(1) Number of pages 12

(2) Date of repair

(3) Initials of the Referencer

TAMIL NADU ARCHIVES

GOVERNMENT OF TAMIL NADU

Revenue DEPARTMENT

G.O. No. / B.P. No.	2925	Press. / Mis.
Dated	25.5.1877	197 .

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Archives I—10,006—19-4-79.

2925
1

GOVERNMENT OF MADRAS.

PUBLIC WORKS DEPARTMENT.

1st May 1877, No. 7 I.

Irrigation.

Account.

Read the following papers :—

No. 13. From Major J. BEATTY, R.E., Officiating Superintending Engineer, Godavery, to the Chief Engineer for Irrigation, dated Dowlaishweram, 25th January 1877, No. 3,035.

I HAVE the honor to forward herewith the revised estimate for the Bank Canal, Western Delta, together with a report from the Range Officer affording all the information called for in your memorandum No. 18 GD of 20th March 1876.

From Lieutenant A. R. F. DORWARD, R.E., Assistant Engineer, Godavery, Western Delta Division, to Major J. BEATTY, R.E., Officiating Superintending Engineer, Godavery, dated Nursapur, 21st December 1876, No. 390.

I HAVE the honor to forward herewith a revised estimate of Rupees 1,14,340 for the Bank Canal.

In G.O. of 15th May 1875, No. 1,388, a revised estimate for part of the canal was sanctioned.

The work provided for in that revised estimate has been nearly finished with a considerable saving.

The present estimate allows for that saving.

Earthworks.—In the original estimate Rupees 20,000 were allowed under head "Earthworks" for improving the canal. This provision was divided as follows :—

From 0 to 16 miles	8,736
From 16 to 22¾ miles	7,964
From 22¾ miles to end	3,300
Total ...	20,000

The new head to the canal shortened it by about a quarter of a mile, so that 22½ miles on the revised sections correspond to about 22¾ on the original ones. From 0 to 22½ miles work has been finished at a cost of Rupees 22,200. In the G.O. above quoted Rupees 13,736 were sanctioned for the portion of the canal from 0 to 16 miles. The total sanction from 0 to 22½ miles was therefore Rupees 21,700. There has therefore been in actual execution an excess of Rupees 500 on this portion of the canal. This is due to no provision having been made for the Sidhantam lock and Koder weir channels, which cost Rupees 860. The Sidhantam weir and Koder lock have been built on the old line of the canal so no separate provision for their channels was required.

The improvement of the canal from 22½ miles to the end is now estimated at Rupees 3,600. The total estimate for the canal "Earthwork" therefore now stands at Rupees 25,800.

There are four ways in which the canal could be ended off. I will notice them all, giving what appears to me to be their respective merits and demerits and summing up the conclusions which have caused me to recommend for adoption the line I have now estimated for :—

I.—To turn off above Doddipatla bridge and run along the north side of the Palkole road to the Pemula kodu, using that kodu or creek which joins the Nakkala just above the girder bridge as the canal.

II.—To turn off just below the Doddipatla bridge and run along the south side of the road to Nakkala.

III.—To run from Doddipatla bridge straight across country and join the Nakkala above Latchmipalem.

IV.—To adopt the existing line of the canal below Doddipatla bridge joining the Nakkala above Latchmipalem by a short cut.

Line No. I is the one at present sanctioned. It is the worst line that could have been chosen. At starting it must either run through a small temple or through a portion of the village or render necessary a diversion of the road. The villagers would object very strongly to the removal of the temple or of their houses, and the diversion of the road would be expensive. None of these things seem to have been considered when the original estimate was sent.

The Pemula kodu is a deep creek, and if improved throughout would make a fair line of navigation. The sanctioned estimate however only allows for improving the upper part of it.

The lower part is of ample dimensions, but winds about a good deal. Its sides are covered with a thick growth of rattan and bushes, which would cost a good deal in clearance.

The kodu joins the Nakkala just above the iron girder bridge carrying the Palkole and Doddipatla road. Boats would therefore have to pass under the bridge, which has two spans of 33 feet each and no tow-paths. The headway of the bridge is too little, being only 11 feet above mean sea level. In the wet season there would rarely be enough headway to allow boats to pass. The river flood marks are clearly marked on the girders.

Were this line adopted the girders would have to be raised, but the bridge abutments are at present badly cracked, and I do not think it would be advisable to meddle with them.

The navigation of the Nakkala from the bridge to about one-fourth mile above Latchmipalem is fair, but not comparable to that provided by a cut canal. It could not be cheaply improved.

In paragraph 88 of his report embodied in G.O. No. 768 of 14th March 1871, Mr. Rundall remarks concerning the outfall sluice proposed to be built to Nakkala drain, "Captain Ryves proposed to place this at Latchmipalem, but the site has been altered to Kattapalem to suit the navigation arrangements proposed." These arrangements I have just described.

In almost every respect Kattapalem is a worse site for the outfall sluice than Latchmipalem. The survey which accompanies this report shows that Kattapalem is about one-fourth of a mile above the iron girder bridge.

Just east of Illapakarru the Pemula kodu is joined by the Vallur drain. The Vallur drain drains about 10 square miles of country. If the Nakkala outfall sluice be built at Kattapalem an outfall sluice would also have to be built to the Vallur drain. In the sanctioned estimates a provision of Rupees 500, about one-fifth of what the work would really cost, has been made for this work. If the outfall sluice across the Nakkala be built below the girder bridge, no sluice for the Vallur drain will be required. With the sluice at Kattapalem the Godavery freshes would have nothing to stop them till they came to the lock proposed to be built just below Doddipatla village—(see paragraph 21 of Mr. Rundall's report above referred to)—that is to say, the freshes would extend inland 3 miles farther than they would do were the sluice built at Latchmipalem. Six miles of extra banking would be required to keep high floods from spreading over the country. An estimate for raising the river bank belonging to this range was lately submitted. Were the arrangements proposed by Mr. Rundall to be carried out about Rupees 10,000 would have to be added on to that estimate.

At present some goods are carried on bandies from Palkole to Nakkala and shipped at the girder bridge for the Central Delta and other places. A sluice at Latchmipalem would stop this traffic or render increased land and water carriage necessary. This, as far as I can see, is the sole advantage that would be gained by building an outfall sluice at Kattapalem and the advantage is not an important one.

I forgot to mention that, in order to prevent too much water running down the existing line of Bank canal, a provision of Rupees 250 was made in the original estimate for a dam to be built across it somewhere below Doddipatla bridge.

I am considerably within the mark when I say that the adoption of this line No. I would entail an expenditure of Rupees 15,000 (not including lock and weir).

Line No. II would allow of the Nakkala outfall sluice being placed below the girder bridge and of the tidal lock being built close to the Nakkala.

Line II.

It would be preferable to line No. 1, but would still possess many of its disadvantages which I need not again mention. It would cost about Rupees 3,000 less than No. 1. It would make an island of the country south of it and would prevent villagers getting at the Palkole road.

Line No. III would be the best line for navigation. The objections to it are—

Line III.

1st.—Its cost.

2nd.—It would leave a strip of land between it and the river bank which could be not drained without a special sluice into the river or a tunnel under the canal, or the forming a river bank of the left bank of the canal.

A large item in its cost would be compensation for land; it would run straight through about the richest tract of land in this delta and the ryots have a very strong objection to parting with such land. It would probably have to be taken up under the Act, and, if this line were adopted, the contemplated improvements would be considerably delayed. The cost of earthwork of a canal dug on this line would be about Rs. 8,000.

Line No. IV is the one I have chosen as being altogether the best. It is in every way a better line than Nos. 1 or 2, and the navigation on it can at a comparatively small cost be made nearly as good as that which line No. 3 would afford. Judging only from the survey, it would seem in some places to run dangerously close to the river. I have given a section at the point where the river is closest. At the present time there is no danger of the river breaching into the canal or of the canal breaching into the river. The strong current of the river is on the opposite side, and year by year a sand shoal is creeping down from the point opposite the large betel garden shown on the survey at about 23 miles.

Line IV.

There has been no erosion for 5 miles below that point since I came to the range.

There is rather a bad set opposite the village of Doddipatla, which is yearly getting nearer to the Bank canal, but that set equally affects all the lines I have mentioned.

Because I do not believe that there is any considerable danger from the river, I have not thought it advisable to quit the existing line at any place. Such diversions would have to run through betel, sugarcane, and plantain gardens, and would be very costly. They would probably also delay work, as I do not think the land requisite for them would be willingly given up.

The line I propose for the junction with the Nakkala is marked on the survey with a dark yellow line. In choosing it I was guided by the wishes of the ryots. It allows of the lock and weir being put in a position perfectly safe from the river, and does not take up so much valuable land as a line further south would do.

The line AB (see survey) is objectionable, as the ground along it is very rugged and, if adopted, several houses would have to be removed.

To sum up, the reasons for which I have selected line No. 4 are—

(1). It can be made all that is required for navigation.

(2). It is the cheapest in itself.

(3). It does away with the necessity of the dam allowed for across the canal below Doddipatla bridge.

(4). Except a small piece at the end of the canal none of the valuable land of this tract is required to be taken up.

(5). There will be no delay required in carrying out the work when once it is sanctioned.

(6). It suits the existing method of irrigation, any unnecessary interference with which is to be deprecated.

(7). It allows of the outfall sluice proposed to be built across the Nakkala being brought down from Kattapalem to a suitable site about 1,000 yards below the road—a move, advantageous in itself, that will do away with the necessity of the outfall sluice allowed for at the mouth of the Vallur drain, and considerably shorten the river flood bank.

The Chief Engineer for Irrigation in his memorandum No. 18 GD of 20th March 1876, remarks, "the undersigned does not at all understand on what principle it has been proposed to provide a bottom width of 9 feet only for a second-class line of navigation."

So far up the canal as 13¼ miles a bottom width of 12 feet 6 inches was sanctioned on a revised estimate submitted by Mr. Walch. This gives in cutting a surface water-spread of 27 feet 6 inches. At 16 miles the bottom width was reduced to 10 feet, and from there to 22½ miles it has been so dug. Neither 9 feet nor 10 feet bottom width is sufficient to allow of two large dhonies passing, but a 9 feet bottom width is large enough for any single boat.

In the same memorandum it was pointed out that the variation of the water-spread between 26 and 61 feet (in the arrangements then proposed) was very objectionable. The undoubtedly excessive variation was due to my endeavour to cheapen the work as much as possible. In the revised sections sanctioned for the canal above 16 miles the surface water-spread varies from 27 feet 6 inches at 13¼ miles to 70 feet at 15 miles. On a narrow canal it is as well to have wide places to allow of boats turning round and passing each other. Practically as silt is deposited a canal assumes a fairly uniform section. Convenience of navigation depends principally on the distance of the canal from the towpath, and in the sections I originally forwarded the distance was too great in some cases.

I was then pressed for time and anxious to get sanction for the work being gone on with before last irrigation season. I have studied the present sections* attentively and now propose a 13 feet bottom width. This gives a mean width of waterway of 20 feet 6 inches. Some

* I have in a remark on canal sections, sheet No. III, that the extra cost of a bottom width of 15 feet would be Rupees 220.

of the sections show more waterway than others and give room enough for the largest boats to pass each other. A bottom width of 13 feet will allow of the generality of boats passing one another, and very few large boats will use the Bank canal. They will only do so when the Narsapur canal is closed. If it be found necessary the Bank canal can be widened hereafter. I do not think it will be found necessary.

The traffic on the canal will, except during periods of closure of the Narsapur canal, always be light and the largest sized boats will seldom come across each other.

For the tail race of the tidal lock I have proposed a bottom width of 30 feet. There is a strong current when the Nakkala comes down in floods and the lock tail race will then act as a sort of harbour for boats.

I forward herewith the original sections from 24¼ miles to end of canal at 24¼ miles, showing the proposed (by Mr. Rundall) channel below the tidal lock. The bottom width there given is 15 feet.

If the arrangements I have proposed are not approved, I hope they will be returned altered or other definite arrangements proposed, so that the canal may be dug before next irrigation season and materials got down for the lock and weir at the end.

The portion of the canal now estimated for has to carry water for the irrigation of about 1,300 acres.

Minor Earthworks.—I have not altered the provision of Rupees 4,980 for "minor earthworks." If the outfall sluice be moved to where I propose to put it, the Vaddilanka, instead of The Kodamanchilli channel, can be used for the irrigation of the land on the west of the Nakkala well, therefore, not to extend it. By using the Vaddilanka channel there would be, I should say, a saving of about Rupees 1,000, but I have not particularly inquired into the matter. The land would certainly be more efficiently irrigated by the Vaddilanka channel, and the extra current its irrigation by that channel would cause at the end of the Bank canal would be advantageous.

Masonry Works.—All the locks and weirs on the Bank canal have been finished or very nearly finished, with the exception of the tidal lock and weir at the end. I have designed the former with a single chamber, as I do not see why a double lock which costs more for construction and establishment is required.

The level of the lower sill will be put 4½ feet below mean sea level; this will give a depth of 3 feet on it at low tide springs.

In designing the weir, to save expense in foundations, I have gone back to the old form of weir with a cushion wall raised above the bed. The discharging capacity allowed for the weir is the same as that of Koder lock weir.

It has been necessary to considerably raise the provision for sluices, which, as on other canals, is too small.

I do not think the revised estimate of any work I have not here mentioned calls for remark. All the necessary information concerning them is given on the comparative statement of original and revised estimates. I have made no change in the amount allowed as "compensation for land."

The total of the present estimate for the whole canal shows an excess of Rupees 6,440 on the original estimate of Rupees 1,07,900. The excess* sanctioned in G.O. No. 1,388 of 15th May 1875 has therefore now been reduced by Rupees 6,421.

The wooden truss bridge at Doddipatla has a span of 30 feet, 5 feet of which is taken up by the towpath. The headway with full supply level will be very nearly 10 feet.

* Rupees 12,861.

GODAVERY DELTA SYSTEM—WESTERN DELTA SECTION—BANK CANAL, CLASS I WORKS.

Comparative Statement showing the Original and Revised Estimates.

ORIGINAL ESTIMATE.					REVISED ESTIMATE.			REMARKS.
Main-head.	Sub-head.	Items.	Amount.	Total.	Items.	Amount.	Total.	
			RS.	RS.		RS.	RS.	
(2) Main Canal and Branches.	B. Land ...	Compensation ...	2,500	2,500	1. Compensation ...	2,500	2,500	
	E. Falls and Weirs.	Dam at 22nd mile ...	250	250	.....	...	...	Not wanted.
	H. Escapes ...	Surplus weir at 2nd mile.	4,310		2. Surplus weir at 2nd mile.	3,090	...	Finished.
		Mukkamala calingulah alterations.	600		3. Mukkamala calingulah alterations.	600		
				4,910			3,690	
	I. Navigation Works.	Lock at Khandavilly.	12,400		.....	...	...	Not wanted.
		.....	...		4. Lock at Sidhantam ...	14,800	...	Estimate sanctioned in G.O. No. 1,388 of 15th May 1875.
		Alterations to lock weir at Sidhantam.	35		5. Do. weir at do. ...	2,870	...	Finished. Revised estimate of Rs. 3,500 sanctioned in G. O. No. 1,388 of 15th May 1875.
		Lock at Koder ...	16,570		6. Do. at Koder ...	15,400	...	Finished. Revised estimate of Rupees 17,300 sanctioned in G.O. No. 1,388 of 15th May 1875.
		Do. weir at do. ...	3,260		7. Do. weir at do. ...	3,155	...	Finished.
		Doddipatla tidal lock...	32,370		8. Do. (tidal) at Latchmipalem.	30,700		
		Lock weir at Doddipatla (tidal) lock.	4,500		9. Do. Weir at do. ...	4,000		
				69,135			70,925	

2/2626

Comparative Statement showing the Original and Revised Estimates—(Continued).

ORIGINAL ESTIMATE.					REVISED ESTIMATE.			
Main-head.	Sub-head.	Items.	Amount.	Total.	——	Amount.	Total.	Remarks.
			RS.	RS.		RS.	RS.	
(2) Main Canal and Branches	L. Earthworks.	Earthworks	20,000		10. Earthworks... ...	25,800		
		Channel from surplus weir at second mile.	2,500		11. Channel from surplus weir at second mile.	2,418	...	Finished.
				22,500			28,218	
		Total, (2) Main Canal and Branches ...	...	99,295	Total, (2) Main Canal and Branches ...	...	1,05,333	
(3) Distributaries.	C. Works ...	Head sluice, Mukkamala channel.	175		12. Head sluice, Mukkamala channel.	350		
		.....	...		13. Head sluice, Sidhantam Parallel channel.	430	...	Estimate, Rupees 450, sanctioned in G.O. No. 1,388 of 15th May 1875. Work finished.
		Head sluice, Kodamanchilli channel.	250		14. Head sluice, Kodamanchilli channel.	610		
		Head sluice, Koder Parallel channel.	200		....	...	...	
		Do. Illapakarru channel.	160		15. Head sluice, Illapakarru channel.	550		Not wanted. Built in connection with Koder weir.
		Do. Vaddilanka channel.	160		16. Do., Vaddilanka channel.	500		
		.....	...		17. Dividing dam at head of Penumanchili channel.	125	...	Work finished.
		.....	...		18. Culvert under Sidhantam lock approach.	512	...	Finished. An estimate of Rupees 600 sanctioned in G.O. No. 1,388 of 15th May 1875.
		Deva channel under tunnel.	750		19. Deva channel under tunnel.	821	...	Finished.
		Illapakarru do. do...	600		20. Illapakarru do. do.	499	...	Do.
		Drop in rear of sluice aqueduct in Kodamanchilli channel.	830		21. Drop in rear of sluice aqueduct in Kodamanchilli channel.	830		
				3,125			5,227	
	L. Earthworks.	Minor channels ...	4,980		22. Minor channels ...	4,980		
				4,980			4,980	
		Total, (3) Distributaries	...	8,105	Total, (3) Distributaries.	...	10,207	
(4) Drainage and Protective Works.	C. Works ...	Vallur drain outfall sluice.	500		.....	...	...	Not required.
				500			...	
		Total, (4) Drainage and Protective Works...	...	500	Total, (4) Drainage and Protective Works ...	...	...	
		Grand Total ...	...	1,07,900	Grand Total ...	...	1,15,540	

FORT ST. GEORGE,
2nd April 1877.

(Signed) JOHN MULLINS, Lt.-Col., R.E.,
Chief Engineer for Irrigation.

No. 175 W.

No. 13-A. *Note by the Chief Engineer for Irrigation.*

IN G.O. No. 1,388 of the 15th May 1875, certain alterations of the arrangements of the Bank Canal were approved, involving an approximate increase of the total cost from Rupees 1,07,900, the amount sanctioned, to Rupees 1,20,761. At that time the arrangements of the lower part of the canal had not been finally settled, and there were many considerations which had to be taken into account and which have unavoidably delayed the submission of a complete revised estimate for the whole of this canal. The correspondence as per margin has taken place in the meantime, and the Superintending Engineer has, with his letter No. 3,035 of the 25th January last, transmitted a revised estimate, amounting to Rupees 1,15,540, which is less by Rupees 5,221 than the approximate estimate of 1875.

Godavery, Western Delta.

From Dist. Engr., No. 3,406, 21st Feb. 1876.
To do., No. 18 GD, 20th Mar. "

2. The arrangements have been very carefully worked out by Lieutenant A. Dorward, who has, in his report, dated 21st December 1876, gone very fully into all the considerations affecting the selection of the part of the canal below the Doddipatla bridge, and has arrived at the conclusion that the present line is preferable to either that referred to in the original estimate, or to the alternative lines which have been at any time proposed. Safety, convenience of navigation, convenience of distribution of water for irrigation, economy, avoidance of valuable lands, &c., have all had their share in deciding upon the selection made, and the undersigned considers that the result is highly satisfactory; for the revised estimate includes the new head,* for which nothing was allowed in the original estimate, and a new Sidhantam lock weir, Rupees 2,870, besides many minor improvements.

* Estimated cost Rupees 4,130.

3. Only a few remarks are necessary on the details of the arrangements provided for.

(1.) The present and selected line runs near the river, and Lieutenant Dorward thinks that there is no risk of the river breaching into the canal or the canal into the river, though at one point the intervening space is only about 100 feet, because the set of the river is towards the opposite bank and is not likely to alter, but he mentions that opposite Doddipatla, which is above the point whence the alternative lines have been investigated there is a set which has been carrying the river nearer to the canal during some time past, and is at one point less than 400 feet distant therefrom. The matter should receive attention, and it seems probable that by attacking this set at its upper end it may by simple means be eased off so as to carry the current outside Doddipatla point. Below this point there should be no difficulty in getting a good and regular alignment. Irregularity is the chief fault at present. Nanel will tend to an alluvial instead of a sand deposit, and though nanel will not grow within the tidal flow it will thrive just above this.

(2.) The reasons given for the selection of the line of junction of the canal and the Nakkala are good, but it should be considered whether it is desirable to make this where the deep channel of the latter is on the bank opposite to the canal, and whether also the junction should be effected at right angles instead of in a direction somewhat down stream.

(3.) The tidal lock is to have one lift instead of being double chambered. This is an improvement. The only double lift lock built in recent years is that at Maddapuram on the Junction canal, and this arrangement is confessedly a mistake. The maximum difference of water level above and below is calculated to be 15 feet. With regard to the level of the lower sill, which is noted on the plan and in the report as M.S.L. —4·50; this, if a minimum depth of 3 feet will be secured, will do: it will be well however to compare it with the level of the Megaltur tidal lock sill, and to see how far the facts of the tidal range agree, so that no mistake may be possible. The level of the chamber walls at top have been designed to be at 11·50, and maximum flood level is noted to be 12·50. The effect of inflow to the lower reach of the canal would not be of much consequence, so long as the water does not rise above or breach the canal banks anywhere. Indeed what will be necessary on the recurrence of such a flood will be to reduce or stop the supply of the canals at the head of the delta, so that it may not flow down to the lower end, and find no exit except of an irregular and perhaps injurious kind. The Superintending Engineer should give attention to an appended memorandum on the design for the tidal lock in connection with which Rupees 1,200 have been added to the estimate for the lock.

(4.) The arrangement of the design for the tidal lock weir may, under the circumstances, be admissible, if the foundations are sufficiently low at only 4½ feet below low water springs with the deep bed of the Nakkala 1·60 feet lower. The slope to the top of the cushion wall should however commence at the edge of the cut stone flooring as shown in dotted lines.

(5.) A bottom width of canal of 13 feet may be considered sufficient for the present as a minimum, seeing that there are many parts much wider, so that numerous places where boats can pass will be available; but hereafter in effecting clearances it should not be overlooked that widths exceeding a maximum, which in this case may be taken as 40 feet, at water surface, if numerous and extended, alter the conditions of discharge and the regime of the canal materially, and a reduction of width in excess should therefore be gradually effected.

FORT ST. GEORGE,
2nd April 1877.

(Signed) JOHN MULLINS, Lt.-Col., R.E.,
Chief Engineer for Irrigation.

To the Secretary to Government, Public Works Department.

No. 13-B. *Memorandum on Design for Latekmipalem Tidal Lock, Bank Canal, Western Delta, Godavery.*

As noted by the Chief Engineer on the plan the section for the chamber wall is decidedly slight; rejecting the cohesion at its basement it would have to depend for its safety on its earth backing when the lock was full, or on the water in the lock if its backing were thoroughly saturated. The earth backing is not *likely* ever to crack away from the wall all the way down, and is not *likely* ever to become a liquid mass, but it will be better to err, if it can be called erring, on the side of safety and to make the wall stronger. Counterforts give a good deal of trouble in getting out foundations in such a place as this lock will be built in, and as an inside batter to lock chamber walls is not advisable, because it may lead to jamming of boats when being locked down, it is recommended that extra weight be given to the wall by just eliminating the front face batter. The top breadth, so as not to increase the quantity of coping, should be kept 3 feet, and the rear of the wall be vertical for 2 feet down and then stepped out 2 feet to meet the rear batter.

Grooves 6 inches wide (such as were provided in some of the old locks in the district) in the head and tail bay walls, down which stop planks can be slipped, may prove useful when clapping sills have to be examined or renewed.

The lower gates should have suspension bars from top of heel posts to mitre posts above high tide level. The fastening of the lower gates should be of copper and they should be sheathed with copper to above high tide level. The tops of the

holding down bolts of the sill beams and the washers and nuts connected with them should be of copper.

FORT ST. GEORGE,
2nd April 1877.

(Signed) G. T. WALCH,
Ag. Dy. Chief Engineer for Irrigation,
for Chief Engineer for Irrigation.

No. 14. ORDER THEREON, 1st May 1877, No. 7 I.

HIS GRACE the Governor in Council sanctions the revised complete estimate of Rupees 1,15,540 for the Bank Canal, Godavery Western Delta. In G.O. No. 1,388 of the 15th May 1875, certain modifications of the arrangements of the upper part of the canal were approved, and it was then estimated that the total cost of this canal would amount to Rupees 1,20,761. The details throughout have now been worked out, and it is satisfactory to find that, notwithstanding the material improvements which have been carried out, the excess cost, Rupees 7,640, will be little more than that of the new head and the new Sidhantam lock weir alone.

2. The excess outlay on this canal will be covered by the savings on the Gostanaddy and Velpur canal, which in the Government Order above quoted were noted as likely to amount to Rupees 9,280.

3. This sanction has been registered as No. 43 I of 1877-78, and the particulars are shown in the comparative statement under revised estimate.

(True Extract.)

Lieut.-Col., R.E.,
Joint Secy. to Govt., P.W.D.,
Irrigation Branch.

24/5

To the Superintending Engineer, Godavery,
" Collector of Godavery.
" Chief Engineer for Irrigation.
" Examiner of Public Works Accounts.
" Revenue Department.

Exd. E. C. Shunker.
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No 2630

IRRIGATION.
ACCOUNT.

Govt. of {1877} Madras.

PUBLIC WORKS.

To

THE SUPERINTENDING ENGINEER,
GODAVERY,
&c., &c., &c.

Dated May 1st.

Issued

Rec.d 24th May 1877 Encl.

G. O., 1st May 1877, No. 7 I.

MAY.

Nos. 13-14.

No 2925.
Comm.d to the
Board of Revenue
25th May 77

Bank Canal, Western Delta, Godavery.—The revised complete estimate of Rupees 1,15,540 for the—sanctioned.

P.C. to the Mr. Engg. Revenue (25-5-77)