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TAMIL NADU ARCHIVES

GOVERNMENT OF TAMIL NADU

RGV - DEPARTMENT

G.O. No.	2117 A	Press.
B.P. No.		Mis.
Dated	26-6-1877	197

Not to be folded or roughly handled

GOVERNMENT
REVENUE DE

26th June 1877, A.

Famine I

Read the following papers :—

No. 585-A. Proceedings of the Board of Revenue, May 1877, No. 2,419.

Read the following letter from C. T. LONGLEY, Esq., Salem, to H. E. STOKES, Esq., Secretary to the Board of Revenue, dated 1877, No. 290-1,551-A.

I HAVE the honor to enclose plans and estimates with irrigation statements and specification reports, for the repair of the Sirukullay and Avaniparur projects in the Namkal and Trichengode Taluqs, respectively, and to request that the Government will obtain the sanction of Government to the latter at as early a date as possible. The estimate for the former is within the competence of the Board to sanction. Both works are now well in hand as relief works, and considerable advance has been made in the copy of the District Engineer's letter is enclosed for the information of the Board and Government.

ENCLOSURE

From Major R. MONTGOMERIE, R.E., District Collector of Salem, dated Triplicane, to C. T. LONGLEY, Esq., 1877, No. 56.

Sirukullay Tank.

- 5 Plans.
- 1 Estimate.
- 1 Comparative Statement.
- 1 Irrigation do.
- 1 Specification.
- 1 Revenue Statement.
- 1 Index Map.

Avaniparur Tank.

- 11 Plans.
- 1 Estimate.
- 1 Specification.
- 1 Irrigation Statement.
- 1 Revenue do.
- 1 Index Map.

- 28
- 1 Letter from Salem Range Officer, No. 79, of 14th April 1877.

29.

The restoration of the Sirukullay Tank is I would have recommended only in most exceptional circumstances, and I draw your special attention to my view of the end of the specification report for the same.

The restoration of the Avaniparur Tank on the other hand will probably yield a return of 21 per cent. on the outlay, which is more than I had anticipated when submitting my estimate to you.

4. The index map and tank plan of the Sirukullay will follow when received from the Range Officer. (Herewith sent.)

The estimate for the Sirukullay Tank, Rupees sanctioned.

2. That for the Avaniparur Tank will be submitted for the sanction of Government.

3. Both works are in progress as relief works.

(True Copies and

red) H. E. STOKES,
Secretary.

TRANSFERRED
plans and estimate
considered necessary

1st June 1877.

RETRANSFERRED to
No. 203 W, dated 14th

FORT ST. GEORGE,
14th June 1877.

No. 555-B.

ation for his remarks with the request that the
ned with such amendments (if any) as may be

der.)

(Signed) J. H. GARSTIN,
Additional Secretary to Government.

, Revenue Department, with a memorandum,
ngineer for Irrigation.

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

MEMORANDUM.

The following remarks on the Rs. 20,000 for the restoration of the Avaniparur
Tank, Salem, have been drawn up in accordance to the endorsement dated 1st instant of the
Additional Secretary to Government, Revenue Department, on Proceedings, Board of Revenue, of
the 26th ultimo, No. 2,419.

2. The tank was inspected at 1874. Its then condition and the opinion expressed
at the time as to the propriety of re will be found in paragraphs 6 and 7 of the notes
in Proceedings, Madras Government 1875, No. 1,431.

3. The tank is near the low great group, and its safety depends, therefore, not
merely on the good order of its flood drainage of its catchment b
tanks above it. In the "State of
surplus into the Avaniparur
the index map, and the largest
breached in 1872, is being resto
damage in future. The numerous
should consequently be attended

4. The requirements of the
paragraph 7, above referred to,
that provided for in the estimate

1st.—An increase in the
additional precaution
Rupees 3,322 only;
the bund, as former
thickness at the for
could have been 6 + (1 + 2) 6 or 24 feet, and at the
higher level 6 + (1 + 2) feet, both very ample if the soil and work be good.
With the modified section thickness will be

$$\begin{aligned} \text{at } 6 + (1 + 2) 7\frac{1}{2} &= 28\frac{1}{2} \\ 6 + (1 + 2) 4\frac{1}{2} &= 19\frac{1}{2} \end{aligned}$$

As a rule it is better to allow not excessive, dimensions, and to do all the work
very thoroughly than to reater dimensions and trust to these rather than to
the goodness of the work present case, as the bund repairs were to be executed
by famine labor, and as work of the class suitable to the bunds of large reser-
voirs was hardly to be eshe District Engineer, it is thought, exercised a wise
discretion in increasing isions.

2ndly.—The substitution of escriptions of work at the surplus weirs:
The details will be noticed in d

5. Earthworks.—The cross s the bund is, as already noticed, suitable. At the
breaches of which there are two in the (cross sections 7, 8, and 21,) the arrangements are
not as suitable to the circumstances might have been. The deepest part of the eastern
breach is 53 — 27.92 = 25.08 feet b.L., the soil at bottom of breach is noted on C.S.
No. 7 as decomposed soft rock, and oo. 8 as 1 foot of gravel on decomposed soft rock.
The bund consequently will rest on pervious to water, and special precautions were
consequently very desirable. A pul is mentioned in the specification and sketched
in pencil on C.Ss. Nos. 7 and 8 for tion with the bund; the trench for its foundation is
specified to be 4 feet wide and 2 feet so the base of the wall cannot be wider. The
proper specification would have been

"A puddle core wall to be carried across each b
the old bund at either end of the breach. The trench
into the decomposed rock and its centre line to be of
core wall to have its top 1 foot above M.W.L. and
the wall to have a batter of 1 in 6." The rest of the
thickness of a puddle wall should be in proportion to

Height 25.08 as above.
Less 3.50
21.58

Further, to prevent all possibility of the base
saturated and becoming unstable, it is desirable to p
wall at its base and another drain or drains there
bund. The drain along the back of the wall to be
rock with a regular fall from the ends to the low
clenched fist, the surface of the stone being covered
the puddle and the stone on that side: one transver
lowest point of the latter to the rear of the bund at
similarly filled with stone. Another transverse dra
the section, as water percolating into this depression
drain. What is of course needful is that saturation
should be effectively guarded against, and this can be
only by a well-arranged system of drainage. The top
rear than at the front edge to throw rainfall drain

6. *Revetments*.—The specification is not fullon
it is intended that the revetment should be 2 feet
3 feet horizontally, whatever its height. It is gene
height in order to prevent displacement by the pre
With latter slopes a variation in thickness is not rears-
sary on the account stated.

better. This would have made the mean thickness

Backing.—No special backing has been show
"the soil is gravel, and this will be carefully ram
above it is specified that the bund is to be formed,
this would not be suitable for a backing to the rev
tight and insoluble. A sort of gravel concrete, with
the whole, is the best backing at a moderate cost.

7. *Surplus Weirs*.—The total length to be p
notes of inspection. It will be ample.

There is a little want of clearness in the way th
but from this and the longitudinal section it is gather
shown below:—

No.	1, west	2	3 (that on former course of river)	4, east
...	...	...	...	...
...	...	...	...	...
...	...	...	...	...
...	...	...	...	...

and for a distance of at least 6 feet into
foundation to be cut about 3 feet deep
of the top rear edge of the bund. The
side at top, the front and back faces of
ation appears to be appropriate. The
it, and face batters of 1 in 6 make the
Stage 2+ height and at the deepest

ich under notice the base of the pnd-
d have been $2 + \frac{21.58}{3} = 9.19$ feet.

behind the puddle wall being
all along the rear of the puddle
beyond the toe of the rear slope of the
case a trench 2 x 2 feet, cut in the soft
and filled with stone of the size of a
ods and a lining of sods placed between
to run from the parallel drain at the
sist of a trench of similar dimensions
probably be necessary at 950 feet on
rhaps not be able to get to the other
base of the rear part of the bund
where subsoil springs are probable,
bund should be 6 inches lower at the
ear.

ad gives no dimensions. Apparently
sured at right angles to the slope or
to proportion the thickness to the
soil behind, which when wetted is
its form. At C.S. No. 8 the revet-
s 50 feet on the slope of 1½ to 1,
ion of 2½ at base would have been
ad of 2 feet.

ions or is provided for. It is said
rear of the revetment," but just
ches, of earth and mosamboos, and
ch is required to be fairly water-
h small gravel and red soil to bind

630 feet, and is that named in the

referred to in the specification,
re will be four weirs of the lengths

FT.
270
747
480
133
1630

ecification or the estimate, and the
ve formerly; four or perhaps five
anywhere that one of them is to
it of bund is to be removed. The
to. 4. Again it is tolerably clear
r lengths as above specified or
here remain 1,630 — (613 + 747)
t end of the west weir is at 4,835
has been removed this weir will be
phering of the sheets (plans) is

Only three weirs are, however, referred to either
west weir is called No. 3, though there were four we
are shown on the longitudinal section, and there is no
be done away with, though between the two at the we
west weir cannot be No. 3, therefore it must be either
that No. 4 (east) and No. 3 (ancient) are to retain
together 613 feet, also that No. 2 weir is to be 747 fe
= 270 feet to make up the total length intended.
and the west end at 5,145, so that after the intermed
510 feet long or 40 feet in excess of the requi
somewhat confusing also, as will be seen when the

Weir No. 1 (West).—The No. 6 are given two cross sections

Sheets Nos. 6 and 11.

When completed is to be 270 as and the ground (rock and decomposed section is good. That at C. S. No. 11, a drop of 2 feet on to the ground. The first apron is wall. At C.S. No. 32 the ground would, it appears, have been to it 10 feet wide, and either horizontal with a retaining wall, and given a third apron and retaining wall.

On sheet No. 11 there is an of an overfall at the crest wall of drops the water but 2 feet or less on to nothing but the ground, and has to be made to carry it. Of than the indifferent rock, and a bedded on a few inches of concrete to stand an overfall of weir. A weir with a sloping cheap, and stone of regular shape vertical falls is a good type which however, it is almost invariably crest wall. Without a plan of the ground a suitable section for ments suitable to these sections.

Weir No. 2.—This weir it appears to be

Removing bund ...
Constructing weir

The new part being 506 f
The work is illustrated by

Section 24 shows a very g only 151 feet of this old section. Probably no better arrangement aprons with gradients of 1 in slope, the top of the wall being carried down either to hard rock the retaining wall from the binding walls of rubble in concrete 3 feet by 3 feet.

There is no necessity for stability depends upon the use 2 to 4 feet long are ample, slope, i.e., nearly vertical, which can be secured with a should be filled in with chips.

The crest of this weir of weir of the type above notice wards raised. Either it is revetments, and other weirs no use to spend money on the survey sheet No. 19 it is

Weir No. 3, 480 feet the old weir remain, so the proposed arrangements are whether it will be prudent not favorable to its design.

9. 11 and no length of crest is noted. On sheet The design has been influenced by the section of the remains of the old weir which appears to be 225 feet in length, and if the full length estimate, Rupees 1,298, is high, F.T.L. is 50.00 rear is at 42.69; difference 7.31 feet. Neither is 25 feet wide with a slope of 2 feet, a retaining wall and 3 feet thick, and a drop of 3 feet on to at the crest wall and 4 feet at the retaining wall 10 feet below F.T.L. A better arrangement first apron at least 3 feet below crest, to have made slope not exceeding 18 inches, to have ended it and second retaining wall with a similar drop, and

tion near the east wing, and here the desirability especially evident, for there is but one apron which is 25 feet, and then there is an overfall of 6 feet on at this high level a bed of clay and morambon. A better apron should be able to stand an overfall better 3 feet thick of large stone with good mortar and on decomposed rock underneath, might very well be the section is not a good example of either type of good type when rough stone is abundant and to be procured, and would be costly. A weir with are inverted. When there is to be a vertical fall, plan to place a considerable part of the fall at the and cross sections at every considerable variation in not be suggested, but on the sections given arrangements have been noted.

From 151 to 747 feet. The estimated cost

	RS.	A.	P.
...	906	4	0
...	3,721	10	0
Total ...	4,627	14	0

cost is moderate, being 7.76 Rupees a foot run. cross sections 24 to 29.

and 26 are of the old weir: they are not good, and as is not seem advisable to retain a faulty construction. with the materials easily procurable than sloping down to retaining walls built at the toe of the rock surface and the foundation of the wall being below the surface. It follows that the distance of with the differences of level. There should be at intervals of 15 or 20 feet. These walls may be

sloping aprons anywhere 6 feet thick. Their of large well-packed stone firmly bedded. Stones placed with their length at right angles to the stones it is only necessary to provide a firm bed. Then the interstices between surface stones even down tight with a crowbar.

permanently at 9 inches below F.T.L., and with a conveniently be placed on a lower level and after to make the F.T.L. at 50.00 and the bund, nat height is excessive and may be reduced. It is and then to lower the water level. From as represent 380,000 cubic yards of water.

estimate is Rupees 8,258. About 200 feet of rk will be about 3 Rupees the foot run. The 4, C. S. Nos. 11 to 16. It is very doubtful work. The recollection of the undersigned is on of it in C. S. No. 16 is not re-assuring.

With regard to the new design it is to be noticed very strong in the sloping apron, the strain on which the effect of the discharge will be a maximum. These hard enough to stand the overfall an apron is not want protection.

Another weak point in these sections is the great danger to form a bed for the sloping apron stone. At C. S. No. 11, material, and even if no water were to reach it, which likely to occur while much of this packing will prob. The ground levels on the longitudinal section of the line, and they differ materially from those of the cross sections. Transferring the latter to the longitudinal section, or at all events from 1,400 to 1,700 a section of the would be suitable, the outside of the retaining wall would be at 35.00, while from 1,700 to the west wing the section wall would be at half the distance from the crest wall a apron to consist of 2 feet of rubble stone masonry on a concrete. Where the retaining wall is much above the level of the ground, if the rock should be packed beyond the retaining wall and either with rock surface, or the rock might be cut out to receive

Wing Walls, Sheet No. 7.—These show little of. They should not be made unnecessarily long or high at 3 feet at most at the toe of the apron or at the first water are to pass the crest of the weir the depth at the be much less than 3 feet.

8. In concluding this memorandum the unders irrigation works which are not sanctionable by the Director, should be sent by the former direct to this sanction. When sanctioned it would rest with the Revenue would be advisable to carry them out from famine relief when the works have been to a great extent carried out at the end of April, and if they had been sent to the might have been made use of in carrying out the work.

Fort St. George,
14th June 1877.

(Signed)

W. LINS, Lt.-Col., R.E.,
Chief Engineer for Irrigation.

To the Additional Secretary to Government, Revenue

No. 585-C. ORDER THEREON, 26th June 1877.

Miscellaneous.

rep
In

Engineer for Irrigation should, as far as possible, be a

(True Extra

rate for the Avaniparur Tank tioned as a famine relief work. tion the remarks of the Chief

J. H. GARSTIN,
Colonial Secretary to Government.

To the Board of Revenue, with 16 enclosures.
the Chief Engineer for Irrigation.
the Financial Department.

Exd. T. D. Ryan.

MISCELLANEOUS No.

REVENUE DEPARTMENT.

PROCEEDINGS OF THE BOARD OF REVENUE

Dated 26th May 1877.

Read the following

Board's No.
5573.

No. 290
1551A

FROM

The Collector of Salem

TO

The Secretary to the Board of Revenue,
Madras.

SIR,

I have the honor to enclose Plans
and Estimates together with Irrigation
Statements and Specification Reports
for the repair of the Serorkalai and
Avaniparoor projects in the Namkal
and Trichengode Taluqs respectively,
and to request that the Board
of Revenue will obtain the sanction
of Government to the latter at as
early

early a date as possible. The Estimate for the former is within the competence of the Board to sanction.

Both the above works are now well in hand as Relief works and considerable advance has been made in them. A copy of the District Engineer's letter is enclosed for the information of the Board and Government.

I have &c.
Salem Collector's Office / Signed C. J. Langley
Salem, 21st May 1877 / Collector.

Enclosure.

No. 56

From The District Engineer
Salem

To The Collector of Salem.

Sir,

As requested in your letter

Enclosures 29

Serukullay Tank

5 Plans

1 Estimate

1 Comparative Statement

1 Irrigation &c

1 Specification

1 Rev Statement

1 Index map

Avani Perur Tank

11 Plans

1 Estimate

1 Specification

1 Irrigation Statement

1 Rev. do

1 Index map

28

1 Letter Salem R
officer

29

No. 79 of 14th April
1877

No. 23/737 A dated 6th March 1877.

I have the honor to submit for the sanction of Government, the Plans Estimates &c as per margin for the restoration of the Serukullay Tank amounting to Rs 9530 and for the Avani

Perur Tank amounting to Rs 20,000.

Both works have been commenced

at your special request as

Famine Relief Works and

are now in fair Progress.

2. The restoration of the

Serukullay Tank is a work I

would have recommended only

under the most exceptional

circumstances

circumstances, and I beg to draw
your special attention to my
remarks at the end of the Specifi-
cation Report for that work.

3. The restoration of the Avani
Peroor Tank on the other hand
will probably yield a return
of about 21 per cent on the outlay
which is more than I had
anticipated when submitting
my approximate estimate to you.

4. The Index map and
Tank Plan of the Sirookalay Tank
will follow when received from
the Range Officer. } herewith sent

District Engineer's Office } I have &c
Sipatone 11th May 1877. } R. Montgomery Major R.E.
District Engineer Calcutta

True.

(True Copy) b 3
Signed J. Pritchard
Dy Collector
for Collector.

The estimate for the Sirookalay
tank Rs 9,530 is sanctioned.

2. That for the Avani Peroor
tank will be submitted for the
sanction of Government.

3. Both works are in progress
as relief works.

(True Copies & Extracts)

Bliss,
Secretary.

To The Addl Secretary to Government
Revenue Department,
with 16 original enclosures
to be returned.

6/10

N^o 203-W 7

Memorandum

The following remarks on the estimate of Rupees 20,000 for the restoration of the Araniparoor tank, Salem, have been drawn up with reference to the endorsement dated 1st Instant of the Additional Secretary to Government Revenue Department on Proceedings Board of Revenue of the 26th Ultimo N^o 2419:-

2 The tank was inspected at the end of 1874. Its then condition and the opinion expressed at the time as to the propriety of restoring it will be found in paras 6 and 7 of the notes in Pros. Madras Govt. 25th May 1875 N^o 1431:-

3 The tank is near the lower end of a great group and its safety depends therefore not merely on the good

Dec 1877 20th 1022

En 74730

Proceedings of the Board of Revenue

Dated 26th May 1877

Read 29th May 1877

From Secretary to the Chief of the District
for the tank, with the report that the tank is in a
very bad state of repair and requires to be
restored (N^o 1022) - 1022
En 74730

Sanctioning Officer
of the Revenue Department
Salem District
proceeding to the
Government for sanction
of the tank in the
Salem District
to the Revenue Department

Returned to the additional Secretary Rev. D. P.
with a memorandum dated 14 June 1877 by the Chief

Secretary for Sanctioning

What is the condition of the tank?
Chief Secretary for Sanctioning

The estimate for the
Araniparoor tank
is now sanctioned
as a famine relief
work. As it is within
the limits of the
C.D. for District D. P.
as far as possible, with
up to 1000 Rs.

Ms. 1022
Chief Secretary for Sanctioning
Salem District
10/6/77

En 74730

good order of its bund, and on the adequacy of its escapes to discharge the maximum flood drainages of its catchment basin of about 360 square miles, but in the good order of the many tanks above it. In the "Statement of particulars" Column 7 it is noted that there are no tanks surplus into the Avaniparoor tank, but really there are very many. Some few are shown on the index map and the largest and most important of them, the Chinnapenputty, which also was breached in 1872, is being restored in a manner which, it is hoped, will secure it from similar damage in future. The numerous upper tanks or as many of them as have not been put to rights should consequently be attended to.

4. The requirements of the Avaniparoor tank if restored were briefly enumerated in the notes, para 7, above referred to. The principal differences between the

the work as there indicated and that provided for in the estimate is:-

1st an increase in the height of the bund from 6 to 7½ feet above F.T.L. This is an additional precaution, and it is observed that the earth-works altogether amount to Rupees 3,322 only, consequently there can be no objection to the alteration. With the bund, as formerly proposed, 6 feet above F.T.L. and 3 feet above M.W.L., the thickness at the former level would have been $6 + (1+2) 6$ or 24 feet, and at the higher level $6 + (1+2) 3$ or 15 feet, both very ample if the soil and work be good. With the modified section the thickness will be,

$$\text{at F.T.L. } 6 + (1+2) 7\frac{1}{2} = 28\frac{1}{2}$$

$$\text{M.W.L. } 6 + (1+2) 4\frac{1}{2} = 19\frac{1}{2}$$

As a rule it is better to allow ample yet not excessive dimensions, and to do all the work very thoroughly than to provide greater dimensions

dimensions and trust to these, rather than to the goodness of the work. In the present case, as the bund repairs were to be executed by famine labour and as therefore work of the class suitable to the bunds of large reservoirs was hardly to be expected, the District Engineer, it is thought, exercised a wise discretion in increasing the dimensions.

2nd - the substitution of cheaper descriptions of work at the surplus weirs.

The details will be noticed in due course.

5. Earth works. The cross section of the bund is as already noticed suitable. At the breaches of which there are two in the bund proper, (cross sections 7, 8 and 21) the arrangements are not as suitable to the circumstances as they might have

been

9
been. The deepest part of the Eastern breach is $53 - 27.92 = 25.08$ feet below M.W.L., the soil at bottom of breach is noted on C.S. No 7 as decomposed soft rock, and on C.S. No 8 as 1 foot of gravel on decomposed soft rock. The bund consequently will rest on material pervious to water, and special precautions were consequently very desirable. A puddle wall is mentioned in the specification and sketched in pencil on C.S. No 7 and 8 for construction with the bund. The trench for its foundation is specified to be 4 feet wide and 2 feet deep, and so the base of the wall cannot be wider. The proper specification would have been, "a puddle core wall to be carried across each breach and for a distance of at least six feet into the old bund at either end of the breach. The trench for the foundation to be cut

cut about 3 feet deep into the decomposed rock and its centre line to be on that of the top rear edge of the bund. The core wall to have its top 1 foot above M.W.L. and 2 feet wide at top, the front and back faces of the wall to have a batter of 1 in 6.

The rest of the specification appears to be appropriate. The thickness of a puddle wall should be in proportion to the height, and face batters of 1 in 6 make the thickness at base $2 + \frac{\text{height}}{3}$ and at the deepest part of the breach under notice the base of the puddle wall should have been $2 + \frac{21.58}{3} = 9.19$ feet.

$$\begin{array}{r} \text{height } 25.08 \text{ as above} \\ \text{less } 3.50 \\ \hline 21.58 \end{array}$$

Further to prevent all possibility of the base of the bund behind the puddle wall being saturated and becoming unstable, it is desirable to provide a drain all along the rear of the puddle wall at its base and another

10
another drain or drains therefrom to beyond the top of the rear slope of the bund. The drain along the back of the wall to be in this case a trench 2 x 2 feet, cut in the soft rock with a regular fall from the ends to the lowest part and filled with stone of the size of a clenched fist, the surface of the stone being covered in with sods and a lining of sods placed between the puddle and the stone on that side, one transverse drain to run from the parallel drain at the lowest point of the latter to the rear of the bund and to consist of a trench of similar dimensions similarly filled with stone. Another transverse drain would probably be necessary at 950 feet on the section as water percolating into this depression would perhaps not be able to get to the other drain. What is of course needful is that saturation of the base of the rear part of the bund should be effectively guarded against, and this can

can be done, where subsoil springs are probable, only by a well arranged system of drainages. The top of the bund should be 6 inches lower at the rear than at the front edge to throw rainfall drainage to the rear.

6. Revetments. The specification is not full enough, and gives no dimensions. Apparently it is intended that the revetment should be 2 feet thick measured at right angles to the slope or 2 feet horizontally, whatever its height. It is generally better to proportion the thickness to the height in order to prevent displacement by the pressure of the soil behind which when wetted is liable to alter its form. At C.S. No. 8 the revetment measured 30 feet on the slope of $1\frac{1}{2}$ to 1 and an addition of $\frac{1}{2}$ at base would have been better. This would have made the inner thickness 3 $\frac{1}{2}$ feet instead of 2 feet.

With flatter slopes a variation in thickness is not necessary on the account stated.

Backing. No special backing has been shown in the sections or is provided for. It is said the soil is gravel and this will be carefully rammed tight.

11
tight in rear of the revetment," but just above it is specified that the bund is to be formed, at the breaches, of earth and moramboo and this would not be suitable for a backing to the revetment which is required to be fairly water-tight and insoluble. A sort of gravel concrete with just enough small gravel and red soil to bind the whole is the best backing at a moderate cost.

7. Surplus weirs. The total length to be provided is 1630 feet, and is that named in the notes of Inspection. It will be ample.

There is a little want of clearness in the way the weirs are referred to in the specification, but from this and the longitudinal section it is gathered that there will be 4 weirs of the lengths shown below.

No. 1 west	270 feet
No. 2	747 "
No. 3 (that on former course of river)	480 "
No. 4 East	133 "
	1630 "

[called also dam]

Only 3 weirs are however referred to either in the specification or the estimate, and the west weir is called No. 3 though there were 4 weirs if not 5 formerly, 4 or perhaps 5 are shown on the longitudinal section, and there is no indication anywhere that one of them is to be done away with though between the two at the west a short bit of bund is to be removed. The west weir cannot be No. 3, therefore, it must be either No. 1 or No. 4. Again it is tolerably clear that No. 4 (East) and No. 3 (Ancient) are to retain their former lengths as above specified or together 613 feet, also that No. 2 weir is to be 747 feet long, so there remain $1630 - (613 + 747) = 270$ feet to make up the total length intended. Now the East end of the West weir is at 4825 and the West end at 5145 so that after the intermediate bund has been removed this weir will be 310 feet long or 40 feet in excess of the requirements. The numbering of the sheets (Plans) is somewhat

Sheets Nos 6 and 11.

12
somewhat confusing also, as will be seen when they come to be quoted. Weir No. 1 (West). The plan is on sheet No. 11 and no length of crest is noted. On sheet No. 6 are given two cross sections Nos 31 and 32. The design has been influenced by the section of the remains of the old weir which appears to be 225 feet in length, and if the full length when completed is to be 270 as above supposed the estimate Rupees 1298 is high. F.T.L. is 50.00 and the ground (rock and decomposed soft rock) in rear is at 42.69 difference 7.31 feet. Neither section is good. That at C.S. No. 31 has an apron 25 feet wide with a slope of 2 feet, a retaining wall, a drop of 2 feet on to an apron 10 feet wide and 3 feet thick, and a drop of 3 feet on to the ground. The first apron is to be 5 feet thick at the crest wall and 4 feet at the retaining wall. At C.S. No. 32 the ground

ground in rear is nearly 10 feet below P.T.L. A better arrangement would it appears have been to have placed the first apron at least 3 feet below crest, to have made it 10 feet wide, and either horizontal or with a slope not exceeding 18 inches, have ended it with a retaining wall, and given a second apron and 2^d retaining wall with a similar drop, and a third apron and retaining wall where necessary.

On sheet No. 11 there is another cross section near the East wing and here the desirability of an overfall at the crest wall of 3 feet or so, is especially evident for there is but one apron which drops the water but 2 feet or less according to scale, in 25 feet, and then there is an overfall of 6 feet on to nothing but the ground, and to put this apron at this high level a bed of clay and Morainboos has to be made to carry it. Of course the massive apron should be

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be able to stand an overfall better than the indifferent rock, and a rubble apron 3 feet thick of large stone with good mortar and bedded on a few inches of concrete, with even decomposed rock underneath, might very well be trusted to stand an overfall of 6 or 8 feet. The section is not a good example of either type of weir. A weir with a sloping apron is a good type when rough stone is abundant and cheap, and stone of regular shape is not easily ^{to be} procured and would be costly. A weir with vertical falls is a good type when the conditions are inverted. When there is to ^{be} a vertical fall however, it is almost invariably the proper plan to place a considerable part of the fall at the crest wall. Without a plan of the weir site and cross sections at every considerable variation in the ground a suitable section for

for each part cannot be suggested - but on the sections given, arrangements suitable to these sections individually have been noted.

Weir No. 2. This weir is to be lengthened from 151 to 747 feet. The estimated cost appears to be,

Removing bund ——— 906-4-0

Constructing weir — 3721-10-0
4627-14-0

The new part being 596 feet in length the cost is moderate being 7.76 Rupees a foot run.

The work is illustrated by sheet No. 5. Cross sections 24 to 29.

Section 24 shows a very good design. 25 and 26 are of the old weir; they are not good, and as only 151 feet of this old section remain it does not seem advisable to retain a faulty construction. Probably no better arrangement is available with the materials easily procurable than sloping

sloping aprons with gradients of 1 in 6 carried continuously down to retaining walls built at the top of the slope, the top of the wall being flush with the rock surface and the foundations of the wall being carried down either to hard rock or to 4½ feet below the surface. It follows that the distance of the retaining wall from the crest wall will vary with the differences of level.

There should be binding walls of rubble in concrete or mortar at intervals of 15 or 20 feet. These walls may be 3 feet by 3 feet.

There is no necessity for making these sloping aprons any where 6 feet thick. Their stability depends upon the use of large well-packed stone firmly bedded. Stones 2 to 2½ feet long are ample and they should be placed with their length at right angles to the slope, i.e. nearly vertical.

Below

Below these surface stones it is only necessary to provide a firm bed which can be secured with a foot of smaller stone. Then the interstices between surface stones should be filled in with chips or small stones driven down tight with a crow bar.

The crest of this weir should not be fixed permanently at 9 inches below F.T.L., and with a weir of the type above noticed the crest cannot conveniently be placed on a lower level and afterwards raised. Either it is necessary or desirable to raise the F.T.L. at 50.00 and the bund, reservoirs and other weirs to correspond, or their height is excessive and may be reduced. It is no use to spend money on making a high bund and then to lower the water level. From the survey sheet No. 10 it appears that this 9 inches represents 380000 cubic yards of water.

Weir No. 3. 480 feet in length. The estimate is Rupees 8,258. about 200 feet.

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of the old weir remain, so the cost of the new work will be about 31 Rupees the foot run. The proposed arrangements are illustrated by sheet No. 4, C.S. Nos. 11 to 16. It is very doubtful whether it will be prudent to retain any of the old work. The recollection of the undersigned is not favourable to its design, and the representation of it in C.S. No. 16 is not reassuring. With regard to the new design it is to be noticed that in the C.S. Nos. 12 and 13 the work is very strong in the sloping apron the strain on which is slight, and very weak below the drop where the effect of the discharge will be a maximum. These lower aprons are useless. If the rock is hard enough to stand the over-fall an apron is not wanted if otherwise these aprons will be no protection.

Another weak point in these sections

sections is the great depth of rammed clay and moramboos required to form a bed for the sloping apron stone. At C.S. No. 12 there will be 12 feet depth of this material and even if no water were to reach it, which is very improbable, settlements would be likely to occur while much of this packing will probably wash out and necessitate frequent repairs.

The ground levels on the longitudinal section of the tank bund at this weir are those on the crest line, and they differ materially from those of the ground at the rear retaining wall on the cross sections. Transferring the latter to the longitudinal section it appears that from the East wing or at all events from 1400 to 1700 a section of the form shown on C.S. No. 12 in dotted lines would be suitable, the outside of the retaining wall at foot of the curved apron being

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being at 35.00, while from 1700 to the West wing, the section would be similar except that the retaining wall would be at half the distance from the crest wall and its top would be at 38.00. The curved apron to consist of $2\frac{1}{2}$ feet of rubble stone masonry on 9 inches of concrete. Where the retaining wall is much above the level of the ground, if the rock be soft, a dry rubble apron at same slope should be packed beyond the retaining wall and either supported by a second retaining wall flush with rock surface, or the rock might be cut out to receive the toe.

Wing walls. Sheet No. 7. These show little or no correspondence with the bund sections. They should not be made unnecessarily long or high and need not, it is considered, be higher than 3 feet at most at the toe.

toe of the apron or at the 1st principal retaining wall. As only 3 feet of water are to pass the crest of the weir the depth at the bottom of the sloping apron will certainly be much less than 3 feet.

8. In concluding this Memorandum the undersigned would remark that all estimates for Irrigation works which are not sanctionable by the District Engineer with the Collector's concurrence, should be sent by the former direct to this office for submission to Government for sanction. When sanctioned it would rest with the Revenue Department to determine whether it would be advisable to carry them out from Famine relief funds. It is of little use to review estimates when the works have

have been to a great extent carried out. The District Engineer signed the plans at the end of April, and if they had been sent to the undersigned then these remarks on details might have been made use of in carrying out the work.

Fort Saint George
14th June 1877-

Voluntariness Lieut. Col. A. J. Chief Engineer for Brigades

To
The Additional Secretary to
Government. Rev. Dept.

File 4780
Rev. 1877 Sept

From
The Chief Engineer for Irrigation

Such a work as this said
never have been put in hand
without submission to [unclear]

and that the work was
performed with a good
motive - but it was wrong
to say that the
engineer was
and the cloud which
fair - 1/2 27/6

Dated 14th June 1877
Recd 16th

No 203-11

Now I am sure that it
is in your hands & we
must hope for the best
but I am sure & am of
pressure of regret &
earnest injunction
as to the execution as
indicated by

Amalgamated Bank - London
District - Please submitting
remains on the estimate of
£20,000 for the restoration of
the -

2376
1877