

MADRAS IRRIGATION SERIES
No 3
ENLARGEMENT
RYVES' CHANNEL
KISTNA.

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M 67
95661

$$\underline{EII} \sim \frac{bh^3}{2}$$

Proceedings of the Madras Government, Public Works Department
20th August 1887.

2ndly.—The ability that would be possessed for carrying on the execution of the work with vigor all the year round, instead of only during the time that the Ellore canal is dry, and when most of the available labor of the district is employed in clearing the channels from their silt deposits.

3rdly.—The diminishing of the current to a slight extent on the Ellore canal rendering it more easy for navigation.

4thly.—A permanent reduction of Conservancy Establishment.

8. The disadvantages are—

1st.—The increased expense in construction, viz., Rupees 80,300.

2ndly.—The necessity of maintaining seven more miles of channel during all future years.

9. In the hope of getting a more economical line, I took levels in two directions, which appeared favorable, as shown in the sketch map accompanying, but the expense of these projects, if they were adopted, would be Rupees 4,360 and 4,34,600 respectively, and they cannot, therefore, be recommended.

10. My own opinion is that the advantages of being able to control the water close to the head works, and of carrying on the work throughout the year, are great, that the extra money would be well expended in adopting the first alternative line, and I may mention that latterly Colonel Anderson has expressed himself the same opinion.

11. The various masonry works are designed to meet the objects desired. They are all of a substantial nature, and I think that the rates allowed will be found sufficient.

12. The probable increase of irrigated land is alluded to in Mr. Ford's letter attached to the Proceedings of Government above quoted. It is impossible to say what the special works now submitted for sanction will return, nor does it appear to be necessary, as they form a portion of the great scheme which in its incomplete state last year returned 21 per cent.

No. 467. From the Superintending Engineer, 2nd Division, to the Secretary to Government, Department Public Works, dated Camp St. Mulikapur, 31st August 1887, No. 62.

1. In reply to your Official Memorandum No. 159, dated 24th July, I have the honor to forward an abstract estimate for the alternative line referred to in paragraph 7 of my letter of 10th July, No. 47.

2. It will be seen that the sum of Rupees 4,06,110 includes compensation for land.

3. There will be no other works be needed, excepting the extension of Trunk Road No. VI., nor will any masonry be entered in the abstract estimate. The bridge proposed, will pass both the Ellore and Ryves' channel close to Bezvada, and as will be observed, will not again cross it, till the existing bridge has been duly allowed. Estimate Rupees 4,170.

Proceedings of the Madras Government, Public Works Department
20th August 1867.

2ndly.—The ability that would be possessed for carrying on the execution of the work with vigor all the year round, instead of only during the time that the Ellore canal is dry, and when most of the available labor of the district is employed in clearing the channels from their silt deposits.

3rdly.—The diminishing of the current to a slight extent on the Ellore canal, rendering it more easy for navigation.

4thly.—A permanent reduction of Conservancy Establishment.

8. The disadvantages are—

1st.—The increased expense in construction, viz., Rupees 80,300.

2ndly.—The necessity of maintaining seven more miles of channel during all future years.

9. In the hope of getting a more economical line, I took levels in two other directions, which appeared favorable, as shown in the sketch map accompanying; but the expense of these projects, if they were adopted, would be Rupees 4,30,000 and 4,34,600 respectively, and they cannot, therefore, be recommended.

10. My own opinion is that the advantages of being able to control the water close to the head works, and of carrying on the work throughout the year, are so great, that the extra money would be well expended in adopting the first alternative line, and I may mention that latterly Colonel Anderson has expressed himself of the same opinion.

11. The various masonry works are designed to meet the objects desired. They are all of a substantial nature, and I think that the rates allowed will be found sufficient.

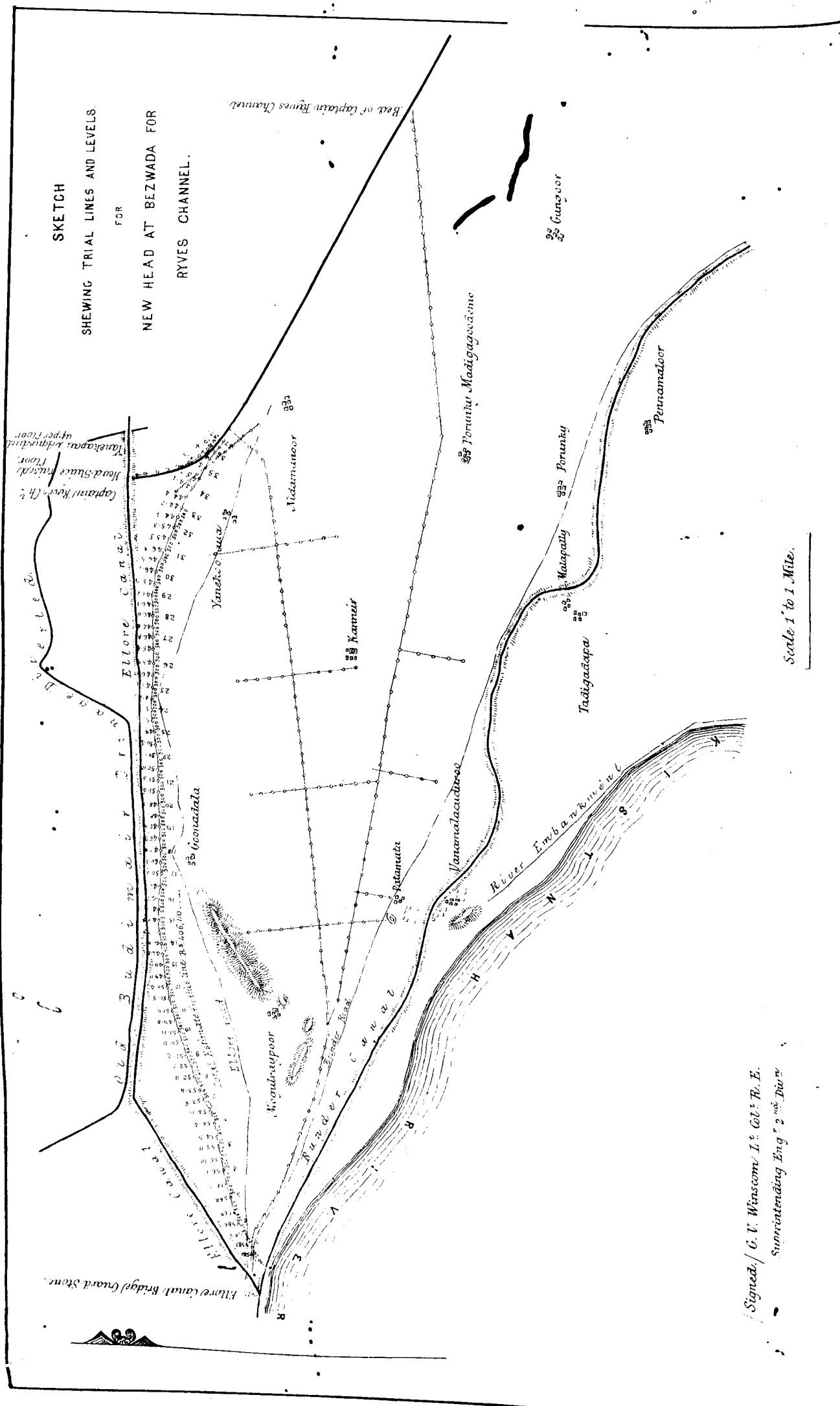
12. The probable increase of irrigated land is alluded to in Mr. Foord's letter, attached to the Proceedings of Government above quoted. It is impossible to say what the special works now submitted for sanction will return, nor does it appear to be necessary, as they form a portion of the great scheme which in its incomplete state last year returned 21 per cent.

No. 467. From the Superintending Engineer, 2nd Division, to the Secretary to Government, Department Public Works, dated Camp at Mulkapur, 3rd August 1867, No. 62.

1. In reply to your Official Memorandum No. 159, dated 24th July, I have the honor to forward an abstract estimate for the alternative line referred to in paragraph 7 of my letter of 10th July, No. 47.

2. It will be seen that the sum of Rupees 4,06,170 includes compensation for land.

3. There will be no detour of Trunk Road No. VI., nor will any masonry works be needed, excepting that entered in the abstract estimate. The bridge, combined with head sluice, have proposed, will pass both the Ellore and the Masulipatam roads as near close to Bezvada, and as will be observed by the map, the Trunk (or Ryves' channel is reached, and will not again cross it, till the existing bridge has been duly allowed. Estimate Rupees 4,170.



Proceedings of the Madras Government, Public Works Department,
20th August 1861.

DETAILED ESTIMATE
KISTNA DISTRICT.

Work.—Constructing two additional Arches to the Bridge at the head of Ellore Canal.

Particulars of Works.	Number.	MEASUREMENTS.			Cubical contents.
		Length.	Breadth.	Depth.	
		Ft. In.	Ft. In.	Ft. In.	Ft. In.
Foundation to Abutments	2	38 0	9 6	5 0	3,610 0
Wing walls	4	34 0	11 0	5 0	7,480 0
Towing path	.....	61 6	5 6	5 0	1,691 3
Retaining walls	2	29 0	1 3	2 6	181 3
Do.	2	23 6	1 3	2 6	146 10
Pedestals	4	4 6	0 3	5 0	22 6
Superstructure.					
Abutments	2	37 0	7 6	8 0	4,440 0
Do.	2	37 0	2 9	2 0	407 0
Backing to do.	2	37 0	9 0	1 0	593 0
Wing walls	4	34 0	8 1 1/2	24 6	20,408 6
Do.	4	1 3	8 4 1/2	10 0	418 9
Do.	4	2 6	4 6 1/2	14 6	596 5
Do.	4	7 6	4 6 1/2	11 0	1,505 7
Piers including cut waters	2	33 6	2 0	6 0	526 0
Pedestals	4	4 6	0 3	24 6	110 3
Towing path	.....	64 0	2 9	9 0	1,584 0
Parapet of do.	.....	69 6	1 0	6 6	34 9
Face walls at abutments	4	15 0	7 0	3 6	420 0
Filling up spandrels	.....	25 0	10 0	3 0	1,500 0
Spandrel walls	4	24 0	2 0	4 9	912 0
Cubic feet	.....	.....	.....	.....	46,397 0
Deduct for ashlar work	.....	.....	.....	.....	5,002 0
Net Cubic feet	.....	.....	.....	.....	41,395 0
Or Cubic yards of rubble stone-in-chamam	.....	.....	.....	.....	1,533 1/4
Arches	2	48 0	26 0	2 6	6,240 0
Cubic feet	.....	.....	.....	.....	6,240 0
Or Cubic yards of arch work, brick-in-chamam	.....	.....	.....	.....	231 1/4
Plastering.	.....	.....	.....	.....	.....
Intrados of arches	2	44 6	26 9	.....	2,314 0
Square feet of plastering with two coats of chamam	.....	.....	.....	.....	2,314 0
Parapets, excluding over pillars	2	149 6	1 6	2 8	1,196 0
Cubic feet	.....	.....	.....	.....	1,196 0
Or Cubic yards of brick-in-chamam	.....	.....	.....	.....	44 1/4
Pointing chamam to parapet walls	2	270 0	2 0	.....	1,080 0
Square feet of pointing to brick work ready	.....	.....	.....	.....	1,080 0

*Proceedings of the Madras Government, Public Works Department,
20th August 1867.*

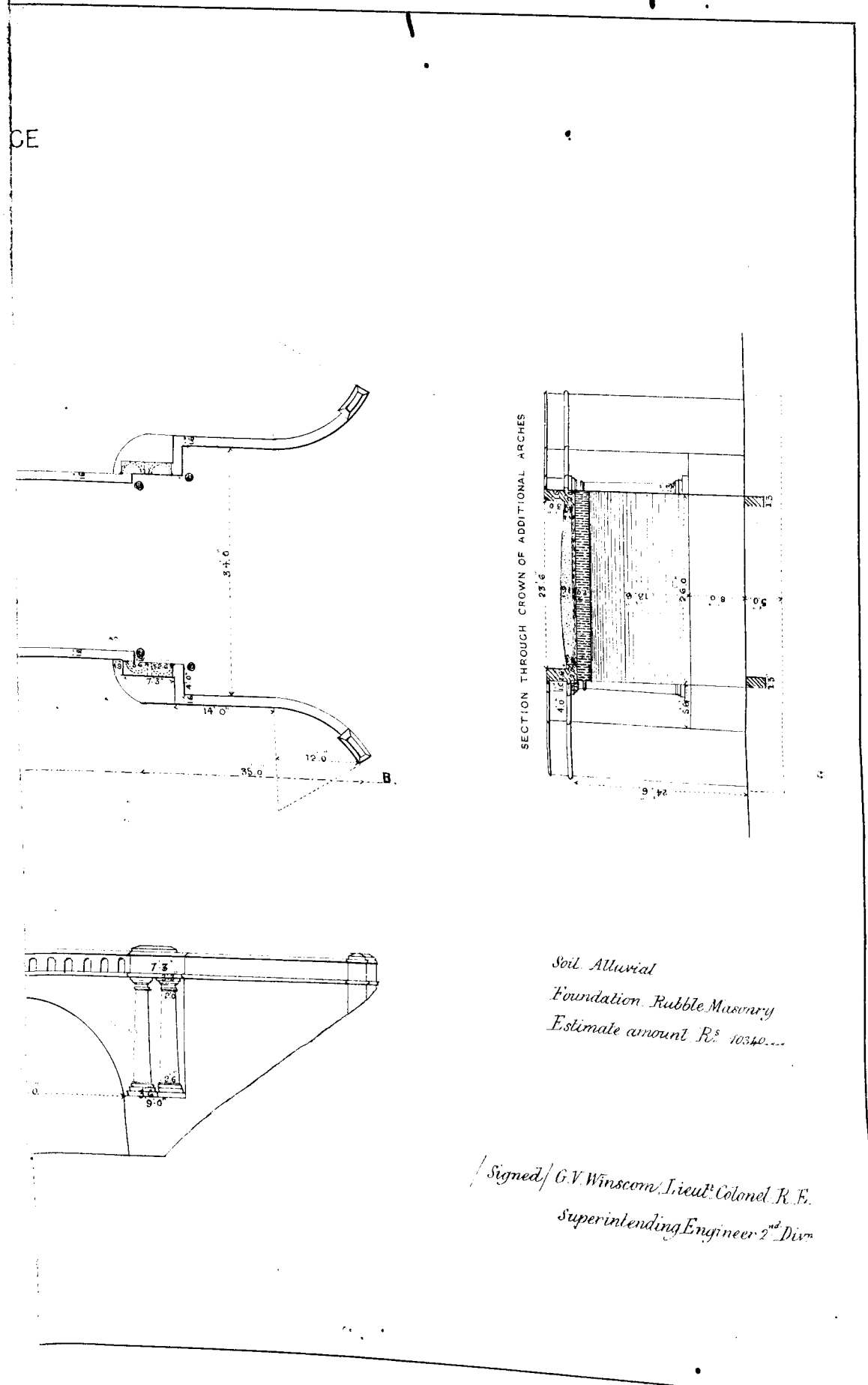
DETAILED ESTIMATE.—(Concluded.)

Particulars of Works.	Number.	MEASUREMENTS.			Cubical contents.
		Length.	Breadth.	Depth.	
		Ft. In.	Ft. In.	Ft. In.	Ft. In.
<i>Vertical ashlar work.—(Concluded.)</i>					
Turfing	2	225 0	15 6	.....	6,975 0
Do.	2	150 0	15 6	.....	4,650 0
Square feet ... ..	.....	.....	.....	.....	11,625 0
Square yards of turfing ... ..	.....	.....	.....	.....	1,291 $\frac{1}{2}$
Guard stones ... ..	.....	.....	.....	.....	4
Centerings ... ..	.....	.....	.....	.....	.....
Baling water ... ..	.....	.....	.....	.....	.....
Removing old work ... ..	.....	.....	.....	.....	.....
Excavating foundations and raising approaches ... ..	.....	.....	.....	.....	.....
Temporary bunds ... ..	.....	.....	.....	.....	.....
Sundries and Contingencies ... ..	.....	.....	.....	.....	.....

ABSTRACT ESTIMATE.
KISTNA DISTRICT.

WORK.—Constructing two additional Arches to the Bridge at the head of Elore Canal.

Quantity.	Description of Charges.	Rate.	Amount.	Total.
		RS. A. P.	RS. A. P.	RS. A. P.
1,533 $\frac{1}{2}$	Cubic yards of rubble stone-in-chunam ...	2 10 2	4,040 7 9	
231 $\frac{1}{2}$	Do. of arch work, brick in do. ...	5 13 9	1,354 2 3	
2,314 0	Square feet of plastering with two coats of chunam	2 12 0	63 10 2	
44 $\frac{1}{2}$	Cubic yards of brick-in-chunam ...	5 0 0	221 7 8	
1,080 0	Square feet of pointing with chunam to brick work neatly	1 4 0	43 8 0	
353 0	Running feet of cut-stone cordon work ...	0 8 0	176 8 0	
353 0	Do. do. coping work	0 12 0	264 12 0	
185 $\frac{1}{2}$	Cubic yards of vertical ashlar stone work ...	7 8 0	1,380 7 1	
78 $\frac{1}{2}$	Do. ashlar work	12 0 0	941 5 4	
62 $\frac{1}{2}$	Do. of concrete work	1 8 0	94 4 0	
183 $\frac{1}{2}$	Do. of metalling with old brick kankur ...	0 5 6	63 2 3	
803 $\frac{1}{2}$	Do. of rough stone revetment for slopes	1 0 0	803 15 0	
1,291 $\frac{1}{2}$	Square yards of turfing	0 0 3	20 2 9	
4	Guard stones	3 0 0	12 0 0	
	Centerings ... ..	.....	250 0 0	
	Baling water ... ..	.....	150 0 0	
	Removing old work ... ..	.....	130 0 0	
	Excavating foundations and raising approaches ... ..	.....	65 0 0	
	Temporary bunds ... ..	.....	50 0 0	
	Sundries and Contingencies ... ..	.....	256 5 9	
	Deduct value of old materials ... ..	.....	.....	10,390 0 0
	Total Estimate ... ..	.....	.....	50 0 0
				10,340 0 0



*Proceedings of the Madras Government, Public Works Department,
20th August 1867.*

Specification Report to accompany Estimate of Rupees 10,340, for constructing two additional Arches to the Bridge at the head of Ellore Canal.

1. The foundations of the new wing-walls, abutments, and towing path are to be of rough stone-in-chunam, 5 feet deep, resting on natural soil.
2. Piers and abutments are to be connected by retaining walls in front and rear, 1 foot 3 inches thick and 2 feet 6 inches deep, and to be of rough stone-in-chunam.
3. The abutments are to be 8 feet 6 inches thick at the level of the bed of the channel, and 6 feet 6 inches at the springing of the arch, and raised to a uniform height of 8 feet; the versed sine of the arch to be $13\frac{1}{2}$ feet, giving a total height of $21\frac{1}{2}$ feet to the soffit. The thickness of the two additional arches to be 3 feet 6 inches, 3 feet, and 2 feet 6 inches at haunches (from the springing measured on the intrados of arch, 3 feet 9 inches each distance), and the remainder to be 2 feet thick, built of brick-in-chunam and pointed neatly.
4. The old abutments of the bridge will be used as piers of the new arches by adding masonry to the proper breadth of 11 feet, and taking away superfluous work.
5. The wing-walls 2 feet 3 inches thick at top and 10 feet at bottom, with a batter of 7 feet 9 inches at the back.
6. The superstructure of the wing-walls, spandrels, face walls of arches, piers, cut waters, and abutments are to be of rubble-in-chunam, faced with ashlar masonry.
7. The parapets are to be 1 foot 6 inches thick and 3 feet high, built of brick-in-chunam, pointed neatly with a cut-stone cordon work of 7 inches high and 4 inches coping; the intrados of arches will be plastered with two coats of chunam.
8. Pillars over the cut waters are to be of ashlar work, with a capping of cut-stone over parapet; the diameter of the pillars at base 2 feet 6 inches, and at top 2 feet.
9. Roadway over the bridge will be metalled with old brick kunkur, at centre 1 foot 6 inches, and at sides 1 foot 3 inches thick. The roadway over the arches to be 23 feet wide and at wings 34 feet.
10. A towing path 9 feet above bed of channel, having parapet 6 inches high, will pass under the western arch. It will be built of rubble stone and chunam, and the interior space between outside and abutment of bridge will be filled with concrete.

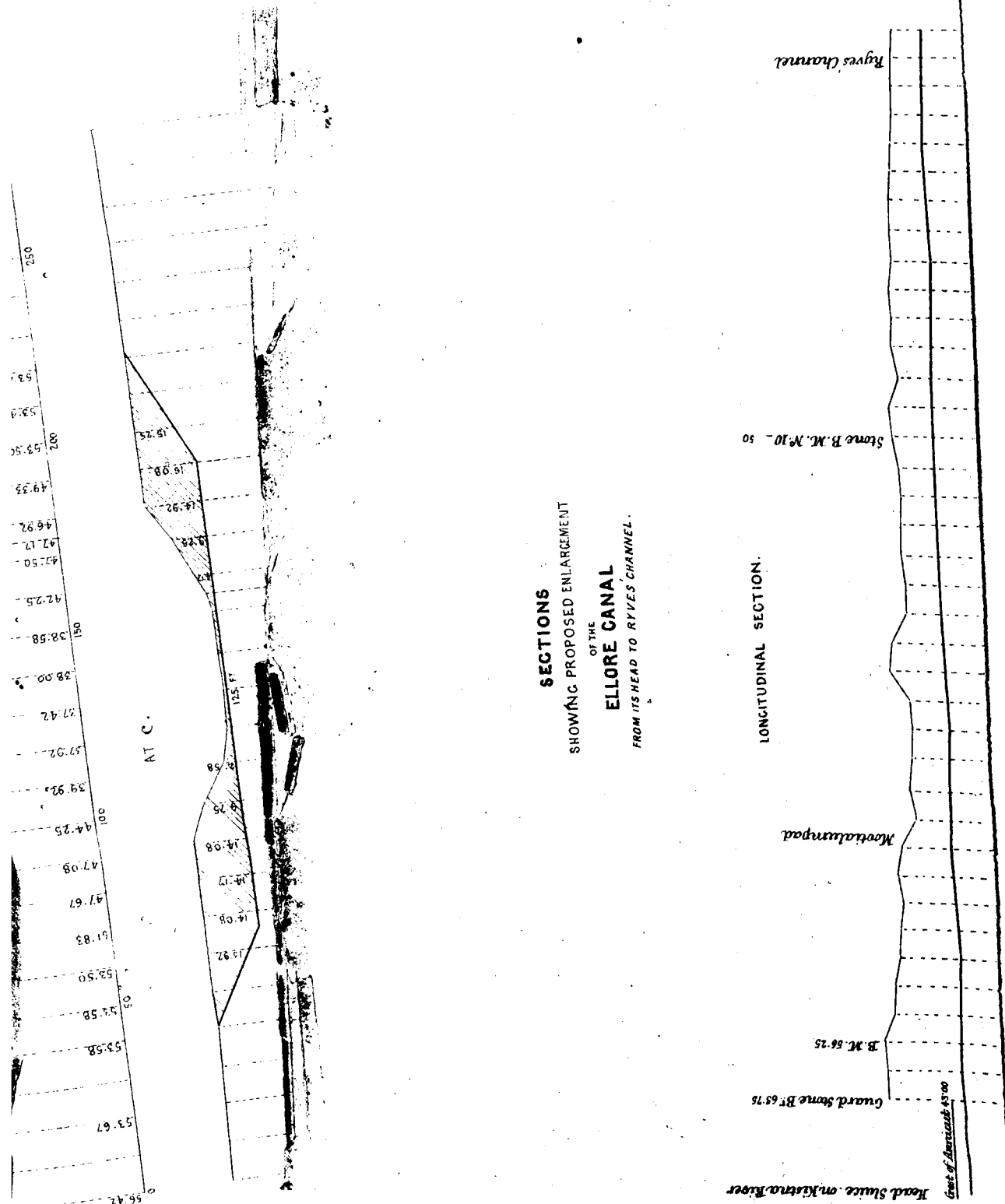
MASULIPATAM.
10th July 1867.

(Signed) G. V. WINSCOM, Lieut-Colonel, R. E.,
Superintending Engineer 2nd Division.

*Proceedings of the Madras Government, Public Works Department,
20th August 1867.*

ESTIMATE of the probable expense of enlarging the Ellore Canal from the head near Bezoarah to the head of Ryves' Channel, between the 7th and 8th mile.
Width of bed 120—150 feet, side slopes 2 to 1, fall $2\frac{1}{2}$ inches per mile.

	Average depth of cutting.	Width.	Area.	Length.	Cubical contents.
Section 1 ...	$\frac{107.8}{10}$	90	970.2	3,420	6,192,867.6
Side slopes ...	$\frac{20.7 \times 41.4}{2}$	40.6	428.49		
	$\frac{20.3}{2}$		412.09		
			1,810.78		
Section 2 ...	$\frac{94.5}{11}$	95	816.13	4,000	4,263,080.0
Slopes ...	$\frac{2 \times 15.3}{2}$	$\frac{31.6}{2}$	249.64		
			1,065.77		
Section 3 ...	$\frac{112.1}{11}$	85	952.85	4,100	5,658,615.0
Slopes ...	$\frac{13.9}{2}$	27.8	193.21		
	$\frac{15.3}{2}$	30.6	234.09		
			1,380.15		
Section 4 ...	$\frac{87.6}{11}$	100	796.36	4,100	4,317,833.
Slopes ...	$\frac{12.6}{2}$	25.2	158.76		
	$\frac{9.9}{2}$	19.8	98.01		
			1,053.13		
Section 5 ...	$\frac{82}{11}$	95	708.18	4,000	3,439,520.
	$\frac{8.3}{2}$	16.6	68.89		
	$\frac{9.1}{2}$	18.2	82.81		
			859.88		
Section 6 ..	$\frac{84.4}{11}$	100	767.27	4,000	3,576,320.
Slopes ...	$\frac{8.4}{2}$	16.8	70.56		
	$\frac{7.5}{2}$	15	56.25		
			894.08		
Section 7 ...	$\frac{74.1}{12}$	110	679.25	4,100	3,465,566.
Slopes ...	$\frac{10.1}{2}$	20.2	102.01		
	$\frac{8}{2}$	16	64.0		
			845.26		



*Proceedings of the Madras Government, Public Works Department,
20th August 1867.*

Estimate of the probable expense of enlarging the Ellore Canal, &c.—(Concluded.)
Width of bed 120—150 feet, side slopes 2 to 1, fall $2\frac{1}{2}$ inches per mile.

	Average depth of cutting.	Width.	Area.	Length.	Cubical contents.
Section 8 ...	87.5	105	835.22	4,000	3,996,280.
Slopes ...	$\frac{11}{2}$	18.4	84.64		
	$\frac{8.9}{2}$	17.8	79.21		
Section 9 ...	63.4	90	634.		
	$\frac{8}{2}$	16	64.	5,000	3,851,250.
	$\frac{8.5}{2}$	17	72.25		
			770.25		
Total Cubic feet...	.....	.....	.....		
Or Cubic yards...					38,761,331.6
					1,435,60.5

Abstract.

1,435,605 Cubic yards of earth-work, at 2 Annas per cubic yard. 1,79,450 10 0
Contingencies, &c., at 5 per cent. ... 8,989. 6 0

Total... 1,88,440 0 0

MASULIPATAM,
10th August 1867.

(Signed) G. V. WINSOM, Lieut.-Colonel, R. E.,
Superintending Engineer, 2nd Division.

*Proceedings of the Madras Government, Public Works Department,
20th August 1867.*

DETAILED ESTIMATE.

KISTNA DISTRICT.

WORK.—Enlargement of the Head-sluice of Ryves' Channel.

Particulars of Work.	Number.	MEASUREMENTS.			Cubical contents.	
		Length.	Breadth.	Height or Depth.		
		Ft. In.	Ft. In.	Ft. In.	Ft.	In.
<i>Foundation, rubble masonry in chunam.</i>						
Abutments ...	1	42 0	6 0	6 0	1,512	0
Do. ...	1	10 0	6 0	6 0	360	0
Wing ...	1	2 6	4 10	6 0	72	6
Do. ...	1	7 6	4 10	6 0	217	6
Piers ...	9	17 6	4 0	6 0	3,780	0
Front retaining wall ...	1	54 0	3 0	5 6	891	0
Rear do. ...	1	79 9	2 3	4 6	807	$6\frac{1}{2}$
Do. do. ...	1	22 0	2 3	4 6	222	9
Do. apron do. ...	1	130 6	3 0	6 0	2,349	0
<i>Superstructure.</i>						
Abutments ...	1	15 0	3 9	6 0	337	6
Do. backing ...	1	15 0	2 3	4 6	151	$10\frac{1}{2}$
Do. ...	1	26 0	3 $1\frac{1}{2}$	10 6	853	$1\frac{1}{2}$
Do. ...	1	10 0	3 $1\frac{1}{2}$	10 6	328	$1\frac{1}{2}$
Piers ...	9	13 9	3 0	6 0	2,227	6
Wing ...	1	7 6	2 7	11 0	213	$1\frac{1}{2}$
Do. ...	1	2 6	2 7	11 0	71	$\frac{1}{2}$
Flooring ...	1	106 0	10 0	2 0	2,120	0
Do. ...	1	55 0	16 0	2 0	1,760	0
Blocking course ...	1	174 0	1 3	0 9	163	$1\frac{1}{2}$
Do. ...	1	54 0	1 3	0 9	50	$7\frac{1}{2}$
<i>Deduct.</i>					18,488	$3\frac{1}{2}$
Roughly chissel dressed stone ...	.....	.....	.....	.....	2,350	6
Cut-stone and cut-stone grooves ...	.....	.....	.....	.....	700	6
					3,051	0
Total rubble masonry in chunam, C. ft. ...	.....	.....	.....	.....	15,437	$3\frac{1}{2}$
Or Cubic yards...	.....	.....	.....	.....	571	$\frac{1}{2}$
Arch work brick-in-chunam ...	10 0	13 0	11 0	1 6	2,145	C. ft.
<i>Cut-stone work.</i>						
Grooves ...	20 0	1 0	0 9	11 0	165	0
Caps of cut waters ...	12 0	3 0	1 6	0 9	40	6
Face of arch ...	24 0	1 3	11 0	1 6	495	0
					700	6
					26	
<i>Roughly chissel dressed stone.</i>						
Side or face walls ...	1	187 0	1 3	2 0	467	6
Cut waters ...	12	2 0	2 6	6 0	360	0
Rear faces of piers ...	12	1 3	3 0	6 0	270	0
Parapet ...	1	464 0	1 0	1 9	812	0
Abutment and wings ...	2	39 0	1 3	6 0	585	0
					2,494	6
					92	$\frac{1}{2}$
Pointing in chunam ...	Squares...	.....	.....	.....	78	$\frac{1}{2}$

Proceedings of the Madras Government, Public Works Department.
20th August 1867.

DETAILED ESTIMATE.—(Concluded.)

Particulars of Work.	Number.	MEASUREMENTS.			Cubical contents.	
		Length.	Breadth.	Height or Depth.		
		Ft. In.	Ft. In.	Ft. In.	Ft.	In.
Concrete to fill spandrels ... Or Cubic yards...	1	60 0	13 0	2 6	1,950 C. ft.	72 $\frac{2}{3}$
Rough stone apron ...	1	63 0	15 6	2 3	2,197	1 $\frac{1}{2}$
	1	61 6	12 0	2 0	1,476	0
	1	62 6	20 0	2 0	2,500	0
Total Rough stone Cubic feet...					6,173 $\frac{1}{2}$	
Or Cubic yards...					228 $\frac{2}{3}$	
Teak-wood shutters ...	10	6 6	12 6	0 2 $\frac{1}{2}$	169	3 $\frac{1}{2}$
Iron bar ...	20	6 9	0 2	0 2	3 $\frac{3}{4}$	
Do. ...	20	6 9	0 3	0 3	8 $\frac{7}{8}$	
Cubic feet...					12 $\frac{3}{4}$	
Or lbs...					5,923	
Excavating foundation. Cubic yards...					1,320	
Centering ...						
Add for removing old abutment, &c. ...						
Metalling ...	1	130 0	8 6	0 6	552 $\frac{1}{2}$ C. ft.	20 $\frac{1}{2}$
Or Cubic yards...						
Sundries and Contingencies ...						

ABSTRACT ESTIMATE.

KISTNA DISTRICT.

WORK.—Enlargement of the Head-sluice of Ryves' Channel.

Quantity.	Description of Work.	Rate.	Amount.	Total.
		RS. A. P.	RS. A. P.	RS.
571 $\frac{1}{2}$	Cubic yards of rubble masonry in chunam ...	3 0 0	1,715 5 4	
2,145	Cubic feet of arch work, brick-in-chunam ...	0 4 0	536 4 0	
26	Cubic yards of cut-stone work ...	12 0 0	312 0 0	
921 $\frac{1}{2}$	Do. of roughly chissel-dressed stone in chunam ...	8 0 0	738 15 5	
78 $\frac{1}{2}$	Squares of pointing in chunam ...	1 8 0	117 6 0	
72 $\frac{1}{2}$	Cubic yards of concrete ...	2 6 0	171 8 6	
228 $\frac{2}{3}$	Rough stone apron ...	1 0 0	228 10 8	
169-3 $\frac{1}{2}$	Cubic feet teak-wood shutters wrought and put up ...	3 0 0	507 13 0	
5,923	lbs. of iron bar ...	0 1 4	493 9 4	
1,320	Cubic yards excavating foundation ...	0 1 0	82 8 0	
	Centering ...	16 0 0	160 0 0	
	Add for removing old abutment, &c. ...		20 0 0	
20 $\frac{1}{2}$	Cubic yards of metalling with brick kunkur ...	1 8 0	30 12 0	
	Sundries and Contingencies, at 5 per cent. ...		5,114 8 7	5,400
			285 7 5	
	Total Estimate...			5,400

Proceedings of the Madras Government, Public Works Department.
20th August 1867.

Specification Report to accompany Plan and Estimate for enlarging the Head-sluice of Ryves' Channel from 3 to 13 vents.

The bed of the channel is alluvial soil.

The head-sluice to consist of 13 vents, having dimensions as follows:—

1. The foundation of the piers and abutments to be 5 feet and 7 $\frac{1}{2}$ feet at bottom, 3 feet and 4 $\frac{1}{2}$ feet at the floor, and 6 feet deep resting on natural soil.

2. The abutments above to be 4 $\frac{1}{2}$ feet at the floor and 3 feet at top in thickness, and 6 feet high, and the piers to be 3 feet wide and 6 feet high.

3. The foundation of wings to be 6 feet at bottom, and 3 feet 8 inches at the floor, and 6 feet deep: and above, 3 feet 8 inches at the floor, and 1 $\frac{1}{2}$ feet at top, and 11 feet high.

4. The arches of vents to have each a versed sine of 3 feet, and to be 1 $\frac{1}{2}$ feet thick.

5. The three vents constructed in 1861-62 are shown in lake in the plan. The parts colored green show the existing work to be removed.

6. Iron bars, 2 inches square, will be placed across the vents in front as shown in the plan, and support the teak-wood shutters, which will be worked in grooves cut in hard stones in the abutments and piers.

7. Four steps to be built on each side of the abutments as shown in the plan, to facilitate the Lascars to work the planks.

8. The flooring under the arches and in rear to be 2 feet thick, and the retaining walls between front and rear wings to be 4 and 2 $\frac{1}{2}$ feet at bottom, 2 feet at top, and 5 $\frac{1}{2}$ and 4 $\frac{1}{2}$ feet deep respectively.

9. Retaining wall between aprons and connecting revetments to be 4 and 2 feet thick, and 5 $\frac{1}{2}$ feet deep.

10. Rough stone apron in front to be 14 feet wide and in rear 20 and 12 feet wide, all 2 feet thick. Revetments to be 2 $\frac{1}{2}$ feet in average thick, 6 feet high, slope 1 $\frac{3}{4}$ to 1.

11. The foundation and superstructure to be of rubble masonry, and arch-work to be of brick-in-chunam.

12. Grooves, caps of cut waters, and face of arch to be of cut-stone; and face walls, cut waters, rear face of piers, parapets, abutments, and wings, to be of roughly chissel-dressed stone, and the whole work to be pointed neatly.

MASULIPATAM,
10th July 1867.

(Signed) G. V. WINSCOM, Lieut.-Colonel, R. E.,
Superintending Engineer, 2nd Division.

*Proceedings of the Madras Government, Public Works Department,
20th August 1867.*

ESTIMATE.

KISTNA DISTRICT.

WORK.—Enlarging and improving Ryves' Canal from Head Sluice to Pullairu near Murrevada.

Number of Stations.	Distance.	Area of cutting.	Total cutting in each mile.	Remarks.
1	660	622·0 $\frac{1}{2}$	2,777,940	
2		580·0 $\frac{1}{2}$		
3		466·11 $\frac{3}{4}$		
4		390·9 $\frac{3}{4}$		
5		455·1 $\frac{1}{2}$		
6		498·7 $\frac{3}{4}$		
7		574·5 $\frac{3}{4}$		
8		620·11 $\frac{3}{4}$		
9	660	4,209·0 $\frac{7}{8}$	3,244,560	
10		604·9 $\frac{1}{2}$		
11		603·0 $\frac{1}{2}$		
12		559·11 $\frac{3}{4}$		
13		616·0 $\frac{1}{2}$		
14		655·0 $\frac{1}{2}$		
15		620·10 $\frac{3}{4}$		
16		624·11 $\frac{5}{8}$		
17	660	631·7 $\frac{3}{8}$	2,428,140	
18		4,916·2 $\frac{1}{2}$		
19		600·0 $\frac{5}{8}$		
20		415·4 $\frac{2}{3}$		
21		287·8 $\frac{5}{8}$		
22		432·3 $\frac{2}{3}$		
23		502·1 $\frac{2}{3}$		
24		433·7 $\frac{9}{16}$		
25	660	477·6 $\frac{5}{8}$	1,855,590	
26		530·3 $\frac{1}{2}$		
27		3,678·11 $\frac{3}{4}$		
28		476·3 $\frac{5}{8}$		
29		419·4 $\frac{1}{2}$		
30		354·0 $\frac{1}{4}$		
31		331·6 $\frac{1}{4}$		
32		340·6 $\frac{3}{4}$		
33	660	270·3	1,573,770	
34		255·10 $\frac{5}{8}$		
35		363·6 $\frac{3}{4}$		
36		2,811·5 $\frac{1}{4}$		
37		377·2 $\frac{2}{3}$		
38		336·10 $\frac{1}{2}$		
39		328·0 $\frac{5}{8}$		
40		297·0 $\frac{1}{2}$		

*Proceedings of the Madras Government, Public Works Department,
20th August 1867.*

ESTIMATE.—(Continued.)

Number of Stations.	Distance.	Area of cutting.	Total cutting in each mile.	Remarks.
41	660	260·3 $\frac{1}{4}$	1,255,980	
42		237·0 $\frac{3}{8}$		
43		244·6 $\frac{1}{2}$		
44		258·1 $\frac{1}{2}$		
45		295·6 $\frac{2}{3}$		
46		227·3 $\frac{7}{8}$		
47		140·6 $\frac{3}{4}$		
48		239·6 $\frac{1}{2}$		
49	660	1,902·9 $\frac{1}{4}$	1,600,830	
50		282·4 $\frac{1}{2}$		
51		277·1 $\frac{1}{2}$		
52		257·6 $\frac{3}{4}$		
53		223·6 $\frac{3}{4}$		
54		275·1 $\frac{7}{8}$		
55		304·7 $\frac{5}{8}$		
56		382·1		
57	660	422·11 $\frac{1}{4}$	1,823,745	
58		2,425·7 $\frac{5}{8}$		
59		358·5 $\frac{1}{2}$		
60		360·5		
61		340·9 $\frac{9}{16}$		
62		302·2 $\frac{3}{8}$		
63		333·3 $\frac{1}{4}$		
64		371·4		
65	660	420·7 $\frac{9}{16}$	1,463,830	
66		276·2 $\frac{5}{8}$		
67		2,763·3 $\frac{1}{4}$		
68		249·5 $\frac{3}{4}$		
69		233·3 $\frac{1}{2}$		
70		255·3 $\frac{3}{4}$		
71		282·9 $\frac{1}{2}$		
72		342·5 $\frac{1}{4}$		
73	660	356·8 $\frac{1}{2}$	799,920	
74		257·4 $\frac{3}{8}$		
75		248·1 $\frac{1}{2}$		
76		2,225·5 $\frac{3}{4}$		
77		252·2 $\frac{1}{2}$		
78		161·6 $\frac{7}{8}$		
79		160·11 $\frac{1}{2}$		
80		150·3 $\frac{3}{8}$		
81	660	127·3 $\frac{3}{4}$		
82		131·1 $\frac{1}{4}$		
83		125·4 $\frac{2}{3}$		
84		104·0 $\frac{3}{8}$		

Proceedings of the Madras Government, Public Works Department.
20th August 1867.

ESTIMATE.—(Continued.)

Number of Stations.	Distance.	Area of cutting.	Total cutting in each mile.	Remarks.
84	660	67.7 $\frac{1}{8}$	580,140	
85		102.1 $\frac{2}{3}$		
86		116.11 $\frac{3}{4}$		
87		177.2 $\frac{6}{4}$		
88		211.10 $\frac{4}{4}$		
		879.1 $\frac{7}{2}$		
89	660	126.9 $\frac{5}{6}$	665,940	
90		75.4 $\frac{3}{8}$		
91		81.7 $\frac{3}{8}$		
92		77.6 $\frac{3}{4}$		
93		125.8 $\frac{5}{4}$		
94		136.11 $\frac{5}{4}$		
95		152.6 $\frac{5}{4}$		
96		232.3 $\frac{1}{4}$		
		1,008.10 $\frac{7}{16}$		
97	660	207.1 $\frac{2}{8}$	618,090	
98		150.2 $\frac{2}{3}$		
99		156.2 $\frac{1}{4}$		
100		144.5 $\frac{7}{6}$		
101		89.1 $\frac{1}{2}$		
102		81.0 $\frac{1}{6}$		
103		81.8 $\frac{1}{2}$		
104		26.5 $\frac{2}{3}$		
		936.4 $\frac{1}{3}$		
105	660	67.9 $\frac{1}{2}$	264,330	
106		152.6 $\frac{1}{2}$		
107		91.1 $\frac{5}{3}$		
108		18.7		
109		24.5 $\frac{7}{4}$		
110		21.11 $\frac{2}{4}$		
111		10.4 $\frac{5}{3}$		
112		13.9 $\frac{2}{3}$		
		400.6 $\frac{1}{2}$		
113	660	13.11 $\frac{5}{6}$	65,340	
114		11.2 $\frac{1}{6}$		
115		15.3 $\frac{1}{4}$		
116		16.11 $\frac{1}{4}$		
117		13.1 $\frac{5}{4}$		
118		10.4 $\frac{5}{4}$		
119		10.8 $\frac{7}{2}$		
120		7.4 $\frac{1}{6}$		
		99.0 $\frac{1}{2}$		
121	660	8.3 $\frac{2}{3}$		
122		19.10 $\frac{7}{8}$		
123		37.10 $\frac{1}{2}$		
124		71.0 $\frac{7}{6}$		
125		104.2 $\frac{1}{2}$		
126		52.9 $\frac{1}{4}$		
127		59.6 $\frac{7}{2}$		

SECTIONS OF RYVES' CHANNEL

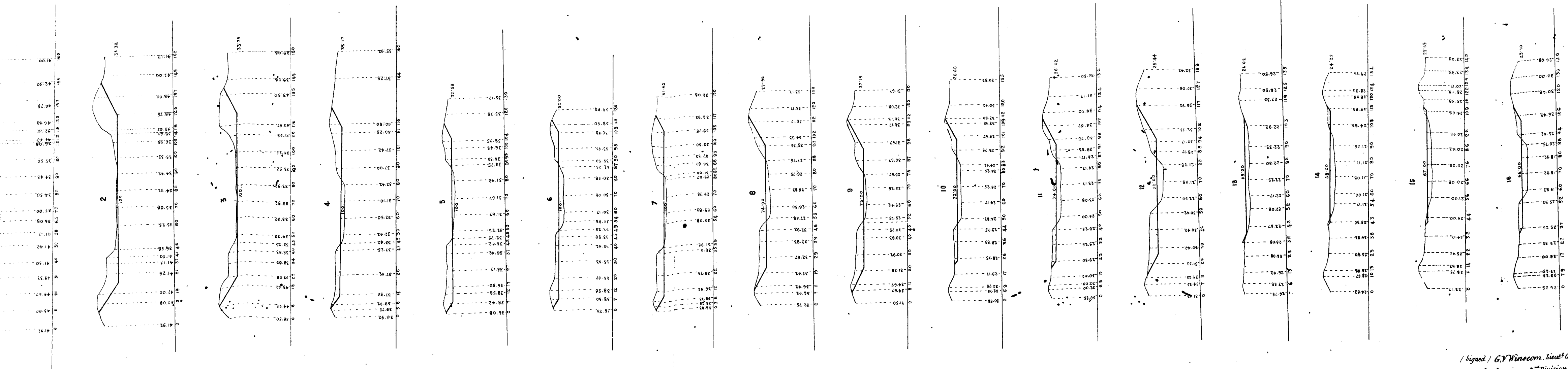
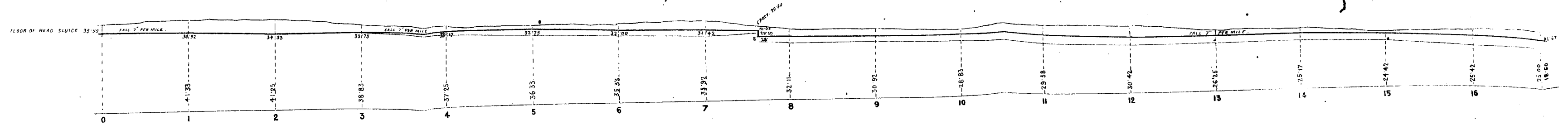
FROM HEAD SLUICE TO PULLAIROO JUNCTION.

SHOWING PROPOSED ENLARGEMENT.

HORIZONTAL SCALE TO LONGITUDINAL SECTION, 1 MILE = 1 INCH

ALL THE REST 40 FT TO 1 INCH

LONGITUDINAL SECTION



TRANSFER BY A. BARRON. LITHO BY G. J. WALDREY. CIVIL LITHO PRESS, CHENNAI, MADRAS. APRIL 1968.

Signed / G. V. Winscom, Lieut. Col.
Sup. Engineer 2nd Division.

*Proceedings of the Madras Government, Public Works Department,
20th August 1867.*

ESTIMATE.—(Concluded.)

Number of Stations.	Distance.	Area of cutting.	Total cutting in each mile.	Remarks.
128	660	39·9 $\frac{2}{3}\frac{5}{2}$	286,110	
		433 5 $\frac{1}{3}\frac{3}{2}$		
129		83·3 $\frac{7}{3}\frac{7}{2}$		
130		116·10 $\frac{2}{3}\frac{9}{2}$		
131		159·7 $\frac{7}{3}\frac{7}{2}$		
132	271·0 $\frac{2}{3}\frac{5}{2}$	6(3,900		
133	284·3 $\frac{1}{4}$			
	915·1 $\frac{6}{16}$			
Total Cubic feet...			21,913,155	
Or Cubic yards...			811,598 $\frac{1}{3}$	

ABSTRACT.

8,11,598 Cubic yards of earth-work at 1 Anna 3 Pies	RS.	A.	P.
per cubic yard	63,406	1	0
Sundries at 5 per cent...	3,173	15	0
Total Estimate...	66,580	0	0

MASULIPATAM,
10th Jnly 1867.

(Signed) G. WINSCOM, Lieut.-Colonel, R. F.,
Superintending Engineer, 2nd Division.

*Proceedings of the Madras Government, Public Works Department,
20th August 1867.*

DETAILED ESTIMATE.

KISTNA DISTRICT.

WORK.—Constructing a Bridge of five arches 20 feet span on Ryves' Channel, at crossing of the Ellore Road.

Particulars of Work.	Number.	MEASUREMENTS.			Cubical contents.
		Length.	Breadth.	Height.	
	Feet.	Feet.	Feet.	Feet.	Feet.
Foundations to abutments (counted square) ...	2	21½	6	5	1,290
Do. to piers including cut waters, do. ...	4	21½	4½	5	2,066½
Do. to wings ...	4	21½	6½	5	2,615½
Do. pilaster to the end ...	4	2	1	5	10
Retaining walls ...	2	98½	1½	1	296½
Do. do. ...	2	92½	2½	4	1,85
Flooring ...	5	19½	11½	1	1,135½
<i>Superstructure.</i>					
Abutments (counted square) ...	2	20½	4½	7½	1,509½
Piers including cut waters, do. ...	4	20½	3½	7½	2,152½
Wings ...	4	21½	3½	10½	2,942½
Do. ...	4	1½	4½	14½	61½
Pilasters ...	4	2	1	7	14
Skew-backs for piers ...	4	14½	3½	5½	169½
Do. do. abutments ...	2	14½	3½	1½	146½
Spandrels ...	4	14½	5	3½	217½
Backing to arches ...	2	14½	7½	1½	180½
Face walls ...	2	94	1½	1½	423
Do. ...	2	35	1½	2	210
Blocking course ...	2	167	1½	1	501
Do. do. for pilaster ...	4	2	2	1	16
Total Cubic feet rubble in chunam ...	...	...	...	...	17,813
Or Cubic yards of do. ...	...	...	...	...	659½
<i>Brick-in-chunam.</i>					
		Ft. In.	Ft. In.	Ft. In.	Ft. In.
Arch work ...	5	24 6	14 6	1 10	3,256 5½
Parapet ...	2	167 0	1 3	1 9	730 7½
Pilasters ...	4	2 0	2 0	1 9	28 0
Total Cubic feet brick-in-chunam ...	...	...	...	...	4,015 1
Or Cubic yards of do. ...	...	...	...	...	148-19-1
<i>Cut-stone Work.</i>					
Stringing course for abutments ...	2	21 0	2 0	0 6	42 0
Do. do. for piers ...	4	21 0	4 0	0 6	168 0
Caps ...	10	3 6	2 0	0 8	46 8
Cordon work for parapets ...	2	167 0	1 8	0 6	278 4
Pilasters ...	4	2 5	2 5	0 6	11 8
Coping for parapets ...	2	167 0	1 6	0 9	375 9
Do. for pilasters ...	4	2 3	2 3	0 9	15 2½
Total Cubic feet of cut-stone work ...	...	...	...	...	937 7½
Or Cubic yards of do. ...	...	...	...	...	34-19-7½
Pointing ... Squares ...	...	...	...	...	99
Excavating foundation Cubic yards ...	...	...	...	...	540
Guard-stones ...	...	...	...	...	.....
Centerings ...	4	...	...	...	.....
Baling water ...	...	...	...	...	.....
Sundries and Contingencies ...	...	...	...	...	.....

*Proceedings of the Madras Government, Public Works Department,
20th August 1867.*

ABSTRACT ESTIMATE.

KISTNA DISTRICT.

WORK.—Constructing a Bridge of five arches of 20 feet span on Ryves' Channel, at crossing of the Ellore Road.

Quantity.	Description of Work.	Rate.			Amount.			Total.		
		RS.	A.	P.	RS.	A.	P.	RS.	A.	P.
660	Cubic yards rough stone in chunam ...	3	2	0	2,062	8	0			
149	Do. of brick-in-chunam ...	6	0	0	894	0	0			
35	Do. of cut-stone in chunam ...	11	15	1	417	15	11			
99	Squares of pointing ...	1	0	0	99	0	0			
540	Cubic yards of earth-work for excavating foundations ...	0	1	0	33	12	0			
4	Guard-stones ...	3	0	0	12	0	0			
	Centerings ...				200	0	0			
	Baling water ...				250	0	0			
	Sundries and Contingencies ...				.....			3,979	3	11
	Total Estimate ...				.....			190	12	1
								4,170	0	0

Specification to accompany the Plan and Estimate for Bridge proposed for construction on Ryves' Channel at the crossing of Ellore Road.

1. The bridge to consist of five arches of 20 feet span, the rise being 5 feet. The height of the piers and abutments to be 8 feet, the former being 3½ and the latter 5 feet in breadth. The arches to be 2 feet 2 inches in thickness at the springing line, and 1½ at the crown.
2. The wings to be 15½ feet in height at the abutment, and 8 feet at the extremities.
3. The depth of the foundation to be reduced by steps of ½ foot up and 2 feet on, for a length of 16 feet, and carried on this level 5½ feet, making the total length 21½ feet.
4. The road-way to be 12 feet in breadth with parapets of 3 feet in height.
5. The cordon work and coping to parapets, stringing course, and curved caps to be of dressed cut-stone in chunam.
6. Arch work and parapets to be of brick-in-chunam, and the rest rubble masonry; the whole to be pointed with chunam.

(Signed) G. V. WINSOM, Lieut.-Colonel, R. E.,
Superintending Engineer, 2nd Division.
MASULIPATAM,
10th July 1867.

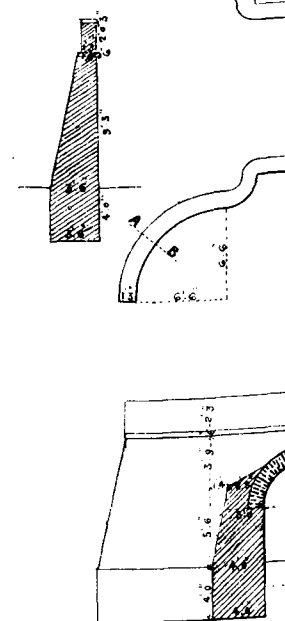
DETAILED ESTIMATE.

KISTNA DISTRICT.

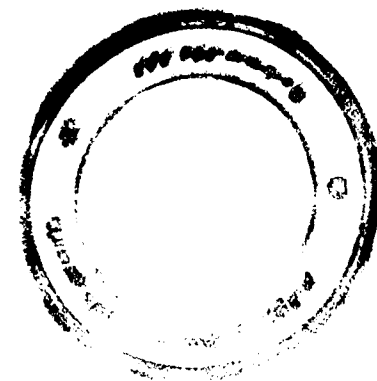
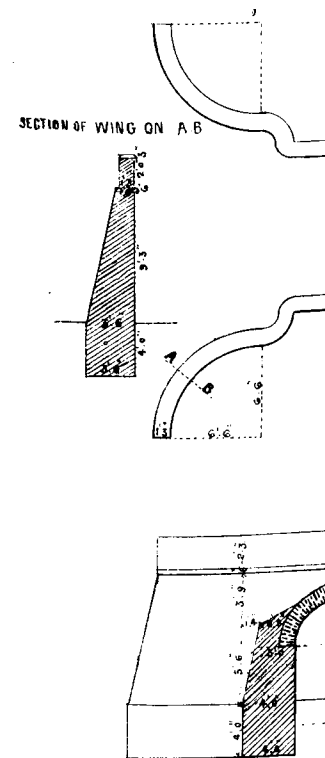
Work.—Constructing accommodation Bridge with elevating platform on Ryves Channel for the use of the villagers and the maintenance of district navigation.

Particulars of Works.	Number.	MEASUREMENTS.			Cubical contents.
		Length.	Breadth.	Depth.	
<i>Foundations.</i>		Ft. In.	Ft. In.	Ft. In.	Ft. In.
Abutments	1	16 0	4 0	4 0	256 0
Do. to elevating platform	1	17 9	4 9	4 0	337 3
Do. do.	1	17 9	4 4	4 0	310 7
Piers	2	17 9	3 3	4 0	461 6
Wing-walls	4	11 6	3 6	4 0	644 0
Retaining walls	1	42 8	1 9	2 0	219 5
<i>Superstructure.</i>					
Abutment	1	16 0	3 6	3 9	210 0
Abutments, including cut waters and caps	2	14 9	4 0	9 9	1,150 6
Piers, including skew backs	2	15 2	4 0	3 0	465 1
Caps to piers	4	1 4	2 6	1 14	17 9
Wing-walls	2	11 6	2 6	9 3	531 10
Do.	2	0 8	2 0	5 6	21 1
Do.	2	1 4	1 10	3 9	18 9
Wing-walls at elevating platform side	2	11 6	2 16	9 3	531 10
Face walls at abutment	2	10 8	1 0	1 4	55 10
Filling up spandrels	2	12 6	1 16	2 10	106 3
Do. do.	2	12 6	2 9	1 0	68 9
Face walls	4	18 6	1 9	0 10	113 4
Do. at elevating platform	2	8 0	1 7	0 7	16 3
Parapet walls excluding cordon and coping work	2	82 6	1 3	2 0	412 6
Total					5,948 7
Deduct for arches	1	12 6	2 2	1 6	40 7
Net Cubic feet					5,908 0
Or Cubic yards of brick work in chunam.					218 7
Arches	3	22 0	12 6	1 6	1,237 6
Cubic feet					1,237 6
Or Cubic yards of arch work, brick in-chunam					45 7
<i>Pointing with chunam.</i>					
Side walls and intrados of arches	3	26 9	12 6		1,003 0
Cut waters of piers including caps	4	5 9	5 9		135 0
Wing-walls including faces and cut waters	4	15 6	3 3		573 6
Abutments of elevating platform	2	12 6	3 9		243 9
Cut waters including caps of do.	12	6 0	11 9		141 0
Face walls over arches	2	8 0	2 5		232 0
Spandrel walls over cut waters of piers.	4	1 2	4 0		40 0
Parapets in and out, &c.	2	80 9	2 0		679 0
Square feet of pointing chunam					3,047 3
Cut stone cordon work	2	82 6			165 0
Running feet of cut stone cordon work					165 0
Cut stone coping work	2	82 6			165 0
Running feet of cut stone coping					165 0

SECTION OF WING ON A B



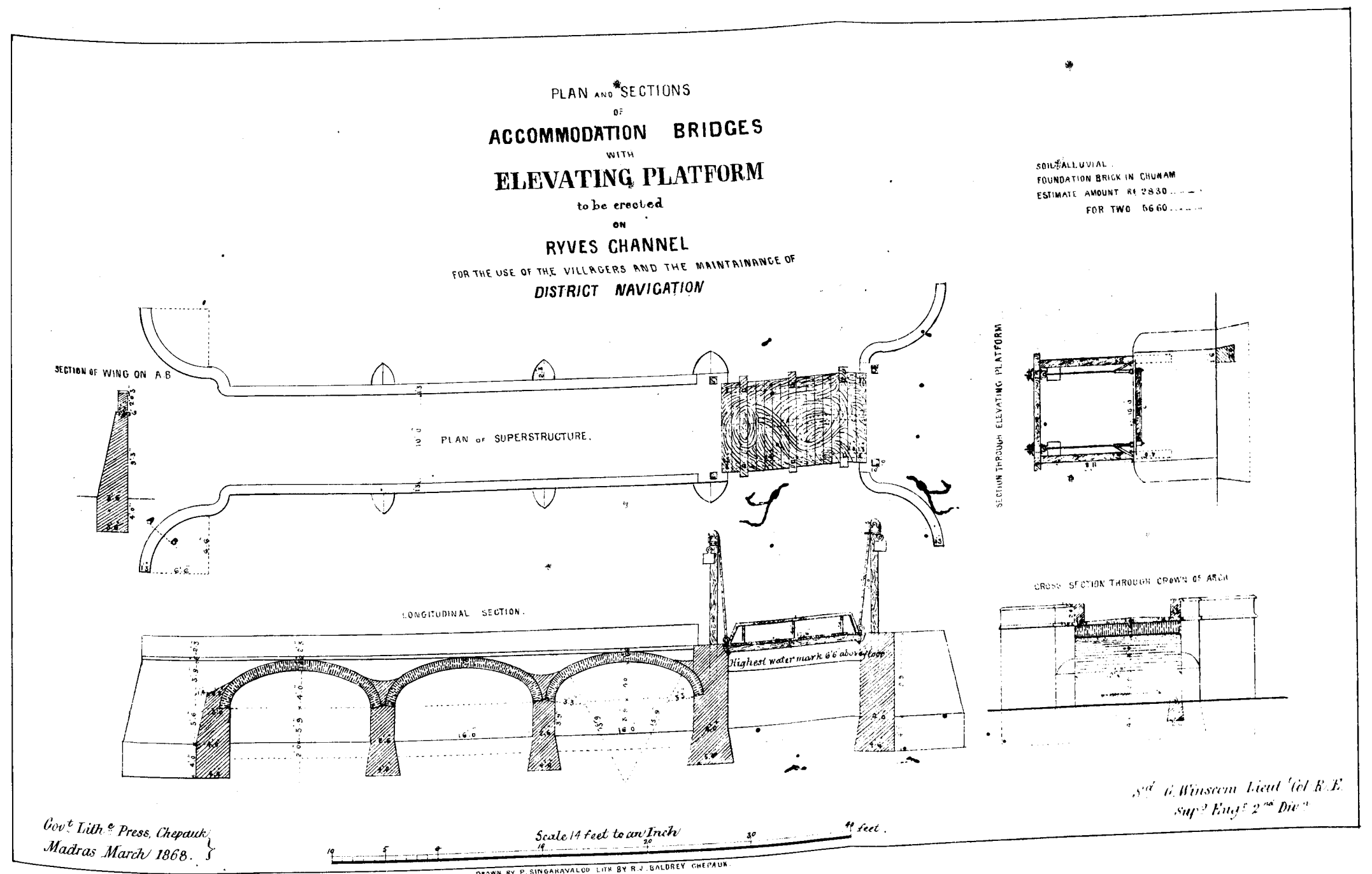
Govt Litho Press, Chempak
Madras March 1868.



DETAILED ESTIMATE.
KISTNA DISTRICT.

Work for constructing accommodation Bridge with elevating platform on Ryves Channel for the use of the villagers and the maintenance of district navigation.

Particulars of Work.	Number.	MEASUREMENTS.			Cubic yards.
		Length.	Breadth.	Depth.	
Foundations.					
Abutments	2	15 0	4 0	4 0	240
Do. elevating platform	1	17 0	4 9	4 0	338
Do. do	1	17 0	4 4	4 0	257
Piers	2	17 0	8 8	4 0	401
Wing walls	2	11 0	8 6	4 0	644
Retaining walls	1	42 8	1 9	2 0	219
Superstructure.					
Abutment	1	16 0	3 6	3 9	210
Abutments, including cut waters and	2	14 0	4 0	9 9	1,180
Face, including skew backs	2	15 2	4 0	3 0	462
Caps to piers	2	1 4	2 6	1 14	17
Wing walls	2	11 0	2 6	9 3	531
Do.	2	0 8	2 0	5 6	21
Do.	2	1 4	1 10	3 9	12
Wing walls at elevating platform side	2	11 0	2 16	9 3	531
Face walls of abutment	2	10 0	1 0	1 4	55
Piling up standards	2	12 6	1 16	2 10	106
Do.	2	12 6	2 9	1 0	68
Face walls	2	18 0	1 9	0 10	113
Do. at elevating platform	2	8 0	1 7	0 7	16
Parapet walls, excluding coping and	2	82 0	1 3	2 0	412
coping work					
Total					5,948
Deduct for arches					40
Net Cubic feet					5,908
Or Cubic yards of brick work at chunam					218 1/2
Arches					
3	22 0	12 6	1 6		1,287 0
Cubic feet					1,287 0
Or Cubic yards of arch work, brick					45 1/2
in chunam					
Pointing with chunam					
Side walls and intrados of arches	8	22 0	12 6		1,009 0
Cut waters of piers including face	2	1 0	5 9		135 0
Wing walls including face and cut	2	11 0	2 6		243 0
waters	2	8 0	1 9		141 0
Abutments of elevating platform	2	12 6	2 5		232 0
Cut waters including caps of do.	2	1 2	4 0		40 0
Face walls over arches	2	82 0	1 3		679 0
Parapet walls over cut waters of piers	2	8 0	1 7		165 0
Parapets in and out, &c.	2	8 0	1 7		165 0
Square feet of pointing chunam					3,047 3
Cut stone coping work	2	82 0	1 3		165 0
Running feet of cut stone coping work	2	82 0	1 3		165 0
Cut stone coping work	2	82 0	1 3		165 0
Running feet cut stone coping	2	82 0	1 3		165 0



*Proceedings of the Madras Government, Public Works Department,
20th August 1867.*

*Proceedings of the Madras Government, Public Works Department,
20th August 1867.*

KISTNA DISTRICT. (Continued.)					
Particulars of Work	Number	Measurements			Cubic contents
		Length	Breadth	Depth	
<i>Wood Work.</i>					
Posts	4	10	6	0 10	25 3
Cross beams over posts	2	0 0	0 0	0 0	0 0
Beams to platform	2	0 0	0 0	0 0	0 0
Tie struts	2	0 0	0 0	0 0	0 0
Planks	2	0 0	0 0	0 0	0 0
Projections of planks for railing	2	0 0	0 0	0 0	0 0
Top and side rails including projections	2	0 0	0 0	0 0	0 0
Railing posts do.	2	0 0	0 0	0 0	0 0
Struts	2	0 0	0 0	0 0	0 0
Cubic feet of teak wood					25 3
Chains, iron	4				3 000
Running feet of iron chain					3 000
Iron weights, nails, and straps, &c.					3 000
Total lbs. of iron					3 000
Iron rings with screw and nut	4				200
Iron pulleys with do. do.	2				100
Metalling roadway					100
Cubic feet					10 000
Or Cubic yards of metalling with kunkur					10 000
Centerings					
Baling water					
Fitting up elevating platform					
Excavating foundation and raising approaches, &c.					
Is and Contingencies					

*Proceedings of the Madras Government, Public Works Department,
20th August 1867.*

ABSTRACT ESTIMATE.

KISTNA DISTRICT.

WORK.—Constructing accommodation Bridge with elevating platform on Ryves' Channel for the use of the villagers and the maintenance of district navigation.

Quantity.	Description of Charges.	Rate.	Amount.	Total.
		RS. A. P.	RS. A. P.	RS.
218 $\frac{2}{3}$	Cubic yards of brick-in-chunam ...	5 8 0	1,203 7 8	
45 $\frac{1}{2}$	Do. of arch work, brick-in-chunam ...	6 12 0	309 6 0	
3,047	Square feet of pointing ...	1 8 0	45 11 3	
165	Running feet of cut-stone cordon work ...	0 4 0	41 4 0	
165	Do. of do. coping work ...	0 6 0	61 14 0	
130	Cubic feet of teak-wood wrought and put up.	2 8 0	325 0 0	
64	Running feet of iron chain ...	1 0 0	64 0 0	
3,600	Lbs. of iron for weights, nails, and straps, &c.	0 1 6	337 8 0	
4	Iron rings with screw and nuts ...	2 8 0	10 0 0	
4	Iron pulleys with do. do. ...	13 0 0	52 0 0	
16 $\frac{7}{8}$	Cubic yards of metalling roadway with brick kunkur ...	1 8 0	25 5 7	
	Centerings ...		125 0 0	
	Baling water ...		60 0 0	
	Fitting elevating platform ...		25 0 0	
	Excavating foundations and raising approaches, &c. ...		75 0 0	
	Sundries and Contingencies ...	2 8 0	69 7 6	
				2,830
	For another similar bridge ...			2,830
	Total ...			5,660

Specification for accommodation Bridges on Ryves' Channel.

1. These bridges are for the accommodation of the neighbouring villagers, who would otherwise be cut off by the water of canal from the adjacent country.
2. They will consist of three arches of 16 feet span and one bay with an elevating platform, which will be balanced by counterpoise weights, so that they can be raised or lowered by the strength of one man.
3. The arches will have a rise of 4 feet, and be oval in form as shown on plan.
4. Each pier will be 3 feet 9 inches in height, and 2 feet 6 inches in thickness.
5. The width of roadway will be 10 feet, and the parapets will be 1 foot 3 inches thick, and 2 feet 3 inches in height, including cornice work.
6. The whole will be built of brick and chunam, pointed very neatly.
7. The elevating bridge will be of teak-wood of the scantlings shown in estimate. The counterpoises will be formed of old iron. The pulleys, chain, &c. will be obtained from the stores at Madras.

MASULIPATAM,
10th July 1867.

(Signed) G. V. WINSCOM, Lieut.-Colonel, R. E.,
Superintending Engineer, 2nd Division

*Proceedings of the Madras Government, Public Works Department,
20th August 1867.*

DETAILED ESTIMATE.

KISTNA DISTRICT.

WORK.—Constructing accommodation Bridge across Pullairu at Murrevada, below junction of Ryves' Channel.

Particulars of Works.	Number.	MEASUREMENTS.			Cubical contents.
		Length.	Breadth.	Height.	
		Feet.	Feet.	Feet.	Feet.
Foundations to abutments, counted Squares.	3	18 $\frac{1}{2}$	4 $\frac{1}{2}$	4	1,054 $\frac{1}{2}$
Do. to piers, do.	3	18 $\frac{1}{2}$	3 $\frac{1}{2}$	4	721 $\frac{1}{2}$
Do. to wings ...	4	11 $\frac{1}{2}$	3 $\frac{1}{2}$	4	644
Retaining wall ...	1	94 $\frac{1}{2}$	1 $\frac{1}{2}$	2	329 $\frac{1}{2}$
<i>Superstructure.</i>					
Abutments ... counted Square	1	17	3 $\frac{1}{2}$	3	178 $\frac{1}{2}$
Do. ... do.	2	17	4 $\frac{1}{2}$	11 $\frac{1}{2}$	1,518 $\frac{1}{2}$
Do. ... do.	3	17	2 $\frac{1}{2}$	3	382 $\frac{1}{2}$
Piers ...	4	11 $\frac{1}{2}$	2 $\frac{1}{2}$	11 $\frac{1}{2}$	1,284 $\frac{1}{2}$
Wings ...	2	1 $\frac{1}{2}$	1 $\frac{1}{2}$	4 $\frac{1}{2}$	17 $\frac{1}{2}$
Do. ...	2	2 $\frac{1}{2}$	1 $\frac{1}{2}$	6	30
Do. ...	6	12 $\frac{1}{2}$	1 $\frac{1}{2}$	1 $\frac{1}{2}$	33 $\frac{1}{2}$
Caps ...	1	12 $\frac{1}{2}$	3 $\frac{1}{2}$	1 $\frac{1}{2}$	20 $\frac{1}{2}$
Backing to abutment	1	12 $\frac{1}{2}$	9	1 $\frac{1}{2}$	18 $\frac{1}{2}$
Do. to arch ...	3	12 $\frac{1}{2}$	4	2 $\frac{1}{2}$	253 $\frac{1}{2}$
Spandrels ...	1	12 $\frac{1}{2}$	1 $\frac{1}{2}$	1 $\frac{1}{2}$	33 $\frac{1}{2}$
Do. ...	2	67 $\frac{1}{2}$	1 $\frac{1}{2}$	2	185 $\frac{1}{2}$
Face walls ...	2	12 $\frac{1}{2}$	12 $\frac{1}{2}$	2 $\frac{1}{2}$	625
Do. ...	2	10	12 $\frac{1}{2}$	2 $\frac{1}{2}$	104 $\frac{1}{2}$
Do. ...	2	91	1 $\frac{1}{2}$	2	182
Blocking course	2	118	1 $\frac{1}{2}$	2	590
Parapets ...					8,206
Total brick-in-chunam, Cubic feet...					303 $\frac{1}{2}$
Or do. do. Cubic yards.					2,177
Arch work ...	4	27 $\frac{1}{2}$	12 $\frac{1}{2}$	1 $\frac{1}{2}$	80 $\frac{1}{2}$
Total arch work-in-chunam, Cubic yards...					228
Cut-stone cordon work ... Running feet...	2	114			228
Cut-stone coping work ... Total Running feet...	2	114			228
Wood Work.					
Posts...	4	16 $\frac{1}{2}$	1	5 $\frac{1}{2}$	45
Cross beams over posts	2	13 $\frac{1}{2}$	1	2 $\frac{1}{2}$	17 $\frac{1}{2}$
Beams for platform ...	3	17 $\frac{1}{2}$	1	2 $\frac{1}{2}$	20 $\frac{1}{2}$
Tie struts ...	2	14 $\frac{1}{2}$	1	2 $\frac{1}{2}$	13 $\frac{1}{2}$
Planks ...	2	17 $\frac{1}{2}$	10	1 $\frac{1}{2}$	29 $\frac{1}{2}$
Projection of planks for railing	6	1	1 $\frac{1}{2}$	1 $\frac{1}{2}$	2
Top and side rails including projections	2	19	2 $\frac{1}{2}$	2 $\frac{1}{2}$	3 $\frac{1}{2}$
Railing posts do. do.	6	2 $\frac{1}{2}$	2 $\frac{1}{2}$	2 $\frac{1}{2}$	1 $\frac{1}{2}$
Struts ...	6	2 $\frac{1}{2}$	2 $\frac{1}{2}$	2 $\frac{1}{2}$	130
Total teak-wood wrought and put up, Cubic feet					49
Pointing ... Squares					

DETAILED ESTIMATE.
KISTNA DISTRICT.

WORK.—Alterations and additions to Komatigoonta Calingulah and Ryves' Branch
Head Sluice as now proposed.

Particulars of Works.	No.	MEASUREMENTS.			Cubical contents.
		Length.	Breadth.	Depth.	
<i>Calingulah.</i>		Ft. In.	Ft. In.	Ft. In.	Ft. In.
Foundation.—Rubble masonry or brick-in-chunam.					
Body wall ...	1	21 9	4 0	6 0	522 0
Wing-wall ...	1	8 0	5 0	6 0	240 0
Abutment ...	1	11 3	5 9	3 6	226 5½
Do. ...	1	8 0	2 0	3 6	56 0
Wing ...	1	7 6	4 0	3 6	106 0
Piers including cut waters ...	2	12 6	4 0	3 6	350 0
Rear retaining wall ...	1	4 6	3 0	6 0	81 0
Front do. to the bridge ...	1	49 0	2 6	4 0	490 0
Flooring ...	1	21 0	15 3	2 0	640 6
<i>Superstructure.</i>					
Body wall, new work ...	1	8 6	2 9	2 6	58 5½
Do. do. throughout ...	1	45 6	1 10½	1 5½	125 3
Wing ...	1	20 0	3 3	10 0	650 0
Abutment ...	1	11 3	4 9	3 0	160 3½
Do. ...	1	8 0	1 6	3 0	36 0
Do. backing ...	2	11 3	3 6	1 6	118 1½
Wing ...	1	7 6	2 6	9 9	182 9½
Piers including cut waters ...	2	12 6	3 0	3 9	281 3
Rear retaining wall ...	1	54 0	2 0	1 6	162 0
Spandrels ...	2	11 3	3 6	1 9	137 9½
Side or face walls ...	2	52 0	2 0	1 8	346 8
Blocking course ...	2	52 0	1 6	0 6	78 0
Parapet ...	1	145 0	1 3	2 0	362 6
Total rubble masonry, Cubic feet ...					5,411 0½
Or Cubic yards...					200 1½
Arch work, brick-in-chunam ...	3	11 3	21 0	1 6	1,063 1½
<i>Pointing in chunam.</i>					
Body wall, new ...	1	8 6	7 6		63 9
Do. throughout ...	1	45 6	5 6		250 3
Wing do. ...	1	11 0	14 0		154 0
Abutments ...	2	11 3	3 0		67 6
Piers including cut waters ...	4	14 6	3 3		188 6
Wing ...	1	12 0	9 0		108 0
Intrados of the arch ...	3	11 3	22 0		742 6
Side or face walls ...	2	71 0	2 9		390 6
Parapets ...	2	71 0	2 7½		372 9
Rear retaining wall, above ...	1	54 0	3 6		189 0
Flooring ...	1	21 0	15 3		320 3
Total pointing, Square feet...					2,846½
Or Squares...					28½
Rough stone apron in rear of bridge ...	2	23 0	2 6	12 6	1,437 6
Do. backing in front of calingulah ...	1	64 6	20 0	2 0	2,570 0
	1	13 0	2 7½	12 6	426 6½
Total rough stone, Cubic feet...					4,434 0½
Or Cubic yards...					164 ½

DETAILED ESTIMATE.—(Concluded.)

Particulars of Works.	No.	MEASUREMENTS.			Cubical contents.
		Length.	Breadth.	Depth.	
		Ft. In.	Ft. In.	Ft. In.	Ft. In.
Excavating foundation ...					18½
Centering and baling ...					
Metalling ...					
Add for removing old materials ...					
Sundries and Contingencies ...					
<i>Head Sluice.</i>					
Foundation.—Rubble masonry or brick-in-chunam.					
Abutment ...	1	11 3	4 0	4 0	180 0
Wing ...	1	15 0	3 0	4 0	180 0
Do. ...	1	6 0	4 0	4 0	96 0
Do. ...	1	11 0	2 0	6 0	132 0
Front retaining wall ...	1	11 0	2 0	6 0	48 0
Rear do. ...	1	4 0	9 6	1 6	185 3
Flooring ...	1	13 0	4 0	1 6	204 0
Do. ...	2	17 0			
<i>Superstructure.</i>					
Abutment ...	1	11 3	3 0	4 0	135 0
Do. backing ...	1	11 3	1 0	4 0	45 0
Wing ...	1	15 0	1 9	6 0	157 6
Do. ...	1	6 0	1 9	8 0	84 0
Do. ...	1	6 0	1 9	8 0	31 6
Side or face walls including binding wall ...	2	14 0	1 1½	1 0	
Total rubble stone or brick-in-chunam, Cubic feet ...					1,478 3
Or Cubic yards...					54½
Arch work, brick-in-chunam... Cubic feet.	2	11 3	8 0	1 6	270
Pointing in chunam ... Squares.					6½
Rough stone apron in rear ...	2	26 0	2 6	10 3	1,332 6
	1	31 0	13 0	2 0	806 0
Total rough stone, Cubic feet...					2,138 6
Or Cubic yards...					79½
Teak-wood shutters ... Cubic feet.	2	4 6	8 0	2½	15
Cut-stone grooves ... Running feet.					32
Excavating foundation ...					6½
Centering and baling ...					
Metalling...					
Add for removing old materials ...					
Sundries and Contingencies ...					

*Proceedings of the Madras Government, Public Works Department,
20th August 1867.*

ABSTRACT ESTIMATE.

KISTNA DISTRICT.

WORK.—Alterations and additions to Komatigoonta Calingulah and Ryves' Branch Head Sluice as now proposed.

Quantity.	Particulars of Works.	Rate.	Amount.	Total.
	<i>Calingulah.</i>	RS. A. P.	RS. A. P.	RS. A. P.
200 ¹¹ / ₁₇	Cubic yards of rubble masonry or brick-in-chunam ...	5 8 0	1,102 3 10	
1,063-1 ¹ / ₂	Cubic feet of arch work, brick-in-chunam ...	0 4 0	265 12 6	
28 ¹ / ₂	Squares, pointing, chunam ...	1 8 0	42 12 0	
164 ² / ₅	Rough stone revetment ... per C. yd.	2 10 0	431 1 4	
	Excavating foundation ...	.....	50 0 0	
	Centering and baling ...	.....	150 0 0	
18 ¹ / ₂	Cubic yards metalling with brick kunker ...	1 8 0	27 12 0	
	Add for removing old materials ...	.....	10 0 0	
	Sundries and Contingencies at 5 per cent. ...	.....	110 6 4	
	<i>Head Sluice.</i>			2,190 0 0
54 ¹ / ₂	Cubic yards of rubble masonry or brick-in-chunam ...	5 8 0	301 13 0	
270	Cubic feet of arch work, brick-in-chunam ...	0 4 0	67 8 0	
6 ³ / ₄	Squares, pointing in chunam ...	1 8 0	10 2 0	
79 ⁵ / ₈	Cubic feet rough stone apron ...	2 10 0	208 13 4	
15	Do. teak-wood shutters wrought and put up... ..	3 0 0	45 0 0	
32	Running feet cut-stone grooves ...	0 12 0	24 0 0	
	Excavating foundation ...	.....	20 0 0	
	Centering and baling ...	.....	40 0 0	
6 ¹ / ₂	Cubic yards metalling with brick kunker ...	1 8 0	9 12 0	
	Add for removing old materials ...	.....	10 0 0	
	Sundries and Contingencies... ..	.....	42 15 8	
	Grand Total...	.....	.....	2,970 0 0

Specification Report to accompany Plan and Estimate for proposed alterations and additions to Komatigoonta Calingulah and Ryves' Branch Head Sluice.

CALINGULAH.

1. Waterway of existing calingulah to be enlarged by 20 feet 6 inches, and a bridge of three arches 16 feet span each to be built in connection with calingulah and immediately below it.
2. The foundation of the abutment to be 5 feet 9 inches broad and 3 feet 6 inches in depth, of the piers 4 feet and 3 feet 6 inches in depth, superstructure of piers and abutment 3 feet in height.
3. The foundation of wings to be 4 feet in average breadth, 3¹/₂ in depth, their superstructure to be 9³/₄ feet high.

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20th August 1867.*

4. The front retaining wall of the bridge to be 3 feet at bottom, 2 feet at top, and 4 feet in depth.

5. The arches of vents to have a versed sine of 4 feet 6 inches, and to be 1¹/₂ thick.

6. The calingulah constructed in 1861 is shown in lake in the plan. The parts colored green show the existing work to be removed.

7. The blocking course to be 1¹/₂ feet wide and 6 inches high.

8. The parapet 1¹/₄ feet wide and 2 feet high.

9. The foundation of body wall of calingulah is to be 4 feet in average breadth and 6 feet in depth.

10. The body wall to be 3 feet 11⁵/₈ inches high.

11. The foundation of the rear retaining wall to be 3 feet in average breadth and 6 feet depth. The wall itself to be 1¹/₂ feet × 2 feet.

12. The flooring between pier and abutment is to be 15 feet in breadth and 2 feet in depth.

13. The rough stone apron in rear to be 20 feet wide 2 feet thick, and the revetment at sides to be 12¹/₂ broad, 2 feet 6 inches thick, with slopes of 1 to 1.

HEAD SLUICE.

1. The head sluice to be increased from three to five vents, the dimensions being as follows:—

2. The foundation of the abutments to have an average width of 4 feet and the piers of 3 feet, both to be 4 feet high.

3. The abutment walls to be 3 feet on an average, and piers of 2 feet 6 inches average breadth, and 4 feet in height.

4. The foundation of wing-wall to be 3 feet 6 inches at bottom, 2 feet 6 inches at floor, 4 feet in depth, and the wall above to be 1 foot 9 inches breadth on an average, and 6 feet in height.

5. The arches of vents to have each a versed sine of 2 feet and to be 1¹/₂ feet thick. The three arches constructed in 1861 are shown in lake in the plan.

6. The parts colored green show the existing work to be removed.

7. Teak-wood shutters to be worked in grooves cut in hard stone in the abutments and piers.

8. The flooring under the arches and rear to be 1 foot 6 inches thick, and the retaining wall between front and rear wings to be 2 feet thick and 6 feet deep.

9. Rough stone apron in rear to be 13 feet wide 2 feet thick, and revetment at sides to be 10 feet 3 inches broad, and 2 feet 6 inches in average thickness.

10. The foundations and superstructure to be rubble masonry or brick-in-chunam, and arch work to be of the latter.

11. All the works to be neatly pointed with chunam.

(Signed) G. V. WINSCOM, Lieut.-Colonel, R. E.,
Superintending Engineer, 2nd Division.

MASULIPATAM,
10th July 1867.

*Proceedings of the Madras Government, Public Works Department,
20th August 1867.*

DETAILED ESTIMATE.

WORK.—Enlarging and improving Gudevadah branch of Ryves' Channel.

Num-ber of Sta-tions.	Distance.	Area of cutting.	Total cutting in each mile.	Extra quantity required for embankment.	Total earth-work for each mile.	Total for the whole channel.
1	660	105.922	427,823.22	94,934.4	522,757.62	
2		99.981				
3		103.431				
4		70.382				
5		119.196				
6		47.522				
7		60.513				
8		41.27				
9	660	648.217	253,484.88		253,484.88	
10		90.948				
11		18.476				
12		49.988				
13		40.002				
14		2.47				
15		66.646				
16		52.55				
17	660	62.988	290,842.86	243,957.12	534,779.98	
18		884.068				
19		100.614				
20		59.593				
21		78.949				
22		5.522				
23		70.277				
24		43.74				
25	660	62.180	568,096.32		568,096.32	
26		19.796				
27		440.671				
28		76.297				
29		103.666				
30		52.275				
31		49.887				
32		112.642				
33	660	76.691	875,762.58	7,529.28	883,291.86	
34		100.68				
35		288.614				
36		860.752				
37		97.456				
38		105.675				
39		83.968				
40		99.405				

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DETAILED ESTIMATE.—(Continued.)

Num-ber of Sta-tions.	Distance.	Area of cutting.	Total cutting in each mile.	Extra quantity required for embankment.	Total earth-work for each mile.	Total for the whole channel.
41	660	167.299	1,006,670.28		1,006,670.28	
42		147.007				
43		128.614				
44		217.557				
45		478.334				
46		111.781				
47		133.034				
48		141.632				
49	660	1,525.258	736,734.9		736,734.9	
50		143.251				
51		275.196				
52		195.509				
53		106.309				
54		78.6				
55		135.988				
56		108.89				
57	660	72.522	449,898.24		449,898.24	
58		1,116.265				
59		102.973				
60		109.361				
61		82.176				
62		37.688				
63		104.304				
64		75.666				
65	660	72.8	758,915.52		758,915.52	
66		96.696				
67		681.664				
68		63.48				
69		216.749				
70		126.067				
71		111.692				
72		152.854				
73	660	152.247	854,905.26		854,905.26	
74		177.571				
75		149.212				
76		1,149.872				
77		164.427				
78		462.549				
79		114.976				
80		110.647				
81	660	91.297				
82		109.145				

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20th August 1867.*

DETAILED ESTIMATE.—(Continued.)

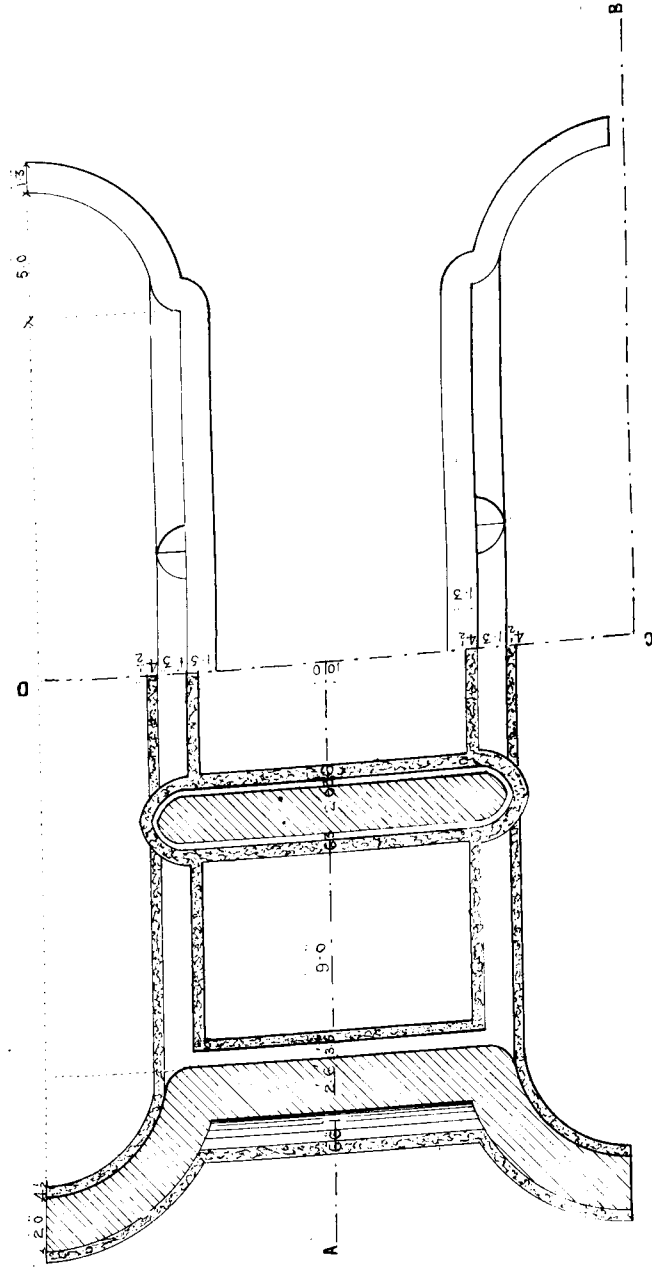
Number of Stations	Distance.	Area of cutting.	Total cutting in each mile.	Extra quantity required for embankment.	Total earth-work for each mile.	Total for the whole channel.
83 84 85 86 87 88	660	94.96 59.741 98.697 102.867 125.501 92.528 706.47	466,270.2	.. .....	466,270.2	
89 90 91 92 93 94 95 96	660	105.545 146.2 90.817 186.066 85.203 103.965 106.044 82.704 906.544	598,319.04	.....	598,319.04	
97 98 99 100 101 102 103 104	660	239.641 89.998 71.801 83.301 38.858 288.53 17.592 37.21 865.931	571,514.46	94,263.84	665,778.3	
105 106 107 108 109 110 111 112	660	76.416 69.132 75.142 33.956 38.482 63.584 48.398 50.55 455.66	300,735.6	.....	300,735.6	
113 114 115 116 117 118 119 120	660	86.626 42.072 42.027 1.456 12.626 14.277 34.667 13.899 247.65	163,449	292,253.28	455,702.28	
121 122 123 124		21.721 43.553 18.335 10.303				

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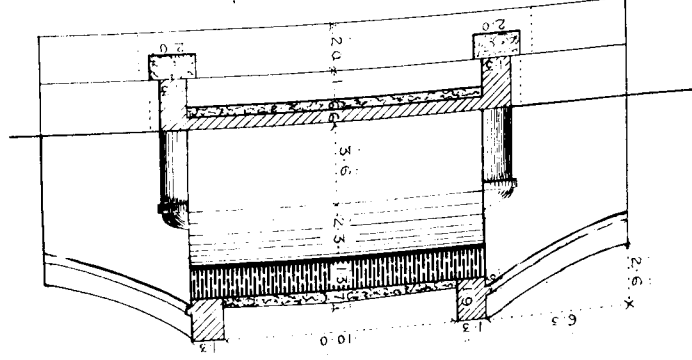
DETAILED ETIMATE.—(Concluded.)

Number of Stations.	Distance.	Area of cutting.	Total cutting in each mile.	Extra quantity required for embankment.	Total earth-work for each mile.	Total for the whole channel.
125 126 127 128	660	31.356 21.578 6.844 15.482 169.172	111,653.52	260,795.04	372,448.56	
129 130 131 132 133 134 135 136	660	41.869 16.424 12.691 25.069 18.655 22.564 16.4 27.878 181.55	119,823.0	210,518.88	330,341.88	
137 138 139 140 141 142 143 144	660	39.193 33.93 25.167 54.383 42.762 28.843 31.843 32.214 288.335	190,301.1	68,830.08	259,131.18	
145 146 147 148 149 150 151 152	660	65.303 32.647 33.826 47.591 23.164 35.421 36.997 36.863 311.812	205,795.92	269,016.0	474,811.92	
153 154 155 156 157	660	31.064 41.352 31.301 31.472 44.533 179.722	118,616.52	.....	118,616.52	
Or C. yards ...		...	.....	.....	.....	10,611,710.34 393,026.3

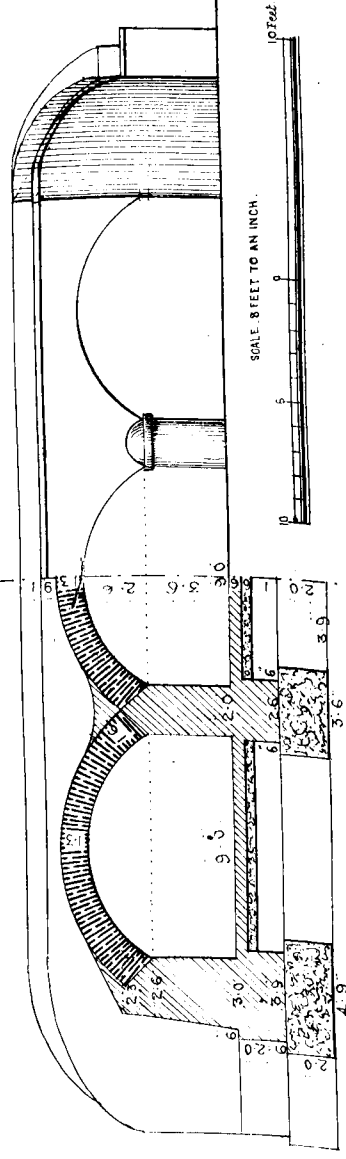
DESIGN FOR ACCOMMODATION BRIDGES TO BE BUILT ON RYVES BRANCH CHANNEL.



TRANSVERSE SECTION ON C.D.



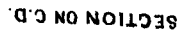
SECTION AND ELEVATION ON A.B.



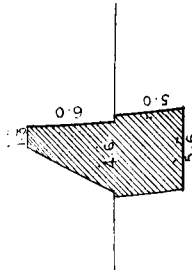
Foundation. Rubble Masonry in Chunam
Soil Alluvial
Amount of Estimate. Rupees 1260
For Three. Rupees 3780

(Signed) G. V. Winscom. Lieut. Col. R. E.
Superintending Engineer 2nd Division.

KISTNA DISTRICT.



SECTION ONE E.F.



Cost Material
Materials.
Estimate for one R^s T-80 - " "
Do for two R^s T-960 - " "

(Signed) G.V. Winscom, Lieut Colonel R.E.
Superintending Engineer 2nd Division.

40 FEET

SCALE - 10 FEET TO $\frac{3}{4}$ INCH.

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DETAILED ESTIMATE.—(Concluded.)

Particulars of Works.	Number.	MEASUREMENTS.			Cubical contents.
		Length.	Breadth.	Height.	
		Feet.	Feet.	Feet.	Feet.
Pointing Squares.	...	...	...	...	37½
Excavating foundations ... Cubic yards.	...	...	...	...	339
Teak-wood shutters... .. Cubic feet.	...	...	...	...	12½
Iron posts	3	...	...	...	...
Groove work Running feet.	...	...	...	...	5
Centerings and baling	...	...	...	...	...
Sundries and Contingencies	...	...	...	...	...

ABSTRACT ESTIMATE.

KISTNA DISTRICT.

Work.—Constructing two Calingulahs and Bridges on the Gudivadah branch of Ryves' Channel.

Quantity.	Description of Charges.	Rate.	Amount.	Total.
		RS. A. P.	RS. A. P.	RS. A. P.
8	Cubic yards of concrete-in-chunam, per			
287	Cubic yard	2 6 0	19 0 0	.....
756	Do. of rough stone-in-chunam, per			
	Cubic yard... ..	3 0 0	861 0 0	.....
78	Cubic feet of arch work brick-in-chunam,			
	per Cubic foot	0 4 0	189 0 0	.....
37½	Cubic yards of rough stone work, per			
12½	Cubic yard	1 0 0	78 0 0	.....
3	Squares of pointing ... per Square...	1 8 0	56 4 0	.....
5	Cubic feet of shutters teak-wood wrought			
	and put up	3 0 0	36 12 0	.....
3	Iron posts, each	12 0 0	36 0 0	.....
5	Running feet of groove work, per			
	Running foot	0 12 0	3 12 0	.....
339	Cubic yards of earth-work, per Cubic yard.	0 1 3	26 7 9	.....
	Centerings ... ..	.....	100 0 0	.....
	Baling ... ..	.....		1,406 8 9
	Sundries and Contingencies 5 per cent.			73 12 3
	Total Estimate Rupees for one.			1,480 0 0
	Do. do. for two.			2,960 0 0

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20th August 1867.*

Specification Report to accompany Plan and Estimate for constructing two Calingulahs and Bridges on the Gudivadah Branch of Ryves' Channel.

1. The foundation of abutments of bridges, including side walls of calingulahs, to be 21½ feet long, 5½ feet thick, and 5 feet deep.

2. Foundation of pier including cut water to be 14½ feet long, 4 feet thick, and 5 feet deep.

3. Foundation of front and rear wing-walls with returns to be 5½ feet thick and 5 feet deep, and above 2½ in average thickness, and the former 6 feet high and the latter 8 feet 7¼ inches.

4. Body wall to be 2½ feet wide, and 5 feet 7 inches in height, or 4 feet 4 inches above the floor, on which three cast-iron posts of 2½ feet high will be placed, thus dividing the water-way into four bays of 5½ feet each to be closed, when water is required, with two planks each, with iron rings. The side walls to be furnished with grooves cut in hard stone in which the planks can be worked.

5. Five steps to be built on each side of the side walls, as shown in plan, to facilitate the Lascars in working the planks. Side walls above 8½ feet × 2½ av. × 8 feet av.

6. Abutments above 12½ feet long 4½ feet wide at bottom, and 3 feet at the springing line, and 5 feet 4 inches high.

7. Pier above, including cut water, to be 13½ feet × 3 feet × 5 feet 4 inches. Bridge consisting of two arches of 10½ feet span each, with a versed sine of 3 feet and 1¼ feet thick to be constructed.

8. Flooring between abutments and pier to be 1½ feet thick, resting on a concrete of 6 inches thick.

9. Retaining walls between abutments and rear wings to be 1½ and 1½ feet thick, and 3¼ and 3½ feet high respectively.

10. The face walls and backing to be 5 and 1½ feet thick, and 1½ and ½ foot in average height.

11. The blocking course over the arch to be 1½ feet thick and 3½ inches in height.

12. The parapet walls to be 1½ feet thick and 2 feet high.

13. The rough stone aprons and revetments as shown in plan to be 13½ and 5 feet wide, 2 and 1½ feet thick to the former and 10 feet wide, 1½ feet thick to the latter.

14. Foundation and superstructure to be of rubble masonry.

15. Arch work and parapets to be of brick-in-chunam, and the whole to be pointed neatly.

(Signed) G. V. WINSCOM, Lieut.-Colonel, R. E.,
Superintending Engineer, 2nd Division.

MASULIPATAM,
10th July 1867.

*Proceedings of the Madras Government, Public Works Department,
20th August 1867.*

GENERAL ABSTRACT ESTIMATE.

KISTNA DISTRICT.

Work.—Enlarging and improving the Ellore Canal, Ryves' Canal, and its branch,
and erecting the necessary masonry works.

Quantity.	Description of Charges.	Rate.	Amount.	Total.
	Constructing two additional arches to the bridge at the head of Ellore Canal ...	...	rs. 10,340	rs.
	Enlargement of the Ellore Canal from the head near Bezoarah to the head of Ryves' channel, between the 7th and 8th mile ...	...	1,88,440	
	Enlarging the head sluice of Ryves' channel ...	...	5,400	
	Enlarging and improving Ryves' channel from head sluice to Pullairu near Murrevada ...	...	66,580	
	Constructing a bridge of five arches of 20 feet span on Ryves' channel at crossing the Ellore road ...	...	4,170	
	Constructing two accommodation bridges with elevating platforms on Ryves' channel ...	...	5,660	
	Constructing accommodation bridge across Pullairu at Murrevada, below junction of Ryves' channel ...	...	3,710	
	Alterations and additions to Komatigoonta calingulah and Ryves' branch head sluice as now proposed ...	...	2,970	
	Enlarging and improving Gudevadah branch of Ryves' channel ...	...	26,800	
	Constructing three accommodation bridges on Ryves' branch channel ...	...	3,780	
	Constructing two calingulahs and bridges on the Gudevadah branch of Ryves' channel ...	...	2,960	
	Stances and minor channels ...	...	5,000	
				3,25,810

MASULIPATAN,
10th July 1867.

(Signed) G. V. WINSOM, Lieut.-Colonel, R. E.,
Superintending Engineer, 2nd Division.

*Proceedings of the Madras Government, Public Works Department,
20th August 1867.*

DETAILED ESTIMATE.—(Continued.)

Particulars of Work.	No.	MEASUREMENTS.			Cubical contents.
		Length.	Breadth.	Height.	
		Ft. In.	Ft. In.	Ft. In.	Ft. In.
Front parapet wall of sluice excluding cut waters and pedestals	...	167 0	1 0	1 6	250 6
Cubic feet...	...	...	...	...	1,743 8
Or Cubic yards of brick-in-chunam...	...	...	...	...	64 $\frac{1}{2}$
<i>Arch work.</i>					
Arches for bridge excluding ashlar work ...	3	55 6	18 0	3 1 $\frac{1}{2}$	9,365 7
Do. small, for sluices do. ...	15	12 0	3 6	1 6	945 0
Arches for spandrels ...	2	16 6	11 9	1 3	484 8
Cubic feet...	...	...	...	...	10,795 3
Or Cubic yards of arch work brick-in-chunam.	...	...	...	...	399 $\frac{1}{2}$
<i>Plastering.</i>					
Intrados of bridge arches excluding ashlar work ...	3	51 3	18 0	...	2,767 6
Do. sluice do. do. do. ...	15	10 0	3 6	...	525 0
Square feet of plastering two coats of chunam.	...	...	...	...	3,292 6
Pointing to front parapets in and out ...	...	...	...	...	962 6
Do. rear parapet ...	...	350 0	2 9	...	1,006 6
Do. to parapet of sluice inside ...	...	366 0	2 9	...	244 6
Do. do. outside ...	...	163 0	1 6	...	135 0
Square feet of pointing to parapet...	...	90 0	1 6	...	2,348 6
Cornice work ...	2	191 0	...	...	382 0
Running feet of cut-stone cornice work...	...	...	...	...	382 0
Cut stone coping work including inside of parapet ...	2	202 0	...	...	404 0
Running feet of cut-stone coping work...	...	...	...	...	404 0
<i>Vertical Ashlar work.</i>					
Abutments including rear cut waters...	2	33 0	1 3	5 6	453 9
Piers including rear cut waters ...	2	59 0	1 3	5 6	811 3
Rear wing walls including pilasters up to cornice ...	2	22 0	1 3	10 6	577 6
Front wing walls ...	2	19 6	1 3	10 9	524 0
Masonry path ...	2	8 0	1 3	6 0	120 0
Front face walls over large arches ...	12	21 3	1 3	2 6	796 10
Rear do. over do. arches ...	12	20 0	1 3	2 6	750 0
Do. do. over piers and abutments ...	4	6 6	1 3	9 0	292 6
Caps to rear cut waters of piers and abutments.	4	6 6	1 3	3 0	97 6
Piers for sluice...	12	6 0	2 6	5 6	990 0
Cut waters of piers for do. above springing ...	12	2 6	1 0	3 9	112 6
Cubic feet...	...	...	...	...	5,526 0
Or Cubic yards of vertical ashlar work...	...	...	...	...	204 $\frac{1}{2}$
<i>lar work.</i>					
Faces of arches for bridge both sides...	6	55 6	1 6	3 1 $\frac{1}{2}$	1,560 11
Do. for sluices fr. ...	15	12 0	1 6	1 6	405 0
Front cut waters ...	4	7 0	1 6	13 0	546 0
Pilasters up to co ...	4	4 0	1 6	10 9	268 0

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20th August 1867.*

DETAILED ESTIMATE.—(Concluded.)

Particulars of Work.	No.	MEASUREMENTS.			Cubical contents.
		Length.	Breadth.	Height.	
		Ft. In.	Ft. In.	Ft. In.	Ft. In.
Pilasters at termination of wings ...	2	4 0	1 6	3 0	36 0
Do. do. of masonry path ...	2	2 0	1 6	2 0	12 0
Cut waters of piers for sluices...	12	2 6	1 0	11 6	345 0
Pilasters in parapet ...	6	4 0	2 9	2 9	181 6
Caps to pedestals ...	6	4 0	2 0	0 3	12 0
Caps to sluice cut waters including coping ...	14	3 0	2 0	0 6	42 0
Stringing course to cut waters of piers ...	2	7 0	0 4	0 6	2 4
Flat coping over sluice parapet ...	15	6 0	1 3	0 3	28 1
Cubic feet...	...	...	...	...	3,429 0
Or Cubic yards of ashlar work...	...	...	...	...	127
<i>Concrete work.</i>					
Concrete under floor ...	3	39 0	21 0	1 0	2,457 0
Filling up masonry path ...	2	10 0	2 4 $\frac{1}{2}$	14 0	665 0
Filling up spandrels of small arches ...	15	4 0	3 6	3 0	630 0
Cubic feet...	...	...	...	...	3,752 0
Deduct for piers ...	...	...	...	...	210 0
Net cubic feet...	...	...	...	...	3,542 0
Or Cubic yards of concrete work...	...	...	...	...	131 $\frac{1}{2}$
Planks for shutters ...	15	6 6	0 2 $\frac{1}{2}$	11 6	233 7
Cubic feet of teak-wood works...	...	...	...	...	233 7
Iron bars ...	15	6 9	0 2	0 2	2 9 $\frac{1}{2}$
...	15	6 9	0 3	0 3	6 3 $\frac{1}{2}$
Cubic feet...	...	...	...	...	9 1 $\frac{1}{2}$
Or lbs. of Iron bar...	...	...	...	...	4,434 $\frac{1}{2}$
Groove work ...	15	21 0	...	...	315 0
Running feet of groove work...	...	...	...	...	315 0
Metalling road-way ...	...	191 0	17 0	1 0	3,247 0
Cubic feet...	...	...	...	...	3,247 0
Or Cubic yards of metalling with brick kunkur.	...	...	...	...	120 $\frac{1}{2}$
Rough stone apron ...	...	133 0	18 0	1 6	3,591 0
Cubic feet...	...	...	...	...	3,591 0
Or Cubic yards of rough stone apron...	...	...	...	...	133
Guard stones ...	4	...	...	...	...
Excavating foundation and raising approaches.	...	...	...	...	...
Centerings ...	...	...	...	...	...
Baling water ...	...	...	...	...	...
Sundries and Contingencies ...	...	...	...	...	...

Proceedings of the Madras Government, Public Works Department,
20th August 1867.

ABSTRACT ESTIMATE.
ALTERNATIVE LINE.—KISTNA DISTRICT.

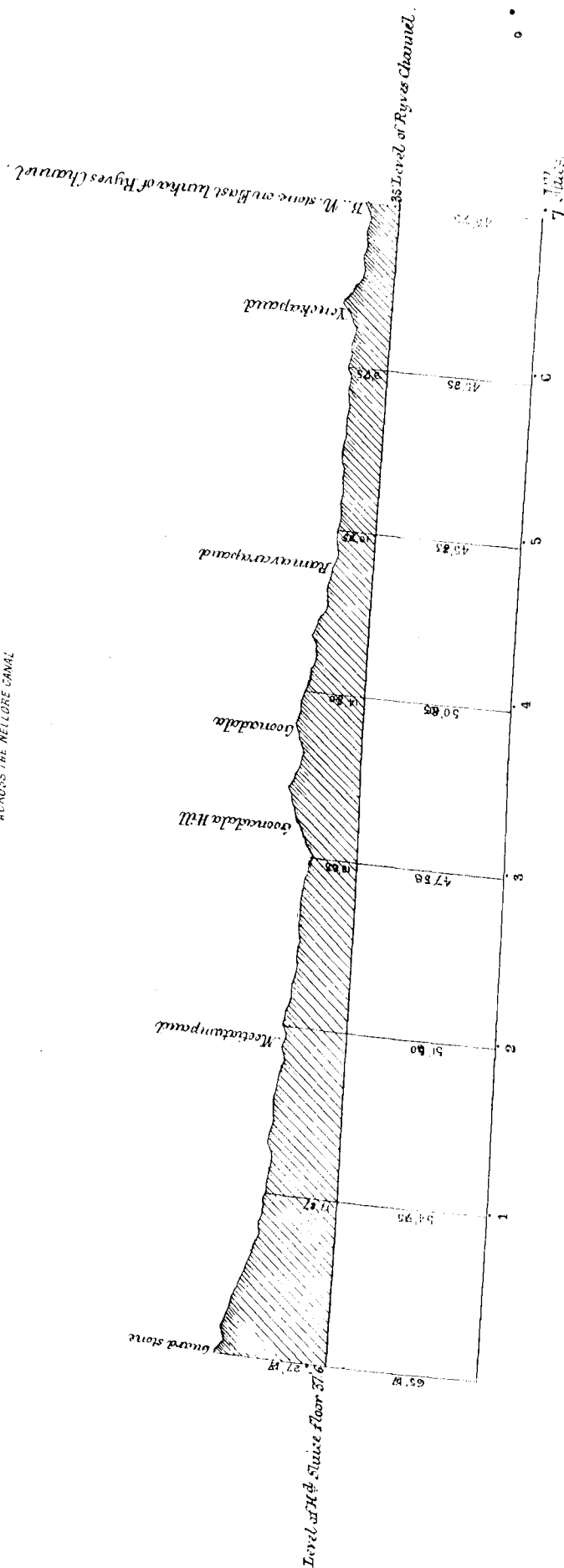
WORK.—Constructing Sluice and Bridge at head of proposed new line for Ryves' Channel at Bezoarah. The Bridge will answer for both the Ellore and Masulipatam roads.

Quantity.	Description of Work.	Rate.			Amount.			Total.		
		RS.	A.	P.	RS.	A.	P.	RS.	A.	P.
1,087 $\frac{3}{4}$	Cubic yards of rough stone in chunam	2	10	2	2,866	15	1			
64 $\frac{7}{8}$	Do. of brick-in-chunam ...	5	0	0	321	7	4			
399 $\frac{3}{4}$	Do. of arch work do. ...	5	13	9	2,342	10	7			
3,292	Square feet of plastering with two coats of chunam...	2	12	0	90	8	5			
2,348	Do. of pointing to parapet very neatly ...	1	4	0	29	5	7			
382	Running feet of cut-stone cornice work ...	0	8	0	191	0	0			
404	Do. of do. coping work ...	0	12	0	303	0	0			
204 $\frac{3}{4}$	Cubic yards of vertical ashlar work.	7	8	0	1,535	0	0			
127	Do. of fine wrought ashlar work ...	12	0	0	1,524	0	0			
181 $\frac{6}{8}$	Do. of concrete work ...	1	8	0	196	12	5			
233-7	Cubic feet of teak-wood wrought and put up for shutters ...	3	12	0	875	15	0			
4,454 $\frac{3}{4}$	lbs. of iron ...	0	1	6	415	12	0			
315	Running feet of groove work ...	0	12	0	236	4	0			
120 $\frac{7}{8}$	Cubic yards metalling road-way with brick kunkur ...	1	8	0	180	6	2			
133	Cubic yards of rough stone apron...	1	0	0	133	0	0			
4	Guard stones ...	3	0	0	12	0	0			
	Excavating foundations and raising approaches, &c. ...	.....			200	0	0			
	Centerings ...	.....			500	0	0			
	Baling water ...	.....			300	0	0			
	Sundries and Contingencies ...	.....						12,254	0	7
	Total Estimate...	.....						745	15	6
								13,000	0	0

Specification Report to accompany Estimate for constructing Bridge and Sluice at the head of proposed new line for Ryves' Channel—Rupees 13,000.

1. The foundations of the abutments, piers of bridge, and sluices to be of rough stone in chunam 6 feet deep, resting on natural soil.
2. Piers and abutments are to be connected by retaining walls in front and rear 2 feet 6 inches thick at top and 3 feet 6 inches at bottom, the latter 6 feet deep, and the former 5 $\frac{1}{2}$ feet only.
3. Abutments and piers of bridge are to be 21 feet long, the thickness of the former to be 11 feet at the floor, and 8 feet 7 $\frac{1}{2}$ inches at the springing, and that of the latter to be of uniform thickness of 6 feet 6 inches; both to be raised to a height of 5 $\frac{1}{2}$ feet above floor. The versed sine of the arches to be 12 $\frac{1}{2}$ feet, giving a total height of 18 feet to the soffit.
4. Length of the projection of the piers and abutments for sluices (excepting cut waters) to be 5 feet, the breadth will be 6 feet 6 inches, and height 10 feet. Rear cut waters of the piers and abutments are to be 2 feet 9 inches from the face of the arch with semi-circular caps of 1 foot 6 inches high, stringing course under 4 inches by 6 inches.

SECTION
OF
ALTERNATIVE LINE PROPOSED
FOR
RYVES CHANNEL.
The Head being adjacent to the Bridge at Bezoarah
ACROSS THE NELLORE CANAL.



Signed / G. V. WINSOM, Lieut. Col. R.E.
Superintending Engineer, 2nd Div.

DRAWN BY P. SINGARAO, LIAISON ENGINEER, GOVT. ENGINEERING, CHENNAI.

Proceedings of the Madras Government, Public Works Department.
20th August 1867.

5. Piers for sluices to be 5 feet in length, excluding cut waters $2\frac{1}{2}$ feet thick and $5\frac{1}{2}$ feet high. Front and rear cut waters to be 2 feet long with two plain faces.
6. Wing walls to vary from $20\frac{1}{2}$ feet in height close to abutment, to 10 feet 9 inches at the extremities; depth of the foundations to be reduced by steps of 2 feet up and 2 feet $9\frac{1}{2}$ inches on, for a length of 18 feet including 4 feet for pedestals.
7. Flooring will be 1 foot thick with a substratum of 1 foot of concrete; masonry path 4 feet wide, (for the Lascars to go over the sluice to work the shutters,) it will be built of rubble in chunam, the interior space between outside and wing-walls and the spandrels of the small arches will be filled up with concrete.
8. The bridge is to consist of three elliptical arches of 40 feet span each and 21 feet long, thickness at crown 2 feet 3 inches, and gradually increases to 4 feet thick at the haunches. The thickness of the semicircular arches of sluices to be $1\frac{1}{2}$ feet and spandrel arches 1 foot, all built of brick-in-chunam, excepting the front and rear faces of the large arches and the front faces of the small arches which are to be of ashlar work, to a depth of $1\frac{1}{2}$ feet. The intrados of arches of bridge and sluices to be plastered with two coats of chunam.
9. The superstructure of the wing-walls, small and large, piers, abutments, rear cut waters of the large and small piers, masonry path, and face walls are to be rubble stone in chunam, and faced with vertical ashlar masonry.
10. Front cut waters of the large and small piers and abutments, pedestals at the termination of the wing walls and masonry path, pilasters of piers and of parapets, caps of the pedestals and pilasters are to be cut-stone ashlar work.
11. Parapets of the bridge to be 1 foot 6 inches thick and 2 feet 9 inches high, excluding coping of 6 inches, and the sluice parapet to be 1 foot thick and $1\frac{1}{2}$ feet high excluding coping, all built of brick-in-chunam pointed very neatly; cut-stone cornice work at the foot of the parapet will be projected 6 inches and 9 inches high. Road-way over the arches in clear width 18 feet all along.
12. Length of the rough stone apron in rear of bridge to be 133 feet and 18 feet wide and $1\frac{1}{2}$ feet thick. Teak-wood shutters which will be worked in grooves in hard stones in the abutments and piers. Iron bars, 2 inches and 3 inches square, will be placed across the vents in rear of shutters as shown in the plan.

MASULIPATAM,
10th July 1867.

(Signed) G. V. WINSOM, Lieut.-Colonel, R. E.,
Superintending Engineer, 2nd Division.

ESTIMATE.
ALTERNATIVE LINE.

Estimate of the probable expense of excavating a new Channel as a head to Ryves' Channel from adjacent to the Bridge at Bezoarah across the Ellere Canal.

Miles.	Depth of cutting.	Area ($w+2d$) d .		
1	19.2	(90+38.4) 19.2	2,465.28	
2	14.7	(90+29.4) 14.7	1,755.18	
3	11.8	(90+23.6) 11.8	1,340.48	
4	13	(90+26) 13	1,508.0	
5	13.6	(90+27.2) 13.6	1,593.82	
6	10.4	(90+20.8) 10.4	1,152.32	
7	9.0	(90+18) 9.0	972.0	
		Square feet	10,787.18	
		Or Square yards	1,198.6 x 1,760 = 2,109,536 Cubic yards.	

*Proceedings of the Madras Government, Public Works Department,
20th August 1867.*

A B S T R A C T.

2,109,536 Cubic yards at 2 Annas per Cubic yard ... Rupees 2,63,692
Contingencies at 5 per cent. „ 13,188
Compensation „ 3,000

Total Rupees 2,79,880

MASULIPATAM,
10th July 1867.

(Signed) G. V. WINSOM, Lieut.-Colonel, R. E.,
Superintending Engineer, 2nd Division.

E S T I M A T E.

KISTNA DISTRICT.—ALTERNATIVE LINE.

WORK.—Enlarging and improving Ryves' Canal from the second mile to Pullairu near Murrevada.

Number of Stations.	Distance.	Area of cutting.	Total cutting in each mile.	Remarks.
1	660	604.9 $\frac{1}{16}$	3,244,560	
2		603.0 $\frac{1}{16}$		
3		559.11 $\frac{3}{8}$		
4		616.0 $\frac{1}{16}$		
5		655.0 $\frac{1}{16}$		
6		620.10 $\frac{5}{8}$		
7		624.11 $\frac{1}{16}$		
8		631.7 $\frac{3}{16}$		
		4,916.2 $\frac{1}{16}$		
9	660	600.0 $\frac{5}{8}$	2,428,140	
10		415.4 $\frac{9}{32}$		
11		287.8 $\frac{3}{4}$		
12		432.3 $\frac{2}{4}$		
13		502.1 $\frac{2}{8}$		
14		433.7 $\frac{9}{16}$		
15		477.6 $\frac{5}{8}$		
16		530.3 $\frac{1}{8}$		
		3,678.11 $\frac{5}{32}$		
17	660	476.0 $\frac{3}{8}$	1,855,590	
18		419.4 $\frac{1}{16}$		
19		354.0 $\frac{1}{4}$		
20		331.6 $\frac{1}{4}$		
21		340.6 $\frac{2}{4}$		
22		270.3		
23		255.10 $\frac{5}{4}$		
24		363.6 $\frac{3}{4}$		
		2,811.5 $\frac{1}{4}$		
25	660	377.2 $\frac{1}{4}$		
26		336.10 $\frac{1}{4}$		
27		328.0 $\frac{5}{8}$		
28		297.0 $\frac{1}{4}$		
29		318.1 $\frac{3}{8}$		
30		279.7 $\frac{3}{16}$		
31		213.11 $\frac{1}{16}$		

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20th August 1867.*

E S T I M A T E.—(Continued.)

Number of Stations.	Distance.	Area of cutting.	Total cutting in each mile.	Remarks.
32	660	233.7 $\frac{1}{32}$	1,573,770	
		2,384.6		
33		260.3 $\frac{1}{16}$		
34		237.0 $\frac{5}{8}$		
35		244.6 $\frac{1}{16}$		
36		258.0 $\frac{1}{16}$		
37		295.6 $\frac{3}{8}$		
38		227.3 $\frac{7}{8}$		
39		140.6 $\frac{9}{32}$		
40		239.6 $\frac{1}{32}$		
		1,902.9 $\frac{1}{16}$	1,255,980	
41	660	282.4 $\frac{1}{16}$	1,600,830	
42		277.4 $\frac{5}{16}$		
43		257.6 $\frac{3}{4}$		
44		223.6 $\frac{3}{4}$		
45		275.1 $\frac{7}{16}$		
46		304.7 $\frac{5}{8}$		
47		382.1		
48		422.11 $\frac{1}{4}$		
		2,425.7 $\frac{5}{16}$		
49	660	358.5 $\frac{2}{32}$	1,823,745	
50		360.5		
51		340.9 $\frac{9}{32}$		
52		302.2 $\frac{3}{16}$		
53		333.3 $\frac{1}{4}$		
54		371.4		
55		420.7 $\frac{9}{16}$		
56		276.2 $\frac{5}{16}$		
		2,763.3 $\frac{1}{16}$		
57	660	249.5 $\frac{3}{32}$	1,468,830	
58		233.3 $\frac{1}{32}$		
59		255.3 $\frac{2}{32}$		
60		282.9 $\frac{1}{32}$		
61		342.5 $\frac{3}{4}$		
62		356.8 $\frac{1}{8}$		
63		257.4 $\frac{3}{32}$		
64		248.1 $\frac{1}{8}$		
		2,225.5 $\frac{2}{32}$		
65	660	252.2 $\frac{1}{32}$	799,920	
66		161.6 $\frac{7}{16}$		
67		160.1 $\frac{1}{16}$		
68		150.3 $\frac{3}{8}$		
69		127.3 $\frac{5}{64}$		
70		131.1 $\frac{3}{16}$		
71		125.4 $\frac{2}{32}$		
72		104.0 $\frac{3}{16}$		
		1,212.0 $\frac{1}{32}$		

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A B S T R A C T.

2,109,536 Cubic yards at 2 Annas per Cubic yard ... Rupees 2,63,692
Contingencies at 5 per cent. " 13,188
Compensation " 3,000

Total Rupees 2,79,880

MASULIPATAM,
10th July 1867.

(Signed) G. V. WINSOM, Lieut.-Colonel, R. E.,
Superintending Engineer, 2nd Division.

E S T I M A T E.

KISTNA DISTRICT.—ALTERNATIVE LINE.

WORK.—Enlarging and improving Ryves' Canal from the second mile to Pullairu near Murrevada.

Number of Stations.	Distance.	Area of cutting.	Total cutting in each mile.	Remarks.
1	660	604·9 $\frac{1}{8}$	3,244,560	
2		603·0 $\frac{1}{8}$		
3		559·11 $\frac{3}{8}$		
4		616·0 $\frac{1}{8}$		
5		655·0 $\frac{1}{8}$		
6		620·10 $\frac{5}{8}$		
7		624·11 $\frac{5}{8}$		
8		631·7 $\frac{3}{8}$		
		4,916·2 $\frac{1}{8}$		
9	660	660·0 $\frac{5}{8}$	2,428,140	
10		415·4 $\frac{3}{8}$		
11		287·8 $\frac{3}{8}$		
12		432·3 $\frac{7}{8}$		
13		502·1 $\frac{3}{8}$		
14		433·7 $\frac{3}{8}$		
15		477·6 $\frac{5}{8}$		
16		530·3 $\frac{1}{8}$		
		3,678·11 $\frac{5}{8}$		
17	660	476·0 $\frac{5}{8}$	1,855,590	
18		419·4 $\frac{1}{8}$		
19		354·0 $\frac{7}{8}$		
20		331·6 $\frac{1}{8}$		
21		340·6 $\frac{3}{8}$		
22		270·3		
23		255·10 $\frac{5}{8}$		
24		363·6 $\frac{3}{8}$		
		2,811·5 $\frac{1}{8}$		
25	660	377·2 $\frac{7}{8}$		
26		336·10 $\frac{1}{8}$		
27		328·0 $\frac{1}{8}$		
28		297·0 $\frac{1}{8}$		
29		318·1 $\frac{3}{8}$		
30		279·7 $\frac{3}{8}$		
31		213·11 $\frac{1}{8}$		

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ESTIMATE.—(Continued.)

Number of Stations.	Distance.	Area of cutting.	Total cutting in each mile.	Remarks.
32	660	233·7 $\frac{7}{8}$	1,573,770	
		2,384·6		
33		260·3 $\frac{1}{8}$		
34		237·0 $\frac{3}{8}$		
35		244·6 $\frac{1}{8}$		
36		258·0 $\frac{1}{8}$		
37		295·6 $\frac{3}{8}$		
38		227·3 $\frac{7}{8}$		
39	660	140·6 $\frac{3}{8}$	1,255,980	
40		239·6 $\frac{3}{8}$		
		1,902·9 $\frac{1}{8}$		
41		282·4 $\frac{1}{8}$		
42		277·4 $\frac{1}{8}$		
43		257·6 $\frac{3}{8}$		
44		223·6 $\frac{3}{8}$		
45		275·1 $\frac{7}{8}$		
46	660	304·7 $\frac{5}{8}$	1,600,830	
47		382·1		
48		422·11 $\frac{1}{8}$		
		2,425·7 $\frac{5}{8}$		
49		358·5 $\frac{3}{8}$		
50		360·5		
51		340·9 $\frac{3}{8}$		
52		302·2 $\frac{3}{8}$		
53	660	333·3 $\frac{1}{8}$	1,823,745	
54		371·4		
55		420·7 $\frac{9}{8}$		
56		276·2 $\frac{5}{8}$		
		2,763·3 $\frac{1}{8}$		
57		249·5 $\frac{3}{8}$		
58		233·3 $\frac{1}{8}$		
59		255·3 $\frac{3}{8}$		
60	660	282·9 $\frac{5}{8}$	1,468,830	
61		342·5 $\frac{1}{8}$		
62		356·8 $\frac{1}{8}$		
63		257·4 $\frac{3}{8}$		
64		248·1 $\frac{1}{8}$		
		2,225·5 $\frac{3}{8}$		
65		252·2 $\frac{3}{8}$		
66		161·6 $\frac{7}{8}$		
67	660	160·1 $\frac{5}{8}$	799,920	
68		150·3 $\frac{3}{8}$		
69		127·3 $\frac{5}{8}$		
70		131·1 $\frac{3}{8}$		
71		125·4 $\frac{5}{8}$		
72		104·0 $\frac{3}{8}$		
		1,212·0 $\frac{1}{8}$		

ABSTRACT ESTIMATE.

KISTNA DISTRICT.

WORK.—First alternative line of Ryves' Channel, referred to in paragraph 7 of
Superintending Engineer's letter to Government, No. 47 of 10th July 1867.

Quantity.	Description of Charges.	Rate.	Amount.	Total.
	Constructing a sluice and bridge at head of the alternative line ... ..	.....	RS. 13,000	RS.
	Excavating a new channel from do., including compensation... ..	.....	2,79,880	
	Enlarging and improving Ryves' channel from the 2nd mile of Ryves' channel to Pullairu, near Murrevada ... ..	.....	58,180	
	Constructing a bridge of five arches of 20 feet span each on Ryves' channel, at crossing the Ellore road ... ..	.....	4,170	
	Constructing two accommodation bridges, with elevating platforms, on Ryves' channel. ....	.....	5,660	
	Constructing accommodation bridge across Pullairu, at Murrevada, below junction of Ryves' channel ... ..	.....	3,710	
	Alterations and additions to Komatigoonta calingulah and Ryves' branch head sluice, as now proposed ... ..	.....	2,970	
	Enlarging and improving Gudevadah branch of Ryves' channel ... ..	.....	26,800	
	Constructing three accommodation bridges on Ryves' branch channel ... ..	.....	3,780	
	Constructing two calingulahs and bridges on the Gudevadah branch of Ryves' channel ... ..	.....	2,960	
	Sluices and minor channels ... ..	.....	5,000	
				4,06,110

No. 468.

ORDER THEREON, 20th August 1867, No. 2,543.

IRRIGATION, No. 7.

1. With the letter above recorded, the Superintending Engineer of the 2nd Division submits plans and estimates for certain works connected with the general scheme of irrigation from the Kistna Anicut, as proposed by Colonel Anderson, the late Superintending Engineer, and approved of by this Government and by the Secretary of State for India.

2. The works which are now brought forward by Colonel Winscom provide for the extension of irrigation in the eastern, or the Masulipatam side of the Kistna Delta, and with this object in view he has submitted two alternative projects; the first including the enlargement of the Ellore Canal, and of its main branch, known as "Ryves' Channel," which at present is led from it, in a south-easterly direction, at a point seven miles east of Bezwarrah; while the second provides for the excavation of an entirely new head to "Ryves' Channel," giving it an independent source at Bezwarrah, at the point where the Ellore and Masulipatam Canals now bifurcate.

3. The estimates submitted by the Superintending Engineer show the cost of the two projects to be respectively Rupees 3,25,810 and Rupees 4,06,110.

4. Colonel Winscom enters in his letter into the advantages and disadvantages of each scheme; and after a full consideration of the papers upon the subject, the Government agree with him that the large additional sum of Rupees 80,300 will be well spent in securing an independent head to a channel which will play so important a part in the irrigation of the Delta.

5. The larger estimate of Rupees 4,06,110 will accordingly be recommended to the Government of India for sanction.

Ordered that the following letter be sent:—

(Here enter No. 2,544, dated 20th August 1867.)

(True Extract.)

(Signed) J. H. M. SHAW STEWART, Major, R. E.,
Under Secretary to Government.

To the Superintending Engineer, 2nd Division.
" Accountant General.
" Controller of Public Works Accounts.
" Revenue Department.

PUBLIC WORKS DEPARTMENT,
FORT ST. GEORGE,
20th August 1867.

No. 2,544.

No. 469.

To

THE SECRETARY TO THE GOVERNMENT OF INDIA,

PUBLIC WORKS DEPARTMENT.

SIR,

IRRIGATION, No. 8.

1. I am directed to forward for the consideration of the Government of India the accompanying plans and estimates for works connected with the general scheme of irrigation from the Kistna Anicut, as proposed* by Colonel Anderson, the late Superintending Engineer of the 2nd

* In letter No. 143, dated 6th January 1863.

Division, and approved of by this Government and by the Secretary of State for India.

2. The works which are included in these estimates provide for the extension of irrigation in the eastern, or the Masulipatam side of the Kistna Delta, and with this object in view two alternative projects have been submitted by the Superintending Engineer; the first including the enlargement of the Ellore Canal, and of its main branch, known as "Ryves' Channel," which at present is led from it, in a south-easterly direction, at a point seven miles east of Bezwarrah, while the second provides for the excavation of an entirely new head to "Ryves' Channel," giving it an independent source at Bezwarrah, at the point where the Ellore and Masulipatam Canals now bifurcate. The cost of the two projects is estimated at Rupees 3,25,810 and 4,06,110 respectively.

3. Colonel Winscom enters in his letter into the advantages and disadvantages of each scheme; and after a full consideration of the papers upon the subject, I am to state that this Government agree with that Officer that the additional sum of Rupees 80,300 will be well spent in securing an independent head to a channel which will play so important a part in the irrigation of the Delta.

4. Seeing that large returns are being realized from the Kistna works in their present incomplete state, and that the development which it is now proposed to give to those works will unquestionably add to their remunerative character by affording better supplies of water to rapidly extending cultivation, I am to request that the estimate of Rupees 4,06,110 may receive the sanction of the Right Honorable the Governor General in Council.

I have the honor to be,

Sir,

Your most obedient servant,

(Signed) J. H. M. SHAW STEWART, Major, R. E.,

Under Secretary to Government.

Exd. T. O'Connor.

No. 603. Read the following letter from the Secretary to the Government of India, Public Works Department, (Irrigation,) to the Secretary to the Government of Madras, in the Public Works Department, dated Simla, 25th October 1867, No. 163 I:—

1. I am directed to acknowledge receipt of your letter, No. 2,544 of 20th August last, submitting estimates, amounting to Rupees 4,06,110, for modifying and enlarging the irrigating channels on the east bank of the Kistna river, being part of a scheme in contemplation for the general enlargement of the Kistna system of irrigation.

2. This project, like the one relating to the Pennair irrigation in Nellore, noticed in my letter No. 147 I., of 18th September last, is submitted in a shape which does not properly admit of the responsible Officers of the Government of India forming an independent judgment regarding it. In the present case, however, the presumptions are so far in favor of the project having been duly considered, and being likely to prove fairly remunerative, that the Governor General in Council will not withhold his sanction from the estimate; but His Excellency in Council, at the same time, directs me to express a hope that all such projects will in future be submitted in the complete form prescribed in the letter above quoted.

3. There are one or two points in connection with the project under consideration, to which it is considered desirable that the attention of the Government of Madras should be drawn, and these I am now briefly to notice.

4. The regulating sluice bridge at the head of the new cut is not adapted for navigation, which is perhaps not necessary, as the old canal is available. But the waterway being broken up into 6 feet openings, it is not clear why a bridge with 40 feet spans should be constructed. Such a bridge may possibly be cheaper than one with smaller openings, but this is not likely, and the matter may, with advantage, be re-considered.

5. The five arch bridge over Ryves' channel for the Ellore road has 20 feet arches, which probably are considerably cheaper than 40 feet arches, but if arrangements are made for the navigation of any part of this channel, it is not evident why this bridge should not be adapted for navigation as well as others. This remark applies also to the Komatigoonta calingulah. Probably the expense of a lock is considered uncalled for, but as the drop at this calingulah is only about $2\frac{1}{2}$ feet, the cost would not be great. Again, if Ryves' channel is to be made navigable throughout, either the old head sluice, or the one at the head of the new cut, should apparently be modified.

6. It is also necessary to notice that no allusion is made to what is intended to be done at the main anicut head sluice. If an increased supply of water is to be sent down Ryves' channel, it must come into the main channel somehow. It is not said whether the existing sluices are sufficient, but it is thought that they are not, and that an enlargement will be needed. Some remarks are made in Colonel Anderson's letter on this point, but they do not admit of any exact conclusions being come to regarding them.

7. Further, I am to notice that no reference is made to the general scope of the extension that it is proposed to give to these works eventually, nor whether what

that, with the channels enlarged to the full capacity, and with a depth on the head sluice floor (in front) of nine feet, there would be a loss of head of nine inches at the sluice itself, and three inches more at the bifurcation of the Ellore and Masulipatam canals, that is, close to the site of the new head to "Ryves' channel," the whole discharge being computed at the rate of 2 cubic yards per hour per acre for 270,000 acres. As the depth of water allowed for Ryves' channel is 7 feet, it is evident that so great a depth as that abovementioned would not be required at the main head sluice.

7. But even allowing 9 feet on the floor to be the standard level required eventually for the full supply of the canals, the only means that are required to obtain it are certain appliances for raising the surface of the water in the river after the close of the freshes in the month of October. The present level of the crest of the anicut is $5\frac{1}{2}$ feet above the main head sluice floor. The average level of the surface water during October is $3\frac{3}{4}$ feet, and during the first half of November $2\frac{1}{4}$ feet above the crest. It would be quite possible to raise the surface to the required standard by means of iron posts and planking, but it is not desirable that such an expedient should be had recourse to until it can be determined for certain whether the desired end cannot be accomplished by the construction of a rough stone dam along the crest of the anicut at the expiration of the freshes of each season. The latter plan is by far the most economical that could be adopted, and it has the advantage of furnishing a supply of material for the annual repair of the work, and of practically lengthening the working season.

8. With reference to Colonel Dickens' remark that no explanation has been given as to the general scope of the extension which it is proposed to give to the works eventually, nor whether "what is now projected may fairly be regarded as "a final measure so far as the particular canals now dealt with are concerned," I would point out that the general design of the extension required for the completion of all the Delta system was fully described in the District Engineer's letter, dated 6th January 1863, and that, so far as the scope of the extension is concerned,

Dated 9th December 1864, No. 33.

the proposed arrangements appear to have met with the full approval of the Secretary of State.

9. The Superintending Engineer has on the present occasion submitted detailed estimates of one section of the general scheme, and in complete accordance with it. He will now be called upon, in conformity with the instructions of the Government of India, to submit plans and estimates for the remaining sections. The *design* of the whole project has already been drawn out, though not apparently in so comprehensive a manner as the Government of India require, and it will therefore be revised and amplified. Full information will be afforded regarding the quantity of water that can confidently be relied on for the supply of the Delta channels, the means by which the delivery of the supply from the river is to be secured, and the area of the lands available for the utilization of that supply.

(Signed) J. C. ANDERSON, Lieut.-Colonel, R. E.,
Chief Engineer for Irrigation.

No. 604.

ORDER THEREON, 27th November 1867, No. 3,684.

IRRIGATION, No. 34.

1. Forwarded to the Superintending Engineer of the 2nd Division, with an intimation that the questions raised in

paragraphs 3, 4, 5, and 6, will be replied to by this Government.

2. In accordance with the instructions of the Government of India, Colonel Winscom will prepare plans and estimates for the completion of the whole Kistna project, and submit with them a report showing, in a full and comprehensive manner the quantity of water that can confidently be relied on for the supply of the channels, the means by which the delivery of the supply from the river is to be secured, and the area of the lands available for the utilization of that supply. He will also revise the scheme which was submitted with the late District Engineer's letter dated 6th January 1863, and allow for the construction of any additional works which further experience may have shown to be necessary, particularly as regards the provision of outlets for the free discharge of surplus or drainage water both at ordinary times, and on occasions, when, from an extraordinary fall of rain or from other causes, the channels may have drawn from the river a larger supply than it may be possible to use.

3. The Revenue authorities should be consulted both as to the number and sites of additional bridges which may be required for the accommodation of traffic along thoroughfares.

4. The design for a bridge of five arches of twenty feet span across Ryves' channel is not a neat one, and an improved design should be substituted, if it can be done without any material increase of cost, and with a view to its not interfering with the occasional passage of punts or other boats.

5. The plans which accompany the estimates for the project now sanctioned are retained for record, but if required by the Superintending Engineer, they will be returned after being copied.

Ordered that the following letter be sent:—

(Here enter No. 3,685, dated 27th November 1867.)

(True Extract.)

(Signed) CHARLES A. ORR, Colonel, R. E.,

Secretary to Government.

To the Superintending Engineer, 2nd Division.

.. Revenue Department.

.. Controller of Public Works Accounts.

.. Accountant General.

Exd. T. O'Connor.

PUBLIC WORKS DEPARTMENT,
FORT ST. GEORGE,
27th November 1867.

No. 3,685.

No. 605.

To

THE SECRETARY TO THE GOVERNMENT OF INDIA,

PUBLIC WORKS DEPARTMENT.

SIR,

IRRIGATION, No. 35.

1. I am directed to acknowledge the receipt of your letter under date the 25th October 1867, No. 163 I., in

which you communicate the sanction of the Government of India to the estimates forwarded with Major Shaw Stewart's letter of the 20th August 1867, No. 2,544, and which, amounting to Rupees 4,06,110, provide for modifying and enlarging certain channels on the left bank of the Kistna in furtherance of the general scheme of irrigation in the Delta of that river under the command of the anicut at Bezwadah. Referring you to the accompanying Memorandum by the Chief Engineer for Irrigation and Joint Secretary in this Department, I am to state that the wishes of the Government of India as to the manner in which plans and estimates hereafter sent up for their consideration shall be submitted, will be strictly attended to.

2. With regard to your remarks on the designs for the regulating sluice bridge at the head of the proposed new cut, and for the bridge of five arches over Ryves' channel for the Ellore road, I am to explain that, as the excessive deposition of silt which takes place in those of the Kistna channels which have been formed with a moderate slope to fit them for navigation greatly interferes with their usefulness both for navigation and irrigation, and necessitates not only a heavy annual outlay on their clearance, but also their being closed for longer periods every year than is desirable, it was some time ago determined by this Government, on the recommendation of the then District Engineer, to restrict navigation to two main through lines on each bank of the river, and to direct that all other channels should be laid out with the more rapid slopes suited for irrigation only.

3. The two main lines on the left bank of the river are the channels from Bezwadah to Ellore, and from Bezwadah to Masulipatam, with its branch to Bantoomilly for the accommodation of the salt trade. The cut to form the proposed new head to Ryves' channel, with that channel itself, is accordingly planned exclusively for irrigation, and the head sluice, requiring to have combined with it a bridge for the Masulipatam and Hyderabad road, is so designed as to give the necessary accommodation to the road, and to afford the requisite power of regulating the supply of the channel with the smallest expenditure of material and at the least cost. In the same way the bridge for the Ellore road across Ryves' channel, and the Komatigoonta calingulah are designed with a view to economy and facility of construction without regard to the requirements of navigation. The bridge will not be a handsome one, and an improved design for it will be substituted if it can be done without any material increase of cost.

4. As regards the doubt expressed in paragraph 6 of your letter of the capacity of the main head sluice at the anicut to deliver the increased quantity of water that will be required by the enlargement of the channels now sanctioned, and by the future enlargement of others to provide for the full area of land which must ultimately be watered, I am to say that the eventual extension of irrigation to the whole culturable lands of the Delta having been kept in view from the beginning, the head sluices at either flank of the anicut were built of sufficient capacity to deliver a full supply to all. Towards the close of the cultivating season the river sometimes falls so low as to make it difficult to throw into the channels a full supply, but this cannot be remedied without obtaining a command of head, and that, in the opinion of this Government as at present advised, can best and most safely be done by constructing each season a rough stone bank along the crest of the anicut on the final subsidence of the freshes.

5. In Major Shaw Stewart's letter submitting the estimates for the enlargement of the channels now sanctioned, reference was made to a general scheme for the completion of the irrigation of the Kistna Delta under the anicut at Bez-wadah which had met the approval not only of this Government but of the Secretary of State for India, and, as that general scheme was before the Government of India, it was not considered necessary to enter into a further description of the scope of the extension which it is proposed to give to the works in the Delta. I am, however, now instructed to state that, in compliance with the desire of the Government of India, steps will be taken for the preparation in a full and detailed shape of a complete project for the whole system of Kistna works, based on the most comprehensive view of the irrigation from that river and of the supply of water it affords.

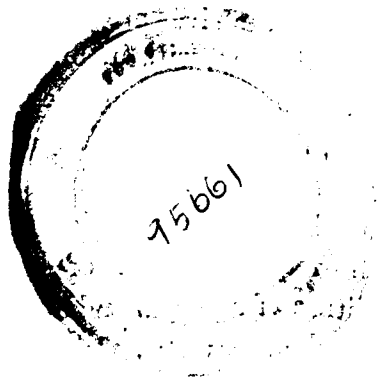
I have the honor to be,

Sir,

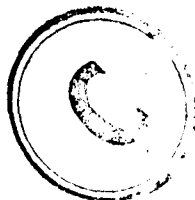
Your most obedient servant,

(Signed) CHARLES A. ORR, Colonel, R. E.,

Secretary to Government.



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of your letter of the capa-
city of water