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MADRAS RECORD OFFICE.**Government of Madras.***Public Works* **DEPARTMENT.***P.W.D.*

G.O. No. 255.

492-493

Press
(Mis.)

Dated

24-1-

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Not to be folded or roughly handled

No. 492. Read the following letter from the Chief Engineer for Irrigation, to the Secretary to Government, Public Works Department, dated Fort St. George, 9th January 1868, No. 18:—

I have the honor to submit a report on the condition of the works in progress at the Red Hill and Cholaveram Tanks, &c., (Madras Water Supply Project) which I lately inspected in company with the Superintending Engineer, Colonel Boileau.

RED HILL TANK.

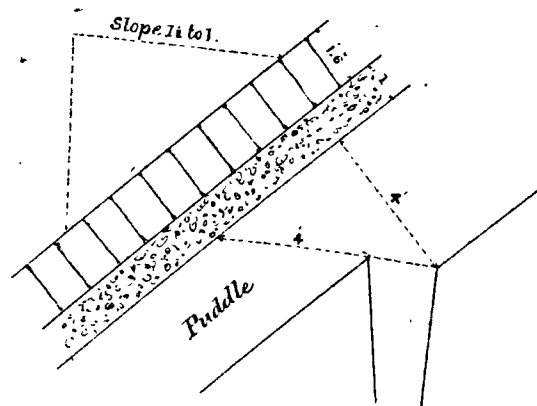
1. Delivery channel not commenced. Compensation for houses and property taken up for the work has been paid to the amount of Rupees 20,600. The balance allowed for in the estimates, Rupees 61,943, or such portion of it as is likely to be required, should be made over to the Collector before the close of the official year, in order that it may not lapse. The area to be taken up should be marked out as soon as possible for the guidance of the Revenue Authorities.

2. The calingulah of the Red Hill Tank is completed in accordance with the design, except that laterite has been substituted for the concrete allowed in the foundations. It rests on laterite rock, but the crest, instead of being on the level the ground or somewhat above it, as it ought to have been, is from one to four feet below it, and as the ground for some distance in front and rear of the work is on the same level, the excavation of a channel is necessary to allow a free passage to the water. This would prove an expensive operation, as the soil is hard and even rocky, and although a partial removal may be effected by quarrying material for the roads from the site, it would be cheaper to extend the calingulah on a lower level than to clear out a channel to the full width and depth. In any case, I think it essential that the new supply should not be raised to the full height until after the tank embankments have been thoroughly tested. The surface will be fifteen feet above the present or old calingulah crest. If the works are carried up so as to admit of a depth of six feet above the calingulah crest during next season, there will then be time for the earth to consolidate under the rain of the next monsoon; whereas, if they are carried up at once to the full height, the failure of the monsoon of this year will injuriously affect the solidity of the embankment, and considerable settlement, if not worse, would be the result. I would therefore propose to finish in the first instance up to a height suitable for a water level six feet above the old calingulah crest, and to raise the calingulahs to that level, the earthwork and revetment being raised about four and two yards higher respectively. During the next season, I would raise the water surface to twelve feet above the old calingulah crest, build an extension of the new calingulahs 200 feet long up to that level, and raise the embankment to the full height allowed for in the design, at the same time closing the old calingulah altogether. The efficiency of the works would thus be gradually tested, and any risk of accident removed. There will be more or less settlement of the earthen embankments for several years after they are thrown up, and I would not advocate the raising of the 200 feet calingulah above proposed to the full supply level of fifteen feet above old calingulah crest until all signs of settlement shall have disappeared. Experience will

then show if it can with safety be raised to that height, without throwing greater strain on the banks during high winds than they are able to bear. The estimate allows a height of six feet above the full supply level together with a rough stone parapet two feet higher, but as there may be three feet of water going over the calingulah, the banks would then be only three feet above the surface, and the crest of the parapets two feet higher. I much doubt if this leaves a sufficient margin for the action of the waves during the storms which are liable to prevail along the eastern coast; but, as I have said above, experience of the working of the tank at a lower level will best show the limit to which the surface can with safety be raised ultimately.

3. The earth-work of the Red Hill Tank bunds is already well advanced, and along the greater part of the old line of bund the revetment has been raised to a height of six or eight feet. A considerable portion of the earth-work of the new bund, from which the delivery channel is to take off, has also been thrown up, but the revetment has not there been commenced. The earthen bank is not being formed so carefully as it ought to be; the tank diggers being allowed to heap up the soil indiscriminately, instead of in layers, and moreover they have not been compelled to break up the clods. Water in one form or another is essential to make a firm embankment, and as this portion of the work has not had any rain upon it, and as it is too expensive to apply water mechanically, and as besides rammers have not been used to consolidate the earth, we must, I think, wait till next monsoon before attempting to finish the work up to the full height.

4. The rough stone revetment, so far as it extends as yet, is well executed. It is backed by a layer of gravel, so called, but more correctly described as lumps of laterite of various sizes. Material of this kind must be more or less liable to displacement, and the Executive Engineer should be careful to fill in the interstices with laterite gravel. The revetment and rough stone work are backed by a layer of puddle. By an oversight on the part of the late Executive Engineer and his Overseer, the thickness of puddle allowed in the estimate was calculated on the horizontal line, instead of on the line perpendicular to the face of the revetment. The consequence is that along a considerable portion of the work, the puddle has been carried to the height of about six feet, of an insufficient thickness. This will be rectified by the insertion of a vertical wall of puddle, in the manner shown in the annexed diagram, equal in quantity to what has been omitted, but only where the puddle already filled in rests against new earth-work. Where it is backed by the compact earth-work of the old bund, nothing would be gained by disturbing it. The full quantity of puddle allowed for in the estimate will be filled in on all the work continued above the present level.



5. The alteration of the irrigation sluices required to adapt them to the increased supply has not been commenced. Plans will be prepared and furnished to the Executive Engineer for guidance as soon as possible. It has already been decided in G. O. No. 2,783, dated 10th September 1867, that an amended pattern of sluices should be adopted. One of the existing irrigation sluices was examined by Colonel Boileau and myself, and was found to be in fair order, and to be constructed of good material. A second sluice could not be inspected in consequence of the tunnel being under water, and a third, which was in bad order, has been destroyed. Two sluices will be required under the improved supply of the tank for the present cultivation. Colonel Boileau recommends that a masonry work should be built in advance of each of the sluices, to allow of the water being shut off, and to facilitate repairs. This suggestion will be acted on when the plans of the sluices are drawn up. If additional sluices are hereafter required to extend the wet cultivation, they may be constructed on a higher level, and at sites where laterite foundations are available.

6. SUPPLY CHANNEL FROM CHOLAVARAM TO RED HILL TANK.—This channel is about half finished. The soil is firm and will probably be able to stand the considerable velocity due to a fall of three feet per mile. The channel has been neatly excavated, but sufficient care has not been taken in arranging the spoil banks so as to prevent the soil being washed over the berms and into the channel. The abutments of a timber bridge have been completed, but the other masonry works, comprising three bridges and two tunnels, have not yet been commenced. I would propose to substitute masonry inlets for the under-tunnels, and supply irrigation water in lieu of what may be intercepted by the new channel, from the Cholaveram Tank.

7. CHOLAVARAM TANK.—The earth-work and revetment of this tank are somewhat further advanced than the similar works at the Red Hill Tank. The same mistake as occurred on that work with regard to the thickness of puddling was made here also, and will be similarly rectified. The laterite revetment is not equal to that at the Red Hill Tank. The stones, though larger, are not dressed on the surface, and they do not present a sufficiently even bed. Captain Scott's attention was drawn to this point, and to the necessity of packing gravel in the interstices of the rough lumps of laterite backing the revetment.

8. The foundations of the new calingulah for the tank have been put in. Further progress on this work will for the present be confined to the consumption of the material on the ground, as the calingulah is not required to be of the full height in the first instance after the admission of the Cortiliar water. The irrigation sluices are not commenced. The large sluice for passing on the water from Cholaveram to the Red Hill Tank will shortly be commenced. A modification of the original design will be necessary. For a sluice to be worked under a head of twenty feet, work of a more massive character than has been allowed by Mr. Fraser is, I think, desirable, and indeed essential. Unless the sluice shutters and grooves were made of cast-iron, which would be very expensive, the labor of opening and shutting the vents must be very considerable, and a second sluice on a higher level may be built with advantage. The main sluice would be used when the Cortiliar freshes commence for passing on the water to the Red Hill Tank, and when it should

be filled, the sluices would then be closed until the Cholaveram Tank should also be filled. The second sluice would then be used for making good the consumption from the Red Hill Tank, and the main sluice would only come into operation again when the surface level should fall below the sill of the second sluice. The latter may be built of laterite, and would not be an expensive work.

9. I would propose the same arrangements at Cholaveram as those above recommended for the Red Hill Tank, as regards the raising of the banks. In fact, as the Cortiliar water may be passed on to the Red Hill Tank if the surface level of Cholaveram Tank is raised six feet above the old calingulah crest, the completion of the embankments to the full height is not of any pressing importance.

10. CHANNEL FROM CORTILIAR TO CHOLAVARAM TANK.—This channel, with the exception of the first mile which has not been touched, is nearly completed as regards the excavation. The work has been neatly done, and the spoil banks have been more carefully placed than has been the case in the channel from Cholaveram to Red Hill Tank, though still capable of improvement. None of the bridges or under-tunnels have been commenced. Masonry inlets may be substituted for the latter with advantage, and, as regards the bridges, I am of opinion that a greater amount of waterway than is allowed in the original designs should be provided, and also that they should all have flooring, retaining walls, and rough stone aprons. The soil along the greater part of the channel is very bad, and is in my opinion certain to give way extensively under the action of a stream with a depth of six feet and fall of two feet per mile. The velocity under these conditions would at the lowest computation be three and a half feet a second, whereas the soil would hardly stand under a velocity of two and a half feet. A channel sixty feet wide, six feet deep, and with a fall of twelve inches per mile, which would give a velocity somewhat over the latter amount, would I consider have been much better adapted to carry the required supply than the channel with double the fall, and half the width, as provided for in the original design. A channel of the above capacity would discharge at the rate of about one inch of rain in twenty-four hours over an area of forty square-miles. The limits of the country drained by the Boosykal and Katinkal cannot be accurately determined, but it does not seem to be too much to assume as an approximation that they will at times bring down at least that quantity of water to the supply channel. An uniform width of thirty feet is allowed throughout, and as the full supply from the Cortiliar might be entering when breaching of tanks or a local rain might suddenly bring down a large addition through the Boosykal and Katinkal, it would appear very necessary that a calingulah with sluices and with ample waterway should be constructed on the north bank of the supply channel. I believe that eventually it will be found necessary to enlarge the supply channel to a width of about sixty feet from the junction of the Boosykal onwards, but it may suffice in the first instance to make all the bridges of that width of waterway, and to provide them with flooring and rough aprons, which may hereafter be adapted as small falls, to reduce the slope of the bed. The simplest, and probably most inexpensive, description of bridges for the light traffic which will pass across the channel is a structure formed of masonry piers and abutments and timber platforms for the roadway, but it may be worthy of consideration whether iron may not be used in preference.

11. ANICUT AND HEAD SLUICE.—The anicut across the Cortiliar has been constructed with the exception of the body-wall and wing-walls. The masonry work is good, but the rough stone apron has not been well packed. The rates allowed the Contractors are very high, and none but the best work should be accepted. The defects in the apron will be rectified.

12. I would recommend that eight or ten sluices be built at the south flank of the work, with a view to keep an approach to the head sluice clear as far as possible of accumulations of sand. The rough stone apron may also with advantage be extended five yards, and still more opposite the proposed under-sluices. The head sluice foundations have been built in with the exception of those of the wings and returns. The work was stopped by Captain Magnay in consequence of his expecting floods in the river, but there is nothing now to prevent this and the other masonry works along the channel being proceeded with vigorously. Every effort should be made to complete the excavation of the channel to the Cholaveram Lake and to get in the foundations of the bridges and masonry inlets, which should advance simultaneously with the prosecution of the head sluice. There is always a small stream in the Cortiliar, and it would be a great advantage to the work at the Cholaveram Tank, to say nothing of its reducing the risk of sickness among the workmen, if it could be turned into the tank during the hot months, when it would otherwise be dried up.

13. There is every prospect of the estimates being exceeded. A statement which I obtained from the Executive Engineer, showing expenditure up to 31st December, is enclosed. A large excess must be incurred on the anicut across the Cortiliar and head sluice of supply channel, also on the sluices generally. A Comparative Statement will be prepared, as soon as amended designs for various masonry works are ready.

14. I regret also to report that the allotment for the current year cannot be fully expended. Of 1,20,000, in round numbers, at the Executive Engineer's disposal, not more than 1,00,000 Rupees are likely to be expended, including amount payable for compensation for lands taken up for the works; 20,000 Rupees may therefore safely be withdrawn at once for other works.

Statement showing the state of progress of Madras Water Works, the amount paid for work executed up to 31st December 1867, and the estimate originally made by Mr. Fraser, C. E., for the completion of the several sections.

Proceedings of the Madras Government, Public Works Department,
24th January 1868.

Number.	Description of Work.	Number.	Amount paid.	Amount due.	Total value of work executed.	Decimal of progress.	Estimate of Mr. Fraser for work.	Remarks.
1	Cortilar anicut	1	40,500	5,392	45,892	...	41,639	
2	Do. head sluice	1	...	8,281	63,828	...	75,637	
3	Channel from Cortilar to Cholaveram Lake	1	55,547	...	...	...	3,738	
4	Division of Katenkal including dam across channel...	1	...	...	...	...	3,340	
5	Boosykal aqueduct	1	...	950	4,242	...	...	* On Boosykal diversion which is in progress. *
6	Do. diversion and dam across channel	1	3,292	...	...	...	...	
7	Cart bridges for main channel crossings	6	...	...	...	...	12,177	
8	Foot do. do. 3 1/2 feet road-way	4	...	...	...	...	3,350	
9	Irrigation under-sluires do. do.	11	...	...	...	...	12,224	
10	Cholaveram Lake bund	1	34,800	9,189	43,989	...	1,24,515	
11	Head-sluiice for supply channel to Red Hill Lake	1	...	...	...	...	11,122	
12	Irrigation sluices to Cholaveram Lake	2	...	...	...	...	1,703	
13	Cholaveram Lake calingulah	1	...	...	...	...	1,412	
14	Channel between Lakes	1	42,928	1,591	44,519	...	56,815	
15	Cart bridges for supply channel crossings	3	2,650	...	2,650	...	6,080	† On cart bridge No. 1 executed
16	Foot do. do.	1	...	...	...	...	837	
17	Irrigation under-sluires do. do.	2	...	...	...	...	2,222	
18	Red Hill Lake bund	1	23,600	8,484	32,174	...	96,791	
19	Bunds across the valleys around the Red Hill Lake...	3	...	...	...	...	17,492	
20	Red Hill lake Irrigation sluices	2	...	...	...	...	1,046	
21	Do. calingulah	1	5,125	...	5,125	...	2,603	
22	Head-sluiice of delivery channel to Madras	1	...	...	...	...	2,898	
23	Delivery channel to Madras	1	...	...	...	...	10,497	
24	Cart bridges for delivery channel crossing	5	...	...	...	...	1,658	
25	Foot bridges do. do.	2	...	...	...	...	503	
26	Irrigation under-sluires for delivery channel crossings	10	...	...	...	...	8,326	

Proceedings of the Madras Government, Public Works Department,
24th January 1868.

27	Otary nullah aqueduct	1	...	...	...	...	1,392	
28	Railway culvert	1	...	...	...	...	...	
29	Poonamallee road bridge	1	...	...	...	...	742	
30	Road bridge from Amuicary to Chetput	1	...	...	...	...	421	
31	Harrington's road culvert	1	...	...	...	...	594	
32	Nabob's garden culvert	1	...	...	...	...	421	
33	Macknical's road do.	1	...	...	...	...	574	
Total			2,08,532	33,887	2,42,419	...	5,03,435	
Compensation of damage to land, &c.			20,600	...	20,600	...	83,140	
Contingence, superintendence, and sundries			20,027	...	20,027	...	50,343	
Grand Total			2,49,159	33,887	2,83,046	...	6,36,918	

No. 493.

ORDER THEREON, 24th January 1863, No. 255.

IRRIGATION, No. 27.

1. Communicated to the Superintending Engineer of the 4th Division, whose attention will be drawn to Colonel Anderson's remarks.
2. The Government have perused the foregoing Memorandum with much interest, and, while disappointed to learn that the rates at which the works comprised in the Madras Water Supply Project are likely to cause an excess over the sanctioned estimate, they are gratified that good progress has been made notwithstanding that the health of the Officer lately in charge was such as to prevent his giving, for some time past, that attention to the works which they required, and which they would doubtless otherwise have received.
3. As, in consequence of the unfortunate failure of the monsoon, the earth which has been thrown up to raise the bunds of the Red Hill and Cholaveram Tanks has not become consolidated under the action of moisture, as in ordinary seasons would have been the case, it would probably not be safe to permit these bunds to be exposed to the great pressure which would be brought upon them if they were raised to the full height at once and the full supply which is intended to be ultimately stored in the tanks were retained during next monsoon, as at one time was contemplated.
4. The Government concur in thinking it advisable to limit the raising of the banks during the present season to fifteen feet above the crest of the present calingulah, and to adding six feet to the height of these works unless the surplus water can be safely disposed of by means of temporary escapes at the flanks of the bunds. This will give time for the earth to consolidate, and will afford an opportunity of observing the effect of the anicut across the Cortilliar and the sufficiency or otherwise of the various surplus and regulating works. The latter, and the excavation of the supply channels, should be pressed forward with the utmost rapidity, provision being made for laying out the bridges for an eventual extension of the channel from the Cortilliar to the Cholaveram Tank to a width of sixty feet.
5. The suggestion to construct a surplus calingulah on the left bank of the channel in the neighbourhood of the Boosykal, to dispose of any excessive supply that may enter from that source, is approved of and will be carried out, a plan and estimate being submitted for sanction. The proposal to substitute masonry inlets in lieu of tunnels is also approved, and may be carried out as it is understood that the change will not cause any increase of expenditure.
6. As regards the further raising of the bunds of the two tanks, Colonel Anderson recommends that, after being exposed to one year's trial under the additional head of water which will be admitted during next monsoon, they should be carried up to the full height, but that the calingulahs which will regulate the surface level should be kept three feet lower than they are ultimately intended to be, in order that the bunds may not be subjected to the full pressure until they have had time thoroughly to settle, and their stability has been tested by at least two years' trial, the old calingulahs being in the meanwhile closed. This procedure is approved of by the Government, and will be followed, as it will allow of the works being brought into operation as speedily as seems to be possible without incurring risk of accidents, and, moreover, as soon as the water that is to be supplied by them

can be made available in Madras. It will also afford the means of judging whether the surface can be safely raised to the full height without a higher bund than Mr. Fraser has allowed for.

7. It appears that, through a mistake in Mr. Fraser's arrangements, the calingulah of the Red Hill Tank has been placed in a position where the water cannot reach it or be safely led away from it without the excavation of a channel, which, having to be cut mainly through laterite rock, will prove a very expensive undertaking. It is a question whether it would not be better to sacrifice a part of the outlay that has been already incurred, and to remove the calingulah to the more suitable level which is available in the immediate vicinity. This will be considered by the Superintending Engineer, who will issue the necessary instructions to the Executive Officer.

8. The description which Colonel Anderson gives of the mode in which the earth-work of the tank embankments is being executed shows that sufficient care is not being paid to this important part of the project. It is not creditable to Mr. Pim, under whose immediate management work of the indifferent kind described has been carried on, and whose duty it is to control the operations of the tank diggers. Colonel Boileau will issue such instructions to the Executive Officer as will ensure a more careful style of work being executed in future. Special attention should also be paid to the raising of the revetments of the two tanks so as to avoid any risk of settlement.

9. A modification of the large sluice at the head of the Red Hill supply channel, as pointed out by Colonel Anderson, seems necessary to allow of its shutters being worked at those times when the Cholaveram Tank being full, a great head of water will stand against the sluice. The arrangement by which this head will be divided between two sluices on different levels appears well calculated to overcome the difficulty, and is approved of; as is also the mode in which Colonel Anderson recommends that the irrigation sluices in the tank bunds should be built and strengthened.

10. The Collector of Madras will be requested, through the Revenue Department, to hasten the valuation of the lands taken up for the works in order that they may be paid for out of the present year's allotment, a great part of which it is feared will otherwise lapse. As under any circumstances it is not probable that the whole appropriation will be expended before the end of the current year, the Superintending Engineer will take immediate measures for putting in hand the works of the Chembrumbakum extension project, and will report what amount can be usefully laid out on that project this season in order that the necessary transfer may be made.

(True Extract.)

(Signed) CHARLES A. ORR, Colonel, R. E.,
Secretary to Government.

To the Superintending Engineer, 4th Division.
.. Revenue Department.
.. Controller of Public Works Accounts.

Exd. F. R. Bantleman.

Imagined by W.

No 18

From.

Lieutenant R. J. C. Anderson R.E.
Chief Engineer for Irr.

To
Colonel L. A. O. R.E.
Secretary to Govt. P.W.D.
Sir.

I have the honor to submit a report on the condition of the works in progress at the Red Hill and Cholawaram Tanks V^o. (Mettur Water Supply Project) which I lately inspected in company with the Superintending Engineer, Colonel Boileau.

I have the honor to be
Sir

Your most Obedt Servt

J. Anderson R.E.

Chief Engineer for
Irrigation Works.

Fort St George
9th Jan'y 1868

[Faint, illegible handwritten notes]

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1899. 11. 10. 11. 12. 13. 14. 15. 16. 17. 18. 19. 20. 21. 22. 23. 24. 25. 26. 27. 28. 29. 30. 31. 32. 33. 34. 35. 36. 37. 38. 39. 40. 41. 42. 43. 44. 45. 46. 47. 48. 49. 50. 51. 52. 53. 54. 55. 56. 57. 58. 59. 60. 61. 62. 63. 64. 65. 66. 67. 68. 69. 70. 71. 72. 73. 74. 75. 76. 77. 78. 79. 80. 81. 82. 83. 84. 85. 86. 87. 88. 89. 90. 91. 92. 93. 94. 95. 96. 97. 98. 99. 100. 101. 102. 103. 104. 105. 106. 107. 108. 109. 110. 111. 112. 113. 114. 115. 116. 117. 118. 119. 120. 121. 122. 123. 124. 125. 126. 127. 128. 129. 130. 131. 132. 133. 134. 135. 136. 137. 138. 139. 140. 141. 142. 143. 144. 145. 146. 147. 148. 149. 150. 151. 152. 153. 154. 155. 156. 157. 158. 159. 160. 161. 162. 163. 164. 165. 166. 167. 168. 169. 170. 171. 172. 173. 174. 175. 176. 177. 178. 179. 180. 181. 182. 183. 184. 185. 186. 187. 188. 189. 190. 191. 192. 193. 194. 195. 196. 197. 198. 199. 200. 201. 202. 203. 204. 205. 206. 207. 208. 209. 210. 211. 212. 213. 214. 215. 216. 217. 218. 219. 220. 221. 222. 223. 224. 225. 226. 227. 228. 229. 230. 231. 232. 233. 234. 235. 236. 237. 238. 239. 240. 241. 242. 243. 244. 245. 246. 247. 248. 249. 250. 251. 252. 253. 254. 255. 256. 257. 258. 259. 260. 261. 262. 263. 264. 265. 266. 267. 268. 269. 270. 271. 272. 273. 274. 275. 276. 277. 278. 279. 280. 281. 282. 283. 284. 285. 286. 287. 288. 289. 290. 291. 292. 293. 294. 295. 296. 297. 298. 299. 300. 301. 302. 303. 304. 305. 306. 307. 308. 309. 310. 311. 312. 313. 314. 315. 316. 317. 318. 319. 320. 321. 322. 323. 324. 325. 326. 327. 328. 329. 330. 331. 332. 333. 334. 335. 336. 337. 338. 339. 340. 341. 342. 343. 344. 345. 346. 347. 348. 349. 350. 351. 352. 353. 354. 355. 356. 357. 358. 359. 360. 361. 362. 363. 364. 365. 366. 367. 368. 369. 370. 371. 372. 373. 374. 375. 376. 377. 378. 379. 380. 381. 382. 383. 384. 385. 386. 387. 388. 389. 390. 391. 392. 393. 394. 395. 396. 397. 398. 399. 400. 401. 402. 403. 404. 405. 406. 407. 408. 409. 410. 411. 412. 413. 414. 415. 416. 417. 418. 419. 420. 421. 422. 423. 424. 425. 426. 427. 428. 429. 430. 431. 432. 433. 434. 435. 436. 437. 438. 439. 440. 441. 442. 443. 444. 445. 446. 447. 448. 449. 450. 451. 452. 453. 454. 455. 456. 457. 458. 459. 460. 461. 462. 463. 464. 465. 466. 467. 468. 469. 470. 471. 472. 473. 474. 475. 476. 477. 478. 479. 480. 481. 482. 483. 484. 485. 486. 487. 488. 489. 490. 491. 492. 493. 494. 495. 496. 497. 498. 499. 500. 501. 502. 503. 504. 505. 506. 507. 508. 509. 510. 511. 512. 513. 514. 515. 516. 517. 518. 519. 520. 521. 522. 523. 524. 525. 526. 527. 528. 529. 530. 531. 532. 533. 534. 535. 536. 537. 538. 539. 540. 541. 542. 543. 544. 545. 546. 547. 548. 549. 550. 551. 552. 553. 554. 555. 556. 557. 558. 559. 560. 561. 562. 563. 564. 565. 566. 567. 568. 569. 570. 571. 572. 573. 574. 575. 576. 577. 578. 579. 580. 581. 582. 583. 584. 585. 586. 587. 588. 589. 590. 591. 592. 593. 594. 595. 596. 597. 598. 599. 600. 601. 602. 603. 604. 605. 606. 607. 608. 609. 610. 611. 612. 613. 614. 615. 616. 617. 618. 619. 620. 621. 622. 623. 624. 625. 626. 627. 628. 629. 630. 631. 632. 633. 634. 635. 636. 637. 638. 639. 640. 641. 642. 643. 644. 645. 646. 647. 648. 649. 650. 651. 652. 653. 654. 655. 656. 657. 658. 659. 660. 661. 662. 663. 664. 665. 666. 667. 668. 669. 670. 671. 672. 673. 674. 675. 676. 677. 678. 679. 680. 681. 682. 683. 684. 685. 686. 687. 688. 689. 690. 691. 692. 693. 694. 695. 696. 697. 698. 699. 700. 701. 702. 703. 704. 705. 706. 707. 708. 709. 710. 711. 712. 713. 714. 715. 716. 717. 718. 719. 720. 721. 722. 723. 724. 725. 726. 727. 728. 729. 730. 731. 732. 733. 734. 735. 736. 737. 738. 739. 740. 741. 742. 743. 744. 745. 746. 747. 748. 749. 750. 751. 752. 753. 754. 755. 756. 757. 758. 759. 760. 761. 762. 763. 764. 765. 766. 767. 768. 769. 770. 771. 772. 773. 774. 775. 776. 777. 778. 779. 780. 781. 782. 783. 784. 785. 786. 787. 788. 789. 790. 791. 792. 793. 794. 795. 796. 797. 798. 799. 800. 801. 802. 803. 804. 805. 806. 807. 808. 809. 810. 811. 812. 813. 814. 815. 816. 817. 818. 819. 820. 821. 822. 823. 824. 825. 826. 827. 828. 829. 830. 831. 832. 833. 834. 835. 836. 837. 838. 839. 840. 841. 842. 843. 8

Delivery Channel not commenced
"Compensation for house and
property taken up for the work
has been paid to the amount
of Rupees 20,600. The balance
allowed for in the Estimate, of
Rs. 61,943, or such portion of it,
as is likely to be required, should
be made over to the Collector,
before the close of the Official
year, in order that it may not
slip. The area to be taken
up, should be marked out as
soon as possible for the guid-
ance of the Revenue Au-
thorities.

2 The Calingulah of the
Red Hill Tank is completed
in accordance with the

design, except that laterite
has been substituted for the
concrete allowed in the founda-
tions. It rests on laterite rock,
but the crest, instead of being
on the level of ground, or some-
what above it, as it ought to
have been, is from one to 14
feet below it, and the ground
for some distance in front,
and rear of the work is on
the same level. The excavation
of a channel is necessary to
allow free passage to the
water. This would prove an
expensive operation, as the soil
is hard and even rocky, and
although a partial removal
may be effected by removing
material for the road from the
site, it would be cheaper to
extend the Calingilah on a

lower level than to clear out a
channel to the full width
and depth. In any case, I
think it essential that the new
surface should not be raised
to the full height until after
the bank embankments have
been thoroughly tested. The
surface will be 15 feet above
the present or old Calingilah
crest. If the works are carried
up 20 ft to admit of a depth
of 5 feet above the Calingilah
crest during wet season, there
will then be time for the
earth to consolidate under
the pressure of the next mon-
soon - whereas, if they are car-
ried up at once to the full
height, the failure of the
monsoon of this year will
injuriously affect the solidity
of the embankment, and con-
siderable settlement, if not

18
I would be the result
I would therefore propose to
finish in the first instance
up to a height suitable for a
water level, 5 feet above the
old Calingulah crest and to
raise the Calingulahs to that
level, the earthwork and re-
tirement being raised about
4 and 2 yards higher respectively.
During the next season, I
would raise the water surface
to 12 feet above the old Cal-
ingulah crest, build an ex-
tension of the new Calingulah
200 feet long to that level, and
raise the embankment to
the full height allowed for
in the design, at the same
time, closing the old Calin-
gulah altogether. The efficiency
of the works would thus be
gradually tested, and any

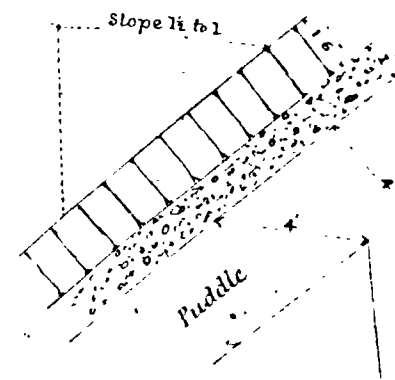
19
risk of accident removed.
There will be more or less settle-
ment of the earthen embank-
ments for several years
after they are thrown up, and
I would not advocate the raising
of the 200 feet Calingulah
above proposed to the full
supply level of 15 feet above
old Calingulah crest until
all signs of settlement shall
have disappeared. Experience
will then show if it can
with safety be raised to
that height, without throw-
ing greater strain on the
banks during high winds
than they are able to bear.
The estimate allows a height
of 6 feet above the full
supply level together with
a rough stone parapet 2
feet higher, but as there

many beds of water going
over the Dalingulak, the banks
will then be 13 feet above
the surface, and the rest of the
parapets, 2 feet higher. I much
doubt if this leaves a sufficient
margin for the action of the waves
during the storms, which are
liable to prevail along the eastern
coast, but as I have said above,
I am prepared for the working of
the work at a lower level.
I will show the limits to
which this surface can with
safety be raised ultimately.
The earthwork of the old
hill, tank, bunds, etc., is
well advanced, and along the
greater part of the old line
of bank the revetment has
been raised to a height of
6 or 8 feet. A considerable

5- 21
portion of the earthwork of the
new bund, from which the
delivery channels to take off
has also been thrown up, but
the revetment has not there
been commenced. The eastern
bank is not being formed so
carefully as it ought to be, the
tank diggers being allowed
to heap up the soil indiscrimi-
nately, instead of in layers,
and moreover they have not
been compelled to break up the
clods. Water in one form
or another is essential to make
a firm embankment and as
this portion of the work has
not had any rain upon it
and as it is too expensive
to apply water mechanically
and as besides rammers have
not been used to com-
pact the earth, we must

I think, wait till next monsoon
before attempting to finish the
work up to the full height
4 The rough stone rivet:
orient, so far as it extends a,
apt is well executed. It is back:
ed by a layer of gravel, so
called but more correctly describ:
ed as lumps of latite, of various
sizes. Material of this kind
must be more or less liable to
displacement, and the Executive
Engineer should be careful
to fill in the interstices with
latite gravel. The pavement
and rough stone work are
backed by a layer of puddle.
By an oversight on the part
of the late Executive Engineer
and his Overseer, the thick
ness of puddle allowed in
the estimate was calculated in
the horizontal line, instead
of

6
of on the line perpendicular



of on the line perpendicular to the face of the revetment. The consequence is that along a considerable portion of the work, the puddle has been carried to the height of about six feet of an insufficient thickness. This will be relieved by the insertion of a vertical wall of puddle, in the manner shown in the annexed diagram, equal in quantity to what has been omitted, but where the puddle is already filled in next against new earthwork. There it is backed by the compact earthwork of the old bund, nothing would be gained by disturbing it. The full quantity of puddle allowed for in the estimate will be filled in on all the work continued above the present level.

The alteration of the
irrigation sluices required to
adapt them to the increased
supply have not been com-
menced. Plans will be pre-
pared and furnished to the
Executive Engineer for guidance,
as soon as possible. It has
already been decided in O. O.
No. 2783, dated 10th September 1867,
that an amended pattern of
sluices should be adopted.
One of the existing irrigation
sluices was examined by
Colonel Boileau and myself,
and was found to be in fair
order, and to be constructed
of good material. A second,
sluice could not be inspected
in consequence of the tunnel
being under water, and a
third

third, which was in bad order,
has been destroyed. Two sluices
will be required under the im-
proved supply of the Tank
for the present cultivation. Col.
Boileau recommends that a
masonry work should be
built in advance of each of
the sluices, to allow of the
sluices being shut off and to
facilitate repairs. This sug-
gestion will be acted on when
the plans of the sluices are
drawn up. If additional
sluices are hereafter required
to extend the wet cultivation,
they may be constructed on a
higher level, and at sites where
laterite foundations are
available.

Supply

6 Supply Channel from
Cholowian to Red Hill Tank.

This Channel is about half finished. The soil is firm and will probably be able to stand the considerable velocity due to a fall of 3 feet per mile. The Channel has been neatly excavated, but sufficient care has not been taken in arranging the spoil banks so as to prevent the soil being washed over the bums and into the Channel. The abutments of a timber Bridge have been completed, but the other masonry works, comprising 3 Bridges, and 2 tunnels, have not yet been commenced. I would propose to substitute masonry mls for the under tunnels,

and supply irrigation water in lieu of what may be intercepted by the new Channel from the Cholowian Tank. The earthwork and revetment of this Tank are somewhat further advanced than the similar works at the Red Hill Tank. The same mistake as occurred on that work with regard to the thickness of puddling wall made here also, and will be similarly rectified. The laterite revetment is not equal to that at the Red Hill Tank. The stone, though larger, are not dressed on the surface, and they do not present a sufficiently even bed. Capt. Scott's attention was drawn to this

point, and to the necessity of
packing gravel in the inter-
stices of the rough turnings of
lignite backing the retaining
wall. The foundations of the
new Calingula, for the tank
have been put in further pro-
gress on this work will for the
present be confined to the con-
sumption of the material
on the ground as the Calingula
is not required to lie of the
full height in the first in-
stance after the admission
of the Cortes water. The
irrigation sluices are not con-
sidered. The large sluice for
passing on the water from
Cholaveram to the Red Hill
Tank will shortly be com-
menced. A modification of
the original design will be

necessary. For a sluice to be
worked under a head of 20 feet,
work of an more massive charac-
ter than has been allowed
by the Engineer is, I think, es-
sential and indeed essential.
Unless the sluice, shutters and
grooves were made of cast iron,
which would be very expensive,
the labor of opening and shutting
the sluice must be very consid-
erable, and a second sluice on
a higher level may be built
with advantage. The main sluice
would be used when the Por-
tular gates commence for
passing the water to the
Red Hill Tank, and when it
should be filled, the sluice
would then be closed until the
Cholaveram Tank should
also be filled. The second
sluice would then be used

for Mr. King, good the con-
servation from the Red Hill
Tank, and the main sluice
would only come into operation
again when the surface level
should fall below the sill of
the second sluice. The latter
might be built in laterite, and
would not be an expensive work
ing. I would propose the
same arrangement at the
Cholavaram as those above
recommended for the Red
Hill Tank, as regards raising
of the banks. In fact, as the
irrigation water may be placed
on the Red Hill Tank if the
level of the Cholavaram Tank
is raised 3 feet above the old
Colingdah Rest, the completion
of the embankments to the full
height is not of any pressing
importance.

10 Channel from Cortilion to
Cholavaram Tank. This chan-
nel, with the exception of the first
mile which has not been touched,
is nearly completed as regards
the excavation. The work has
been neatly done, and the spoil
banks have been large carefully
placed than has been the case
in the Channel from Cholavaram
to Red Hill Tank, though still
capable of improvement. Some
of the Bridges or under tunnels
have been commenced. Mason-
ry inlets may be substituted
for the better with advantage; and,
as regards the Bridges, I am
of opinion that a greater amount
of waterway than is allowed
in the original designs should
be provided, and also that they
should all have flooring,

retaining walls and rough
stone aprons. The soil along
the greater part of the Channel
is very bad and is in my
opinion certain to give way
extensively under the action of
a stream with a depth of 6 feet
and fall of 2 feet per mile.
The velocity under these condi-
tions would at the lowest
computation be $2\frac{1}{2}$ feet a second,
whereas the soil would hardly
stand under a velocity of $2\frac{1}{2}$
feet a second. A channel 6 feet
6 inches deep, and with a fall
of 12 inches per mile, which
would give a velocity somewhat
over the latter amount, would I
consider have been much better
adapted to carry the required
supply than the channel with
double the fall, and half the
width.

width, as provided for in the
original design. A channel
of the above capacity would
discharge at the rate of about
1 inch of rain in 24 hours
over an area of 40 square
miles. The limits of the country
drained by the Booyhal and
Kathukal cannot be accurately
determined, but it does not
seem to be too much to as-
sume, as an approximation
that they will at times bring
down at least that quantity
of water to the supply chan-
nel. An uniform width
of 30 feet is allowed through-
out, and as the full supply
from the Cortis might
be entering, when breaking
up tanks, or a local rain
might suddenly bring down
a large addition through the

the Booykal and Kalinkal,
it would appear very necessary
that a Calingulah with sluice
and with ample waterway
should be constructed on the
North bank of the Supply
Channel. I believe that even
actually it will be found ne-
cessary to enlarge the supply
channel to a width of about
60 feet from the junction
of the Booykal onwards but
it may suffice in the first
instance to make all the Bridges
of that width of waterway and
to provide them with flooring
and rough aprons, which may
hereafter be adapted as small
falls to reduce the slope of the
bed. The simplest and probably
most inescapable description

12
of Bridges, for the light traffic
which will pass across the
channel is a structure formed
of masonry piers and abut-
ments and timber platforms
for the roadway, but it may be
worthy of consideration whether
iron may not be used in
preference.

Amount and head Sluice.

The amount across the Corbular
has been constructed with the
exception of the body wall and
wing walls. The masonry work
is good, but the rough stone
apron has not been well packed.
The gates allowed the Contractors
are very high and none but the
best work should be accepted.
The defects in the apron will
be rectified.

¹² I would recommend that 8 or 10 sluices be built at the South flank of the work, with a view to keep an approach to the head sluice clear as far as possible of accumulations of sand.

The rough stone apron may also with advantage be extended 5 yards, and still more if possible the proposed under sluices. The head sluice foundations have been built in with the exception of those of the wings and returns. The work was stopped by Captain Magnan in consequence of his expecting floods in the River, but there is nothing now to prevent this and the other masonry works along the channel being proceeded with

with vigour. Every effort should be made to complete the excavation of the channel to the Cholavaram Lake and to get in the foundations of the Bridge and masonry inlets, which should advance simultaneously with the prosecution of the head sluice. There is always a small stream in the Cutler, and it would be a great advantage to the work at the Cholavaram Tank, to say nothing of its reducing the risk of sickness among the workmen, if it could be turned into the Tank during the hot months when it would otherwise be dried up.

¹³ There is every prospect of the Estimate being exceeded. A statement which I obtained from the

the Executive Engineer, showing
expenditure up to 31st December
is enclosed. A large excess must
be incurred on the Ancient charges
the Portion and head sluice
of supply channel, also on
the sluices generally. A com-
parative statement will be
prepared, as soon as amended
designs for various masonry
works are ready.

14. I regret also to report that
the allotment for the current
year cannot be fully expended -
of 120,000, in round numbers
at the Executive Engineer's disposal,
not more than 100,000 (Rs.) are
likely to be expended in-
cluding amount payable
for compensation for lands
taken up for the work.
At

16 . 39
~~At all events~~ 20,000 (Rupees)
therefore may safely be withdrawn
at once for other works.

J. Andrew Scott Esq. A.E.
Chief Engineer for
Port of George
9th Jan'y 1868 } Navigation.

| Brought over. | 134,139 | 20,812 | 107,907 | 2,77,277 |
|--|----------|--------|----------|----------|
| 11 Head sluice for supply channel to Red Hill Lake | | | | 11,122 |
| 12 Irrigation sluices to Cholavaram Lake | | | | 1,703 |
| 13 Cholavaram Lake Calingalah | | | | 1,412 |
| 14 Channel between lakes | 42,928 | 1,591 | 44,519 | 56,515 |
| 15 Girt bridges for supply channel | | | | |
| Crossings | 3 | 2,600 | | 6,089 |
| Foot do do | 1 | | 2,600 | 837 |
| 17 Irrigation under sluices do do | | | | 2,222 |
| 18 Red Hill Lake bund | 23,690 | 8,484 | 32,174 | 96,791 |
| 19 Bunds across the valleys around the Red Hill Lake | 3 | | | 17,492 |
| 20 Red Hill Lake irrigation sluices | 2 | | | 1,046 |
| 21 do. Calingalah | 1 | 5,125 | 5,125 | 2,603 |
| 22 Head sluice of delivery channel | | | | |
| to Madras | 1 | | | 2,898 |
| 23 Delivery Channel to Madras | 1 | | | 10,497 |
| 24 Cart bridges for delivery channel crossings | | | | 1,658 |
| 25 Foot bridges do do | 2 | | | 503 |
| 26 Irrigation under sluices for delivery channel crossings | 10 | | | 8,328 |
| 27 Olay nullah aqueduct | 1 | | | 1,342 |
| 28 Railway Culvert | 1 | | | 742 |
| 29 Ponnammallee road bridge | 1 | | | 421 |
| 30 Road bridge from Arinjicay to Chetpet | 1 | | | 594 |
| 31 Harringtons road culvert | 1 | | | 421 |
| 32 Naloh's garden culvert | 1 | | | 574 |
| 33 Mac Kinnell's road do | 1 | | | 574 |
| Total | 200,532 | 33,887 | 2,42,419 | 5,03,435 |
| Compensation of damage to land &c | 20,600 | | 20,600 | 83,140 |
| Contingence, Superintendence & sundries | 20,027 | | 20,027 | 50,343 |
| Grand Total. | 2,49,159 | 33,887 | 2,83,046 | 6,36,918 |

P.W. 1868 Dept
Pro of Govt for January
No 138

From
The Chief Engineer
for Irrigation
No 18

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

Dated 9 } January 1868
Recd 15 }

No 18

Submitting a
report on the condi-
tion of the works
in progress at the
Red Hill and Chola
Taveram Tanks Year

etc 255. 24 Jan 1868

Ob 192

c. 15 Jan 1868 Pa. 17

circulate

255

Public Works Dept.

etc 255

Proceedings of the Madras Government
Under date the 24th Jan 1868
Read the following

From the Chief Engineer for
Irrigation - (P.W.D. No 18 of 9th Jan 1868)

Communicated to
the Supy Engineer of the 4th
Division, whose attention will
be drawn to Colonel Anderson's
remarks.

The Government have
perused the foregoing Memo.
with much interest, and,
while disappointed to learn
that the rates at which the
works comprised in the
Madras Water Supply pro-
ject are likely to cause an
excess over the sanctioned
estimate, they are gratified
that good progress has been
made notwithstanding that
the health of the Officer

lately

lately in charge was such
as to prevent his giving,
for some time past, that
attention to the works which
they required, and which
they would doubtless other-
wise have received.

As in consequence
of the unfortunate failure
of the monsoon, the earth
which has been thrown up
to raise the bunds of the
Red Hill and Cholaveram
Sanks has not become
consolidated under the
action of moisture, as in
ordinary seasons would
have been the case, it
would probably not be
safe to permit these bunds
to be exposed to the great
pressure which would be
brought upon them if
they were raised to the
full height at once
and the full supply
which is intended to be
ultimately stored in
the

47
Sanks retained during
next monsoon, as at one
time was contemplated.

The Govt. concur in
thinking it advisable to
limit the raising of the
banks during the present
season to 15 feet above
the crest of the present
Calinguloh and to adding
6 feet to the height of these
works, unless the surplus
water can be safely dis-
posed of by means of
temporary escapes at the
flanks of the bunds. This
will give time for the
earth to consolidate, and
will afford an opportunity
of observing the effect of
the aqueduct across the
fertilliar and the suf-
ficiency or otherwise of
the various surplus and
regulating works. The
latter, and the excavation
of the supply channels,
should be pressed forward
with

with the utmost rapidity,
provision being made for
laying out the Bridges for
an eventual extension of
the Channel from the
Castellar to the Cholaravim
Tank to a width of 60 feet.

The suggestion to con-
struct a surplus calingulas
in the left bank of the
Channel in the neighbour-
hood of the Boosyhal
to dispose of any excessive
supply that may enter
from that source is ap-
proved of and will be
carried out, a plan and
estimate being submit-
ted for sanction. The
proposal to substitute
masonry inlets in lieu
of Tunnels is also approved
and may be carried out,
as it is understood that
the change will not cause
any increase of expendi-
ture.

As regards the
further

17
49
further raising of the bund
of the two Tanks, Colonel
Anderson recommends
that, after being exposed
to one year's trial under
the additional head of
water which will be ad-
mitted during next mon-
soon, they should be car-
ried up to the full height,
but that the Calingulas
which will regulate the sur-
face level, should be
kept 3 feet lower than they
are ultimately intended
to be, in order that the
bunds may not be sub-
jected to the full pressure
until they have had
time thoroughly to settle,
and their stability has
been tested by at least
two year's trial, the old
Calingulas being in the
meanwhile closed. This
procedure is approved
of

of by the locks and will be followed, as it will allow of the works being brought into operation as speedily as seems to be possible without incurring risk of accidents, and, moreover, as soon as the water that is to be supplied by them can be made available in masonry. It will also afford the means of judging whether the surface can be safely raised to the full height without a higher bank than Mr. Fraser has allowed for.

It appears that through a mistake ~~in~~ Mr. Fraser's arrangements, the Calingula of the Red Hill Tank has been placed in a position where the water cannot reach

reach it or be safely led away from it without the excavation of a channel, which having to be cut mainly through laterite rock, will prove a very expensive undertaking. It is a question whether it would not be better to sacrifice a part of the outlay that has been already incurred, and to remove the Calingula to the more suitable level, which is available in the immediate vicinity. This will be considered by the Superintending Engineer, who will issue the necessary instructions to the Executive officer.

The description which Colonel Anderson gives of the mode in which the Harbours of the Tank Substantments is

being executed shows that sufficient care is not being paid to this important part of the project. It is not creditable to Mr. Pinn under whose immediate management work of the indifferent kind described has been carried on - and whose duty it is to control the operations of the Tank differs. Col. Roileau will issue such instructions to the Executive Officer as will ensure a more careful style of work being executed in future. Special attention should also be paid to the raising of the Revetments of the two Tanks so as to avoid any risk of settlement.

A modification
of

of the large sluice at the head of the Red Hill Supply Channel, as pointed out by Col. Anderson, seems necessary to allow of its shutters being worked at those times when the Cholavaram Tank being full, a great head of water will stand against the sluice. The arrangement by which this head ^{will} be divided between two sluices on different levels appears well calculated to overcome the difficulty, and is approved of; as is also the mode in which Colonel Anderson recommends that the irrigation sluices in the Tank bunds should be built and strengthened.

The Collector of Madras will be requested, through the Revenue Dept. to hasten the valuation
of

of the lands taken up
for the works in order
that they may be paid
for out of the present
year's allotment, a great
part of which it is fear-
ed will otherwise lapse.
As under any circum-
stances it is not pro-
bable that the whole
appropriation will
be expended before
the end of the current
year, the Supy. Engineer
will take immediate
measures for putting
in hand the works of the
Cheribrambakkum
extension project, and
will report what amount
can be usefully laid
out on that project
this season in order that
the necessary transfer may
be made.

[Signature]

To
The ~~Ch. Engr for Supt.~~
S. Engr 4th Div
Rene Dep't.
Conty

Dec 20/18

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492-493

Public Works Department

Proc. of Govt. for January
No. 255

Proc. of the Madras Govt.
21st January 1868

Passing orders on a
report by the Chief Engineer for
Irrigation on the works in
progress at the Red Hill and
Cholavaram Sanks &c.

No. 492-493

15th Jan 1868 R. 17th