reservoir, as the swamp will be drained and brought under wet cultivation by the proposed arrangements.

*Proceedings of the Madras Government, Public Works Department,
17th February 1868.*

From the section taken, it appears the average depth of the water in the deep portion of the existing tank when full is 4½ feet; but in computing the capacity, 4 feet only were assumed.

By raising the surface level of the water 6 feet, as proposed for the enlarged reservoir, 1,285 acres of land will be submerged; from this the general slope of the sides of the present tank to its deep bed were calculated as follows:—

If by raising the surface level of the tank 6 feet, 1,285 acres will be submerged, it may be assumed, without much practical error, that the area of the side slopes of the existing tank is 857 acres.

6 : 4 :: 4285 : 857 or 4,147,880 square yards. The area of the contour of the present full tank (to be included in the calculation for the enlarged reservoir) is 14,946,000 square yards. Taking the average depth of the main portion of the tank at 4 feet, and that on the sides at one-half of this, (2 feet,) the capacity will be 17,162,746 cubic yards. Annexed is the calculation:—

	Square yards.
From total area of the contour	14,946,000
Deduct area of sides	4,147,880
	10,798,120
10,798,120 × 1½ =	14,397,493
4,147,880 × ½ =	2,765,253
Capacity of existing tank	17,162,746 cubic yards.

MEMORANDUM.

1. Submitted for the information of Government with reference to G. O. dated 21st October 1867.

2. The Superintending Engineer of the 2nd Division now re-submits the project for the completion of the Irrigation works in the Pennair Delta, with information on various points which were not entered upon in the first instance so fully as the Government of India required.

3. As a Memorandum conveying a full explanation of what appeared to the Government of India to be either oversights or mistakes on the part of the Officer who drew up the scheme has already been forwarded by this Government, excepting as regards some details which could only be dealt with by the local Officers, it would appear to be needless for me to go over the whole subject afresh. It has been acknowledged that the general nature of the project is simple, and that it is carefully prepared in its details; but it was expected that the Engineer should have entered more fully than he had done into the reasons which led him to adopt each particular design, and that he should have anticipated objections and have answered them when he submitted his report. As the return of a project for revision or re-consideration is a reflection on the Engineer who prepared it, and in this particular case on a very deserving Officer, who has worked his way up from the lowest grade in the department, I would beg to point out the extreme difficulty which most Officers must labor under in supplying the want of local knowledge on the part of those through whose hands their reports are to pass. There must be risk on the one hand of their entering into a tedious description of what may already be well known to every one, and, on the other, of their leaving out information which may be indispensable for a correct understanding of what is proposed. Had the project under consideration been an entirely new one, it might have been expected that a complete description of the country to be influenced by it would have accom-

*Proceedings of the Madras Government, Public Works Department,
17th February 1868.*

panied its submission to Government for sanction, but the works in the Pennair Delta have already been the subject of numerous reports, and it is but natural that the local Officers should refrain from entering upon a general description of the scope of the delta works in bringing forward a project merely for completing a single section of them. I trust, therefore, that these Officers will be held excused in this instance for having neglected to furnish information on various points which have no closer reference to that particular section of the delta system, than to the others which had already been before Government, and which had received their approval.

4. I may now mention that the Pennair Delta, or at all events the portion to the northward of the river, commences at the town of Nellore, and that above or to the westward of that point the drainage of the country falls towards the river. Excepting for a short distance from the banks the country is undulating and in some parts hilly. At Nellore and along the line of trunk road there is a strip of country of laterite formation considerably higher than the delta, and separating it from the undulating ground inland. It is along the eastern limit of the laterite plateau or rather at a short distance from it, that the proposed new Survapully channel is to run, and it is thus on the extreme margin of the delta. I may add that the channel passes for some distance through the laterite formation, and that the head sluice and other masonry works are built upon it.

5. The Survapully channel is not an entirely new work. Nearly the whole of the tanks in the delta were to a certain extent supplied by means of flood-cuts from the river long before the construction of an anicut was thought of. It may be readily understood from a glance at the diagrams of the rise and fall of the river, that the supply could not possibly have then been in a satisfactory state. During the ten years prior to the completion of the anicut the revenue fluctuated from Rupees 52,400 in the worst year to Rupees 1,30,000 in the best. The improvements introduced, like most others in the Madras Presidency, were for the purpose of securing the existing revenue in the first instance, and of increasing it in the second.

6. The delta being a small one, hardly fifteen miles wide, the works to be carried out were on a miniature scale compared with those in the Godavery and Kistna, but they were precisely similar in character, with the exception that the cultivation was more dependant on tanks, and that the channels were not adapted for navigation.

7. Of the two principal channels which formerly conveyed a supply to the delta, one, the Jaffer Sahib's channel with its two branches, called the Labur and the Idoor branches, supplied the tanks in the northern half of the delta, and the Survapully Channel, called also the Rameruddy Channel, supplied those in the southern half. The latter conveyed water to the Survapully Tank, and by the surplus of the latter to several tanks still further from the river. The water spread of the Survapully Tank reaches the laterite formation before-mentioned, and it will thus be seen that the old channels embraced the same area as that comprised by the recent or contemplated improvements.

8. The only entirely new channel of any considerable size which has up to this time been carried out in the delta is the Kistnapatam Channel, which runs in a

line nearly midway between the Jaffer Sahib and Survapully Channels. The other improvements have been confined to the enlargement of the old channels, to the construction of sluices, small masonry falls, escapes, under-tunnels, &c., and to the excavation of small branches to tanks.

9. These works were sanctioned at the dates mentioned below, and they may be said to have been completed, and to have proved in every respect satisfactory. A statement lately submitted by the Collector is appended, which will, I hope, satisfy the Government of India, that those small works have proved really remunerative. The late Collector of the district took the greatest pains in the preparation of the statistics on which the present return is based. I may remark as the Nellore Tank has been referred to in connection with the new Survapully project that it lies to the westward of the town of Nellore, that it irrigates a narrow strip of land along the margin of the river above the anicut as well as a portion of the delta lands, by means of channels which are cut through the laterite plateau on which the town stands. Some of the lower lands to which these channels extend can also be irrigated by the anicut channels, and the revenue of the tank is thus upheld and improved when its supply may not be competent to irrigate its whole ayacut. The effect which the delta channels have had on its revenue is also shown in the return I have just referred to.

Improving Idoor branch of Jaffer Sahib's Channel, G. O., dated 15th May 1861	rs. 27,100
Do. Labar branch, G. O., dated 15th May 1861, 20th March 1862	30,600
Connecting Survapully Channel with Jaffer Sahib's Channel, G. O., dated 17th February 1860, 29th June 1860, 8th December 1862	92,630
Canal of Irrigation from Nellore to Kistnapatam	59,600
Pennair embankment, G. O., dated 5th October 1861, 12th July 1864	13,410
Improving Nellore tank, G. O., dated 28th October 1857	16,400
Pennair Anicut, dated 19th August 1859	17,100
	1,12,500

10. The works on the new Survapully project are precisely similar to those in the channels above described, with the exception that they comprise an enlargement of the Survapully tank. The Nellore tank was similarly improved two or three years ago, and the new revetment is the best executed work of the kind I have seen. The Executive Engineer has thus had no want of experience on works similar to those which he has lately designed.

11. The only defect of any note which, in my opinion, exists in the small system of works in the Pennair Delta, is in the alignment of the head of the channel. It was for purposes of economy carried along the old native channel, and being in deep cutting, extensive spoil banks old and new had to be disposed of. I do not say that this defect could have been avoided without a serious extra expense, but had there been no restriction to width of channel, I should certainly have preferred to have allowed an increase of capacity in that form rather than in depth, as the Executive Engineer and Superintending Engineer, after careful consideration propose.

12. I do not think I should make the subject clearer were I to enter into the calculations which have been made in the Secretary's Memorandum, dated 11th

November 1867, and in the Superintending Engineer's letter now submitted. The supply of water available, which is the most important point of all, is not strictly capable of correct calculation, but ample proof has been given not only that it is more than sufficient for the cultivation in the delta, but that the Officer who designed the works has drawn up the project in the most thorough and skilful manner though he did not fully express the reasons which guided him to the particular designs he arrived at.

13. The question of combining navigation with irrigation in the delta channels has already been disposed of. Two separate projects for the Kistnapatam Channel were drawn up, one for combining irrigation and navigation at an estimated cost of Rupees 2,08,400, and the other for irrigation only, to cost Rupees 66,180. These were submitted to the Secretary of State (Despatch No. 65 of 1861),

* No. 49, dated 9th November 1861. who in reply* authorized the construction of the latter only. I agree with the

Superintending Engineer that if it is considered desirable to form a navigable communication between Nellore and the Kistnapatam back-water, after the completion of the Coast Canal to the latter, the most suitable mode of effecting it would be by means of a still-water canal, the lockage of which should be supplied from the Nellore tank, but it is quite premature to discuss the question at present, or until it is finally decided how far the operations of the Madras Irrigation and Canal Company are to extend into the Nellore District, and what particular lines their canals will occupy.

14. The Superintending Engineer, in reply to the Inspector General's exception to the slope allowed for the Survapully tank, has given what appear to me to be sufficient reasons for retaining the slope of 2 to 1, which the estimates provide for. The formation and revetting of a tank bank cannot properly be compared with the revetment of a canal bank in which a slope of 1 to 1 may generally be sufficient. There must of course be a greater tendency in an artificial bank to slip than there is in the generality of soils in their natural compressed and homogeneous state, unless considerable extra expense were incurred in compressing the artificial bank mechanically. The Superintending Engineer has however stated that he would not object to a reduction of the stone work of the revetment from the average thickness allowed in the estimate, viz., 1½ foot to 1 foot, which would reduce the estimate by Rupees 20,400. I would not however advocate this change. Laterite though on the whole an admirable material for revetment wears away considerably in the course of time, particularly when exposed to the action of waves, and it may be questioned if a reduction of six inches in the thickness allowed for in the estimate would leave a sufficient margin for such wear and tear. In any case if the reduction was made, I should consider it necessary to provide for extra thickness of gravel backing, six inches only being allowed, and for larger expenditure in ramming the earth-work, than the rate allowed (1 Anna 6 Pice per cubic yard in all) is sufficient to cover. Under these circumstances, I would recommend that the original estimate be allowed to stand.

15. I should remark that some confusion has been caused by a want of clearness in the designation of the channel leading to the Survapully Tank. The upper portion has been called the "Survapully Channel," and the lower, which leaves the old line of channel, nearly opposite to the new Woleru Channel, at times the "Sur-

8

Enfer

Proceedings of the Madras Government, Public Works Department,
17th February 1868.

vapully Channel" and the "Survapully branch Channel." This accounts for the difference in the calculations of the Inspector General and of the Executive Engineer of the capacity and duty of the Survapully Tank.

16. In conclusion, I would beg leave to state that the project under reference was submitted to Government some time before I took charge of my present office. In future, I propose to arrange the details of projects of any considerable importance in company with the Superintending Engineers, before the designs are drawn up for submission to Government. This course will, I trust, have the effect of saving considerable amount of correspondence, and of facilitating the preparation of the designs in the manner prescribed by the Government of India.

(Signed) J. C. ANDERSON, Lieut.-Colonel, R. E.,
Chief Engineer for Irrigation.

FORT ST. GEORGE,
1st February 1868.

Memorandum by Colonel Strachey, Inspector General of Irrigation Works.

Having read the report of the Superintending Engineer on the points connected with the project for the extension of Irrigation from the Pennair Anicut, on which further information was desired by the Government of India, and also Colonel Anderson's observations on the subject, I am of opinion that the explanations given are such as are likely to remove all objections on the part of the Government of India to the sanction of the project and estimate, and I therefore desire to record my recommendation that the works should be carried out without further delay.

(Signed) R. STRACHEY, Colonel, R. E.,
Inspector General of Irrigation Works.

MADRAS,
14th February 1868.

No. 380. ORDER THEREON, 17th February 1868, No. 535.

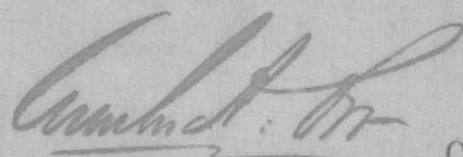
IRRIGATION, No. 21.

Ordered that the further report submitted by the Superintending Engineer of the 2nd Division on the

project for the extension of irrigation from the Pennair Anicut, together with the observations thereon by the Chief Engineer for Irrigation, and the Memorandum by the Inspector General of Irrigation Works, expressive of his approval of the project, be forwarded to the Government of India with the following letter :—

(Here enter No. 536, dated 17th February 1868.)

(True Extract.)



Colonel, R. E.,
Secretary to Government.

To the Superintending Engineer, 2nd Division.
" Controller of Public Works Accounts.
" Revenue Department.

Exd. S. T. Augustin.

Wm. Van Alstyne
Leane

Revenue 1868 Sept
Pro of Govt on Shelby.

No 4937.

No of the Charles Fort
of 21 February 1868.

100454 # 2454 C

154. 20. 154. 6