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MADRAS RECORD OFFICE.

Government of Madras.

Public Health DEPARTMENT.

G.O. No. 2826 Press Mis.

286-89

Dated 18 DEC.

Not to be folded or roughly handled

Read the following letters:—

No. 286. From Captain F. H. RUNDALL, Consulting Engineer for the Irrigation and Canal Company, to J. D. SIM, Esq., Acting Secretary to Government, Fort Saint George, dated Madras, 20th November 1860, No. 92.

SIR,

1. With reference to the Order of Government of the 9th instant, No. 2,324, and to the remarks therein reflecting upon myself, I beg to be allowed to offer the following explanations:

2. The Chief Engineer's letter of the 21st December last, having entered only into the *general* Estimates for the different Sections, without attempting details for particular works, my letter of the 9th March with which it was forwarded, likewise referred only to the *general* scope of the works, and not to the *particulars* of design, I stated in paragraph 16 that, "I did "not enter into the proposed work in *detail*, as this could be better done when the Surveys and "Plans had been prepared," and that "in the absence of more minute Surveys, the Chief Engi- "neer's Estimates could only be taken as approximative," though I added "that as far as the "means of judging existed, I considered they erred on the side of excess." This was strictly correct. The means then at my disposal for forming a judgment were the series of levels referred to in the Chief Engineer's letter to the Company's Secretary of the 20th September 1859, as having been taken previous to his arrival by members of the Public Works Department. Had these proved perfectly correct, the arrangement described by the Chief Engineer in that letter and alluded to in paragraphs 22 and 23 of my letter of the 1st February (not 9th March) would probably have held good.

3. I could but form a judgment from such particulars of information* as were available for the correctness or otherwise of the levels above referred to, I can scarcely be held responsible, any more than I conceive the Chief Engineer, Department Public Works, can be called to account for want of accuracy in similar work on the part of subordinate Officers in his Department.

* Viz., letter from Chief Engineer, Department Public Works, to Government, dated 24th February 1858, accompanied by remark from Captain Orr, Deputy Chief Engineer, Northern Circle, dated 27th January 1858, and Lieutenant Steward, District Engineer, Cuddapah, dated 3rd February 1858.

4. Before submitting detailed designs for any works, however, I called upon and received from the Chief Engineer *trial* levels taken by his own Engineers of the *principal* point to be ascertained, viz., the level of the water-shed separating the Kundár from the Kistna. These were carefully taken, and checked, and formed the key to the practicability of the scheme or otherwise, and they are the levels referred to in paragraph 2 of my report,† as having been subsequently confirmed by the *final* Surveys and Sections of the country adjoining the water-shed. These *trial* levels showed that the levels which had been previously obtained from the Department of Public Works were incorrect, and induced the Chief Engineer to change the site of the Anicut from 12 miles below Kurnool to Kurnool itself, as explained in his letter‡ and forwarded with mine, No. 65, of the 12th April.

†No. 71, of 15th October 1860.

‡ 30th March, re-forwarded for information.

5. In his letter, full explanations are entered into for removing the site of the Anicut from the place originally proposed to where it has been commenced, and are such as clearly showed its expediency. I would here take the opportunity of adding, that in my frequent discussion with the Chief Engineer regarding the site of the Anicut, one of the reasons that weighed with me in assenting to its final location at Kurnool, was the necessity that existed of having an Anicut there under any circumstances, and as the levels had determined the practicability of crossing the water-shed, the probability was that one work would suffice for both purposes.

6. The Government state in paragraph 6 that it was on my "assurance not only of the "physical but the economical practicability of the Kurnool works" that they sanctioned the project. The physical practicability I certainly attested and still maintain; to its superior economy over every other arrangement I could not certify, as there was no other information before me with which to compare it. The sufficiency of the Estimate for the particular works required and sanctioned for Kurnool itself, is not, I believe, called in question. In the economy of the *scheme*, and of the *general* Estimates *as a whole*, I have indeed acquiesced; but the absolute correctness of the Estimates for any one particular Section I have not that I am aware ever guaranteed, for there were no data before me to do so.

7. In my letter of the 1st February last, No. 36, at paragraph 33, I stated that the *total* cost of the works would be about 130 lacs, the Chief Engineer's aggregate Estimate is given in his letter of the 21st December 1859, as Rupees 134,54,500. For this outlay, I stated that 12,00,000 acres would be irrigated, which would give Rupees 11·2 of capital per acre. This rate my previous experience enable me to judge was sufficient, and I am still of the opinion that, however much, the Estimates for the various detached portions may vary, the aggregate cost will not exceed 12 Rupees per acre. I can only regret that my defective explanations should have led the Government to infer, that my assertions of the economy of the *general* scheme implied also an assurance of its economy in every detail, when I had already stated that the Chief Engineer's Estimates could be considered only as approximative.

In the Godavery Delta, the cost when completed will be Rupees 6 per acre, i., e.,
Rupees 3 for Main Works.
„ 3 for Distribution.
„ 6
In the present works
Rupees 9 are allowed for Main Works.
„ 3 for Distribution.
„ 12

8. With all due respect, I would urge that the expression "the *scheme* must be almost wholly changed," is calculated to be misapprehended by parties not only unprofessional, but ignorant of the localities and of the nature of the works involved.

In paragraph 6 of G. O No. 2,324 of 9th November 1860, under reply.

9. The "scheme," is the diversion of the flood waters of the Tumbaddra into the Pennár, by a Canal affording both irrigation and navigation to the country through which it runs. This remains unaltered. Had I led the Government to believe first that this was practicable, and then had to report that after-investigation had proved it impracticable, I should have deservedly forfeited all claim to confidence—such however is not the case. The measure that I have recommended being not "an alteration in the scheme," but an improvement in the design of one of its details subsequently suggested by the Chief Engineer.

10. As regards the design of the actual works sanctioned and partially executed, I beg to submit that the information before me and the full explanation contained in the Chief Engineer's letter of the 30th March above referred to, in addition to the reasons assigned in paragraph 5 were sufficient to justify a recommendation of their adoption, more especially as my duties lay, not in planning the works myself, but only in judging of such plans as are laid before me, and I am of opinion that though involving "much more expense than was originally expected" they could be still carried out both physically and not unremuneratively as regards the *whole scheme*; but as subsequent investigations have shown that with an equal outlay, still greater advantages both in time and money may be gained, the proposed modification has been advocated, more especially as there has been no unnecessary expenditure, and the work hitherto executed forms an essential connection in the modification.

11. The Government have misunderstood the allusion to the aqueduct required to span the Hindri. Its dimensions were not alluded to in my letter. I only mentioned that 40 feet was the difference of level in the two Canals. The aqueduct will be situated two miles above the head of the present Canal, and there is a rise in the bed of the Hindri of 16 feet between the two places. The aqueduct therefore, instead of being 40 feet, will be little more than half that height.

12. As respects the submission of the papers, I beg to explain that on my return to Madras, I received the Government Orders* calling for information on the various rumours which had appeared in the public prints To this I replied† immediately, promising a further detailed report. The Government in their Order of 13th October, No. 2,136, which reached me on the 15th, "desired that this report might be furnished with as little delay as possible," and I accordingly submitted it‡ that same evening without waiting for the Chief Engineer's letter.

* No. 2,091, of 8th October 1860.

† In letter No. 67, of the 11th October 1860.

‡ No. 71, of 15th October 1860.

13. It was not in consequence of the omission having been demi-officially pointed out as supposed in paragraph 5, but simply because it had not reached me, and because the Government Order appeared to me to admit of no delay, that the letter* from the Chief Engineer did not accompany my report. That letter did not reach my Office till the 24th, or nine days afterwards, and was submitted by me on the same day.

* 12th October 1860.

14. I regret the proper order of correspondence was not observed, but I will take care that it shall be conducted for the future as directed.

The omission to notice the necessity for the Anicut at Kurnool was an inadvertency. The ridge separating the Kistna from the Tumbaddra is so high opposite Kurnool, that a Canal even from the higher site at Sunkasala would have to make a long detour *below* Kurnool before it could be turned. Besides the extra labor involved in the excavation of an additional

20 miles of Canal, all produce coming from beyond the Kistna would have to be carried an increased distance of forty miles before it could pass Kurnool. This will at once explain the necessity for the work; besides this, great convenience is afforded to the town of Kurnool and to the villages on the bank for navigating the river itself for about five miles above the town.

15. With respect to the last paragraph, I beg to state that my reason for mentioning the feeling existing at Kurnool was to explain the probable origin of the various letters which had appeared in the newspapers, and of the rumours which had led the Government to call for my report. It was not my intention to allude to any one person in particular. The feeling was manifested in general personal conversation with myself, no ill effects had then resulted from it however, beyond that the towns-people were not disposed to be so friendly as they had been found at the outset. With the laboring population, as I stated before, the works are popular enough, and their extension anxiously looked for.

From F. AGNEW, Esq., Agent, Madras Irrigation and Canal Company, to Captain F. H. RUNDALL, Consulting Engineer for the Irrigation and Canal Company, dated Madras, 11th April 1860, No. 32.

SIR,

1. I have the honor to forward the first plans and drawings Nos. 1, 2, 3 and 4, and Estimate of Kurnool Anicut and subsidiary works, together with a letter, dated 30th ultimo, received from Colonel H. C. Cotton. These papers I now forward for the consideration of His Excellency in Council.

2. The Estimate amounts to Rupees (3,03,079-13) *three lacs, three thousand and seventy-nine, and thirteen Annas*, and I have the honor to request that the sum of Rupees (3,10,000) *three lacs and ten thousand*, may be placed at my disposal to be drawn by me through you as required.

3. In addition to this amount, I shall require the sum of *two lacs* of Rupees, for the purchase of "Stores" as stated in my letter No. 30 of this date.

From Colonel H. C. COTTON, Chief Engineer, Madras Irrigation and Canal Company, to F. AGNEW, Esq., Agent, Madras Irrigation and Canal Company, dated Bangalore, 30th March 1860.

SIR,

In forwarding to you the accompanying letter to Mr. Westwood with Plans and Estimates for the Kurnool Anicut and Channel head, I beg to say that I am now quite prepared to undertake those as the first works, and would suggest that funds be placed at my disposal for erecting Sheds as shelter for laborers, Stores, Shops and a Hospital, also for opening quarries, contracting for materials, and other preliminary works. The Surveys are proceeding and I expect shortly to be able to furnish further Estimates.

From Colonel H. C. COTTON, Chief Engineer, Madras Irrigation and Canal Company, to J. WESTWOOD, Esq., Secretary, Madras Irrigation and Canal Company, dated Madras, 30th March 1860.

SIR,

1. In my Report of 21st December, I furnished a rough Estimate of the cost of the whole system of works in the general project, extending from Walabapúr on the Tumbaddra west of Bellary to the East Coast near Nellore. I have since been engaged in examining more critically the Kurnool Division of the undertaking, and am prepared to forward plans and actual Estimates of the works, commencing with those of the Anicut across the Tumbaddra below Kurnool and, in succession as they are completed, those of the Canals and other works dependent on the Anicut.

2. I herewith beg to forward (1), a general plan of the meeting of the rivers Tumbaddra and Hindri encompassing the town and fort of Kurnool, showing the proposed sites of the Anicut, the north and south channel heads with their regulating sluices, and the locks by which the navigation will pass from the river to the channels; (2), a plan with elevations and sections of the proposed lock for the south Canal; (3), the section of the river at the sites of the Anicut with plan, elevation and section of the Anicut showing the discharge sluices constructed at each extremity of the Anicut for the removal of sand accumulation and (4), the Estimate of these works amounting in the aggregate to Rupees 3,03,179-13.

3. The site originally proposed for these works was chosen on the ground of some approximate levels which had been previously taken, it was about 12 miles below the town of Kurnool, and was in many respects a favorable site for the construction of a dam as explained in my report, and Captain Rundall the Government Consulting Engineer, visited the spot with me and gave it his approval. Upon further survey, however, and more accurate levelling I found that many advantages would be gained by an alteration in the site, and that which I have chosen is

immediately below the confluence of the Hindri as shown in the plan (1). By placing the dam here the following advantages will be gained :—

(1.) The level affords a better command to the south canal branching from it, which is the main channel of irrigation and will be the great line of navigation to the valley of the Kundár and Pennár and to the East Coast, this superior command causing a reduction in the depth of cutting where the canal passes the water-shed into the Kundár basin.

(2.) The Anicut here will throw back the two rivers, making them permanently navigable to above the town, and render unnecessary the construction of an acqueduct across the Hindri. The Bellary Canal will drop into the Tumbaddra above the town and boats will pass by the river to both the northern and southern Canals.

(3.) The site is better for the northern Canal, as it will be more easily carried to a point in the Kistna above its rapids, and will command for irrigation a tract of about 10,000 acres between the two rivers.

(4.) The arrangement will be highly conducive to the health and prosperity of the town, which will become the great entrepôt of produce and merchandize conveyed by the Canals to the north, the west and the east. The town, whose suburbs are now dry and barren, will be encompassed on three sides by water, its climate will be rendered temperate and it will be surrounded by a belt of productive gardens.

(5.) In this position both extremities of the dam are on British ground, whereas in the first site selected they were both in the territory of the Nizam. I have brought to the notice of Captain Rundall the alteration in the proposed site of the Anicut, and he appears fully to concur with me in the arrangement.

4. The capacity given to the lock 200 feet by 20 feet is that which will be established for the coast Canal and will be necessary for the great traffic which these Canals will carry when the connection with the rivers above and the coast is completed.

5. In a separate letter I will report on the distribution of the Establishment and the work in progress.

6. I propose as each Estimate is completed to proceed at once with the required preparations for the work. That now forwarded will not require extensive workshops, as those attached to the building hired as an Office will answer the purpose, but it will be necessary to erect extensive sheds of a temporary character for laborers, a Hospital and Store rooms, and it is important that contracts for materials to some extent should be at once taken, in order that the work may actually commence on receipt of the Board's authority. I am now gathering some first class mechanics and laborers which are necessarily drawn from a distance and will require to be on the spot when the work commences.

7. My next Estimate will be the south Canal from the Kurnool Anicut, which I propose to designate the Kurnool Main Channel, extending to the Bowanassy river near Mettacondul.

8. I must beg to note here that the prices which govern these Estimates are fixed upon the best data I can at present obtain where no works of magnitude are known, and may not be so near the truth as I shall possess for future Estimates when these works have made some progress.

(True Copies.)

(Signed) F. H. RUNDALL, Captain,
Consulting Engineer.

No. 287. From Captain F. H. RUNDALL, Consulting Engineer for the Irrigation and Canal Company, to J. D. SIM, Esq, Acting Secretary to Government, dated Madras, 23rd November 1860, No. 94.

SIR,

1. With reference to the Order of Government, No. 2,397, I have the honor to offer the following observations on the paragraphs, commenting on certain incongruities and omissions in my letter of the 2nd November, as they admit of an immediate reply.

5 to 12.

2. In paragraph 5, the Government are right in supposing that no provision is made in the sketch Estimate submitted by the Chief Engineer for the Canal from the north end of the Kurnool Anicut to the Kistna. But the other conclusions, as to the insufficiency of the sum required for the portion from the south end of it, show that the Government have overlooked the marginal calculations given in paragraph 18 of my letter, and intended to be explanatory of the 4th item of the Chief Engineer's Estimate worded thus: "completing Kurnool dam and

"one lock including expenses already incurred." It will be seen that the sum of 2 lacs of Rupees is not intended by him to be expended on the *Anicut alone*, but includes, together with the cost of the entrance lock, "the expenses already incurred," by which is meant the *whole* sum expended at Kurnool up to that time, including the cost of the Canal already excavated.

3. With reference to paragraph 6, I beg to observe that previous to commenting on the Chief Engineer's Estimates, I quoted* his own words that they had been prepared "in the light of present positive information afforded by the Surveys "hitherto carried out." I regret that I omitted to add what this information was, and that it had been gathered and looked into by me during my last tour. The particulars of it were explained in my letter of the 18th October 1860, No. 74, enumerating the work which had hitherto been performed by the Company's Officers. It consisted of,

* Vide paragraph 12.

(1.) Surveys and levels from Kurnool to the water-shed.
(2.) Do. do. of the Kundár and Pennár rivers.
(3.) Do. and plans for the greater portion of the Nellore project and the levels and sections on the basin of the Mári reservoir.

4. In the following paragraphs from 7 to 12, Government animadvert on what they consider a failure on my part to notice the apparent "omission" in the Estimate for the storage of water. On this subject the Chief Engineer wrote, "in a reduced scheme the storage of water must not "be omitted, and it can no where be so cheaply and satisfactorily stored, as in the proposed "Mári tank, which therefore especially should form a part," and my own remark was "as "regards the storage of water the Mari Tank will be sufficient to supply the quantity required "for the reduced scheme."

5. At the time I so wrote, the Despatch from the Secretary of State, desiring the rejection of this reservoir from the Company's Estimates had not reached me,

6. In addition to this, however, the Government object that the supply from the Mári tank "cannot after furnishing water for 2½ lacs of acres in Mysore and Bellary, be sufficient to "compensate for the want of the reservoirs in the valley of the Hindri and Pennár." In reply to this, I beg to annex the following calculations, as the grounds on which my opinion of its sufficiency was based.

7. In my letter* of the 9th March, I stated "that 1¼ cubic "yards per hour per acre might be assumed as the *average* quan- "tity requisite for the irrigation of lands in Mysore and Bellary." The paddy crop raised under a regular and certain supply of water is commenced in the first week in June, and reaped in the first week in December, being on the ground about 180 days. In the first 15, while in the seed bed, there is a very small quantity of water consumed; in the last 15, while the crop is ripening, it is shut off entirely. Water is, therefore, required for about 150 days, at the rate of 1¼ cubic yards per hour, or 36 cubic yard pers day per acre, giving as the *total* quantity 5,400 cubic yards per acre.

* Paragraph 8, No. 54

8. The second crop of paddy is sown in the middle of February and reaped in the middle of May, or is on the ground 90 days, of which as before, little or no water is required during 30 days. The remaining 60 will require 2 to 3 cubic yards per hour, or from 50 to 70 cubic yards per day. Taking the average at 60, the total quantity required per acre will be $60 \times 60 = 3{,}600$ cubic yards; supposing, therefore, the whole of the 2½ lacs of acres, deriving their supply from the Mári tank *alone*, were cultivated with 2 crops of paddy, the total quantity of water consumed would be $(5{,}400 + 3{,}600) \times 2{,}50{,}000 = 2{,}250$ millions. The annual available quantity in the Mári reservoir is estimated at 4,700 millions. Deducting 2,250 millions from this quantity leaves 2,450 millions available for the navigation, and for the summer or second crop of the remaining 4,00,000 acres in the Kundár valley and Nellore. Water will cease to be drawn from the Tumbaddra from early in December until the first freshes in the end of May or about 180 days. Dividing 2,450 by 180 gives 13,600,000 cubic yards per day, or 5,66,666 cubic yards per hour, much more than is required for the second crop, as these 4 lacs of acres will not take water for more than 60 days, and consume only 1,440 millions out of the 2,450 available. There being 180 days to provide for, out of which water for full irrigation would be required for only 60 days, there will remain 120 days, during which navigation alone has to be provided for, the water carried for irrigation affording it in the interim. For this $2{,}450 - 1{,}440 = 1{,}010$ millions are available. This sum divided by 120 gives rather more than $8\frac{4}{6}$ million per day or close upon 3,50,000 cubic yards per hour.

9. In paragraph 30 of my Report of 1st February last, I stated that 3,00,000 cubic yards per hour were more than sufficient to maintain a first-rate navigable Canal.

10. The following sentence quoted by Government occurs in the previous paragraph, and I am glad of this opportunity of explaining it, as it entirely supports, instead of subverting my opinion: "it has been shown that the Mári tank will supply enough for 3,00,000 acres and "suffice for the Canal between Paramdevanhulle and Kurnool." The 300,000 acres there alluded to are contained in the strip lying east of, and parallel to the Huggry, and were to be supplied *all the year round* by the Mári tank. The Canal from Paramdevanhulle to Kurnool would have commanded in addition to these, 200,000 more lying south of, and parallel to the Tum-

baddra. These last would also receive the Mári tank water for the *second crop*, the first crop having been provided for direct from the Tumbaddra.

11. In addition to these 600,000, water was set aside for 50,000 acres in Mysore so that the Mári tank would have furnished a supply to 650,000 acres altogether—of which 350,000 acres would have water for the first and second crops and 300,000 for the second crop only.

12. The opinion I expressed of its sufficiency in the reduced scheme, is likewise for the supply of 650,000 acres, of which however only 250,000 are now to be provided with water for *both* crops and 400,000 with water for the second crop *alone*.

13. As the resolution of Government contained in paragraph 13 was based on the supposition that I had omitted to notice the want of provision for reservoirs in the reduced scheme, I can only regret that I was not previously afforded the opportunity of laying before them the above explanation, which will, I trust, be now considered sufficient to exonerate me if not from all blame, at least from *that* charge and to show that the subject had not only been not overlooked, but that careful calculations had been entered into before my opinion on this important point was expressed.

13. The resolution of Government places me in such a painful position, and represents my professional character before its chief Officers and the public in so questionable a light, I trust that as I was allowed no opportunity of previous explanation, the Government will not object to accord to this letter the same measure of publicity as has been given to the strictures to which it is a partial reply.

14. The remaining points I forbear to notice until Major Orr's report has been submitted to Government, when I trust the opportunity will be granted me to furnish such further explanation as I have to offer.

No. 288. From Captain F. H. RUNDALL, Consulting Engineer for the Irrigation and Canal Company, to J. D. SIM, Esq., Acting Secretary to Government, Fort Saint George, dated Madras, 23rd November 1860, No. 95.

SIR,

1. With the accompanying letter the Agent submits one from the Chief Engineer written on receipt of the late Despatch from the Secretary of State, communicated with the Proceedings of Government of the 7th instant, No. 2,293, relative to the non-cession of the Mári reservoir to the Company.

2. The Chief Engineer states that having represented in previous reports that "great "reservoirs were elements rather than adjuncts" in the scheme of the Company's works, he included in his *original* proposals the Mári tank, "because there is no site on any of the rivers "of supply or their basins where water can be stored at so small an expense" and "that for the "same reason he included it in his reduced scheme."

3. He further states that the cost of storage in small tanks, judging from the localities he had seen, will vary from 800 to 2,000 cubic yards per Rupee, whereas in great reservoirs at sites like that of the Mári it could be stored at 6,000 cubic yards per Rupee.

4. The Chief Engineer is evidently under the impression that the order from the Secretary of State is not final, as he requests the Government will yet approve of the Plans and Estimates being proceeded with.

5. On re-perusing the despatch in question, it seems as though an opening were still left—for the ground on which the refusal is based, is, that its execution would involve an expenditure beyond the guaranteed sum. If such is the only objection it might not be considered of force in the reduced scheme, where a certain sum *must* be set apart for storage, and as the site of the Mári reservoir is apparently the most favorable, it would be better to lay out the money there than elsewhere. My letter of the 23rd November, No. 91, will have explained how the quantity expected to be stored in this tank alone will provide sufficient water for the scheme in its reduced dimension.

6. Should the Government concur in this view they may not object to the Surveys and Estimates being at all events completed, as when the reduced scheme is laid before the Secretary of State, he will again have an opportunity of expressing his opinion. This need not interfere with the prosecution of the Surveys and Estimates for other sites, as they could be proceeded with simultaneously, so that in the event of a second refusal there will be other reservoirs to fall back upon.

From JOHN TAWSE, Esq., Agent, Madras Irrigation and Canal Company, to Captain F. H. RUNDALL, Consulting Engineer, Madras Irrigation and Canal Company, dated Madras, 20th November 1860, No. 131.

SIR,

1. I have the honor to forward herewith copy of a letter from the Chief Engineer, dated the 12th instant, in which he urges the great importance of the construction of the Mári tank being entrusted to the Company, as a part of the revised scheme.

2. I shall feel obliged if you will lay Colonel Cotton's letter before Government with your observations thereon.

From Colonel H. C. COTTON, Chief Engineer, Madras Irrigation and Canal Company, to JOHN TAWSE, Esq., Agent, Madras Irrigation and Canal Company, dated Kurnool, 14th November 1860, No. 246.

SIR,

1. I have received a copy of the Order of Government, 7th instant, No. 2,293, on a letter from the Right Honorable Sir C. Wood, regarding the proposal that the Company should be permitted to form a great reservoir at the Mári Canvai. The Secretary of State meets the recommendation of the Madras Government with an objection to the following effect: The works, exclusive of the Mári tank, which the Company purpose to undertake will, if their Estimates are correct, absorb the whole of their guaranteed capital, to commit to them the construction of the Mári tank in addition is in such circumstances evidently impossible, and urges on the Government the necessity of restricting them (the Company) to works which shall be perfect in themselves and shall not require the aid of subsidiary "works to render them remunerative." In my general reports, I have shown the necessity of great reservoirs as elements more than adjuncts in the scheme of the Company's works, my first Estimate was for a scheme the cost of which would have exceeded the guaranteed million. In that scheme I included the Mári tank because there is no site on any of the rivers of supply or their basins where water can be stored at so small an expense, and when called upon to reduce the scheme to the compass of the guaranteed million, I included in it for the same reason the Mári tank. In small tanks water may be stored at a cost varying according to the nature of the sites selected from 800 to 2,000 cubic yards per Rupee, but as many such small reservoirs would be required I expect the average cost would be about the mean of those two, judging from the localities which I have seen in these parts of the country.

2. In my first Report I estimated roughly the cost of works for the Mári tank at 9 lacs of Rupees, but from a survey which has since been taken, I find the dam may be reduced in height, and by a plan which I propose to adopt, I expect the total cost will not exceed 7 lacs, and at that cost it is inserted in my Estimate of the contracted scheme. The quantity of water which will be actually available from this reservoir in ordinary years after allowing for evaporation, will be 4,700 millions of cubic yards, which at 7 lacs will yield 6,714 cubic yards per Rupee or allowing for a reservoir of 500 millions, only to be drawn off in extreme circumstances, 6,000 cubic yards per Rupee.

3. Under these circumstances the absolute necessity of reservoirs to maintain continually the water supply, and the very great advantage of adopting so favorable a site as the Mári Canvai, and observing that the Madras Government has recommended that the guarantee should be allowed on an extended amount of capital to enable the Company to undertake this tank, I conclude that as it is now connected with the scheme as projected, and which will be completed within the million sterling already guaranteed, the Government will approve of its being at once planned and estimated. Before I proceed with the drawings, however, it seems necessary that the approval of the Government should be received.

(True Copy.)

(Signed) JOHN TAWSE, *Agent.*

No. 289 ORDER THEREON, 22nd December 1860, No. 2,620.

1. In the last of the communications recorded above, Captain Rundall alludes to the observation made by Government in paragraph 4 of their Order No. 2,397, dated 20th November, and suggests that perhaps the Secretary of State would not object to the Mári tank scheme being included in the Irrigation Company's operations, if by a modification of plans this can be done within the guaranteed capital of one million sterling. This may be the case, and as the Company consider the Mári tank reservoir to be the foundation of their project, the Government will request Major Orr to attend to any representations made regarding it by the Company's Chief Engineer during his tour, in order that he may be able to advise Government on the subject. Indeed the second* point in the instructions to Major Orr cannot be completely carried out without taking the Mári tank into consideration, but it is possible that the 4th paragraph of the Government Order may lead Major Orr to think himself prohibited from entering on that part of the question without these further instructions.

*Paragraph 13, of Order 20th November 1860, No. 2,397.

2. In his letter of the 23rd November, No. 94, Captain Rundall gives the calculations upon which he had assumed that the projected Mári reservoir can supply summer water throughout the line to the coast both for irrigation and navigation purposes. An experienced Engineer Officer, Lieutenant-Colonel Lawford, had however calculated† that this tank cannot be made available for more than the Irrigation of 1,50,000 acres, and the Government understand that two Engineer Officers in Mysore, Colonel Green and Captain Wilkieson, arrived after inquiry at conclusions which agree more with Colonel Lawford's than with those on which the Irrigation Company's project is based. Moreover the Government do

†Letters to Chief Engineer, dated 14th and 17th April, in Proceedings, 9th May 1860, No. 962.

not find that until now any idea has been held of the Mári tank being turned to use beyond the Bellary limits and the neighbourhood of Kurnool. When therefore it was newly and suddenly proposed to give up reservoirs in the Hindri and Penn'ár and make an immense scheme of irrigation and navigation in Mysore, Bellary, Kurnool, Cuddapah and Nellore, depend entirely for its summer water on this one tank, the Government deemed it advisable to call for an experienced and unbiased opinion before accepting the new scheme, especially since over-sanguine haste and deficient preliminary inquiry had already led to erroneous conclusions in selecting sites for the Anicut to supply the Kundár Valley Canal, in the first instance below and afterwards at Kurnool.

Colonel Bell's letter of 27th April 1860, and Colonel H. C. Cotton's letter enclosed in Captain Rundall's Report of 9th March 1860 No 54, in Proceedings 4th April and 15th May 1860, Nos. 716 and 1,013.

3. The next subject which the Government will here notice comprises the Kurnool works. Captain Rundall's Report of 2nd November, No. 85, submitting for approval a modified plan of operations had obliged Government to suppose either that the "Junction Canal," using that expression in its full sense, had been insufficiently estimated for, or that the longest portion of it lying between the Tumbaddra and Kistna rivers had not been estimated for at all. Captain Rundall now* acknowledges the latter supposition to be correct, and thus establishes the propriety of the order given for suspending the Kurnool works. The navigableness of the Kistna has not been ascertained nor is the cost of a Canal from the north side of Kurnool to that river known. When therefore the Secretary of State had called for a plan of some complete and remunerative project within the cost of £1,000,000, it naturally excited surprise that while valuable irrigation works in Bellary were abandoned, money should have been proposed to be expended on an incomplete and nearly useless line of navigation only two miles in length between the projected Sunkasala Channel and Kurnool.

* Letter of 23rd November.

4. Captain Rundall's letter of the 20th November shows that on one point blame was without cause imputed to him regarding the Kurnool works. In paragraph 8 of the Order of Government of 9th November, No. 2,321, information was called for of "the reasons that led "the Chief Engineer to change the site of the Anicut from the one originally decided upon "several miles below Kurnool, to that one where operations were actually commenced," and Captain Rundall now shows that he forwarded a letter of Colonel H. C. Cotton with this explanation on the 12th April last. He is thus fully relieved from any charge of neglect on this point, and the Government cannot but regret that when writing their Orders this letter was overlooked in consequence of an omission to print it with the other papers. The question however remains whether the explanation given by the Chief Engineer for altering the original site of the Anicut and commencing work at Kurnool is satisfactory, and the Government apprehend that this cannot be the case when a second and more important change was so soon found unavoidable.

5. The Government do not consider it necessary in this place further to remark on the explanatory statements made by Captain Rundall regarding the new and modified scheme of operations which he laid before Government with his support in his letter of 2nd November last, No. 85. This subject will be more properly treated of when Major Orr's report has been received, and the Government have taken care that Captain Rundall shall have an opportunity of the fullest explanatory communication with that Officer on the spot. Meanwhile they will comply with the wish expressed by Captain Rundall in paragraph 13 of his letter of the 23rd November, that the present letters and orders of Government thereon should be furnished to the Departments to whom the former orders were sent.

6. One point only remains, Captain Rundall was called on to explain his charge against the European community of Kurnool of exhibiting "a decided hostility to the Company's operations." This explanation was deemed necessary because the European community at that station consists with hardly an exception of Government servants. Captain Rundall cannot now show that any practical ill-will was exhibited, the ground necessary for the Company's operations was at once obtained, and more laborers than could be employed were forthcoming. The unfavorable letters [illegible] newspapers to which Captain Rundall alludes might have emanated from discontented servants of the Company itself, and the Government consider that Captain Rundall is greatly to blame for bringing forward so serious a charge in an official and deliberate form. Disapproval of the operations at Kurnool might well be felt by those who wish the Company every success, and such an unsustainable charge as Captain Rundall made on this occasion besides being unjustifiable in itself must be prejudicial to cordiality and good will.

(Signed) J. D. SIM,
Acting Secretary to Government.

No. 32. Madras Irrigation & Canal C.

Madras 11th April 1860.

From,

F. Agnew Esqr.
Agent M. S. & C.

To

Captain F. H. Rundall,
Consulting Engineer for S. & C.

Sir,

I have the honor to forward the first plans and drawings Nos. 1, 2, 3 & 4. and Estimate of Kurnool Anicut and subsidiary Works, together with a letter dated 30th Ultimo, received from Colonel H. C. Cotton. These papers I now forward for the consideration of His Excellency in Council.

2. The Estimate amounts to Rupees 303079-13-0 Three Lacs three thousand and seventy nine, and thirteen Annas and I have the honor to request that the sum of Rs. 310000 Three Lacs and ten thousand, may be placed at my disposal to be drawn by me through you as required.

I

3 In addition to the amount I shall require the sum of four Lacs of Rupees for the purchase of "Stores" as detailed, in my Letter No. 30 of this date.

I have the honor to be &c.
(Signed) F. Ignacio.
Agent.

Madras Irrigation & Canal Co.
Bangalore 31st March 1860.

To

F. Ignacio Esquire
Agent &c. &c. &c.

Dear Sir,

In forwarding to you the accompanying Letter to Mr. Henwood with Plans and Estimates for the Kurnool Anicut and Channel Head, I beg to say that I am now quite prepared to undertake those as the first works and would suggest that funds be placed at my disposal for erecting sheds as shelter for the laborers, Stores, Shops and a Hospital also for opening quarries, Constructing for Materials, and other preliminary work.

I am &c.
(Signed) H. C. Cotton

Madras Irrigation & Canal Co.
Madras 31st March 1860.

J. Henwood Esq.
Secretary Madras Irrigation & Canal Co.

Sir,

In my Report of 21st December I furnished a rough Estimate of the cost of the whole system of works on the general Project extending from Nalalapoor on the Tumbadra West of Bellary to the East Coast near Nellore. I have since been engaged in examining more critically the Kurnool Division of the undertaking and am prepared to forward Plans and actual Estimates of the works, commencing with those of the Anicut across the Tumbadra below Kurnool and, in succession as they are completed, those of the Canals and other

the works dependent on the Anicut.

I herewith beg to forward (1) a general Plan of the meeting of the Rivers Kundaur and Kinday encompassing the Town and Fort of Kurnool, showing the proposed site of the Anicut, the North and South Channel Heads with their regulating sluices and the Locks by which the navigation will be given from the River to the Channels, (2) a plan with elevations and sections of the proposed Dock for the South Canal. (3) The Section of the River at the site of the Anicut with plan, elevation and section of the Anicut showing them discharge sluices, constructed at each extremity of the Anicut, for the removal of annual accumulation & (4) The estimate showing the aggregate

for

late

also fo

for Materi

construction of a Dam as explained in my
Report and Captain Rundall the
Government Consulting Engineer visited
the spot with me and gave it his approval
Upon further survey however and more
accurate levelling I found that many
advantages would be gained by an alter-
ation in the site, and that which I have
chosen is immediately below the confluence
of the Kinday as shewn in the plan (1).
By placing the Dam here the following
advantages will be gained.

1st. The level affords a better command
to the South Canal branching from it,
which is the main Channel of Irrigation
and will be the great line of Navigation
to the Valley of the Kundaur and Penniar and
to the East Coast, their superior command
causing a reduction in the depths of Cutting
where the Canal passes the watershed
into the Kundaur Basin.

2nd. The Anicut here will throw back
the two Rivers making them permanently
navigable to above the Town, and render
unnecessary the construction of an aqueduct

across

across the Boundary.

The Bellary Canal will descend into the Inundation above the Town and Lands will pass by the River to both the Northern and Southern Canals.

8th The site is better for the Northern Canal, as it will be more easily carried to a point in the River above its rapids, and will command for irrigation a tract of about 10,000 acres between the two Rivers.

4th The arrangement will be highly conducive to the health and prosperity of the Town which will become the great entrepôt of produce and merchandize conveyed by the Canals to the North, the West and the East. The Town whose suburbs are now dry and barren will be encompassed on three sides by water, its climate will be rendered temperate and it will be surrounded by a belt of productive gardens.

5th In this position both extremities of the Dam are on British ground whereas in the first site selected they were both in the Territory of the Nizams. I have brought to the notice of Captain Rundall the

the alteration in the proposed site of the Anicut and he appears fully to concur with me in the arrangement. 15

The capacity given to the Lock 200 feet by 20 feet in the Canal which will be established for the Coast Canal and will be necessary for the great traffic which these Canals will carry when the connection with the Rivers above and the Coast is completed.

In a separate letter I will report on the distribution of the Establishment and the work in progress.

I propose as each Estimate is completed to proceed at once with the required preparations for the work. That now forwarded will not require extensive workshops as those attached to the Building hired as an Office will answer the purpose, but it will be necessary to erect extensive sheds of a temporary character for Labourers, a Hospital and store Rooms, and it is important that, contracts for Materials to some extent should be at once taken in order that the work may actually commence on receipt of the Boards

Authority

Authority I am now gathering some first Class Mechanics and Laborers which are necessarily drawn from a distance and will require to be on the Spot when the work Commences.

My next Estimate will be the South Canal from the Kurnool Anicut which I propose to designate the Kurnool Cumma Channel extending to the Bonauvy or River near Mellacondu &c.

I must beg to note here that the prices which govern these Estimates are fixed upon the best data I am at present obtain where no works of magnitude are known, and may not be so near the truth as I shall propose for future Estimates when these works have made some progress.

I am &c.

(Signed) W. B. Cotton.

Chief Engineer

(True Copies)

(Signed) F. Agnew

Asst.

(True Copies)

F. W. Russell Capt.

Consulting Engineer S. & C. Co.

Consulting Engineer's Office
Irrigation & Canal Company
Palais Jardin, Madras, 23rd Nov.

No 95

From

Captain F. H. Rundall,
Consulting Engineer for I & C Co.

To

The Secretary to Government
In the Department of Public Works
Fort Saint George

Sir,

Enclosures 2. 1. With the accompanying Letter the Agent submits one from the Chief Engineer with Letter of receipt of Public Despatch from the Secretary of State communicated with the Proceedings of Government of the 7th Instant, relative to the possession of the Mauri Reservoir to the Company.

2. The Chief Engineer states that having represented in previous Reports that Great Reservoirs were elements "rather than adjuncts" in the scheme of the Company's works, he included, in his original proposals the Mauny Tank, "because there is no side on any of the River

of

of supply or their having where water can be stored at so small an expense and that for the same reason he included it in his reduced scheme.

3. He further states that the cost of storage in small Tanks, judging from the localities he had seen will vary from 800 to 2,000 Cubic yards per Rupee whereas in great Reservoirs at sites like that of the Mâri it could be stored at 6,000 Cubic yards per Rupee.

4 The Chief Engineer is evidently under the impression that the order from the Secretary of State is not final as he requests the Government will get approval of the Plans and Estimates being proceeded with.

5th On perusing the Despatch in question, it seems as though an opening were still left, for the ground on which the refusal is based, is that its execution would involve an expenditure beyond the guaranteed sum. If such is the only objection it might not be considered of force in the reduced scheme where

a certain sum must be set apart for Storage and as the site of the Mauri Reservoir is apparently the most favorable it would be better to lay out the money there than elsewhere. My letter of the 23d Nov. will have explained how the quantity expected to be stored in this Tank alone will provide sufficient water for the scheme in its reduced dimensions.

6. Should the Government concur in this view they may not object to the surveys and Estimates being at all events completed so when the reduced scheme is laid before the Secretary of State, he will again have an opportunity of expressing his opinion. This need not interfere with the prosecution of the Surveys and Estimates for other sites, as they could be proceeded with simultaneously, so that in the event of a second refusal there will be other Reservoirs to fall back upon.

I have the honor to be
Sir,
Your most obedient Servant,
F. W. Rundall Capt.
Consulting Engineer for N.W.P.

Encl. Ltr. from Secy. to Govt.

Canal Office Esquimalt Dec 13

No 94

Brigadier W Cannel Commanding

Royal Sappers Miners 23rd Regt

Victoria

Captain H.H. Rundall

Consulting Engineer for Irrigation

& Canals

To

The Secretary to the Governor

&c &c &c

Victoria

Sir

Referring to the order of Government

No 2397 dated 30th November 1864 directing me to report on the Lands and Water Privileges connected with the Harrison Lillooet Canal

I have the honor to report as follows

1. In the first place I would observe that the Canal from the Harrison to Lillooet Lake is not intended for navigation purposes but only for irrigation and should therefore be constructed with a view to economy

2. The Lands to be irrigated by the Canal are situated on the Fraser River between Port Douglas and Lillooet Lake and consist of a narrow strip of land on the banks of the River and of a few small Flats at the mouths of the Streams which flow into the River from the Mountains on either side

The Lands on the Fraser River are rich and productive and when irrigated will be capable of producing large crops of Hay and Grain

The Lands on the Flats at the mouths of the Streams are also rich and productive but are subject to be overflowed by the Streams in the Spring of the year when the Snow melts on the Mountains

The Lands on the Flats are generally covered with Timber and Brushwood and require to be cleared before they can be cultivated

The Lands on the Fraser River are generally free from Timber and require little or no clearing

that the Government have overlooked the marginal calculations given in para 18 of my letter and intended to be explanatory of the 4th item of the Chief Engineers estimate worded thus "Completing Hurnool Dam and 1 Lock including expenses already incurred". It will be seen that the sum of 2 Lacs of Rupees is not intended by him to be expended on the Hurnool alone, but includes, together with the cost of the entrance Lock, "the expenses already incurred" by which is meant the whole sum expended at Hurnool up to that time, including the cost of the Canal already excavated.

3. With reference to Para 6 I beg to observe that previous to commencing on the Chief Engineer's estimates, I quoted his own words that they had been prepared "in the light of present positive information afforded by the Surveys hitherto carried out". I regret that I omitted to add what this information was, and that it had been gathered and looked into by me during my last Tour. The particulars of it were explained in my letter

Vide para 12

of

of the 18th Octr/60 enumerating the work which had hitherto been performed by the Company's Officers. It consisted of 25

1 Surveys and Levels from Hurnool to the watershed

2 Do Do of the Kundair and Pennair rivers

3 Do Do and for the greater portion of the Nellore Project. The levels & Sections on the basin of the Mari reservoir.

In the following paras from 7 to 12.

4 Government animadvert on what they consider a failure on my part to notice the apparent "omission" in the Estimate for the Storage of water. On this subject the Chief Engineer wrote "In a reduced scheme the Storage of water must "not be omitted, and it can no where be so cheaply "and satisfactorily stored, as in the proposed "Mari Tank which therefore especially should "form a part" and my own remark was "As regards "the Storage of water the Mari Tank will be "sufficient to supply the quantity required for "the reduced scheme".

5. At the time I so wrote, the despatch from the Secretary of State desiring the rejection of this Reservoir from the Company's Estimates had not

not reached me.

6- In addition to this however the Govt. must object that the supply from the Mari Tank "cannot after furnishing water for 2½ Lacs "of acres in Mysore and Bellary be sufficient "to compensate for the want of the Reservoirs "in the valley of the Kundr and Pennair"—

In reply to this I beg to annex the following calculations, as the grounds on which my opinion of its sufficiency was based

7- In my letter of the 9 March I stated × [illegible]
"that 1½ Cubic Yards per hour per acre might be "assumed as the average quantity requisite "for the Irrigation of Lands in Mysore & Bellary"—

The Paddy crop raised under a regular and certain supply of water is commenced in the first week in June, and reaped in the first week in December, being on the ground about 180 days. In the first 15, while in the seed bed there is a very small quantity of water consumed in the last 15, while the crop is ripening it is shut off entirely—Water is therefore required for about 150 days, at the rate of 1½ Cubic Yds per hour, or 36 Cubic Yards per day per acre, giving as the total quantity 5400 Cubic Yards per acre.

12

8- The 2 crop of Paddy is sown in the middle of February and reaped in the middle of May, or is on the ground 90 days, of which as before, little or no water is required during 30 days— The remaining 60 will require 2 to 3 Cubic Yards per hour, or from 50 to 70 Cubic Yards per day— Taking the average at 60 the total quantity required per acre will be 60×60=3600 Cy^ds— Supposing therefore the whole of the 2½ Lacs of acres, deriving their supply from the Mari Tank alone, were cultivated with 2 crops of Paddy the total quantity of water consumed would be (5400+3600)×250,000 = 2250 Millions— The annual available quantity in the Mari Reservoir is estimated at 4700 Millions— Deducting 2250 Millions from this quantity leaves 2450 Millions available for the Navigation, and for the Summer or 2^d crop of the remaining 400,000 acres in the Kundar Valley and Nellore— Water will cease to be drawn from the Tumbadra from early in December until the first freshes in the end of May or about 180 days— Dividing 2450 by

by 180 gives 13.6,00,000 cubic yards per day or 566666 cubic yards per hour, much more than is required for the 2 crops as these 4 Lacs of acres will not take water for more than 60 days, and consume only 1440 Million out of the 2450 available; There being 180 days to provide for. out of which water for full irrigation would be required for only 60 days. There will remain 120 days during which Navigation alone has to be provided for, the water carried for Irrigation affording it in the interim. For this 2450-1440=1010 Millions are available. This Divided by 120 gives rather more than 8 4/10 Million per day or close upon 350,000 Cubic Yards per hour.

9- In para 30 of my report of 1st Feby last I stated that 300,000 Cubic yards per hour were more than sufficient to maintain a first rate navigable Canal.

10- The following Sentence quoted by Government occurs in the previous paragraph and I am glad of this opportunity of explaining it, as it entirely supports instead of subverting my opinion.

"It has been shewn that the Mâri Tank will supply enough for 300,000 acres and suffice for the Canal between

"between Paramdevanhalle and Kurnool" the 300,000 acres there alluded to are contained in the strip lying east of and parallel to the Huggy and were to be supplied all the year round by the Mâri Tank. The Canal from Paramdevanhalle to Kurnool would have commanded in addition to these, 300,000 more lying South of and parallel to the Tumbaddra. These last would also receive the Mâri Tank water for the 2d crop. the first crop having been provided for direct from the Tumbaddra

11- In addition to these 600,000, water was set aside for 50,000 acres in Mysore so that the Mâri Tank would have furnished a supply to 650,000 acres altogether of which 350,000 acres would have water for the first and second crops & 300,000 for the second crop only.

12- The opinion I expressed of its sufficiency in the reduced Scheme, is likewise for the supply of 650,000 acres, of which however only 250,000 are now to be provided with water for both crops & 400,000 with water for the second crop alone.

13— As the resolution of Government contained in Para 13 was based on the supposition that I had

had omitted to notice the want of provision for
Reservoirs in the reduced scheme, I can only regret
that I was not previously afforded the opportu-
nity of laying before them the above explanation,
which will I trust be now considered sufficient
to exonerate me if not from all blame, at least
from that charge & to shew that the subjects had
not only been not overlooked, but that careful
calculations had been entered into before my
opinion on this important point was expressed.

13. The resolution of Government places me
in such a painful position, and represents my
professional character before its Chief Officers &
the Public in so questionable a light, I trust
that as I was allowed no opportunity
of previous explanation, the Government will
not object to accord to this letter the
same measure of publicity, as has been
given to the Strictures to which it is a
partial reply.

14. The remaining points I forbear
to notice until Major Ord's Report has been
submitted to Government, when I trust

the

the opportunity will be granted me to furnish
such further explanation as I have to offer.

I have the honor to be
Sir
Your most obed.t Servant
F. W. Rundall Capt.n
Consulting Engineer for
Irrigation &c.a

Compared
Sept.r
&c.a

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No 92 — Consulting Engineer's Office, [illegible]

Irrigation & Canal Department

Allahabad the 25th Nov. 1860

From

Captain J.H. Randall

Consulting Engineer for Irrigation

North West

To

The Secretary to Government

N.W.P. Public Works

Sir

With reference to the order of Government

No 2324 1

-mission of Mr. G. Lindsay and to Mr. Fernandez Mission

respecting irrigation projects to be submitted to Govt.

Mr. following explanation —

1. Mr. Chief Engineer's letter of 10th Dec.

2. Each having visited only into the several Estimates

from the different sections without a Memorandum

delivered for Assistant Engineers letter of the

9 March with which it was forwarded, letters

referred only to the general scope of the Irrigation

and not to particulars of design. Subjects

are plans & Estimates into the Report

Kui detail, and this could be better done

when the Surveys & Plans & Estimates are

Dated

Pro: 4th April 1860 Nos. 31-32 82 983.

" 28th Sept. " 277-298

" 20th Nov. " 2397

Copy in a Letter to Engr. in Chief No 22 Dated 4th Dec. 1860 No 256

No 257

C. 29th Nov. C. 18 Dec. 61

No. II. 1860 Elephanta

Pro: of 9th Jan. Dec.

No. 2792.

From

Capt. J.H. Randall

Cons. Engr. for N.W.P. 1860

To

The Asst. Secretary to

Government in

the Dept. of Public Works

Fort St. George

Dated 23d

Rec'd 24th } November 1860

Offers observations on

paras 5 & 12 of the order of

Govt. No 2397 of 20 Nov. to com-

-municating observations on the Sket-

-ches & Connexions on the Irri-

-gation of the Cons. Engr. in submitting

to Govt. the revised Scheme &

Sketch Estimate for the

Company's works —

No 2620. 22d December

Submitted

and that "in the absence of more minute Surveys the Chief Engineer's Estimates could only be taken as approximative," though I added "that as far as the means of judging existed, I considered they erred on the side of excess" This was strictly correct. The means then at my disposal for forming a judgement were the Series of levels referred to in the Chief Engineer's letter to the Company's Secretary of the 20 September/59. as having been taken previous to his arrival by Members of the Public Works Department. Had these proved perfectly correct, the arrangement described by the Chief Engr. in that letter and alluded to in para 22 & 23 of my letter of the 1st. February, (not 9th March) would probably have held good.

3. I could but form a judgement from such particulars of information as were available for the correctness or otherwise, of the levels above referred to. I can scarcely be held responsible, any more than I conceive the Chief Engineer D. P. W. can be called to account for want of accuracy in similar work on the part of Subordinate officers in his Department.

4 Before submitting detailed designs for any works, however, I called upon & received from the Chief Engineer trial levels taken by his own Engineers of the principal point to be ascertained. Viz: the level of the watershed separating the Kundar from the Kistna. These were carefully taken & checked, and formed the key to the practicability of the Scheme or otherwise. They are the levels referred to in para 2 of my Report, as having been subsequently confirmed by the final Surveys and Sections of the country adjoining the watershed. These trial levels shewed that the levels which had been previously obtained from the Department of Pub. Works were incorrect, and induced the Chief Engineer to change the Site of the Annicut from 12 miles below Kurnool to Kurnool itself as explained in his letter & forwarded with mine of the 12 April

5 In his letter full explanations are entered into for removing the Site of the Annicut from the place originally proposed to where it has been commenced, and are such as clearly shewed its expediency. I would here take the opportunity of adding that in my frequent discussion with the Chief Engineer regarding the Site of the Annicut, one of the reasons that weighed with me in assenting

assenting to the final location at Kurnool, was the necessity that existed of having an Anicut, there under any circumstances, as the levels had determined the practicability of crossing the watershed, the probability was that one work would suffice for both purposes—

6— The Government State in para 6 that it was on my "assurance not only of the physical but the economical practicability of the Kurnool Works" that they sanctioned the project—

The physical practicability I certainly attested & still maintain to its superior economy over every other arrangement I could not certify, as there was no other information before me with which to compare it. The sufficiency of the estimate for the particular works required & sanctioned for Kurnool itself, is not I believe called in question. It is the economy of the scheme, and of the general estimates as a whole. I have indeed acquiesced, but the absolute correctness of the estimates for any one particular Section I have not that I am aware ever guaranteed, for there were not data before me to do so—

7 In my letter of the 1st Febry last at para 33 I stated that the total cost of the works would be about 130 lacs. The Chief Engineer's aggregate estimate is given in his letter of the 21st December /57 as Rupees 134.54.500. For this outlay I stated that 12.00.000 acres would be irrigated which would give Rupees 11.2/ of capital per acre. This rate my previous experience enabled me to judge was sufficient, and I am still of the opinion that however much the estimates for the various detached portions may vary, the aggregate cost will not exceed 12 Rupees per acre. I can only regret that my defective explanations should have led the Government to infer, that my assertions of the economy of the general scheme implied also an assurance of its economy in every detail, when I had already stated that the Chief Engineer's estimates could be considered only as approximative—

8— With all due respect I would urge that the expression "the scheme must be almost wholly changed" is calculated to be misapprehended by parties not only unprofessional, but ignorant of the localities & of the nature of the works involved.

In the Godavery delta the cost when completed will be £. 6 per acre viz.
£. 3 - for Main works
£. 3 - for distributaries
£. 6
In the present works £. 9 - are absorbed for Main Works
3 - distributaries
12

in para 6 of G.G. No. 2324 of 9 Dec 58

9 The "Scheme" is the diversion of the flood waters of the Tumbaddra into the Tenmair by a Canal affording both Irrigation & Navigation to the Country through which it runs. This remains unaltered. Had I led the Government to believe first that this was practicable, & then had to report that after investigation had proved it impracticable, I should have deservedly forfeited all claim to confidence. Such however is not the case. The measure that I have recommended being not "an alteration in the Scheme" but an improvement in the design of one of its details subsequently suggested by the Chief Engineer.

10 As regards the design of the actual works sanctioned & partially executed, I beg to submit that the information before me & the full explanation contained in the Chief Engr's letter of the 30th March above referred to, in addition to the reasons assigned in para 5 were sufficient to justify a recommendation of their adoption, more especially as my duties lay not in planning the works myself, but only in judging of such plans as are laid before me. & I am of opinion that

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that though involving "much more expense than was originally expected" they could be still carried out both physically, & not unremuneratively as regards the whole Scheme, but as subsequent investigations have shewn that with an equal outlay, still greater advantages both in time & money may be gained, the proposed modification has been advocated more especially as there has been no unnecessary expenditure, & the work hitherto executed forms an essential connection in the modification.

11. The Government have misunderstood the allusion to the aqueduct required to span the Hindri. Its dimensions were not alluded to in my letter. I only mentioned that 40 feet was the difference of level in the two Canals. The aqueduct will be situated 2 miles above the head of the present canal & there is a rise in the bed of the Hindri of 16 feet between the two places. The aqueduct therefore instead of being 40 feet, will be little more than half that height.

12. As respects the submission of the

Papers

Papers, I beg to explain that on my return
to Madras, I received the Government order calling
for information on the various rumours which
had appeared in the public prints. To this
I replied immediately, promising a further detailed
Report. The Government in their order of 13th Oct
which reached me on the 15th, desired that this
Report might be furnished with as little delay
as possible, and I accordingly submitted it
that same evening without waiting for the Chief
Engineer's letter.

13- It was not in consequence of the omission
having been officially pointed out as supposed
in Para 5, but simply because it had
not reached me, and because the Government
order appeared to me to admit of no delay, that
the letter from the Chief Engineer did not accom-
pany my Report. That letter did not reach
my office till the 24th, or 9 days afterwards, &
was submitted by me on the same day.

14- I regret the proper order of correspondence
was not observed, but I will take care that
it shall be conducted for the future as directed.

The omission to notice the necessity
for

for the Aumicut at Kurnool was an inadver-
tency. The ridge separating the Kistna from
the Tumbadra is so high opposite Kurnool
that a Canal even from the higher site at
Soonkasala would have to make a long
detour below Kurnool before it could be
turned. Besides the extra labor involved in
the excavation of an additional 20 miles
of Canal, all produce coming from beyond
the Kistna would have to be carried an in-
creased distance of 40 miles before it could
pass Kurnool. This will at once explain
the necessity for the work; besides this, great
convenience is afforded to the town of Kurnool
& to the villages on the bank for navigating the
River itself, for about 5 miles above the town.

15 With respect to the last para.
I beg to state that my reason for mention-
ing the feeling existing at Kurnool was
to explain the probable origin of the various
letters which had appeared in the newspapers,
and of the rumours which had led the Govern-
ment to call for my report. It was not
my intention to allude to any one person
in

in particular— The feeling was manifested in general personal conversation with myself, no ill effects had then resulted from it however, beyond that the Townspeople were not disposed to be so friendly as they had been found at the outset with the laboring population as I stated before the works are popular enough, and their extension anxiously looked for—

I have the honor to be
Sir
Your Most Obed Servt
F. W. Randall Capt Engrs
Consulting Engr for
Ill Cent R R

Comd'g Officer
Chas

Memorandum.

Subject: Mr Hurdis's Memorandum to the Viceroy

Mr Hurdis's Memorandum to the Viceroy

Mr Hurdis's Memorandum to the Viceroy

printed and the
orders attended to
In the present case
no such instruction
was given. The of-
-ficer also has acci-
-dentally omitted
out to the Lett. the en-
closures that were
thought should be
printed, and taken
his orders but such
cases were confined
to those in which
the covering letter
was simply such
or where was other
similar circum-
-stances to show

of the question without further instructions.

Under the order
of Genl. D. of 21st Nov.
1861 the found-
-ing of Enclosures
has been discontinued. When
-ever any of the Enclo-
-sures are deemed
by the Genl. officer
sufficient importance
to be transcribed on the
Pro he generally mark
-ed in pencil at the
head or foot.

Other unimportant letters of Enclosures
to Mrs Watson have been omitted as
being void of interest to Capt. Chandler
and of such a character as to do
injustice to the writer to
be made public by the publication
of them generally in the Gov. Records.
Etc

3rd. Head Qrs. Letters & Telegrams
enclosed in Capt. Rundalls of the 12th Inst
were not printed among
the Genl. proceedings as it
was not deemed

Since the Order of Govt dated 9 Nov 1860 No 2324
was issued Captain Rundle the Consulting
Engineer has written the following 3 letters which
may be considered together —

No 92 — dated 20 Nov 1860
" 23d " "
No 94 — "

In the first of these communications he alludes
to the observations made by Govt in Par 7 of their Order
No 2397 dated 20th Nov & suggests that perhaps the
Secretary of State would not object to the Shore
Tank scheme being included in the Company's
Operations, if by a modification of plans this can
be done within the Guaranteed Capital of one
Million Sterling. This may be the case, as
the Company contract the Shore Tank reservoir
& the first foundation of their present pier should
eventually Mr Hayes not be required
to attend to any representations made regarding
it by the Company's Chief Engineer during his tour
in order that he may be able to advise Govt on
the subject — Indeed the 2nd point in Mr Hayes's
instructions cannot be completely carried out
without taking the Shore Tank into consideration
but it is possible that the 4th Para of the Govt Order may
lead Mr Hayes or to think himself prohibited from entering on
this part of the question without further instructions.

Shore Head Tank &c &c
may be necessary —

7/12/60

3 — In his letter of the 23 Nov. Capt. Randall gave the calculations upon which he had opined that the projected Mere Reservoir can supply Summer water throughout the line to the Coast both for Irrigation & Navigation purposes — The experienced Engineer Officer Lt Colonel Lawford had however calculated † that the Tank can not be made available for more than the irrigation of 150 000 Acres, and I understand that two Engineer Officers in Mysore Colonel Green & Capt Wilkinson have arrived at conclusions which agree more with Colonel Lawford's than with the Irrigation Company's project. in this Moreover I do not find that More Tank water now supplies has been held of that being turned to use beyond the Bellary limits near Kurnool — Men therefore gave premature the Kudal Canal it was newly & suddenly proposed to make an entire scheme of irrigation & navigation in Mysore, Bellary Kurnool Cuddapa & Nellore depend entirely for its Summer water on this one Tank, it was likely advisable to call for an experienced & unbiassed opinion before accepting the new scheme & officially since my sanguine hope & belief may be disappointed by further & more careful inquiry, but should lead to erroneous conclusions & mislead the Secretary of State proposal for the

† See Letter to Chief Engineer of 14 & 17 April 1860

* See Colonel Kelly's letter of 27 April/60 & Colonel Hall's Letter & Colonel Lawford's Letter & Colonel Cotton & Capt Randall's Report of 9 March/60 to 54

4 — The next subject to which I shall allude connects the Kurnool Works — Capt Randall's Report of 2nd Nov. No 85 submitting for approval a modified plan of operations had obliged Govt to suppose either that the Junction Canal was inefficiently estimated for, or that the longest portion of it lying between the Tombudra & Kistna rivers had not been estimated for at all — Capt Randall now acknowledges † in the letter of reference to be correct & thus establishes the principle of the order passed for suspending the Kurnool Works — The navigableness of the Kistna has not been ascertained nor is the cost of a canal from the North side of Kurnool to the river known — Men therefore the Secretary of State's plan of operations called for a complete & thoroughly matured project within the cost of £1 000 000 — It might excite surprise that while valuable irrigation works in Bellary were sanctioned, the navigation should be proposed to be suspended on completion nearly only two miles in length between the proposed Canal & Kurnool

† Letter of 23 Nov.

Capt.n Rundall's letter of the 20 Nov.r shows that on the joint blame has been cast-lessly imputed to them regarding the Kurnool Works. By the Order of Govt of 9th Nov.r No 2324 information was called for from the Chief Engineer of the reasons that led the Chief Engineer to change the date of the Kurnool from the one respectively decided upon several miles below Kurnool to that on where operations were unfortunately commenced" and Capt.n Randall knew that he forwarded a letter of explanation on Colonel H. C. Cotton with this explanation on the 12th April last. He has thus fully relieved any the charge of neglect to them joint, & must I can only regret that when writing my Memoir of 24th & 25th Oct. this letter was not brought to my notice. I can only add that I never saw it & it was not among the papers circulated when the Kurnool works were under consideration & it does not appear to have been printed among the Govt Proceed-ings as it ought to have been. The explanation required - will be furnished on this point by the Sec.y Public Works Department - But while the question remains undecided whether the explanation given by the Chief Engineer for altering the original line of the Kurnool Canal is satisfactory, and the Court be the case when it is found to have important changes was so soon found unavoidable -

It is not necessary now to make any further remarks on the explanatory statements made by Capt.n Rundall on these letters regarding the new & modified scheme of operations which he laid before Govt with his despatch in his letter of 2 Nov.r last No 65. This subject will be more properly treated of when Major Orr's despatch has been received, & the Govt have taken care that Capt.n Rundall shall have an opportunity of the fullest explanatory communication with that Officer on the spot. Meanwhile I see no objection to com-municate Capt.n Rundall's work (Letter of 23 Nov.r P13) that the present letter shall be forwarded & the Sec.y to whom the letter of Govt of 9th inst. was addressed. One point only remains. Capt.n Randall was called on to explain his charge against the European Community of Kurnool of exhibiting a decided hostility to the Company's operations" This explanation was deemed necessary because the European community at that station con-sists with hardly an exception of Govt servants. Capt.n Randall cannot now show that any practical ill will was exhibited - the general necessary for the Company's operations was ob-tained, & more labourers than could be employed were forthcoming. - The unfavorable letters in the Newspapers to which Capt.n Randall alludes might have emanated from disinterested

servants of the Company itself, and I consider Capt. Rundell greatly to blame for bringing forward so unfounded a charge in an official & deliberate form. - Disapproval of the operations at Kurnool might well be felt by those who wish the Company every success, and such an unsustainable charge as Capt. Rundell has made, however in the opinion justifiable in itself must be prejudicial to confidence & good will.

3 Dec/65 - Elle

No. 2620. P.W.D. 57

Proceedings of the Madras Government
Under date the 22nd December 1860.

Read the following letters
from the Consulting Engineer
for Irrigation & Canal Company

Offers explanations to the remarks made by Government in their order No 2324 of 9th instant on the points reflecting on the Proceedings of the Consulting Engineer. (Here enter 20th November 1860 No 92)

Offers observations on paras 5 to 12 of the order of Government No 2397 of 20th November 1860 commenting on certain incongruities and omissions on the part of the Consulting Engineer in submitting to Government the revised scheme and sketch estimate for the Company's works. (Here enter 23rd — " — " — 94)

Forwards letters from the Secy of Govt written on the late despatch from the Secy of State relative to the concession of the Mauri Reservoir to the Company with the Consulting Engineer's opinion thereon and should the Government agree with the same suggests that they may not object to the Surveys and Estimates of the Mauri Reservoir being completed. (Here enter 23rd — " — " — 95)

Pl In the last of the communications recorded above Captain Rundall alludes to the observations made by Government in Para 4 of their order No 2397 dated 20th November, and suggests that

C. 18 Dec. Pl.

that perhaps the Secretary of State would not object to the Mari Fault & Lehenne being included in the Irrigation Company's operations, if by a modification of plans this can be done within the guaranteed Capital of one million Sterling. This may be the case, and as the Company consider the Mari Fault reservoir to be the foundation of their project the Government will request Major Orr to attend to any representations made regarding it by the Company's Chief Engineer during his tour, in order that he may be able to advise Government on the subject. Enclosed the 2nd & 3rd paragraphs of the instructions to Major Orr cannot be completely carried out without taking the Mari Fault into consideration, but it is possible that the 4th Para of the Government order may lead Major Orr to think himself prohibited from entering on that part of the question without these further instructions.

Sir

Board's Order 20th Nov. 1860 No. 2397.

Letter to Chief Engr. E.D. 11th & 17th April in Pro: 9th May 1860 No. 962.

Colonel Bell's letter of 27th April 1860 & Colonel H.C. Cotton's letter enclosed in Captn. Rundall's Report of 9th March 60 No. 54. in Pro: 4th April & 15th May 1860 No. 716 & 1013.

2 59 In his letter of the 23rd November No. 94 Captn. Rundall gives the calculations upon which he had assumed that the projected Mari Reservoir can supply a Summer water throughout the line to the Coast both for Irrigation and Navigation purposes. An experienced Engineer Officer Lieutenant Colonel Crawford had however calculated that this Fault cannot be made available for more than the Irrigation of 150,000 acres, and the Government understood that two Engineer Officers in Mysore Colonel Green and Captain Wilkinson arrived after enquiry at conclusions which agree more with Colonel Crawford's than with those on which the Irrigation Company's project is based. Moreover the Government do not find that until now any idea had been held of the Mari Fault being turned to use beyond the Bellary limits & the neighbourhood of Kurnool. When therefore it was newly & suddenly proposed to give up reservoirs in

tive

the Kundri and Kumár and made an immense scheme of irrigation and Navigation in Mysore, Bellary, Kurnool, Cudalapa and Nellore - depend entirely for its summer water on this one tank, the Govern- ment deemed it advisable to call for an experienced and unbiassed opinion before accepting the new scheme, es- pecially since over sanguine haste and deficient preliminary enquiry had already led to erroneous conclusions ~~in the~~ ~~here alluded to~~ in selecting the ~~mistaken~~ site proposed for the ancient to supply the Kandalur Valley canal in the first instance below and afterwards at Kurnool.

Kundair

3 The next subject on which the Government will have notice comprises the Kurnool Works - Captain Rundall's Report of 2d November 85 submitting for approval a modified plan of operations had obliged Govt to suppose either that the Junction canal using that expression in its

Jan Letter 1

2 Letter of 23rd November

b1

its full sense had been insuffi- ciently estimated for, or that the longest portion of it lying between the Toombudra and Kistna rivers had not been estimated for at all. Capt.n Rundall now acknowledges the latter supposition to be correct, & thus establishes the propriety of the order given for suspending the Kurnool Works. The navigableness of the Kistna has not been ascer- tained nor is the cost of a canal from the North side of Kurnool to that river known. When therefore the Secretary of State had called for a plan of some complete and remunerative project within the cost of £1,000,000, it naturally expected surprise that while valuable irrigation works in Bellary were abandoned, money should have been proposed to be expended on an incomplete and nearly useless line of navigation only two miles in length between the projected Coom- bala Channel and Kurnool.

4 Capt.n Rundall's letter of the 20th November shows that on one point blame was ~~been~~ without cause lately imputed

imputed to him regarding the Kurnool Works. In para 8 of the order of Government of 9th Nov. No. 2324 information was called for of "the reasons that led the Chief Engineer to change the site of the anicut from the one originally decided upon several miles below Kurnool to that one where operations were actually commenced," and Capt.n Rundall now shows that he forwarded a letter of Colonel H.C. Cotton with this explanation on the 12th April last. He is thus fully relieved from any charge of neglect on this point, and the Government cannot but regret that when writing their orders this letter was overlooked in consequence of an omission to file it with the other papers.

The question however remains whether the explanation given by the Chief Engineer for altering the original site of the anicut and commencing work at Kurnool is satisfactory, and the Govt apprehend that this cannot be the case when a second and more important change was so soon found unavoidable.

The

5. The Government do not consider it necessary in this place further to remark on the explanatory statements made by Capt.n Rundall regarding the new and modified scheme of operations which he laid before Government with his despatch in his letter of 2nd November last. This subject will be more properly treated of when Major Orr's report has been received, and the Govt have taken care that Capt.n Rundall shall have an opportunity of further explanatory communication with that Officer on the spot. Meanwhile they will not fail to comply with the wish expressed by Captain Rundall in para 13 of his letter of the 23rd November that the relevant letters and orders of Govt thereon should be furnished to the Departments to whom the former orders were sent.

6. One point only remains. Capt.n Rundall was called on to explain his charge against the European Community of Kurnool of exhibiting a decided hostility to the Company's operations. This explanation was deemed un-

necessary

necessary because the European Community at that station consists with hardly an exception of Govt. Servants. Capt.n Randall cannot now show that any practicable will were exhibited. the ground necessary for the Company's operations was at once obtained, and more labourers than could be employed were forthcoming. The unfavorable letters in the newspapers to which Capt.n Randall's address might have emanated from discontented servants of the Company itself and the Government consider that Capt.n Randall is greatly to blame for bringing forward so ~~serious~~ unfounded a charge in an official and deliberate form. Disapproval of the operations at Kurnool might well be felt by those who wish the Company every success, and such an unascertainable charge as Capt.n Randall made on this occasion besides being, unjustifiable in itself must be prejudicial to cordiality and good will.

J. W.S

Copy to Hd. Comp.y E.I.H. Cy Dep.t 22
3 — Agent to do — do 22
1 — Major C.A. Bn 22
10 — Chief Engr 24
12 — Asst. Engrs 24
1 — Dist.t Engr Kurnool 22
3 — Civil Asst.s 24
4 — Field Deputies

15

Copy in a Letter to Engineers
of 22nd December 60 No 88.

Relating to the revised
Scheme of Public Works
proposed by the Irrigation
Company.

Public Works 1860 Despatch.
Pro: of Govt for Decr.

No 2620.

Pro: of the Madras Govt.
of 22d Decr 60.

From the Agent of Madras Irrigation and Canal Company
of 27th December 60 Cost
317 in Pro.

Major Orr to attend to
any representations made by
the Irrigation Company's Chief
Engineer regarding the Mari
Tank Project during his
Tour.

No 286 at 289.

C. 18 Dec. R.