M.R.O. 1—77,606—8-6-37.

(1) Number of pages 38

(2) Date of repair 14-11-40

(3) Initials of the Referencer

MADRAS RECORD OFFICE.

Government of Madras.

Financial DEPARTMENT.

G.O. No. 80 Press Mis.

Dated 16-1- 1876.

Not to be folded or roughly handled

Local Funds—Roads.

Read the following papers :—

No. 112. From E. H. PRINGLE, Esq., Acting Special Executive Engineer, Wynaad, to Major-General G. W. WALKER, R.E., Secretary to Government, Public Works Department, dated Luckadie, 26th June 1875, No. 524.

I have the honor to report the partial failure of the Kallur Bridge, on the Sultan's Battery and Gundalpett Road, now in course of erection, through the cracking of one of the teak beams of the girders.

2. The bridge is one of 75 feet span, teak, cross braced with iron, originally sanctioned in G.O., No. 2515, dated 5th August 1868. In 1869 this bridge failed by reason of the omission of the understring and the bad work of the contractor, Mr. I. Tipping, C.E. The latter fault necessitated the rebuilding of a large portion of the abutments, a matter of time, for the feverish nature of the place shortens the working season and acts as a great deterrent to contractors, &c., doing work that requires a lengthened stay.

3. The masonry was therefore only completed last year, and in March the girder was begun to be put across. This work, through the constant sickness of those employed and difficulties of labor, has been so slow that it was only last Saturday, 19th June, that the supports could be removed, which was carefully done under the personal supervision of the Overseer. The several rods of the understring, however, did not fit accurately enough to relieve the strain and both girders sagged considerably. Whilst repropping them to have alterations made the centre beam of one girder sprung to the extent of some three inches.

4. On the 20th instant I inspected the damage and find it will be necessary to take down both girders. This will be done as soon as the state of the river, now flooded by the monsoon rains, will permit, and in the meantime the temporary bridge will be repaired to allow of traffic being resumed.

No. 113. From E. H. PRINGLE, Esq., Acting Special Executive Engineer, Wynaad, to Major-General G. W. WALKER, R.E., Secretary to Government, Public Works Department, dated Luckadie, 1st September 1875, No. 683.

In furnishing the fuller report on the failure of the Kallur Bridge called for in your memorandum, No. 154, dated 1st July 1875, I have the honor to explain that some delay has arisen from my inability to visit the work until recently.

2. As before reported, the immediate cause of the cracking of the teak beam was the absence of support by the tie-rod, the sections of which were too long.

3. The total distance from outside to outside of the pins upon which the parts of the tie-rod bore is 12 feet and 8 inches, and had the eyes of the rod been of equal diameter to the pins (two inches) there would have been two inches to spare for tightening up. Unfortunately the diameter of each eye is $3\frac{1}{2}$ inches,*

* I have been unable to find a copy of the drawings of extra iron work required, forwarded by Colonel Kennedy to the Public Works Workshops in 1869. The disparity between the eyes and pins is difficult to account for.

and the distance between their bearing points in tension on the pins exceeds that from outside to outside of pins by one inch (*vide* accompanying sketch A).

4. But for an untimely accident this error in the length of the rods would have been discovered before the final erection of the bridge. Colonel Kennedy had ordered the Superintendent, Mr. D'Souza, in charge of the work, to put up one girder on the bank, and on the 2nd of June had gone to inspect it, the Superintendent having reported that it was ready. A few hours before Colonel Kennedy's arrival the timber supports upon which the girder rested gave way and the girder falling had to be taken to pieces. The close approach of the monsoon and much prevalent sickness, that had already retarded and was likely still further to interfere with progress, made it obligatory to proceed with the work *in situ*.

5. Subsequently to this Colonel Kennedy was engaged in handing over charge to me, and could not again inspect the bridge. The next visit to Kallur was my own, on the 19th June, that during which the accident occurred. The Overseer, Mr. Brown, had had in the interim no time to go out himself to the place as he was fully occupied with the erection of the Kulpetta iron bridge—a work thrown on our hands through the failure of the contractor, Mr. Maylor, to provide labor for it prior to the monsoon.

6. On the 19th it was raining heavily and a flood was imminent; it was therefore necessary to clear the river of the scaffolding with the utmost expedition. On the morning in question I had, as far as possible, examined the girders in their position, and, in case I should be unable to attend when their supports were removed, gave directions to the Overseer about equalizing the strain on the tie-rods, some of which I had noticed were somewhat slack. It was then impossible to see that the tie-rods were too long, as the girders were very much hogged. There was no labor present that morning, so I returned to Sultan's Battery with the intention of returning next morning, leaving the Overseer to collect coolies so that there might be no delay in clearing the river. After my departure a gang of Kurambers returned to work, and by their means the Overseer lowered the girders until he found that the sag was becoming so great that he ordered them to be repropped; at this moment the strain on the centre beam of one girder became too heavy and it cracked, as before reported.

7. I can hardly consider Mr. D'Souza to be blameable, as he has had no experience in the erection of such bridges, although he was the only man it was possible to place in charge of the work. The Overseer's time was, as I have already stated, taken up with work that was not actually in his division and of still greater urgency than the Kallur Bridge, or I do not doubt he would have discerned the error.

8. I cannot help thinking that much of the blame is to be attributed to the design. It may be remembered that the first bridge erected by Mr. Tipping, C.E., over the Kallur River failed in 1869 through the bending of the end pins. These were strengthened and the tie-rod added, and yet, with the end pins nearly doubled in section, the truss rods have not been able to bear the weight of the girders. On the tie-rods alone therefore fall the weight of a considerable portion of the girders,

the whole of the flooring and rails, and the entire moving load that may pass over the bridge on its length of 75 feet.

9. I regret that a search through the office records has failed in bringing to light either a correct plan or a specification, and I have been obliged to deduce the former from the original plan, since modified, and notes of my own, and the perfect accuracy of it, except where figures are given, cannot be relied on. It gives, however, a fair idea of the bridge girders as they were intended to be erected.

10. The greatest depth of the girders between centre and centre of opposite pins is certainly less than one-twentieth of the span. The pins have a heavy transverse strain on them, and have one and all suffered from the enormous leverage of the truss rods. Had the brackets been provided with tight-fitting collars to fit over the pins, the strain would have been a shearing one that their diameter of 2 inches might have well resisted.

11. If it is necessary I can have an accurate plan drawn out; but I believe the accompanying one will be sufficient, added to the remarks I have made, to show the objections I have to the bridge. It will be seen, too, that great exactness is required in equalizing strains, especially in the compound tie-rod; and in Wynaad skilled supervision and trained labor are not easily procurable, and the more simple a design the better chance there is of its satisfactory execution.

No. 114. No. 23.

MEMORANDUM.

Letters from the Acting Special Executive Engineer of Wynaad, Nos. 524, of 26th June, and 683, of 1st September 1875.

The bridge to which the above reports refer was sanctioned in G.O., No. 2515, of 5th August 1868, in the letter recorded with which it is stated that its principle was much approved of by the undersigned, and in the Order itself that the altered plan was, in his opinion, especially well adapted for the site. For the latter statement the authority is unknown, and Major-General Walker declines to admit the inference drawn therefrom that his original design, sanctioned in G.O., No. 3424, of 26th October 1866, was unsuitable to the locality and site. His jurisdiction over Lieutenant-Colonel Kennedy and the works in the Wynaad ceased absolutely by the terms of G.O., No. 3927, of 13th December 1866, and he must protest against being held responsible in any way for the design that was substituted for his own. He has some recollection of being shown a rough sketch of Mr. Tipping's idea, and having said it was ingenious and might be tried on a small scale. But it was not fair to him that a plan for a 75-feet span, which he never saw, should have been approved of as his design in an Order which was never communicated to him, and which he has now seen for the first time. He was, against his will and advice, absolved of all responsibility for Wynaad works in December 1866, and objects that responsibility should have been reimposed and reflections cast upon him, without his knowledge, in August 1868.

2. The bridge as originally constructed on Lieutenant-Colonel Kennedy's design is stated by Mr. Pringle in one letter to have failed in 1869, partly by reason of omission of the understring, partly by reason of bad masonry in the

abutments. In his second letter failure is attributed to the bending of the end pins, a discrepancy which is not explicable by reference to any report made at the time. It is presumed that sanction for a supplemental estimate was included in the sanction of Rupees 5,98,762 communicated in G.O., No. 1659, of 11th July 1870, for completing the whole road from the Mysore frontier by Sultan's Battery to the foot of the Tambercherry Ghaut.

3. After great delay the masonry work of the bridge appears to have been reconstructed in all 1874-75, and the girders began to be placed in position in March. Not till the middle of June 1875, however, long after the commencement of the monsoon, when floods were imminent, could the supports be removed. On their removal one of the girders broke, and it would appear from Mr. Pringle's report that, assuming the principle and proportions of the bridge to be correct, which the Chief Engineer considers they are not, certain glaring defects of construction inevitably led to that result. Lieutenant-Colonel Kennedy appears to be answerable for not having discovered these by the simple test of putting the girder together on the ground, his arrangement for doing so having been baulked by an accident also implying defective management and supervision.

4. The Chief Engineer has always been of opinion that in a district like Wynaad, where skilled labor is scarce, while good teak is, or ought to be, procurable from the Moodamullay Forests, through which this road passes, it is a mistake to substitute iron-work for timber except when a reliable contractor can be found to undertake to put together his own work on the spot. It remains to be seen what further report and recommendations will be made by Lieutenant-Colonel Kennedy on his return from furlough early in March.

FORT ST. GEORGE, 8*th January* 1876. (Signed) G. W. WALKER, Major-General, R.E., *Chief Engineer, P.W.D.*

No. 8.

Transferred to the Financial Department.

FORT ST. GEORGE, 8*th January* 1876. (Signed) G. W. WALKER, Major-General, R.E., *Secy. to Govt., P.W.D.*

No. 115. ORDER THEREON, 14th January 1876, No. 80.

Communicated to the President of the Local Fund Boards, Malabar.

(True Extract.)

Chief Secretary.

To the Board of Revenue.
,, President of the Local Fund Boards, Malabar.

Public Works Dept

Exd. A. S. Rodgers.

Govt of Madras.

FINANCIAL.

To

THE BOARD OF REVENUE,
&c., &c., &c.

Dated January 14th.

Issued

Recd.

G.O., 14th January 1876, No. 80.

JANUARY.
Nos. 112–115.

Local Funds—Roads.—The Chief Engineer's views on the failure of the Kallar Bridge, on the Sultan's Battery and Gundalpett Road, Wynaad, communicated to the President of the Local Fund Boards, Malabar.

Rec'd the following Report

112.

No. 524

Special Executive Engineer's Office,
Luckadie, Wynaad, 26th June 1875.

From

E. H. Pringle Esqre.,
Ag. Special Executive Engineer,
Wynaad,

To

The Secretary to Government,
Public Works Department,
Madras.

Sir,

I have the honor to report the par=
=tial failure of the Kallur Bridge on the
Sultan's Battery & Gundalpett road, now
in course of erection, through the crack=
=ing of one of the Teak beams of the
girders.

2 The bridge is one of 75' span,
teak, cross braced with iron, orginally
sanctioned in G. O. No. 2515, dated 5th Augt.
1868 – In 1869 this bridge failed by reason
of the omission of the understring &
the bad work of the Contractor Mr. J.
Tipping, C.E. – The latter fault ne=
=cessitated the rebuilding of a large

portion

No. 603. Special Executive Engineer's Office,
Luckadie, Wynaad, 1st September 1875.

From

E. H. Pringle, Esqre.,
Ag: Special Executive Engineer,
Wynaad.

To

The Secretary to Government,
Public Works Department,
Madras.

Sir

In furnishing the fuller report on the failure of Kullur bridge called for in your Memo No. 154, dated 1st July 1875, I have the honor to explain that some delay has arisen from my inability to visit the work until recently.

2. As before reported the immediate cause of the cracking of the teak beam was the absence of support by the tie rod, the sections of which were too long.

3. The total distance from outside to outside of the pins upon which the parts of the tie rod bore is 12' 8" & had the eyes of the rod been of equal dia=meter to the pins (2") there would have been 2" to spare for tightening up. Unfortu=nately the diameter of each eye is 3½" and the

side footnote

Rec'd 6 Sept 1875
No. 1238
From Asst Engr Kullur
To Secy to Govt Public Works Dept Madras
Dated 1st Sept 1875
Rec'd 29 Sept 1875
Report on the failure of Kullur Bridge on the Kullur Putteri & Cannanore Road
No. 603
Sept 1875

the distance between their bearing points in tension on the pins exceeds that from outside to outside of pins by 1," vide accompanying Sketch A.

4. But for an untimely accident, this error in the length of the rods, would have been discovered before the final erection of the bridge. Colonel Kennedy had ordered the Superintendent, Mr. D'Souza, in charge of the work, to put up one girder on the bank, and on the 2nd of June, had gone to inspect it, the Superintendent having reported that it was ready- A few hours before Colonel Kennedy's arrival, the timber supports upon which the girder rested gave way & the girder falling, had to be taken to pieces- The close approach of the Monsoon & much prevalent sickness that had already retarded & was likely still further to interfere with progress made it obligatory to proceed with the work "in situ".

5. Subsequently to this Colonel Kennedy was engaged in handing over charge to me, and could not again inspect the bridge. The next visit to

to Kullur was my own, on the 19th June, that during which the accident occurred- The Overseer Mr. Brown had had, in the interim, no time to go out himself to the place, as he was fully occupied with the erection of the Kulpetta iron bridge, a work thrown on our hands through the failure of the contractor Mr. Naylor to provide labor for it prior to the Monsoon.

6. On the 19th it was raining heavily, and a flood was imminent; it was therefore necessary to clear the river of the scaffolding with the utmost expedition- On the morning in question I had as far as possible examined the girders in their position, and in case I should be unable to attend when their supports were removed gave directions to the Overseer about equalising the strain on the tie rods, some of which I had noticed were somewhat slack. It was then impossible to see that the tie rods were too long, as the girders were very much bagged- There was no labor present that morning

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7. I can hardly consider Mr. De Souza to be blamable, as he has had no experience in the erection of such bridges, although he was the only man it was possible to place in charge of the work. The Overseer's time was as I have already stated taken up with work that was not actually in his division & of still greater urgency than the Kullur bridge or I do not doubt he would have discerned the error.

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9. I regret that a search through the Office records has failed in bringing to light either a correct plan or a Specification & I have been obliged to deduce the former from the original plan, since modified, & notes of my own & the perfect accuracy of it except where figures are given cannot be relied on. It gives however

Copy of Plan since prepared and sent

however a fair idea of the bridge girders as they were intended to be erected.

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The pins have a heavy transverse strain on them & have one and all suffered from the enormous leverage of the truss rods. Had the brackets been provided with tight fitting collars to fit over the pins, the strain would have been a shearing one, that their diameter of 2" might have well resisted.

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procurable

1760

procurable and the more simple a design the better chance there is of its satisfactory execution.

I have the honor to be,

Sir,

Your Most Obedient Servant,

Ewbank

Ag: Spl: Ex: Engineer,
Wynaad.

* Note:- I have been unable to find a copy of the drawings of extra iron work required, forwarded by Colonel Kennedy to the Public Works Workshops in 1869. The disparity between the eyes & pins is difficult to account for.

R. WS. 1875 Rec'd.
Same
Ref. to Mr. Spl. Engr. Wynaad
No. 5744

From
The Secy: to Government
Public Works Department
Madras.

No. 683.

Dated Ootacamund
Septr. 15th 1875.
Recd. 7.

Enclosures 2.

Transmitting a letter
regarding the failure
of the Pullen Bridge.

Read No. 5 of
Dated

Rec'd 6 Oct 7-9-75
WE 1113-

114

No. 23

Memorandum.

Letters from the Acting Special Executive Engineer of Wynaad No. 524 of 26th June and 683 of 1st September 1875.

The Bridge to which the above Reports refer was sanctioned in G.O. No. 2515 of 5th August 1868; in the letter recorded with which it is stated that its principle was much approved of by the undersigned, and in the order itself that the altered plan was in his opinion especially well adapted for the site. For the latter statement the authority is unknown, and Major General Walker declines to admit the inference drawn therefrom that his original design, sanctioned in G.O. No. 3424 of 26th October 1866, was unsuitable to the locality and site. His jurisdiction over Lieut. Colonel Kennedy and the works in the

the Wynaad ceased absolutely by the terms of G.O. No. 3927 of 13th December 866; and he must protest against being held responsible in any way for the design that was substituted for his own. He has some recollection of being shewn a rough sketch of Mr. Tippings idea, and having said it was ingenious and might be tried on a small scale. But it was not fair to him that a Plan for a 75 feet span which he never saw, should have been approved of as his design in an Order which was never communicated to him, and which he has now seen for the first time. He was, against his will and advice, absolved of all responsibility for Wynaad works in December 866; and objects that responsibility should have been reimposed and reflections cast upon him, without his knowledge, in August 868.

The

The bridge as originally constructed on Lieut. Colonel Kennedy's design is stated by Mr. Pringle in one letter to have failed in 869 partly by reason of omission of the understring; partly by reason of bad masonry in the abutments. In his second letter failure is attributed to the bending of the end pins, a discrepancy which is not explicable by reference to any report made at the time. It is presumed that sanction for a supplemental Estimate was included in the sanction of Rs 5,98,762 communicated in G.O. No. 1659 of 11th July 1870 for completing the whole road from the Mysore Frontier by Sultan's Battery to the foot of the Sambercherry Ghaut.

After great delay the masonry work of the Bridge appears to have been reconstructed in all 1874-75, and the Girders began to

be

be placed in position in March.
Not till the middle of June 1875
however, long after the commencement
of the Monsoon, when floods
were imminent, could the supports
be removed. On their removal one
of the girders broke, and it would
appear from Mr Pringle's report that
assuming the principle and pro-
portions of the bridge to be correct,
which the Chief Engineer considers
they are not, certain glaring defects
of construction inevitably led to
that result. Lieut Colonel Kennedy
appears to be answerable for not
having discovered these by the simple
test of putting the girder together
on the ground; his arrangement for
doing so having been baulked by
an accident also implying defective
management.

management and supervision.

The Chief Engineer has
always been of opinion that in a
District like Wynaad where skilled labour
is scarce while good teak is or ought
to be procurable from the Mookarnbi-
kay Forests, through which this road
passes, it is a mistake to substitute
Iron work for Timber except when
a reliable Contractor can be found
to undertake to put together his
own work on the spot. It remains
to be seen what further report
and recommendations will be
made by Lieut Colonel Kennedy on his
return from Furlough early in March.

C. Walker Major Genl. R.E.
Fort St George
8th Janry 1876 } Chief Engineer P.W.D.

X. Attd

Transcribed

No 8

Transferred to the Financial Department

Lt. Col. Walker Royal Engrs

Secy to Govt Ind Brd

Sabathoo
8th Jany 1876

Enclosures

1. Letter from the Supt Ex. Engr Lyndaud No 524 of 29-6-75
2. —do— —do— " 683 of 1-9- " with 2 plans
3. Original Plan of Culvert Bridge dated 15th Oct 1866.
4. —do— —do— " 17 Septr 1875.

Given on Monday

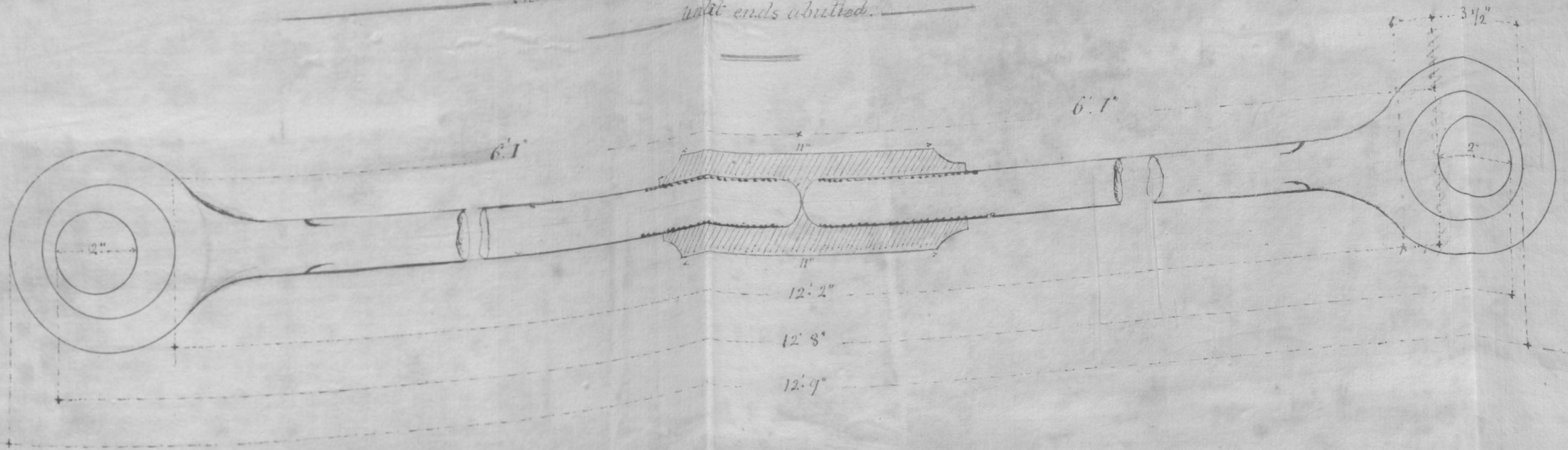
To the Financial Dept. with 5 spare copies of the following Orders:-

GO. 748 of 9-3-69	GO. 749 of 9-3-69	to be returned
" 1934 of 14-6-69	" 876 987 of 19-3-70	
" 2515 of 6-8-68	" 3424 of 26-10-66	
" 3927 of 13-12-66	" 1659 of 11-7-70	

25

A

Sketch showing position of tie-rod and pins, former tightened
and ends abutted.



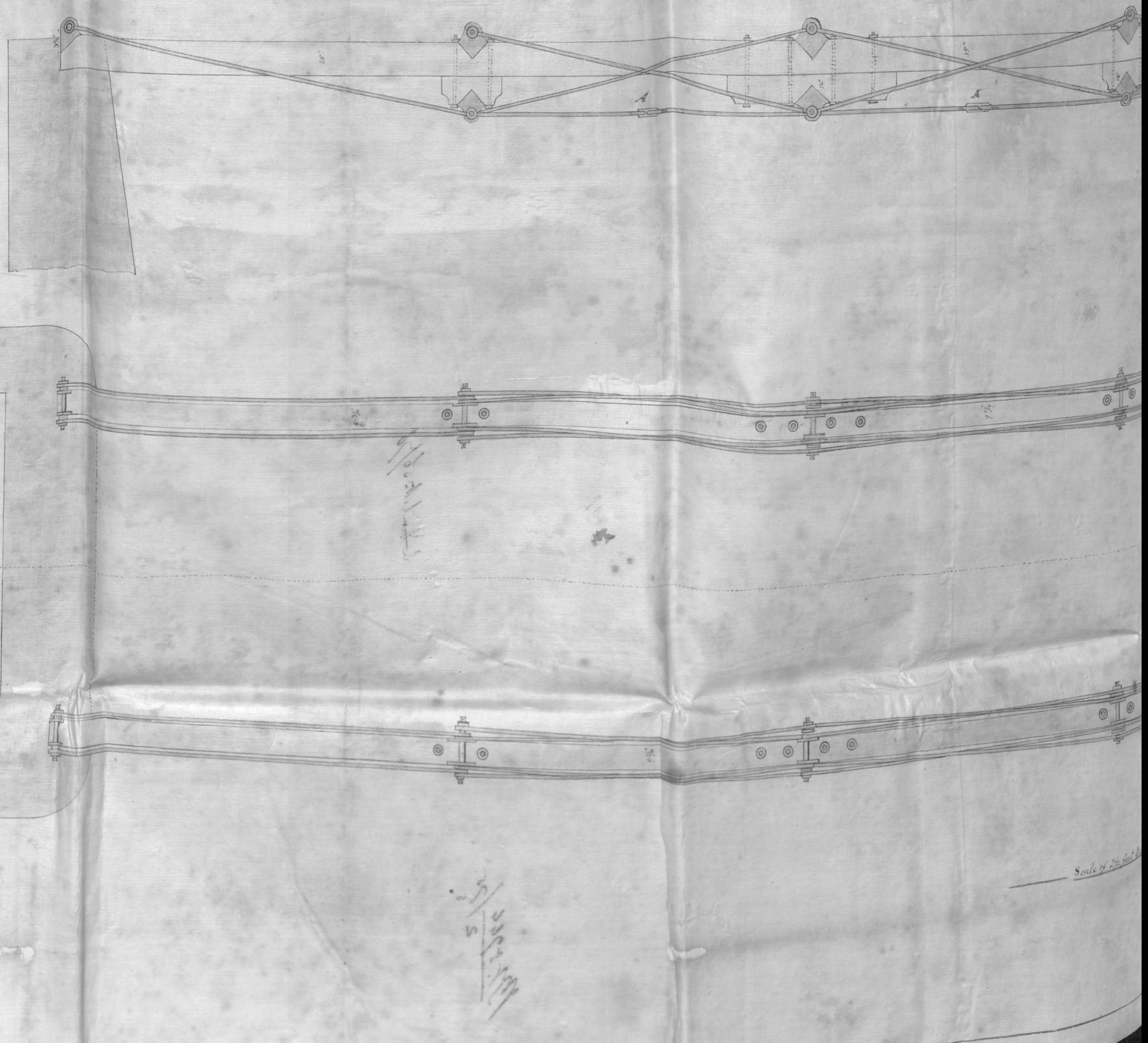
Sub Engr

Acting Spl. Ex. Engr. Wynaad.

Asst Mob/76 Spl. Ex. Engrs Office. Wynaad
Luckadi 2nd September 1875.

BRIDGE OVER THE C

of



Scale ¼ Inch to

Spec. Ex. Engr's Office Wynaad
2nd September 1875 Luckadie

Bridge over the Cooloor River - Wynaad

of 75 feet Span.

Scale of 2½ feet to an inch.



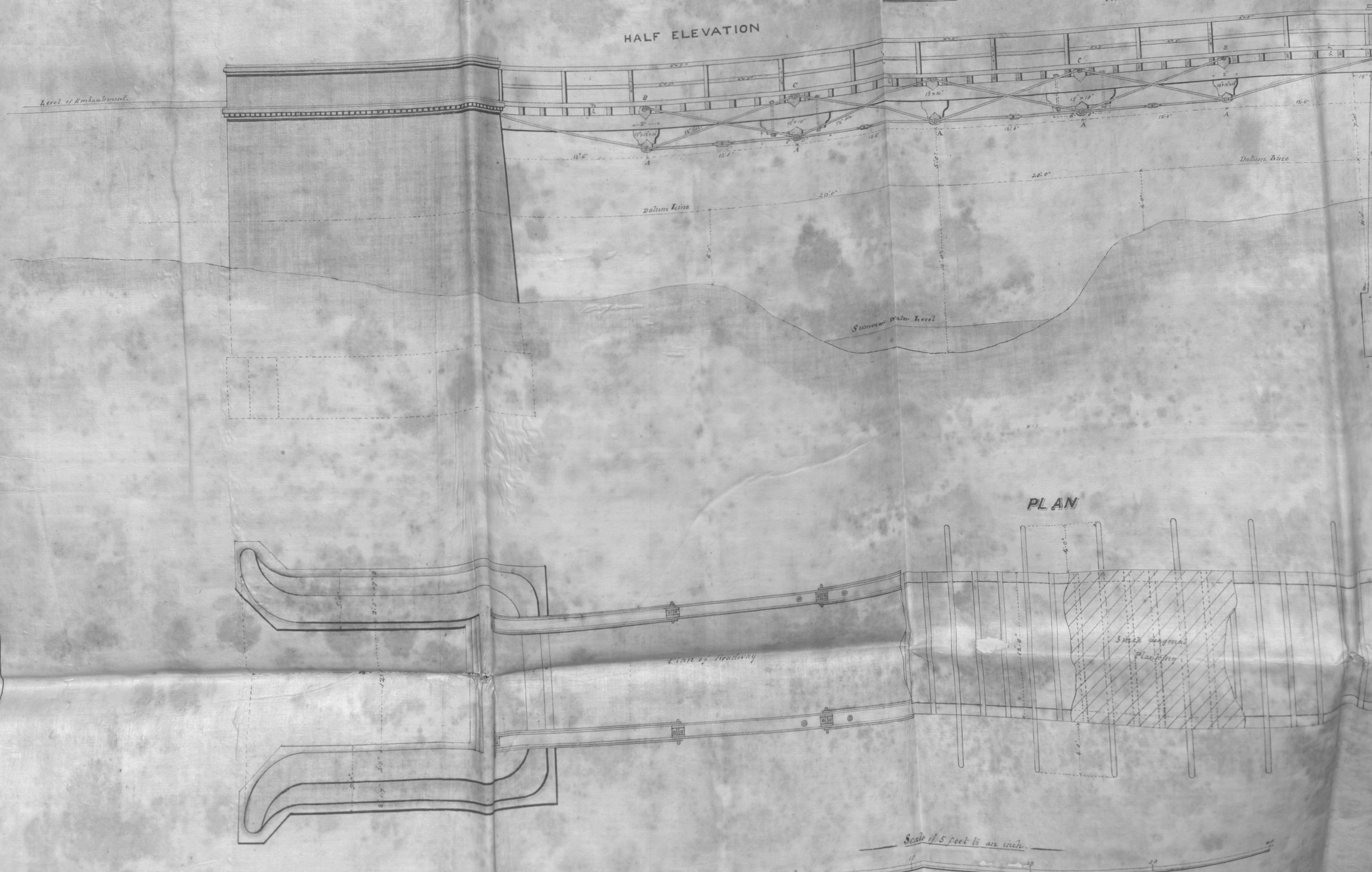
Acting Special Ex. Engineer
Wynaad.

BRIDGE OVER THE CULLOOR RIVER - WYNAAD

75 feet Span.

HALF ELEVATION

HALF SECTION



PLAN

Scale of 5 feet to an inch.

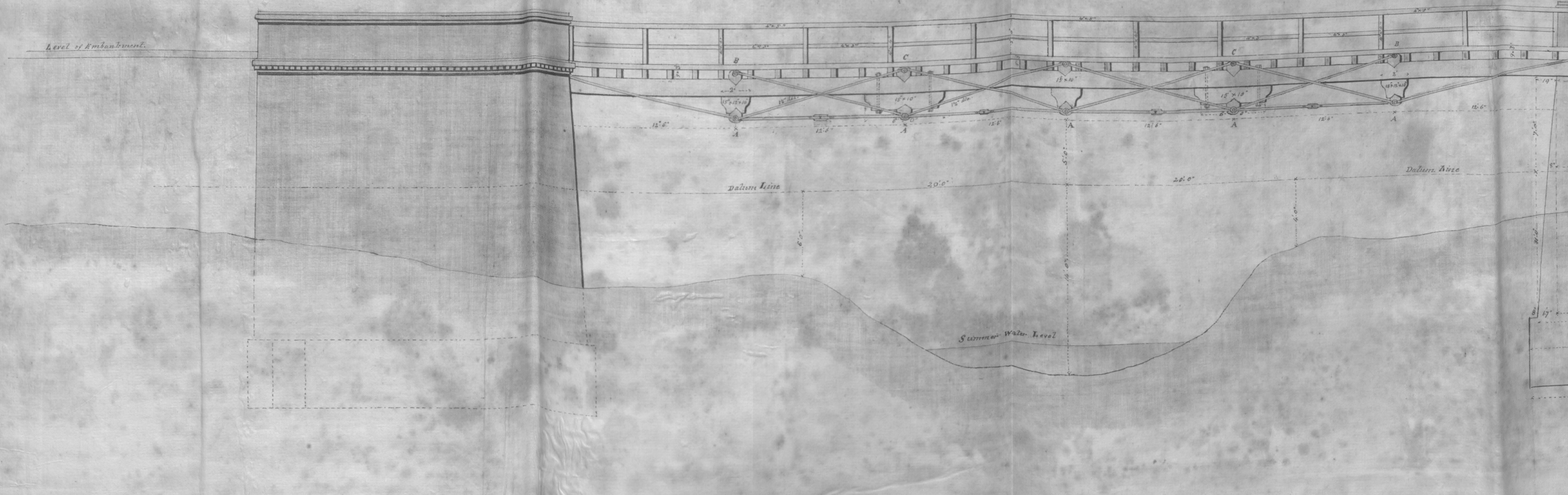
Drawn by T. Ramaswamy Pillai

BRIDGE OVER THE CULLOOR RIVER - WYNAAD

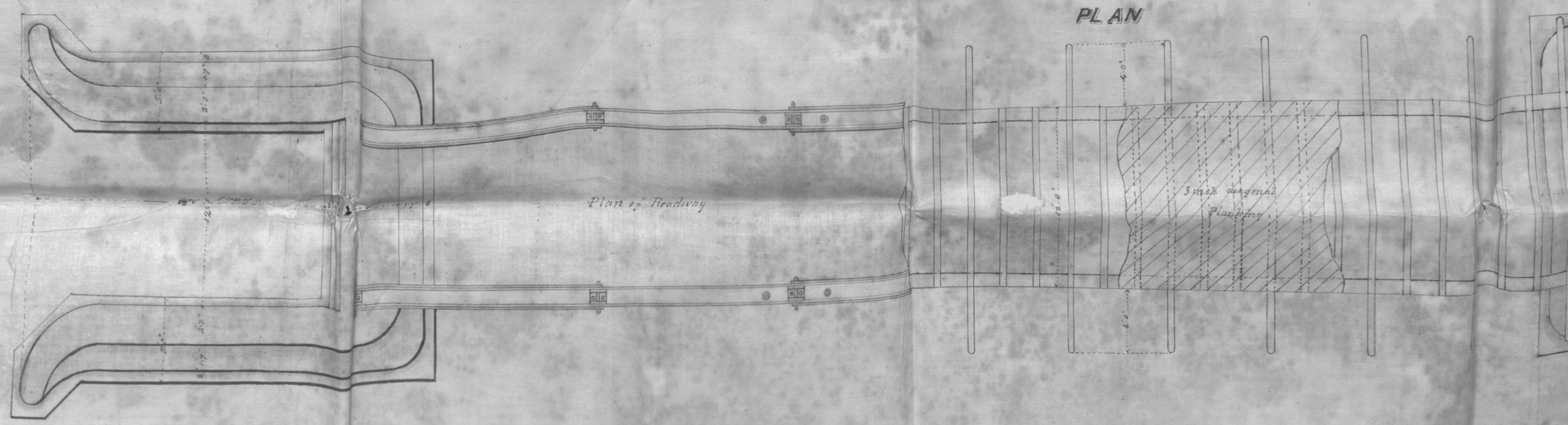
75 feet Span.

HALF ELEVATION

HALF SECTION



PLAN



Scale of 5 feet to an inch.

Drawn by T. Ponnusawmy Pillai

Spel. Ex. Engineers office Wynaad,
Luchadee 17th September 1875.

Ag. Stud. Ex. Engr. Wynnaad.

Plan of Pavement

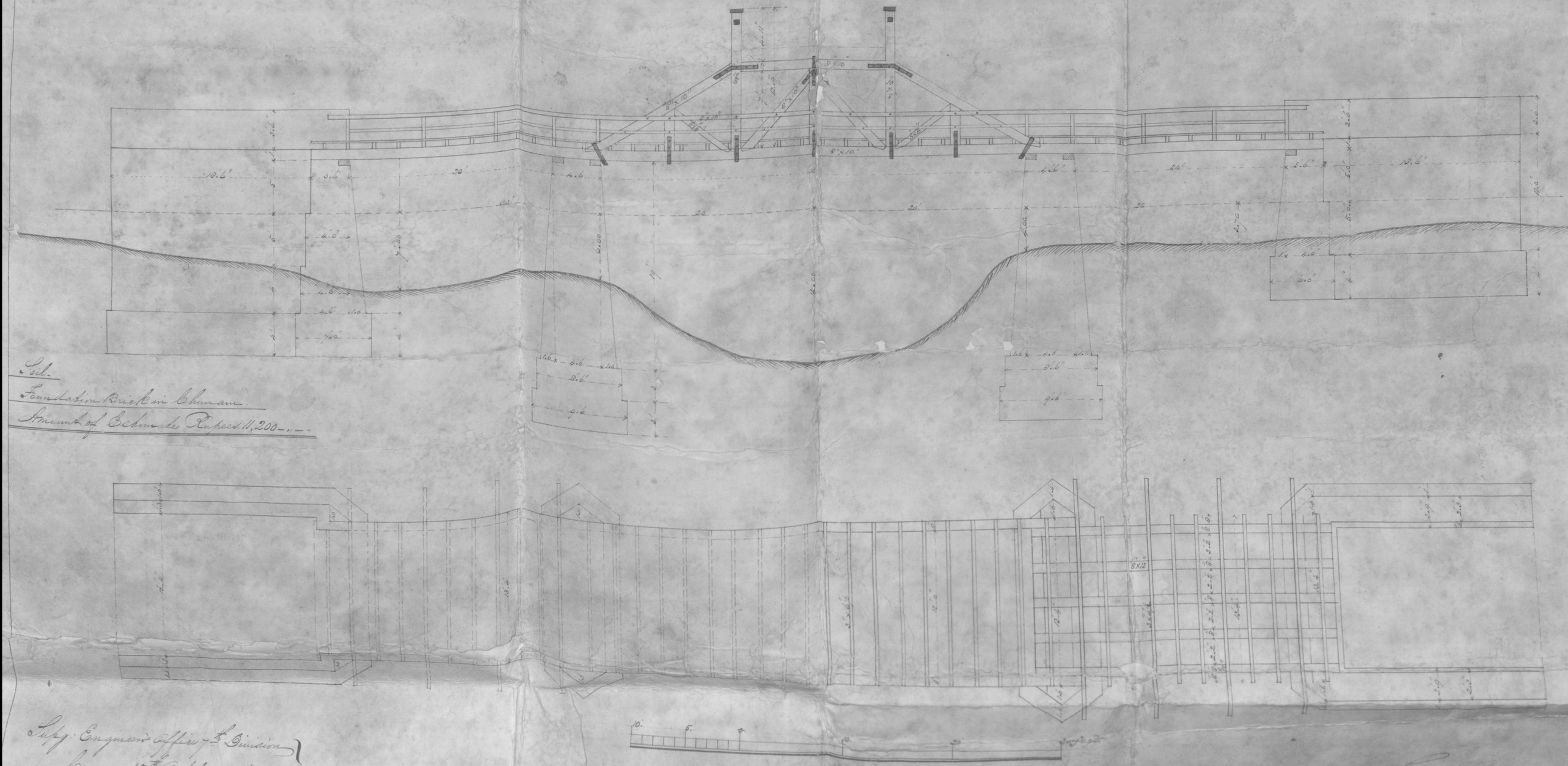
HALF SECTION

SECTION ON AA

Delaware Avenue

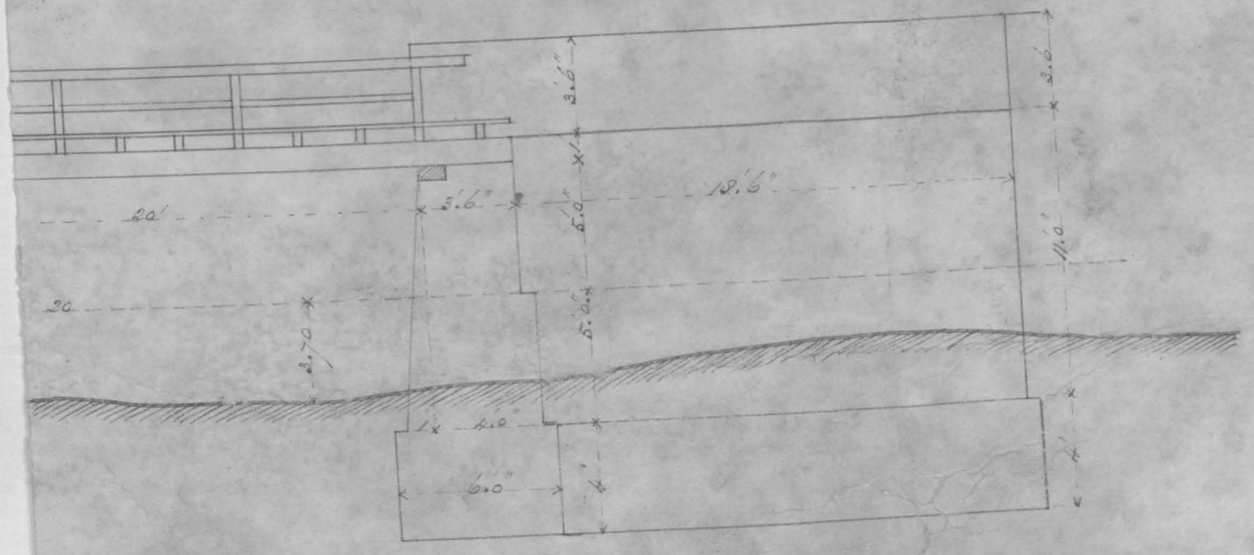
R-WYNNAD

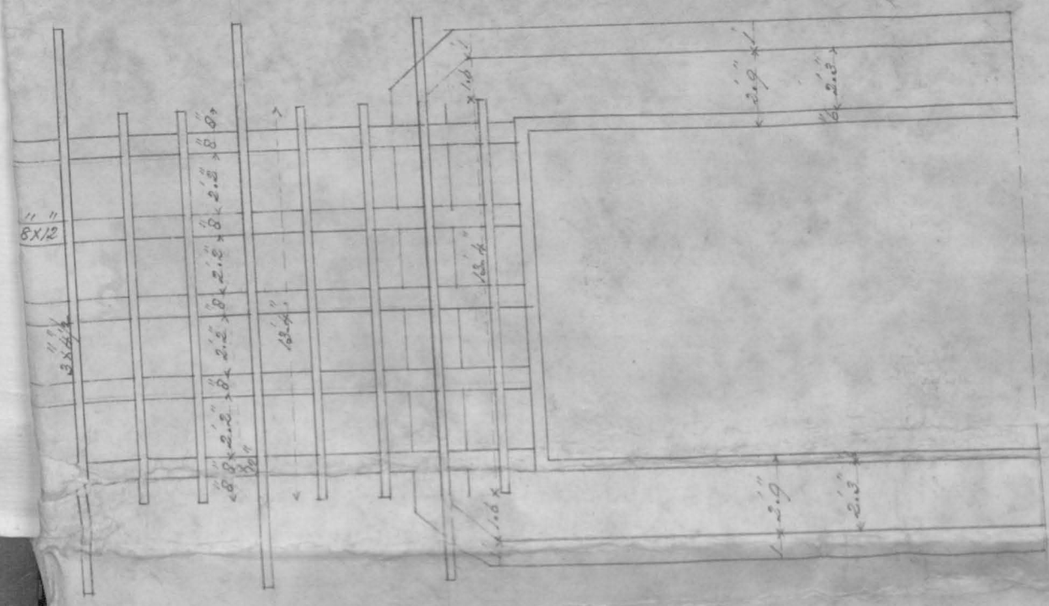
Plan of a Bridge proposed to be Constructed over Cullor River on the High Road from Mysore Frontier to the head of the Tambercherry Ghaut.



33

Road from Mysore Frontier





C. W. Webber Lt Col: R.E.
Superintending Engr 7th Div

Hindi 1876 DEPARTMENT.
(Local Govt. Roads)

From

The Chief Engineer
P. W. Dept

No. 293

Dated 8.
Received 10. } January 76.

No. 56

Communicating his views on the failure of the Kuttiar Bridge on the Sultans Battery & Gundelpett road in the Wynaad.

With enc.

115

Submitted
Sd/ [illegible]
Secy to Govt
Public Works Dept

Sd/ [illegible]
12.1.76

Sd/ [illegible]
Secy to Govt
Public Works Dept

1115-

Govt. of 187 } Madras.

G.O., 14 June, 187 6 No. 83

Nos. 112 13.

P.W. Road. The Ch. Engineer on the failure of the Kullur bridge on the Salem Bellary & Cundulpett Road, & grand Contr.r to the Rent. & P.W.Ds, Malabar.