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MADRAS RECORD OFFICE.

Government of Madras.

DEPARTMENT.

G.O. No. Press / Misc.

Dated 18 .

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Read the following papers :—

No. 269. From Colonel G. W. WALKER, R. E., Superintending Engineer, 7th Division, to the Secretary to Government, Public Works Department, dated Coimbatore, 24th February 1870, No. 198 :—

I HAVE the honour to submit herewith a revised estimate of Rupees 18,180 for the construction of the Mungamary Aqueduct on the Arkenkōtta Channel, with extract of the Collegal Range Officer's report on the causes of excess over the sanctioned estimate of Rupees 16,100, and comparative statement further illustrative of the same.

1 Revised Estimate, No. 38, of 1869-70, Rupees 18,180.
1 Estimate for reparation of damage, Rupees 2,300.
1 Comparative Statement.
1 Letter from Collegal Range Officer.
1 Extract from a letter from do.

2. The sanction for the original estimate of this work bears date 11th December 1863, G. O., No. 3,668, and its amount was Rupees 14,930, the original papers having been prepared before I took up my present appointment. Under G. O., No. 234, of 22nd January 1868, a revised estimate of Rupees 16,100 was sanctioned, the increase of Rupees 1,170 being more than accounted for by the addition of another twenty feet span ordered by me on personal inspection of the site. Out of the present further increase of Rupees 2,080, Rupees 1,046 is not unfairly accounted for under the head of Superintendence and Sundries, the work having had to be taken out of the hands of unsatisfactory contractors on the 10th December 1868 and completed under departmental agency. Bad flooring caused an excess of Rupees 220, the work having to be taken up and re-laid; Rupees 283 under the head of Earthwork; and Rupees 531 under the head of Brick-in Chunam and Plastering are legitimately accounted for by unforeseen excesses of quantities of work to be performed.

3. Altogether, in spite of exceeding bad arrangements for the work from first to last, on which from time to time I have had to animadvert severely, and for which I hold Mr. Sub-Engineer Smither chiefly responsible, I should not have felt much hesitation in sending up the estimates for sanction as finally revised. But, having pressed for the sufficiency of the work being tested by actual use previously to their submission, I regret to have to state that it has failed apparently from defect of design, *i. e.*, from shortness of the wing-walls on one side, as reported in the accompanying letter from the Collegal Range Officer, No. 988, of 26th January 1870.

4. The excess over estimate for the original work has already been covered by the transfer sanctioned in G. O., No. 376, of 1st February 1870. The further expense to be incurred in reparation of the damage caused by the admission of wate., as represented in the accompanying estimate of Rupees 2,300, will have to be provided from the reserve of 1870-71.

No. 270. From Colonel G. W. WALKER, R. E., Superintending Engineer, 7th Division, to the Secretary to Government, Public Works Department, dated Coimbatore, 24th February 1870, No. 204:—

I HAVE the honour to submit a revised estimate of Rupees 28,700 for the construction of the Vanipoottoor Aqueduct on the Arkenkotta Channel; the anticipations of a saving on the original estimate of Rupees 24,700, expressed in paragraph 3 of my memorandum quoted in G. O., No. 234, of 22nd January 1868, having proved fallacious to such an extent that a demand of Rupees 4,000 in excess has now to be made. More than half of this excess is shown by the comparative statement and report accompanying to arise from irrecoverable payments to the contractors, and the rest to be accounted for legitimately by payment for land and necessarily higher rates.

1 Revised Estimate, No. 44, of 1869-70, Rupees 28,700.
1 Comparative Statement.
1 Mr. Nordmann's Report.
1 Extract from Mr. Smither's letter.
1 Contract Certificate.
1 Estimate for repairing damages, No. 45, of 1869-70, Rupees 4,490.

2. Lieutenant R. F. Taylor, then in charge of the range, is answerable for having, in the month of June 1867, made advances of nearly Rupees 3,000 on a contract not previously sanctioned by me and on no security, and for having increased such advances and payments for materials of indefinite quantity up to nearly Rupees 5,000 by the month of September 1867 (at which date no actual commencement of work had been made) in the face of the following prohibition, contained in my letter to him, No. 38, of 22nd June 1867, namely, "The payment of advances to contractors without valid security to at least double the amount is absolutely prohibited." The works were visited by me in July, and my dissatisfaction with Lieutenant Taylor's proceedings resulted in his charge being restricted to the Barghoor Ghaut and in Mr. Sub-Engineer Smither being placed in charge of the range, including the aqueduct works. (See G. O., No. 2,317, of 1st August 1867).

3. In the transfer certificate passed between Lieutenant Taylor and Mr. Smither, it is stated that "the value of materials at site, and advances made on "account thereof, agree with the accounts of the Vanipoottoor and Mungamary "Aqueducts." In a report dated 1st October, Mr. Smither defines the advances on the Mungamary Aqueduct, not covered by materials at site or labour performed, to be Rupees 1,528 out of a total outlay of Rupees 2,632. Of the Vanipoottoor Aqueduct he says, "The materials are too scattered to admit of their number or "quantity being ascertained except at some outlay, but there can be no doubt that "the materials at site are insufficient to cover half the outlay entered against the "work, namely, Rupees 4,440-12-0."

4. On three different occasions, namely, in Memorandum, No. 35, of 12th June 1867, in Memorandum, No. 95, of 5th September 1867; and again in Memorandum, No. 116; of 22nd October 1867, had I to disallow contracts for one or both of the aqueduct works, those finally accepted by me not having received my countersignature till 30th December 1867; and paragraph 3 of my memorandum, printed with G. O., No. 234, of 22nd January 1868, will show that not only were no apprehensions then entertained of exceeding the estimate for the Vanipoottoor Aqueduct, but that a saving of Rupees 1,750 was anticipated; in fact, Mr. Smither's inspection lists of that period are full of expressions of complacent satisfaction with the contractors and himself on the subject of the work, and he appears to have resumed payments to them freely from December 1867 up to March 1868, at the end of which he went on sick leave, his last remarks on the Vanipoottoor work, dated 17th March, being "these people are going on slow, but very well."

5. I am inclined to attribute the failure to recover the advances of Rupees 2,078 on the Vanipoottoor work, as those of Rupees 1,528 on the Mungamary work were recovered, to this break in Mr. Smither's continuous supervision of the range; for on his return he complains that he found his practice of measuring at every inspection and withholding five-eighths of the value of work done in the interval, had not been adhered to, but a full stop put to all payments, so that the contractors, never so tractable and honest as those at Mungamary, had thrown up work altogether. And, although Mr. Smither on his return in July 1868 paid them up as much as Rupees 561 in full of work done in his absence, he never appears to have been able to induce them to resume operations in earnest; for in October 1868 I find him reporting that he had dispensed with their services, in a letter of which the accompanying is an extract, fixing the deficit of Rupees 2,078 so far back as that period. It will be observed that Mr. Smither then considered it hopeless to expect to recover the amount. I have only to add that his own proceedings in granting such a contract certificate as that dated 24th July, herewith forwarded, are the main obstacles to any legal proceedings having been adopted.

6. Observing in Mr. Smither a tendency to throw all responsibility for the work on the Talook Overseer, and to exonerate himself from personal liability concerning it, I took measures to relieve him of charge of the range for which I found him unfitted, and to confine his attention to the aqueducts alone, in sole charge of which he accordingly remained from November 1868 till 1st February 1869, when he had to be relieved on account of sickness, and eventually transferred to Malabar. The works have since progressed to completion under Mr. Assistant-Engineer Nordmann, and were last visited by me in July 1869, when the Mungamary Aqueduct was all but completed, and the flooring of the Vanipoottoor Aqueduct in progress.

7. It was then that I made the discovery that, though I had so far back as the 7th May 1867 called special attention to the use of soorkee in cement over the arches and in plastering, and described its composition, ordinary brick jelly in chunam had been used for the Mungamary Aqueduct, and was being used for the Vanipoottoor Aqueduct, and that entire ignorance existed as to the composition of the cement. I am assured that, since my visit and communication of a formal recipe, it solely has been used; but I am bound to record the fact of neglect on the part both of Mr. Smither and Mr. Nordmann to attend to the details of a sanctioned estimate, and to inform themselves of the exact nature of the work to be carried out.

8. I regret further to say that, as in the case of the Mungamary, so in that of the Vanipoottoor Aqueduct, I am obliged to submit a fresh estimate of Rs. 4,490 for re-laying the flooring of the latter under the following circumstances, extracted

from Mr. Nordmann's reports, No. 907, of 4th January 1870, and No. 1,052, of 17th February, viz., "As reported in my inspection report for the month of November "1869, in consequence of the heavy rains of the past season the flooring of the "aqueduct between the wing-walls sank in those parts where Mr. Smither had laid "it on made soil, without increasing the estimated thickness of half a yard. I was "just about to admit the channel water over the aqueduct, in which a yard of "water already stood partly from leakage through the channel bank and partly "from the rain, when suddenly the flooring sank more than an inch on both sides "of the arches to a total length of 198 feet, and all the water ran out and soaked "into the ground," and "a portion of the side walls of the duct has to be re-built. "This did not become evident until the excavation for the new flooring had been "dug, when it was found that the foundation of a portion of the side walls near the "abutment did not go down as deep as the new flooring. Thus that portion of "the side wall became unstable, and had to be taken down to prevent accidents."

9. The transfer of Rupees 2,562, made in G. O., No. 376, of 1st February 1870, to credit of the Vanipoottoor Aqueduct, served not only to pay up the excess incurred on the original estimate, but to defray Rupees 315 of the expenditure unauthorizedly incurred by Mr. Nordmann on the supplemental estimate of Rupees 4,490 now submitted. But he informs me that Rupees 1,117 more are already due to workmen; and I must request to be absolved of all responsibility with reference to this unauthorized outlay, and that Government will be pleased to take notice of it. Mr. Nordmann has, in fact, put me to great annoyance by his repeated transgressions of the standing orders of the department in respect to the supply of estimates and obtaining of sanctions, so that he should make use of his cash credits on duly authorized works only. The Controller might also be instructed absolutely to refuse to pass expenditure more than five per cent. in excess of any estimate, unless a distinct assurance is given him that supplemental estimates have duly been sent in to Superintending Engineers.

No. 271. From Lieutenant-Colonel W. FAREWELL, S. C., Acting Superintending Engineer, 7th Division, to the Secretary to Government, Public Works Department, dated Suttiamungalum, 5th August 1870, No. 91 :—

WITH reference to the Acting Chief Engineer for Irrigation's memorandums, Nos. 48 and 49, dated 1st March 1870, relating to the Mungamary and Vanipoottoor Aqueducts, I have the honour to reply thereto as follows.

1 Sanctioned Plan of Mungamary Aqueduct.
1 Plan as actually built.
1 Plan of Vanipoottooor Aqueduct as sanctioned and as actually built.
2 Revised Estimate and Comparative Statement, No. 38, of 1869-70, Rupees 18,180.
1 Extract Report on causes of excess (A).
2 Revised Estimate and Comparative Statement of Vanipootoor Aqueduct, No. 44, Rupees 28,700.
1 Report on causes of excess, etc., (B).
2 Mr. Smither's letter, No. 346, of 27th October 1868, and Contract Certificate.

2. Both works are over jungle streams which formerly emptied themselves into the Arkenkotta Irrigation Channel, discharging over rudely constructed weirs. The aqueducts are situated at a distance of about six miles apart, and the works were constructed under the same superintendence and were built simultaneously.

Proceedings of the Madras Government, Public Works Department, 16th September 1870.

3. The plans called for are herewith submitted. The alterations in the design consist of the lengthening of the wing-walls, the introduction of spandril arches, and a central dividing wall in the Mungamary Aqueduct, all of which were reported to the Superintending Engineer, who did not, however, appear to have approved of the dividing wall.

4. The corrected remarks of the Range Officer will sufficiently explain the items of excess. No large aqueducts have ever before been built in the district; at least, I have inspected now nearly every irrigation work in the district, and have only seen a couple of very small works of the kind that have been built of late years. The rates of the Mungamary Aqueduct, on referring to the comparative statement, will be found to be the same in the revised as in the sanctioned estimate; but it is understood that this sanctioned estimate was really a revised one prepared only in December 1867, which is the estimate sanctioned in G. O., No. 234, dated 22nd January 1868, and the excess is accounted for in detail by the Assistant Engineer in memorandum marked A. On referring to the comparative statement of the Vanipoottoor Aqueduct it will be observed that the rates differ considerably. The estimate for the Vanipoottoor Aqueduct, sanctioned in 1863, is framed on the old data of the range, the rates of which have of late years considerably increased, (*vide* comparative statement and report marked B). The above accounts for the difference in rates between the estimates for the aqueduct.

5. The Range Officer lastly engaged on the work, which he took charge of in February 1869, in August 1869 reported to this office that he anticipated the estimates for both aqueducts being considerably exceeded in consequence, in reference to the Mungamary, of more work done than estimated for, and the amount allowed for superintendence being insufficient; and, on the Vanipoottoor, in regard to old rates having been used in the estimate, and owing to a loss by an advance made by one of his predecessors already reported; and he submitted the revised estimates on the 4th January 1870.

6. The excesses over estimates on the works are as follow,

	RS.
Mungamary	2,080
Vanipoottoor, after deducting the loss by an advance of Rupees 2,078 included in the revised estimate ...	1,922

the excess in the former being 12·919 per cent. over the estimate, and in the latter 7·785 per cent. due to reasons already given. Though Lieutenant Taylor is to blame in having made advances without the Superintending Engineer's authority, yet, considering at the time this officer was young and inexperienced and quite new in the department, I would respectfully recommend the balance of advance made by him which remains unrecovered, namely, Rupees 2,078, be written off to "Profit and Loss," or, as at present, charged to the estimate, and the accounts, under authority of Government, passed by the Controller.

7. On perusing the whole of the papers connected with these works that are to be found in my office, Mr. Sub-Engineer Smither appears to have been to blame in having for some time complacently regarded the completion of the works under

estimate as certain and thus misled the Superintending Engineer on the subject, as also in not having taken earlier steps than he did to try and recover the advances made by Lieutenant Taylor—on one occasion having actually paid the contractors Rupees 561 in full for work done without attempting to make any recovery from them, finally dispensing with their services, and rendering it impossible to recover any of the advances then due by them by furnishing them with a contract certificate that closed the door to legal recovery. This, however, may have been done in good faith by oversight; and, though there can be no doubt of the carelessness of the act, yet Mr. Smither has always borne so unblemished a character, that I am inclined to recommend that the loss resulting from his conduct in failing to recover the balance of advance made by Lieutenant Taylor be treated as already pointed out, and hope that an expression of the displeasure of Government in reference to his proceedings in the matter will tend to make him more cautious in future.

8. The Range Officer lastly concerned in the construction of the work appears to me to have taken great interest in the works and done his best, and can only be blamed for not having taken earlier steps to submit the revised estimates. This, he has personally explained to me, was in consequence of having a great deal of travelling to do and works at great distances apart to look after; he was unable to devote the time that these large works required to them; and it was, therefore, some time before he ascertained, on measurement and by close examination of the accounts, that the rates and quantities were insufficient and incorrect. The additions to the plan made by this officer are the introduction of a central dividing wall in the Mungamary Aqueduct which, though useless for the purpose constructed, may eventually prove useful in case of repairs being necessary while the water-supply must be maintained intact in the channel; and spandril arches not shown in the original plan have been used in both aqueducts under sanction of the Superintending Engineer.

9. The failure of the works noticed in Memorandum, No. 48, from the Acting Chief Engineer for Irrigation, forms the subject of a separate letter.

No. 272. From Lieutenant-Colonel W. FAREWELL, S. C., Acting Superintending Engineer, 7th Division, to the Secretary to Government, Public Works Department, dated Camp at Suttiamungalum, 5th August 1870, No. 93.

In reply to those portions of memorandums Nos. 48 and 49, dated 1st March, 1870, from the Acting Chief Engineer for Irrigation which refer to the failure of the Mungamary and Vanipoottoor Aqueducts for which estimates, amounting to Rupees 2,490 and Rupees 4,800 respectively, are now re-submitted for sanction, I have the honour to report that I have carefully inspected both aqueducts. The materials used appear to me to be of the best description, and the work to have been very well done. I attribute the failure in both aqueducts to an oversight in the original design, the

1 Report, No. 988, of 26th January 1870.
1 Estimate, No. 42, of 1869-70, Rupees 2,490.
1 do. ,, 45, of do. ,, 4,800.

wing-walls, uselessly long, being furnished with neither retaining nor tie walls. The water from the channel has thus entered below the floors of the aqueducts at their points of junction with the earthen bed of the channel, and the filling below, consisting simply of the very indifferent earth excavated in situ, has sunk and caused the floors to collapse immediately they had to bear the weight of water above them.

2. The Range officer reports that the filling, though he believes was never tamped, had laid between the wings for a whole monsoon, having been constantly trodden under foot by the numerous workmen engaged on the works, and had apparently consolidated when the flooring was laid. The use of puddle not having been mentioned in the estimate or specification was not used, and besides no good puddle clay is to be had near the sites, the only clay of the kind obtainable being potter's clay in small quantities at considerable distances. Had tie and retaining walls, (in my opinion essential to the safety of works of this kind,) filled with good river-sand, obtainable in abundance close to the works, been used in the first instance, the floors would never have given way. To remove the whole floor and re-lay the filling would be so expensive an undertaking that I now only recommend the construction of retaining walls at the points of junction of the aqueduct floors with the earthen channel beds, as noted in red dotted lines on the plan of the "Aqueducts as built," forwarded with my letter reporting on the excess over original estimate.

3. G. Os., No. 1,136, dated 29th April, and No. 1,259, dated 16th May 1870, have already provided funds to the extent of Rupees 4,140 on account of the Vanipoottoor Aqueduct, an additional allotment of Rupees 310 is, therefore, all that is required for this work, while sanction and provision of funds for the re-construction of the floors and additions to the Mungamary Aqueduct, to the extent of Rupees 2,490, still remain to be made.

	Rs.	A.	P.
Expenditure in 1869-70	350	0	0
Allotment of 1870-71	4,140	0	0
Further allotment required in 1870-71	310	0	0
Total Estimate...	4,800	0	0

No. 273. *Note by the Acting Chief Engineer for Irrigation.*

With letters Nos. 198 and 204 of the 24th February last the Superintending Engineer, 7th Division, submitted revised estimates for the construction of the Mungamary and Vanipoottoor Aqueducts, on the Arkenkotta Channel,* in the Coimbatore District, and at the same time estimates for the repair of damage which these aqueducts had sustained were transmitted. Subjoined are the particulars of the estimates for each work:—

* From the Bhowany.

	Sanctioned Estimate.	Revised Estimate.	Repair Estimate.
	Rs.	Rs.	Rs.
Mungamary Aqueduct	16,100	18,180	2,300
Vanipoottoor do.	24,700	28,700	4,490

2. The excess on the Mungamary Aqueduct was reported to be due to the following causes :—

	Rs.
Superintendence and sundries	1,046
Bad flooring re-laid	220
Earthwork	283
Brick-in-chunam and plastering	531
Total...	2,080

The Superintending Engineer deferred submitting the revised estimate for sanction until the aqueduct had been tested by the admission of water, and, on this taking place, some of the flooring sank, and the right upper wing gave way; the estimate for re-construction, and for alterations considered requisite for preventing a recurrence of the accident, amounted to Rupees 2,300.

3. The Superintending Engineer was called upon for further information—first, with regard to alterations of design which had led to increase of expense; secondly, with regard to the cause of the failure of the work, which had been apparently due to indifferent constructions and want of tamping when filling in behind the wings; and thirdly, as to the officer responsible. The Acting Superintending Engineer now reports that the alterations made were the lengthening of the wings, the insertion of spandril arches, and the addition of a central dividing wall, and these, with the exception of the last item, appear to have been approved by Colonel Walker. The central wall was a useless addition, and it is not clear how it came to be built without the approval of the Superintending Engineer.

Letter No. 91, 5th August 1870.

4. I inspected this work on the 22nd of June last, and I found that the fallen wing had been re-built and lengthened 30 feet, and that it was intended to lengthen the left wing to a similar extent. The cause of the damage was evidently the absence of any precautions against leakage. The soil is bad and not well fitted to retain water, and it appeared to me probable that the filling in behind the wings had not been properly rammed. The lengthening of the wings without precautions against leakage would be useless, and with these unnecessary, and I instructed the Range Officer to put in puddle so as to prevent water getting to the back or round the ends of the wings, and I made a sketch of the arrangements required. Colonel Farewell considers that retaining walls connecting the wings at their outer ends are essential to safety. They would be useful to strengthen the wings, and would be unobjectionable if kept several feet below canal bed-level; but, if brought up to the floor-level, they interfere very prejudicially with the proper junction of the canal banks with the wings, and there would consequently be great risk of leakage, and of the undermining of the wings at the ends and outside face. It would be preferable, therefore, to place the cross wall twelve or fifteen feet from the ends of the wings, and to terminate the flooring there—then the embankments would have a sufficient overlap. In my opinion, the puddle is

Letter No. 93, 5th August, paragraph 2.

necessary for the security of the work, and it would be better to cart suitable clay from a distance than to omit this material, where the soil at the site of the aqueduct is so inferior and porous. The Acting Superintending Engineer says that no good puddle clay is to be obtained in the neighbourhood; but it may be noticed that all along this canal the ryots do construct small water-tight bunds in connection with temporary sluices, and there should, therefore, be no great difficulty in obtaining suitable material. I noticed also that the rubble masonry of the flooring was very indifferent. I agree with Colonel Farewell that the materials and workmanship of the other parts of the aqueduct were good: the design is in some respects faulty, for instance the side walls of the aqueduct should not be two feet thick throughout, but thicker at the base than at the top, and three feet for the former dimension would have been appropriate.

5. The repair estimate, as revised by Colonel Farewell, has been raised from Rupees 2,300 to Rupees 2,490; but I have shown that the lengthening of the wing-wall on the north side and of the flooring is not requisite, and the following items should, therefore, be omitted,

Foundations to north wing extension	630	cubic feet.
Lengthening flooring	3,240	,,
	3,870	,,

		Rs.	A.	P.
143⅓ at 4½	=	645	0	0
...		202	8	0
...		11	4	0
...		81	4	0
		940	0	0

Brick jelly in soorkee cement ... ...
Plastering ... ...
Contingencies ... ...

and I would add for puddle—

North wing return ...	$8 \times 1\frac{1}{2} \times 2\frac{1}{2}$	$= 30$
Across aqueduct ...	$14 \times 1\frac{1}{2} \times 3$	$= 63$
Along back of south wing	$10 \times 1\frac{1}{2} \times 2\frac{1}{2}$	$= 37\frac{1}{2}$
South wing return ...	$3 \times 1\frac{1}{2} \times 2$	$= 9$
	$139\frac{1}{2}$ cubic yards at 1 Rupee ...	139 8 0
	Contingencies ...	13 8 0
		153 0 0

The amount of the estimate will then be Rupees 1,703. Colonel Walker notices that he had been obliged to animadvert on the bad arrangements at this work from first to last while under the superintendence of Mr. Sub-Engineer Smither; but he adds that, but for the failure of the work, he would not have felt much hesitation in recommending the sanction of the revised estimates. I do not know what Mr. Smither's experience has been, but I am quite sure that works of this class require to be carried out under more competent supervision than members of the Upper Subordinate Establishment are usually qualified to afford, and that, while they may be excellent executives when furnished with definite

instructions on every point of importance, they should not be expected to judge what arrangements are requisite to enable such works to answer their purpose efficiently. I am not prepared, therefore, to recommend that Mr. Smither should be held responsible for the failure of the wing-wall, and the only expenditure for which he may perhaps be deemed liable is the cost of the division wall, which would amount to about Rupees 300.

6. With regard to the Vanipoottoor Aqueduct, out of the difference of Rupees 4,000 between the sanctioned and revised estimates, Rupees 2,078 are reported to be due to advances made by Lieutenant Taylor to a contractor and now irrecoverable. It appears from Colonel Walker's letter, No. 204, that Rupees 3,000 were advanced by that officer, when in charge of the range, without any security, and that subsequently these advances were increased to Rupees 5,000 before the actual commencement of the work: this course was followed in spite of a distinct prohibition against the practice of making advances without valid security to double the amount of the advance being taken. I have no doubt that the advances were made first for the preparation of materials and afterwards on account of materials supposed to be ready, but Lieutenant Taylor is responsible for mistakes made either in trusting his contractors improperly, or in overestimating the value of the materials prepared. Mr. Smither took charge of the range from Lieutenant Taylor, and it would seem that, when he examined the accounts and inspected the materials, he had no misgivings, and the transfer certificate appears to shift the responsibility from Lieutenant Taylor to Mr. Smither. Subsequently he stated that "the materials" were "too scattered to admit of their "number or quantity being ascertained except at some outlay; but there can be "no doubt that the materials at site are insufficient to cover half the outlay entered "against the work, namely, Rupees 4,440-12-0." The outstanding advances at the Mungamary Aqueduct were adjusted, but those at Vanipoottoor were mismanaged. Mr. Smither went on sick leave in March 1868, and then his practice of stopping five-eighths of the value of the work done in adjustment of advances was superseded by a suspension of payments, and this led to the work coming to a stand-still altogether. This again led to the work being gone on with departmentally and to the services of the contractors being dispensed with, and then Mr. Smither committed the great error (Colonel Farewell's letter, No. 91, paragraph 7) of giving the contractors a contract certificate which, as he says, "closed the door to legal recovery" of the balance due by them. In all probability, from the fact of their requiring repeated advances, the law would not have mended matters much; and, while Mr. Smither is to blame for forgetting the consequences of his grant of a certificate, I am inclined to believe that the practical result was not very material. Colonel Farewell says of Lieutenant Taylor that, though he was wrong in making advances without the Superintending Engineer's authority, yet, considering that he was "young and inexperienced and quite new in the department," he should not be held responsible. As already mentioned, I think his responsibility ceased when he made a regular transfer of the range and obtained the acknowledgment of his successor as to the correctness of the accounts of materials and advances, though it is not quite clear whether the latter were duly represented by the former.

7. It appears that here also both Lieutenant Taylor and Mr. Smither ought, instead of being in independent charge, to have acted under a competent officer,

Proceedings of the Madras Government, Public Works Department,
16th September 1870.

from whom they would have received definite instructions. Neither of them was qualified for the duty imposed upon him, and each in turn committed errors which led to loss, and this loss is but a small part of the expenditure which might, and would, have been avoided had the aqueduct been designed and carried out by an officer acquainted with the site and the requirements of works of this kind.

8. It will be seen from the plan that the deviations from the sanctioned design are—

1*st*.—That, as executed, the piers are four to five feet lower than was originally intended, the difference being apparently due to rock having been met with.

2*ndly*.—The length of the wing-walls has been increased slightly at one end, and more considerably at the other.

3*rdly*.—A central longitudinal wall has been added.

The last item is an altogether useless expense; its length is 640 feet, and its cost was probably about Rupees 1,120, namely:—

	Rs.
4,800 cubic feet of brick-in chunam, at 17 Rupees per 100 cubic feet	816
Plastering 8,480 square feet, at 2½ Rupees per square	212
Contingencies	92
Total...	1,120

The first alteration may have been quite legitimate, and the second was perhaps pardonable under the circumstances, as the wings of the sanctioned design extended up to within a few feet of the old line of the canal at either end, and it was perhaps thought that it was intended that they should reach from end to end of the new line. I must here remark, however, that there was no more necessity for constructing these long wings on the new line of the channel than there would have been for giving a masonry revetment to the canal throughout. The original design was very unnecessarily expensive in this respect, and these walls represent a very useless waste of many thousand rupees. The whole revenue of the channel is but 27,000 Rupees, and the expenditure on this one aqueduct will amount to upwards of 31,000 Rupees. If an aqueduct was really required, which I doubt, about half this sum would have sufficed to provide one in all respects perfectly efficient; but I am of opinion that the existing surplus weir on the old line might have been made fully suitable to the wants of the canal had sluices been inserted in it at a cost of perhaps 3,000 or 4,000 Rupees.

9. The repair estimate for this aqueduct may be reduced considerably. Where the masonry flooring has failed it will be unnecessary to re-place it beyond the wings proper of the aqueduct, as distinguished from the extensions of those wings which form a sort of masonry revetment to the channel. The central wall at either end from the same point may be taken down. In lieu of the masonry flooring the soil should be removed for a width of four feet and for a depth of four feet at the side walls on the inside, and good clay should be put in here, well-watered and thoroughly rammed, and then the space between these two trenches should be cleared out to a depth of two feet and filled in with similar material. Brick or stone rubbish may be rammed down over the surface of this clay for a thickness of about

three or four inches just to prevent erosion by the current. I cannot say exactly what reduction of the estimate these modifications will occasion; but I think about 3,000 Rupees for masonry may be struck out of the estimate if none of the work has been already done, and the addition for clay would apparently be—

$66 \times 8 \times \frac{3}{3} = 352$ cubic yards.
$132 \times 1\frac{1}{3} \times \frac{2}{3} = 117\frac{1}{3}$ "
$469\frac{1}{3}$ "

	Rs.	A.	P.
at 1 Rupee ...	469	5	4
Contingencies.	45	10	8
	515	0	0

10. The Arkenkotta Channel wants a good deal of improvement. Many streams run into it and deposit silt; there are scores of cuts for irrigation, which are most prejudicial to the efficiency of the canal and must lead to great waste of water. It will not do, however, to go on spending money on costly aqueducts where less expensive arrangements will do equally well, or, instead of getting the whole of the irrigation into good working order, all the money that can be allowed will be devoted to a few works which will have but little effect on the value of the canal generally. Some fifteen years ago a great many masonry sluices were built, and they were no doubt very necessary. I am told that one square inch of opening was allowed for each acre under a sluice. The ryots say they are too small, and consequently many of them are not used at all, while others are supplemented by cuts. All these sluices should be carefully examined and the vents enlarged where requisite; they should also be provided with wooden shutters. The mistake made in the construction of these sluices is not an uncommon one. For large areas the openings would, at the rate of one square inch per acre with a head of water of about two feet, be ample, but the maximum supply required for small areas is very much greater, and, of course, a sluice must be capable of passing this maximum. Owing to the nature of the ground, the areas under individual sluices are very small, and probably most of the sluices will require vents of $2\frac{1}{2}$ to 4 square inches per acre. A circular on this subject was issued from this office in May last.

11. I would recommend, therefore, that the revised estimate, Rupees 18,180, for the Mungamary Aqueduct be sanctioned, as also Rupees 1,703 for its repair; that similarly the revised estimate, Rupees 28,700, for the Vanipoottoor Aqueduct be sanctioned, and Rupees (say) 2,500 for its repair, Colonel Farewell being guided as to the nature of the work to be done by the remarks contained in this note. I think that it is also necessary that the Superintending Engineer should ascertain and report who is responsible for the construction of the central wall of the Mungamary Aqueduct at a cost about 300 Rupees and of that of the Vanipoottoor Aqueduct 1,120 Rupees, as also how it happened that, although Colonel Walker did not approve of these additions, they were nevertheless made.

12. It will be seen from the last paragraph of Colonel Farewell's letter, No. 93, that the sums already placed at his disposal will suffice for the completion and repair of the aqueducts in the manner suggested by me.

OOTACAMUND,
15*th August* 1870.

(Signed) J. MULLINS, Major, R. E.,
Acting Chief Engineer for Irrigation.

No. 274. ORDER THEREON, 16th September 1870, No. 2,227.

IRRIGATION, No. 15.

THE papers submitted by the Acting Chief Engineer for Irrigation relate to the Mungamary and Vanipoottoor Aqueducts, on the Arkenkotta Channel in the Coimbatore District, for which estimates, amounting to Rupees 16,100 and Rupees 24,700, respectively, were sanctioned in the orders as per margin. Revised estimates, amounting for the former work to Rupees 18,180, and for the latter to Rupees 28,700, are now forwarded for sanction, while, owing to faulty construction and want of experience on the part of the officers who have been in charge of the works, estimates amounting to Rupees 2,490 and Rupees 4,800 for the repair of damage caused on the admission of water to the aqueducts, and for preventing similar accidents in the future have been prepared.

G. O., 11th December 1863, No. 3,668.
" 22nd January 1868, " 234.

2. There can be no doubt that the history of these works, as derived from the papers now laid before Government, is very discreditable. It would appear, however, that they were placed in charge, first, of an officer of no experience, and, secondly, of an Upper Subordinate who, though of long service in the department, was clearly not qualified for independent charge of works of this class. The result has been a considerable waste of money. The Acting Chief Engineer for Irrigation and the Acting Superintending Engineer of the division both consider that the materials and workmanship of the aqueducts were, with the exception of the flooring, sufficiently good: what was wanted was experience, on the part of those who built them, of the requirements of hydraulic works; the requisite knowledge was wanting, and failure and loss have been the necessary consequence.

3. The management of these works was also very far from efficient. Lieutenant Taylor made large advances and he was transferred elsewhere, leaving a considerable amount unadjusted; Mr. Sub-Engineer Smither, who relieved him, appears to have made some examination of the accounts and materials, but not such a careful investigation as would have demonstrated exactly what sums were due by the contractors. Something was done to adjust the advances outstanding, and those of the Mungamary Aqueduct were recovered, while arrangements, under which three-eighths only of the value of subsequent work done at the Vanipoottoor Aqueduct by the contractors was paid to them, the rest going to clear off arrears, were made. Mr. Smither afterwards went away sick, and his *locum tenens* stopped further payments altogether; this course resulted in the contractors being unable to go on, and ultimately the work was taken out of their hands, leaving Rupees 2,078 unadjusted. Mr. Smither granted these contractors a certificate which appears to have rendered it impracticable to attempt recovery of the amount due by a civil suit, and the Government observe that no adequate explanation is given of this circumstance, though the Superintending Engineer thinks it was "done in good faith by oversight." It is certainly very extraordinary that the Sub-Engineer should have so acted, when, during a long period, the adjustment of the contractors' accounts had occupied his attention, and when, therefore, he must, it is thought, have known very well, and it was clearly his duty to know, that there was still a considerable sum due by them.

4. The Acting Chief Engineer for Irrigation notices that central walls, which were unprovided for in the sanctioned designs, and which are altogether useless, have been constructed on both aqueducts at a cost for the Mungamary of about Rupees 300, and for the Vanipoottoor Aqueduct of about Rupees 1,120. It is reported that the Superintending Engineer, Colonel Walker, did not approve of these additions, but it has not been clearly explained when they were built, and under whose orders. Neither inexperience, nor any of the causes which have led to excess expenditure in other directions, will account for outlay upon unsanctioned and useless masonry, and His Excellency the Governor in Council must require, therefore, full and clear explanation as to the member of the department who is responsible for this departure from the sanctioned arrangements, and it should be understood that the recovery of the value of this work from the officer liable will be ordered, unless good reasons can be adduced for allowing it to stand as a charge against the aqueducts.

5. The attention of Colonel Farewell should be given to the remarks of the Acting Chief Engineer for Irrigation, and more particularly to those which relate to the work to be done to remedy the defects of the aqueducts as at first constructed. His Excellency in Council observes that the latter officer recommends the reduction of the repair estimate for the Mungamary Aqueduct from Rupees 2,490 to Rupees 1,703, and of that for the Vanipoottoor Aqueduct from Rupees 4,800 to Rupees 2,500, and these amounts are accordingly sanctioned, as are also the revised estimates, Rupees 18,180 and 28,700, for the construction of these two works, subject, however, as regards the final passing of the expenditure, to further orders upon the unauthorized outlay referred to in the preceding paragraph.

6. The Government have learnt with regret that, in the opinion of the Acting Chief Engineer for Irrigation, far less expensive works than these aqueducts would have sufficed to effect the desired improvement of the Arkenkotta Channel at these points. The remarks on this subject, in paragraph 10 of that officer's note, should receive the careful consideration of the Superintending Engineer, to whom the Government will look for the provision of such improvements to this and other irrigation channels in his division in a manner more consonant with the requirements of the canals and more consistent with proper economy.

7. Colonel Farewell is authorized to transfer from the Vanipoottoor to the Mungamary Aqueduct such funds as may be required for the latter, and which will not, under the arrangements now sanctioned, be required for the former.

(True Extract.)

Colonel, R. E.,
Secretary to Government.

To the Superintending Engineer, 7th Division.
,, Controller of Public Works Accounts.
,, Acting Chief Engineer for Irrigation.
,, Revenue Department.

Exd. A. S. Rodgers.

Superintending Engineer's Office &c.

No 198. Coimbatore 24th February 1870

From Colonel G. W. Walker R.E.
Superintending Engineer 7th Div.

To Colonel C. Orr R.E.
Secretary to Government P.W.D.

Sir,

I have the honor to submit herewith a Revised Estimate of Rs 18,180 for the construction of the Mungamary Aqueduct on the Arkencottah Channel, with extract of the Collegal Range Officers Report on the causes of excess over the sanctioned Estimate of Rs 16,100, and Comparative Statement further illustrative of the same.

2 The sanction for the original Estimate of this work bears date 11th December 1863 G.O.c No 3668 and its amount was Rs 14,930, the original papers having been prepared before I took up my present appointment. Under G.O. No 234 of 22nd January 1868, a revised Estimate of Rs 16,100 was sanctioned, the increase of Rs 1170 being more than accounted for by the addition of another 20 ft Span ordered by me on personal inspection of the Site. Out of the present further increase of Rs 2080, Rs 1046

Enclosures
1 Revised Estimate No 38 of 1869-70 Rs 18,180
1 Estimate for repairing damage Rs 2300
1 Comparative Statement
1 Letter from Collegal Range Officer
1 Extract from a letter from do.
5

is not unfairly accounted for under the head of Superintendence and Sundries, the work having had to be taken out of the hands of unsatisfactory Contractors on the 10th December 1868, and completed under Departmental agency - Bad flooring caused an excess of Rs 220 the work having to be taken up and relaid; Rs 283 under the head of Earthwork, and Rs 531 under the head of Brick in Chunam and Plastering are legitimately accounted for by unforeseen excesses of quantities of work to be performed.

3. Altogether, in spite of exceeding bad arrangements for the work from first to last, on which from time to time I have had to animadvert severely and for which I hold the Sub Engineer chiefly responsible, I should not have felt much hesitation in sending up the Estimates for sanction as finally revised. But having prefaced for the sufficiency of the work being tested by actual use previously to their submission, I regret to have to state that it had failed apparently from defect of design, i.e. from shortness of the wing walls on one side as reported in the accompanying letter from the Collegal Ranger officer No 988 of 26th January 1870.

4. The excess over Estimate for the original work has already been covered by the transfer sanctioned in G.O. No 376 of 1st February 1870. The further expense to be incurred in reparation of the damage caused by the admission of water, as represented in the accompanying Estimate of Rs 2300 will have to be provided from the Reserve of 1870-71.

I have the honor to be
Sir
Your most Obt Servant

— Chambers Colonel &c
Superintending Engineer 7th Dn

No. 204. Superintending Engineer's Office
Coimbatore 24th February 1870.

From

Colonel G. St. Walker R.E.

Superintending Engineer 4th Rly.

To

Colonel C. A. Orr R.E.

Secretary to Government P.W.D.

Sir,

I have the honor to submit a Revised Estimate of Rs 28700 for the construction of the Vannisheollor Aqueduct on the Arkancottah Channel, the anticipations of a saving on the original Estimate of Rs 24700, expressed in para 3 of my Memorandum quoted in G.O. No. 234 of 22nd January 1868, having proved fallacious to such an extent that a demand of Rs 4000 in excess has now to be made. I have shown half of this excess is shown by the Comparative Statement and Report accompanying to arise from irrecoverable payments to the Contractors; and the rest to be accounted for legitimately by payment for land and necessarily higher rates.

2. Lieutt. R. F. Taylor, then in charge of the Range is answerable for having in the month of June 1867 made advances of nearly Rs 3000 on a Contract, not previously sanctioned by me, and on no security; and for having increased such advances and payments for materials of indefinite quantity, up to nearly Rs 5000 by

Enclosures
1 Revised Estimate No 1440 of 18-9-70 Rs 28700
1 Comparative Statement
1 Memorandum Report
1 Extract from Mr Smither's letter
1 Contract Certificate
1 Estimate for Repairing damage No 45 of 1869-70 Rs 4490
6

From the Superintending Engineer
No 204 dated 24th February 1870.

To the Secretary to Govt
P.W.D.

Dated 24th February 1870
Received 28th ditto
Acknowledged
Encls 6

Submitted, revised Estimate for Rs 28700 for Construction of an Aqueduct over the Arkancottah Channel at Vannisheollor.

Comparative Statement.

Extract from Mr Smither's letter.

Contract Certificate.

Estimate for Repairing damage Rs 4490 from Upper Anicut Channel.

No 269

the month of September 1867 (at which date no actual commencement of work had been made,) in the face of the following prohibition contained in my letter to him No. 38 of 25th June 1867 viz "The payment of advances to Contractors without valid security to at least double the amount is absolutely prohibited" - The works were visited by me in July, and my divergation with Lieut Taylor's proceedings resulted in his charge being restricted to the Burghon Chaut, and in Mr Sub Engineer Smither being placed in charge of the Range including the Aqueduct works - Ver G.O. No. 2317 of 1st August 1867.

3. In the Transfer Certificate signed between Lieut Taylor and Mr Smither, it is stated that "the value of materials at site, "and advances made on account thereof, agree "with the accounts of the Vanipootoor and Mungamary Aqueducts" - In a report dated 1st October, Mr Smither defines the advances on the Mungamary Aqueduct, not covered by materials at site or labour performed, to be Rs 1528 out of a total outlay of Rs 2632 - Of the Vanipootoor Aqueduct he says "the materials "are too scattered to admit of their number or "quantity being ascertained except at some "outlay, but there can be no doubt that the "materials at site are insufficient to cover half the outlay entered against the work, viz Rs 1,1,40-12-0"

4. On three different occasions viz in Memo No. 35 of 12th June 1867, in Memo No 95 of 5th September 1867, and again in Memo No 116 of 22nd October 1867 had I to disallow Contracts for one or both of the aqueduct works; those finally accepted by me not having received my countersignature till 30th December 1867 - and para 3 of my Memorandum printed with G.O. No. 231 of 22nd January 1865 will show that not only were no apprehensions then entertained of exceeding the Estimate for the Vanipootoor aqueduct, but that a saving of Rs 1750 was anticipated; in fact Mr Smithers Inspection Lists of that period are full of expressions of complacent satisfaction with the Contractor and himself, on the subject of the work; and he appears to have resumed payments to them freely from December 1867 up to March 1868 at the end of which he went on sick Leave, his last remarks on the Vanipootoor work dated 17th March being "these people are going on slow, but very well."

5. I am inclined to attribute the failure to recover the advances of Rs 2078 on the Vanipootoor work, as those of Rs 1,528 on the Mungamary work were recovered, to this break in Mr Smithers continuous supervision of the Range

For on his return he complains that he found his practice of measuring at every inspection, and withholding 5/8ths of the value of work done in the interval, had not been adhered to, but a full stop put to all payments, so that the Contractors, never so tractable and honest as those at Mungamary, had thrown up work altogether. And although Mr Smither on his return in July 1868 paid them up as much as Rs 561 in full of work done in his absence, he never appears to have been able to induce them to resume operations in earnest. For in October 1868, I find him reporting that he had dispensed with their services, in a letter of which the accompanying is an Extract, fixing the deficit of Rs 2078 so far back as that period. It will be observed that Mr Smither then considered it hopeless to expect to recover the amount. I have only to add, that his own proceedings in granting such a Contract Certificate as that dated 24th July, herewith forwarded, are the main obstacle to any legal proceedings having been adopted.

6. Observing in Mr Smither a tendency to throw all responsibility for the work on the Tolok Overseer, and to exonerate himself from personal liability concerning it, I took measures to relieve him of charge of the Range for which I found him unfitted, and to confine his attention to the Aqueducts alone, in sole charge of which he accordingly remained from November 1868 till 1st February 1869, when he had to be relieved on account of sickness, and eventually transferred to Balasbar. The works have since progressed to completion under Mr Assist Engineer Nordmann and were last visited by me in July 1869, when the Mungamary Aqueduct was all but completed, and the flooring of the Vanipootoor Aqueduct in progress.

It was then that I made the discovery, that though I had so far back as the 7th May 1867 called special attention to the use of Soorkee in Cement over the Arches, and in plastering, and described its composition, ordinary Brick Jelly in Chunam had been used for the Mungamary Aqueduct, and was being used for the Vanipootoor Aqueduct; and that entire ignorance existed as to the composition of the Cement. I am assured, that since my visit and communication of a formal receipe, it solely has been used; but I am bound to record the fact of neglect on the part both of Mr Smither and Mr Nordmann to attend to the details of a sanctioned Estimate, and to inform themselves of the exact nature of the work to be carried out.

8. I regret further to say that, as in the

to

case of the Nungambary, so in that of the Vani-
=pooltoor Aqueduct I am obliged to submit a
fresh Estimate of Rs 6,490 for relaying the flooring
of the latter under the following circumstances extrac
=ted from Mr Nordmann's Report Nº 907 of
14th January 1870 and Nº 1052 of 17th February
viz. "As reported in my Inspection Report
"for the month of November 1869 in consequence
"of the heavy rains of the past season the flooring
"of the Aqueduct between the wing-walls sank
"in those parts where Mr Smither had laid
"it on made soil, without increasing the
"estimated thickness of half a yard - I was
"just about to admit the Channel water over
"the Aqueduct, in which a yard of water
"already stood partly from leakage through
"the Channel bank and partly from the
"rain, when suddenly the flooring sank
"more than an inch on both sides of the
"Arches to a total length of 198 feet, and all
"the water ran out and soaked into the ground"
and "a portion of the side walls of the duct
"has to be rebuilt - This did not become evi-
"dent until the excavation for the new flooring
"had been dug, when it was found that the
"foundation of a portion of the side walls near
"the abutment did not go down as deep as
"the new flooring - Thus that portion of the
"side wall became unstable and had to
"be taken down to prevent accidents"

9. The transfer of Rs 2562 made in G.O. Nº 376 of 1st February 1870 to credit of the Vanipoottoor Aqueduct saved not only to pay up the excess incurred on the original Estimate, but to defray Rs 315 of the expenditure unauthorizedly incurred by Mr Nordmann on the Supplemental Estimate of Rs 6490 now submitted - But he informs me that Rs 1117 more are already due to workmen; and I must request to be absolved of all responsibility with reference to this unauthorized outlay, and that Government will be pleased to take notice of it - Mr Nordmann has in fact put me to great annoyance by his repeated transgressions of the Standing orders of the Department in respect to the supply of Estimates and obtaining of sanctions so that he should make use of his Cash Credits on duly authorized works only - The Controller might also be instructed absolutely to refuse to pass expenditure more than 5 per Cent in excess of any Estimate, unless a distinct assurance is given him that Supplemental Estimates have duly been sent in to Superintending Engineers -

I have the honor to be
Sir
Your most Obt servant
G. Walker Colo RE
Superintending Engineer &c

No 91

Copy Cargo Office Trincomalee
Sixty Commissariat Staff Corps

From

Lieut Colonel W. Yarnell R.E.
Cy Superintending Engineer 4th Div.

To

Colonel W. A. Cox R.E.
Secretary to Government N.W.P.

Sir

With reference to the Cy Abstract
Enquiries for Irrigations Estimate Nos 48 and
48 (dated 1st March 1870, relating to the
Kanniyarpanay and Kanjikoottan Aqueducts
Kanniyarpanay Aqueduct, all of which
the Planning Aqueduct, all of which
were referred to the Superintending
Engineer, which has not yet forwarded

Succeeded it.
1. Lieutenant Wardell
Manipaymaney Aqueduct.
Abstract -
1. Plans & estimate
Aqueduct.
1. Plan of Kanniyarpanay the Same to reply thereto
Aqueduct as under
has actually built.
2. Rev? Estimate of Kanniyarpanay, which
this Office No 3034
1869-70, dated 19/8/69.
1. Statement showing Irrigation Channels
Proceed. - A
2 Rev? Estimate of Canjipoottan
Aqueduct, No 44, dated 23/7/70
1 Report on canon of
Aqueduct No - B.
2. Specification letter
No 346 of 27 Dec 1869
Contract estimate.

Dated 24th
Received 26th February 1870
Enclosures 6

No 2/70

No 49 of 1st March 1870.

P.W. 1970 Dept
From Cy Superintendent 4th Division
To The Secretary to Govt
P.W. Dept
No 204
Dated 24th February 1870
Received 26th February 1870
Enclosures 6
P.W. 3434/70
Submits a Revised Estimate of Rs 28,700 for Constructing an Aqueduct over the Kanniyarpanay Single Stream and an Estimate of Rs 1490 for relaying damaged flooring of the Aqueduct

No 2/70

appear to have approved of the dividing wall.

4. The corrected remarks of the Range Officer will sufficiently explain the items of excess. No large Aqueducts have ever before been built in the District at least I have inspected now nearly every Irrigation Work in the District and have only seen a couple of very small works of the kind that have been built of late years. The rates of the Mungamary Aqueduct on referring to the Comparative Statement will be found to be the same in the Revised as in the sanctioned Estimate; but it is understood this sanctioned Estimate was really a revised one prepared only in December 1867, which is the Estimate sanctioned in G.O. No. 234, dated 22nd January 1868. And the excess is accounted for in detail by the Assistt. Engineer in Memo marked A. On referring to the Comparative Statement of the Vanipoottoor Aqueduct it will be observed that the rates differ Considerably. The Estimate for the Vanipoottoor Aqueduct sanctioned in 1863 is framed on the old data of the Range. The rates of which have of late years considerably increased. Vide Comparative Statement and Report marked B. The above accounts for the difference in rates between the Estimates for the Aqueducts.

5. The Range Officer lastly engages on the work which he took charge of in February 1869, in August 1869 reported to this office that he anticipated the Estimates for both aqueducts being considerably exceeded in consequence, in reference to the Mungamary of more work done than Estimated for, and the amount allowed for superintendence being insufficient, and on the Vanipoottoor in regards to old rates having been used in the Estimate and owing to a loss by an advance made by one of his predecessors already reported. And he submitted the Revised Estimates on the 4th January 1870.

6. The excesses over Estimates on the works are as follows.—

Mungamary	Rs. 2,080
Vanipoottoor, after deducting the loss by an advance of Rs. 2078 included in the Revised Estimate.	" 1,922

6. The Excess in the former Item 12.919 per cent over the Estimate, and in the latter 7.785 per cent due to reasons already given. Though Lieut. Taylor is to blame in having made advances without the Superintending Engineers authority, yet considering at the time this Officer was young and inexperienced and quite new in the Department, I would respectfully recommend the balance of advance made by him which remains unrecovered, viz:- Rupees 2,978, be written off to "profit and loss" as is at present, charged to the Estimate and the accounts, under authority of Government, passed by the Controller.

7. On perusing the whole of the papers connected with these works that are to be found in my Office Mr Assistant Engineer Dimitto appears to have been to blame in having for some time complacently regarded the completion of the works under Estimate as certain, and thus misled the Superintending Engineer on the subject, as also in not having taken earlier steps than he did to try and recover the advances made by Lieut. Taylor, on the occasion having actually paid the Contractor Rupees 561 in full for work done without attempting to make any recovery from them, finally dispensing with their services, and rendering it impossible to recover any of the advances then due by them by furnishing them with a Contract Certificate that closed the door to legal recovery. This however may have been done in good faith by oversight, and though there can be no doubt of the carelessness of the act, yet Mr Smither has always borne so unblemished a character that I am inclined to recommend that the loss resulting from his Conduct in failing to recover the balance of advance made by Lt Taylor be treated as already pointed out, and hope that on representation of the displeasure of Government in reference to his proceedings in the matter will tend to make him more cautious in future.

8. The Range Officer lastly concerned in the construction of the work appears to me to have taken great interest in

the works and done his best, and can only be blamed for not having taken earlier steps to submit the Revised Estimates. This, he has personally explained to me, was in consequence of having a great deal of travelling to do and works at great distances apart to look after, he was unable to devote the time that these large works required, to them, and it was therefore some time before he ascertained on measurement and by close examination of the accounts that the rates and quantities were insufficient and incorrect. The additions to the Plan made by this Officer, are the introduction of a central dividing wall in the Mungemary Aqueduct which, though useless for the purpose constructed, may eventually prove useful in case of repairs being necessary while the water supply must be maintained intact in the channel; and spandril arches not shewn in the original Plan have been used in both Aqueducts under sanction of the Superintending Engr. The failure of the works is noticed in Memo: No 48 from the Acting Chief Engineer for Irrigation forms the subject of separate letter.

I have the honor to be
Sir
Your most Obed.t Servant

W Hasenth Lt Colonel R.E.
Org Supg Engr 1st Division

R.A.

No. 93

Superintending Engrs. Office
7th Division,
Camp Sattiamangalam 5th Augt 1870

From,

Lieut.-Col. C. W. Farewell R.E.
Off. Supg. Engr 7th Dn

To,

Colonel C. A. Orr R.E.
Secretary to Government, P.W.D.
Madras

Sir,

In reply to those portions of
Memo No. 18849 dated 1st March 1870
from the Chief Engineer for Irrigation
which refer to the failure of the Munga-
nary and Kanipooloor Aqueducts, for which
Estimates amounting to Rs 2490 and
Rs 4800 respectively are now resubmitted
for sanction, I have the honor to report
that I have carefully inspected both
Aqueducts — the materials used appear
to me to be of the best description and
the work to have been very well done —
I attribute the failure in both Aqueducts
to

Enclosures 3.
1 Rept No. 988 C
28th Jany 1870.—
1 Estn No. 42 of 1869-70
Rupees 2,490.
1 Dgn No. 45 of 1869-70 Rupees 4,800.

Recd 5th August 1870
Endorsement II

Explains the causes of
excess expenditure on
Kanjampooloor round
Kunjarankan Aqueduct.

Rs 24,34,50

No 91

Copies submitted to Govt.
P.W.D. for information
by the Secretary to Govt.
Public Works Dept.
Fort St. George
The 30th August 1870
Superintending Engr 7th Dn

Recd 5th August 1870
Endorsement II

Explains the causes of
excess expenditure on
Kanjampooloor round
Kunjarankan Aqueduct.

Rs 24,34,50

No 2/91

Memo to Chief Engr 28th Jany 1870

to an oversight in the original design, the Wing Walls, useless long, being furnished with neither retaining or tie Walls, the Water from the Channel has thus entered below the floors of the Aqueducts at their points of junction with the Earthen bed of the Channel, and the filling below, Consisting simply of the very indifferent Earth excavated in situ, has sunk and Caused the floors to Collapse immediately they had to bear the weight of Water above them—

2. The Range Officer reports that the filling, though he believes was never tramped, had laid between the Wings for a whole Monsoon having been Constantly trodden under foot by the numerous Workmen engaged on the Works, and had apparently Consolidated when the flooring was laid— The use of Puddle not having been

been mentioned in the Estimate or Specification was not used, and besides, no good puddle clay is to be had near the sites, the only clay of the Kind obtainable being potter's clay in small quantities at Considerable distances— Had tie & retaining Walls (in my opinion essential to the safety of Works of this Kind) filled with good river Sand, obtainable in abundance close to the Works, been used in the first instance, the floors would never have given way— To remove the whole floor and relay the filling would be so expensive an undertaking that I can only recommend the Construction of Retaining Walls at the points of junction of the Aqueduct floors with the Earthen Channel beds as noted in red dotted lines on the Plan of the "Aqueducts as built" forwarded with my letter reporting the excess over original Estimate—

3.

G.O. No 1136 dated 29th April & No 1259 dated 16th May 1870 have already provided funds to the Extent of Rs 4,140. on account of the Vaniyoor Aqueduct and Additional Allotment of Rs. 310 is therefore all that is required for this work; while sanction and provision of funds for the reconstruction of the floors and additions to Irungamary Aqueduct to the extent of Rs 2490 still remain to be made.-

Expenditure in 1869-70	Rs 350-0-0
Allott. of 1870-71	4140-0-0
Further allott. required in 1870-71	Rs 310-0-0
Total Estt.	Rs 4,800-0-0

I have the honor to be,
Sir,
Your most obed.t Servt.

W Thuresson Asst. Engr.

Actg. Supdg. Engr.

MEMORANDUM.

REQUESTED for reference the under-mentioned papers —

All original Enclosures submitted with Irrigation Chief Engineer's Note 715 August/70, referred to in S.R. No. 2225. 716 September/70.

OFFICE OF THE CHIEF ENGR. FOR IRRIGATION, P. W. Department, Ootacamund 3 — 3 — 1874.

To

The Registrar of the P.W. Secretariat.

D. W. Hamilton
Head Clerk.

No 1870 dated 5th Sept
From No 3094
The Ag Supg Engr
Irrign dated 7th Aug
To
The Secretary to Govt
P.W.D.
Madras

No 93
Dated 5th
Rec'd 10th August/70

Enclosures 3
Reports about the failure of the Mungamary and Vaniputtur Aqueducts.

Dft 3434/70

No 272

Copied C. Reddy 11 Aug 70 dR. 295

From the Chowarry

Note by the Acting Chief Engineer for Irrigation

With letters Nos 198 & 204 of the 24th February last the Superintending Engineer 7th Division submitted revised estimates for the construction of the Mungamary and Vanipoothoor aqueducts, on the Arkenkotta channel, in the Coimbatore District, and at the same time estimates for the repair of damage which these aqueducts had sustained were transmitted. Subjoined are the particulars of the estimates for each work.

	Sanctioned estimate	Revised estimate	Repair estimate
Mungamary Aqueduct	16,100	18,180	2,300
Vanipoothoor do.	24,700	28,700	4,490

2. The excess on the Mungamary aqueduct was reported to be due to the following causes

Superintendence & sundries	Rupees	1046
Bad flooring retaid	"	220
Earthworks	"	283
Brick in channain & plastering	"	531
		2080

The Superintending Engineer deferred submitting the revised estimate for sanction until the

aqueduct

aqueduct had been tested by the admission of water, and, on this (taking) place, some of the flooring (arch), and the right upper wing) gave way; the estimate for reconstruction, & for alterations considered requisite for preventing a recurrence of the accident, amounted to Rupees 2,300.

3. The Superintending Engineer was called upon for further information; first with regard to alterations of design which had led to increase of expense; secondly with regard to the cause of the failure of the work, which had been apparently due to indifferent construction and want of tamping when filling in behind the wings; and 3rdly as to the officer responsible. The city Superintending Engineer now reports that the alterations made were the lengthening of the wings, the insertion of spandril arches, and the addition of a central dividing wall, and these, with the exception of the last item, appear to have been approved by Colonel Walker. The central wall was a useless addition, and it is not clear how it came to be built without the approval of the Superintending Engineer.

letter № 91. 5th August /70

4. I inspected this work on the 22nd June last, and I found that the fallen wing had been rebuilt and lengthened 30 feet, and that it was intended to lengthen the left wing to a similar extent. The cause of the damage was evidently the absence of any precautions against leakage. The soil is bad and not well fitted to retain water, and it appeared to me probable that the filling in behind the wings had not been properly rammed. The lengthening of the wings without precautions against leakage would be useless, and with these unnecessary, and I instructed the Range officer to put in puddle so as to prevent water getting to the back or round the ends of the wings, and I made a sketch of the arrangements required. Colonel Farewell considers that retaining walls connecting the wings at their outer ends are essential to safety. They would be useful to strengthen the wings, and would be unobjectionable if kept several feet below canal bed level; but, if brought up to the floor level, they interfere very prejudicially with the proper function of the

letter № 93. 5th August para 2.

This work of the wall is not entirely in accordance with the original design, & I cannot say who has been responsible for it.

Canal

canal banks with the wings, and there would consequently be great risk of leakage, and of the undermining of the wings at the ends and outside face. It would be preferable therefore to place the cross wall 12 or 15 feet from the ends of the wings, and to terminate the flooring there, where the embankments would have a sufficient overlap. In my opinion the puddle is necessary for the security of the works, and it would be better to cart suitable clay from a distance than to omit this material, where the soil at the site of the aqueducts is so inferior & porous. The Asst superintending Engineer says that no good puddle clay is to be obtained in the neighbourhood; but it may be noticed that all along this canal the ryots do construct small watertight bunds in connection with temporary sluices, and there should therefore be no great difficulty in obtaining suitable material. I noticed also that the rubble masonry of the flooring was very indifferent. I agree with Colonel Farewell that the materials and workmanship of the other parts of the aqueduct were

were good: the designs in some respects faulty, for instance the side walls of the aqueduct should not be 2 feet thick throughout, but thicker at the base than at the top, and 3 feet for the former dimension would have been appropriate.

5. The repair estimate, as revised by Colonel Farewell, has been raised from Rupees 2,300 to Rupees 2490, but I have shown that the lengthening of the wing wall on the North side, and of the flooring is not requisite, and the following items should therefore be omitted

Foundations to North wing extension	630 cubic feet	
Lengthening flooring	3240 "	
	3870 "	
	143⅓ at 4½ =	645-"-"
Brick jelly in floor three cement		202-8-"
Plastering		11-4-"
Contingencies		81-4-"
		940-"-"

and I would add for puddle

North

North wing return $8 \times 1\frac{1}{2} \times 2\frac{1}{2} = 30$

Across aqueduct $14 \times 1\frac{1}{2} \times 3 = 63$

Along back of South wing $10 \times 1\frac{1}{2} \times 2\frac{1}{2} = 37\frac{1}{2}$

South wing return $3 \times 1\frac{1}{2} \times 2 = 9$

$139\frac{1}{2}$ Cyrs at 1 Rupee 139-8-0

Contingencies 13-8-0

153-0-0

The amount of the estimate will then be Rupees 1,703. Colonel Walker notices that he had been obliged to animadvert on the bad arrangements at this work from first to last, while under the superintendence of Mr Sub Engineer Smither, but he adds that, but for the failure of the works, he would not have felt much hesitation in recommending the sanction of the revised estimates. I do not know what Mr Smither's experience has been, but I am quite sure that works of this class require to be carried out under more competent supervision than members of the upper subordinate establishment are usually qualified to afford, & that, while they may be excellent executives, when furnished with definite instructions on every point of importance, they should not be expected to judge what arrangements are requisite to enable such works to answer their purpose efficiently. I am not prepared therefore to recommend that Mr Smither should be held responsible for the failure of the wing wall, and the only expenditure for which he may perhaps be deemed liable is the cost of the division wall which would amount to about Rupees 300-0-0

(31)

6. With regard to the Vaniyambadi aqueduct, out of the difference of Rupees 4,000 between the sanctioned & revised estimates, Rupees 2,078 are reported to be due to advances made by Lieutenant Taylor to a contractor and now irrecoverable. It appears from Colonel Walker's letter, No 204, that Rupees 3,000 were advanced by that officer, when in charge of the Range, without any security, and that subsequently these advances were increased

increased to Rupees 5,000 before the actual commencement of the work: this course was followed in spite of a distinct prohibition against the practice of making advances, without valid security to double the amount of the advance being taken. I have no doubt that the advances were made first for the preparation of materials and afterwards on account of materials supposed to be ready, but Lieutenant Taylor is responsible for mistakes made either in trusting his contractors improperly, or in overestimating the value of the materials prepared. Mr Smither took charge of the Range from Lieutenant Taylor, and it would seem that, when he examined the accounts and inspected the materials, he had no misgivings, and the transfer certificate appears to shift the responsibility from Lieutenant Taylor to Mr Smither. Subsequently he stated that "the materials" were "too scattered to admit of their number "or quantity being ascertained except at some "outlay, but there can be no doubt that the

" materials

"materials at site are insufficient to cover half "the outlay entered against the work, viz Rupees "4440-12-". The outstanding advances at the "Nungamary aqueduct were adjusted, but those at Vanipoothoor were mismanaged. Mr Smither went on sick leave in March 1868, and then his practice of stopping 5% of the value of the work done in adjustment of advances was superseded by a suspension of payments; and this led to the work coming to a standstill altogether. This again led to the work being gone on with Departmentally, and to the services of the contractors being dispensed with, & then Mr Smither committed the great error (Colonel Farewell's letter 1st Sept para 7) of giving the contractors a contract certificate which, he says, "closed the door to legal recovery" of the balance due by them, & all probability, from the fact of their requiring repeated advances, the law would not have mended matters much, and while Mr Smither is to blame for forgetting the consequences of his grant of a certificate, I am inclined to believe that the practical result was not very material. Colonel Farewell says of Lieutenant Taylor that though he

he was wrong in making advances without the superintending Engineer's authority, yet considering that he was "young and inexperienced and quite new in the Department" he should not be held responsible. As already mentioned I think his responsibility ceased when he made a regular transfer of the charge, and obtained the acknowledgment of his successor as to the correctness of the accounts of materials and advances, though it is not quite clear whether the latter were duly represented by the former.

7. It appears that there also both Lieutenant Taylor & his brother might, instead of being in independent charge, to have acted under a competent officer, from whom they would have received definite instructions. Neither of them was qualified for the duties imposed upon him, and each in turn committed errors which led to loss, and this loss is but a small part of the expenditure which might and would have been avoided had the aqueduct been designed & carried out by an officer acquainted with the site and the requirements of works of this kind.

8 It will be seen from the plan that the deviations from the sanctioned design are

1st that, as executed, the piers are 4 to 5 feet lower than was originally intended, the difference being apparently due to rocks having been met with,

2nds the length of the wing walls has been increased slightly at one end, and more considerably at the other;

3rds a central longitudinal wall has been added.

The last item is an altogether useless expense; its length is 6440 feet, and its cost was probably about

Rupees 1760

viz 4800 C ft of brick in chunam at 17½ per 100 C ft	816
Plastering 6440 sq ft at 2½ a per square	212
Contingencies	92
Rupees	1120

The first alteration may have been quite legitimate, and the second was perhaps pardonable under the circumstances, as the wings of the sanctioned design extended up to within a few feet of the clear line of the canal at either end, and it was perhaps thought that it was intended that they should reach from end to end of the new line. I must here remark however, that there was no more necessity for constructing these

these long wings on the new line of the channel the there would have been for giving a masonry revetment to the canal throughout. The original design was very unnecessarily expensive in this respect, and these walls represent a very useless waste of many thousand Rupees. The whole Revenue of the channel is but 2,000 Rupees and the expenditure on this one aqueduct will amount to 3,200 Rupees. If an aqueduct was really required, which I doubt, about half this sum would have sufficed to provide one in all respects perfectly efficient, but I am of opinion that the existing surplus weir on the old line might have been made fully suitable to the wants of the canal had sluices been inserted in it at a cost of perhaps 3,000 or 4,000 Rupees.

9. The repair estimate for this aqueduct may be reduced considerably. Where the masonry flooring has failed it will be unnecessary to replace it beyond the wings proper of the aqueduct, as distinguished from the extensions of those wings which form a sort of masonry revetment to the channels. The central wall at either end from the same point may be taken down. The line of the masonry flooring the soil should be removed for a width of 11 feet, and for a depth of 11 feet, at the side walls on the inside, and good clay should be put in here well watered and thoroughly rammed, and then the space between these two trenches should be cleared out to a depth of 2 feet and filled in with similar material. Brick or stone rubbish may be rammed down over the surface of this clay for a thickness of about 3 or 11 inches just to prevent erosion by the current. I cannot say exactly what reduction of the estimate these modifications will occasion but I think about 3,000 Rupees for masonry may be struck out of the estimate if none of the work has been already done, and the addition for clay would apparently be

66 × 8 × 2/3 = 352 Cubic yards
132 × 1/3 × 2/3 = 117/3
469/3 Cubic yards at 1 Rupee 469-5-4
Contingencies 45-10-8.
515-"-"

10 The Arkenkotta channel wants a good deal

deal of improvement. Many streams run into it and deposit silt; there are scores of cuts for irigation, which are most prejudicial to the efficiency of the canal and must lead to great waste of water. It will not do however to go on spending money on costly aqueducts, where less expensive arrangements will do equally well; or instead of getting the whole of the irigation into good working order, all the money that can be allowed will be devoted to a few works which will have but little effect on the value of the canal generally. Some 15 years ago a great many masonry sluices were built, & they were no doubt very necessary. I am told that 1 square inch of opening was allowed for each acre under a sluice. The ryots say they are too small, and consequently many of them are not used at all, while others are supplemented by cuts. All these sluices should be carefully examined and the vents enlarged where requisite, they should also be provided with wooden shutters. The mistake

mistake made in the construction of these sluices is not an uncommon one. For large areas the openings would, at the rate of 1 square inch per acre with a head of water of about 2 feet, be ample, but the maximum supply required for small areas is very much greater, and of course a sluice must be capable of passing this maximum. Owing to the nature of the ground the areas under individual sluices are very small, and probably most of the sluices will require vents of 2½ to 4 square inches per acre. A circular on this subject was issued from this office in May last.

11. I would recommend therefore that the revised estimate Rupees 18,180 for the Irungamangy aqueduct be sanctioned, as also Rupees 1,703 for its repair; that similarly the revised estimate Rupees 28,700 for the Vanipoothoor aqueduct be sanctioned and Rupees (say) 2,500 for its repair, Colonel Farewell being guided as to the nature of the work to be done by the remarks

remarks contained in this note. I think that it is also necessary that the Superintending Engineer should ascertain and report, who is responsible for the construction of

the central wall of the Munganary aqueduct at a cost about Rupees 300

& of that of the Vanipoothoor aqueduct " 1120

as also how it happened that, although Colonel Walker did not approve of these additions, they were nevertheless made.

12. It will be seen from the last para of Colonel Farewell's letter, № 93, that the sums already placed at his disposal will suffice for the completion & repair of the aqueducts in the manner suggested by me.

Potacamund } Lieutenant Colonel Major R.E.
15th August 1870 } Acting Chief Engr for Irrigation

To

The Secretary to Govt P.W. Dept

P.W. 1870 Sept.

No 3434

Pro. for September

From

The Chief Engineer
for Irrigation.

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

Dated 15th August 1870
Desp.
Recd 31st

No

Encls. 18 Lrs

Note on the Nyanagaram and Vanipoothoor aqueducts on the Arkenkottai channel in the Coimbatore District.

No 2227-16-Sept. 1870.

No 213

No 2227/W. 8

Proceedings of the Madras Govt
Read the following

From The Supt Engr do (M.E. No 198 of 26th July/70)
do do (M.E. No 206 of do do)
do do (M.E. No 91 of 5th Augt/70)
do do (M.E. No 93 of do do)

The Chief Engr for Irrigation (M. E. No — of 15th Augt 1870)

The papers submitted by the Acting Chief Engineer for Irrigation relate to the Nanganam and Vanipoothoor aqueducts on the Arkenkotta channel in the Coimbatore District, for which estimates amounting to Rs. 16,100 and Rs. 24,700 respectively were sanctioned in the orders as per margin. Revised estimates amounting, for the former work to Rs. 18,180, and for

G.O. 11th Decr 1863 No 3668
22nd Jany 1868 — 234

would like to have the question considered.

I attribute the failure of Jacuzilli professional opinion in [illegible] Canal Water echo sanctioned from [illegible] inferior [illegible] the water [illegible] the water [illegible] by incompetent officers [illegible] Engrs. personal inspection. (M. [illegible] have visited the work — [illegible] July 67 — [illegible] Esq. if understand [illegible] nights.

[illegible] Annacutte stone [illegible] the [illegible] Madras the [illegible] lower the [illegible] sanctioned [illegible] the [illegible] suspected the [illegible] did he submit [illegible] carried out. [illegible] Subject [illegible]

the latter to Rs. 28,700. are now forwarded for sanction, while owing to faulty construction, and want of experience on the part of the Officers who have been in charge of the works, estimates amounting to Rs. 2,490 and Rs. 4,800 for the repair of damage caused on the admission of water to the Aqueducts, and for preventing similar accidents in the future have been prepared.

2. There can be no doubt that the history of these works, as derived from the papers now laid before Government, is very discreditable. It would appear however that they were placed in charge, first of an Officer of no experience, and secondly of an under Subordinate who, though of long service in the Department, was clearly not qualified for independent charge of works of this class. The result has been a considerable waste of money. The Acting Chief Engineer for Irrigation and the Acting Supdg. Engr. of the Div. both consider that

that the materials and workmanship of the Aqueducts were, with the exception of the flooring, sufficient good: what was wanted was experience on the part of those who built them, of the requirements of Hydraulic works; the requisite knowledge was wanting, and failure and loss have been the necessary consequences.

Major Farrell says of the last description a very well done.

This does not seem to me quite fair - Major Farrell says that the cause of the failure of the works was an insufficient - the original design of the wash of retaining in the walls. But the Superintending Engineer E. Walker is responsible for the as he sanctioned the Design. Col. Walker might be severely blamed by name if this defect is distinctly attributable to him. The blame should

The management of these works was also very far from efficient- Lieutenant Taylor made large advances

with the exception of the executive officers who are responsible for the bad flooring & cement used but not for the faulty plan. N.

and he was transferred elsewhere, leaving a considerable amount unadjusted. Mr. Sub Engineer Smithers who relieved him, appears to have made some examination of the accounts and materials, but not such a careful investigation as would have demonstrated exactly what sums were due to the Contractors. Something was done to adjust the advances outstanding, and those of the Mungamury aqueduct were recovered, while arrangements, under which

which $\frac{3}{8}$ths only of the value of subsequent work done at the Vanisoottoor aqueduct by the Contractors was paid to them, they not going to clear off arrears were made. Mr. Smithers afterwards went away sick, and his subordinate stopped further payments altogether; this course resulted in the Contractors being unable to go on, and ultimately the work was taken out of their hands, leaving Rs. 2,078 unadjusted. Mr. Smithers granted these Contractors a Certificate which appears to have rendered it impracticable to attempt recovery of the amount due by a civil suit, and the Government observe that no adequate explanation is given of this circumstance, though the Engr. thinks it was "done in good faith by oversight". It is certainly very extraordinary that the Sub. Engr. should have so acted, when, during a long period, the adjustment of the Contractors' accounts had occupied his attention, and where therefore he must, it is thought, have known very well, and it was clearly his duty to know, that there was still a considerable sum owed by them.

The

4 The Acting Chief Engineer for Irrigation notices that Central walls, which were interpolated for in the sanctioned designs, and which are altogether useless, have been constructed on both aqueducts at a cost for the Mungamary of about Rs. 300, and for the Vanipottoor aqueduct of about Rs. 1120. It is reported that the Superintg. Coll. Walker did not approve of these additions, but it has not been clearly explained when they were built, and under whose orders. Neither inexperience, nor any of the

Walker
reported Turnbull and
Lean for their acts
here

causes which have led to excess expenditure in other directions, will be count for outlay upon unsanctioned and useless masonry, and His Excellency the Governor in Council must require therefore full and clear explanation as to the member of the Department who is responsible for this departure from the sanctioned arrangements, and it should be understood that the recovery of the value of this work from the Officer liable will be ordered, unless good reasons can be adduced for allowing it to stand as a charge against the aqueducts.

5. The attention of Colr Farewell should be given to the remarks of the Acting Chief Engineer for Irrigation, and more particularly to those which relate to the works to be done, to remedy the defects of the aqueducts as at first constructed. His Excellency in Council observes that the latter Officer recommends the reduction of the repair estimate for the Alangonam Aqueduct from Rs. 2,490 to Rs. 1703, and of that for the Vannipottoor Aqueduct from Rs. 4800 to Rs. 2500; and these amounts are accordingly sanctioned; as are also the revised estimates Rs. 18,180 and 28,700 for the construction of these two works, subject however, as regards the final passing of the expenditure to such orders upon the unauthorised outlay referred to in the preceding paragraph.

The Govt have learnt with regret that in the opinion of the Acting Chief Engr for Irrigation far less expensive works than these aqueducts would have sufficed to effect the desired improvement of the Arkeri Kolta Channel at these points. The remarks on this subject in para 10 of that Officer's note should receive the careful consideration of the Engrs to

to whom the Government will look for the provision of such improvements to this and other irigation channels in his Dn. in a manner more consonant with the requirements of the Canals, and more consistent with proper economy.

7. Coll Farewell is authorized to transfer from the Vanipoottoor to the Alungaman Aqueduct such funds as may be required for the latter, and which will not, under the arrangements now sanctioned be required for the former.

Lly. 17/8/70

Recd 17/9/70.

3990, 792, 509 s, 3074 & 3439.

Govt. of 1870 Nagpur.

PUBLIC WORKS.

To The Superintending Engineer
for Coimbatore

Further Rec.d 21st February/71
No 311

Read
Rec.d 15 Jany.
C. 16 Sept. No. 2227

No 269 @ 274

Mungamany and Vanipoothoor

Inducts. Paying orders on
etc. Note by the Agt. Chief Engr
on Irrign. ~~matter~~ Submitting
letters relating to the Mungn-
many and Vanipoothoor
Inducts. in the Arkenkottai
Channel in the Coimbatore
District.

Recd 17/9/70.