

(1) Number of pages _____

(2) Date of repair _____

(3) Initials of the Referencer _____

MADRAS RECORD OFFICE.

Government of Madras.

Public works DEPARTMENT.

G.O. No. 488,489	2062	Press Mis.
Dated	28 8	18 72

Not to be folded or roughly handled

*Proceedings of the Madras Government, Public Works Department,
28th August 1872.*

No. 488. Read the following letter from the Secretary to the Government of India, Public Works Department (Account—Buildings and Roads), to the Secretary to the Government of Madras, Public Works Department, dated Simla, 1st August 1872, No. 297 A. B. :—

I AM directed to forward herewith the papers noted in the margin, in which the necessity for an expenditure of Rupees 10,000 during 1872-73 on Military buildings in Mercara is urged, and to request that the Government of Madras may be moved to state whether

Note by Chief Engineer, Mysore, dated 12th May 1872.
Extract, paragraphs 1 to 10, of letter from Assistant Engineer, Coorg, No. 113, dated 7th May 1872.

the needful funds can be provided for the purpose by a transfer from the ordinary imperial public works grant assigned to Madras for public works for the current official year.

2. It will be seen from the papers forwarded that, owing to the style of construction followed in the re-roofing of the old palace at Mercara, a large expenditure is now necessitated in remedying the defects. The Governor-General in Council would be glad to receive any explanation on this subject which the Government of Madras may desire to afford.

Note on requirements under the head "Military" to be provided from the Department Public Works Grant for Coorg.

THESE requirements have always heretofore been met from the Madras Public Works Budget Grant; but in the orders passed by His Excellency the Governor-General on the Coorg Budget, it was ruled that the money required for Military buildings at Mercara should be provided out of the Coorg allotment for the current official year.

One of my first steps on finding this department charged with these Military buildings was to ascertain their present condition and immediate requirements and Mr. Gramatzki's report of the 8th instant, herewith attached, gives a full and at the same time fair statements of the present condition of matter.

I may here observe that the placing of an iron roof on the Mercara Palace (which is the work of most pressing importance alluded to by the Assistant Engineer) was undertaken originally by the Madras Government in consequence of my bringing to notice, after my inspection tour of 1864, the highly dangerous state of the old native roof, and especially of the terrace immediately over the mess-room and officers' quarters.

It appears that, for economy sake, the Madras Government decided to employ continuous iron sheeting in lieu of the old tiles, and in place of the terrace a ceiling of 8 inches in depth of concrete resting on boards. This new roof, which cannot have cost first and last much under Rupees 50,000, has in many respects failed, and we are now called on to deal with it.

Mr. Gramatzki thinks that "it would have answered had it been better constructed;" but of this I have my doubts, continuous iron sheeting is so thin that, under certain conditions, it must very soon rust through, and the difficulties of fixing it (so as to prevent the rain being carried through by strong winds in an exposed position like that of the Mercara Fort) are, as shown by the present example, serious objections. The placing of an 8 inch thick ceiling of concrete resting on boards I conceive to have been wholly wrong, as even thick beams had before in a similar position been found rotted through, and I have little hesitation in saying that sooner or later this ceiling will have to be removed as dangerous.

These observations were called for, as they will explain my decided preference (if the work of repair have to be undertaken by this department) of dealing with the iron of the outer pent roof, and not with the ceiling, although this plan will doubtless cost more money. Mr.

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Gramatzki's guess estimate is between Rupees 3,000 and Rupees 4,000. It would be safer to take the latter amount, as evidently from his report the roof timbers will have to be examined and sundry work executed which he has not provided for.

His other estimates and statement of requirements, which I may assume to have been drawn up in immediate correspondence with the Officer Commanding Mercara, speak for themselves; and I need only therefore here observe that while possibly the charge of Rupees 7,350 may be doubtful as an immediate requirement most of the rest appears so far emergent that, if now neglected or postponed, much greater outlay will be required before very long. On the whole, then, I should say that the immediate requirements amount to about Rupees 20,000, of which at least one half ought to be spent in the current official year.

In addition to the above, the Secretary to the Government of Fort Saint George, Military Department, called on the Chief Commissioner, in No. 680 of the 26th February 1872, to provide a sum of Rupees 7,000 per annum for the completion of new lines for the Native Infantry Regiment at Mercara, and again, as per Proceedings No. 2,110 of the 30th June 1871, to supply Rupees 1,500 as a grant-in-aid for improving the water-supply.

As regards the cost of these new lines, it would appear that their estimated cost is Rupees 38,219, and that out of this Rupees 13,871 were spent in 1869-70 and 1870-71. The accounts not having been as yet rendered for the past official year, I can only assume the outlay to have been Rupees 7,000. Deducting the probable outlay from the estimate, it may at least be assumed that we should have to provide in all Rupees 17,318, distributed as follows:—Rupees 7,000 to the grants for 1872-73 and 1873-74 severally, and Rupees 3,318 for 1874-75.

It is incidentally mentioned in the correspondence that eventually Rupees 15,216 will be recoverable from the Regiment, but whether by the revenues of Coorg or Madras is not stated. The matter is, however, immaterial so far as concerns this department, as any such recoveries or payments could in no wise affect the budget grant.

Taking the whole position of matters as they now stand, I should consider that the sums

Requirements.	YEARS' BUDGETS.		
	1872-73.	1873-74.	1874-75.
	RS.	RS.	RS.
Palace and other buildings at Mercara, as per Executive Engineer's estimate	10,000	10,000	8,500
New No. 1 Regimental Lines.	7,000	7,000	3,350
Grant-in-aid to water-supply.	750	750	...
Latrines in sanctioned Budget.	8,200	...	...
Total.	20,000	17,750	11,850

shown as totals in the marginal table are the least that would have to be provided in the Coorg Budgets, under Military, for the current and two following official years. Nothing, however, is allowed in this for small current repairs and other possibly pressing requirements that may arise from time to time.

The Government of India has not seen fit to accord its assent to the earnest representation put forward by the Chief Commissioner in this office No. 1 A. G. of the 6th January

1872, as to extreme difficulties of making any provision for Military out of the Budget Grant for Coorg, reduced as it had been from Rupees 2,00,000 to Rupees 91,000 per annum; but it must be admitted that the apprehension expressed in paragraph 7 of that communication, that the provision for Military works having no longer to be made from the Budget grants for Madras, the tendency of the requirements under this head would be to increase rather than to diminish, has been fully borne out by the correspondence I now submit for the Chief Commissioner's orders.

In the face of the Budget sanction and orders, we can, of course, oppose the *non possimus* plea, and indeed we are bound to do so under every consideration. I have in fact been obliged to ask the Officer Commanding to arrange with the Assistant Engineer for making the Budget allowance, as sanctioned by the Government of India, go as far as possible, though of course it is absurd to say that this can be done with any chance of satisfaction.

The demands are clearly beyond the means at disposal in Coorg, and yet, if not very soon attended to, very serious loss must be looked for by Government.

Over and above this difficulties of another nature, and which it would be desirable to avoid, will more than likely follow. However anxious one may be to avoid discussion with the

*Proceedings of the Madras Government, Public Works Department,
28th August 1872.*

Madras Government, we are almost certain to be drawn into it. In this very note I have reluctantly been obliged in our own self-defence to point out the inherent defects of the plan adopted by the Madras Department in re-roofing the Mercara Palace, and to allude to requirements which are only the growth of previous inability to meet them or of neglect.

Again the Commander-in-Chief, in his natural anxiety for the welfare of the Regiments at Mercara, cannot fail to make demands, which, as in the present instance, and under a strictly limited Budget, it will be quite out of our power to meet.

The above observations I venture to commend for the Chief Commissioner's consideration, with a request for instructions as to the immediate action to be taken in regard to all the demands above set forth.

(Signed) R. H. SANKEY, Lieut.-Colonel, R.E.,
Chief Engineer of Mysore.
BANGALORE,
12th May 1872.

Extract from a letter from the Assistant Engineer, Coorg Division, to the Assistant Chief Engineer of Mysore, dated 7th May 1872, No. 113-757.

I HAVE the honour to acknowledge the receipt of the marginal noted correspondence, and in reply beg to submit the following statement.

2. About three or four years' ago the covering of the old roof of the palace in the Mercara fort, which consisted of flat tiles (about 6" x 23" called Rajah tiles) was dismantled by the Madras Public Works Department, and a

covering of continuous iron sheeting over boarding substituted. The sheeting was laid longitudinally parallel to the ridge of the roof in continuous lengths of about 150 feet; and as it appears to me, on account of this, it was thought necessary to make provision for the extension and con-

traction of the sheeting occasioned by the variation of temperature, for this purpose the sheeting was held down by straps 5 feet apart, fixed with bolts as shown in annexed sketch Fig. I. At first no other fastenings whatever were fixed between the straps A, but it was found that the high winds blowing during the rainy season lifted up the lower edge of the sheet, and drove the rain below the iron sheeting, on to the boarding, which occasioned considerable leakage on to the ceiling of the upper storey. To remedy this, galvanized clips were inserted between the straps (*vide* Figs. I. and II.), which have lessened the evil but not obviated it, as the roof is still unsound to a great extent. The percolation of water through the roof is of little consequence on the north, west, and south sides of the palace quadrangle, where it falls on a terrace 2½ or 3 feet thick, which is provided with suitable outlets for it, but it makes the east side mess-room and part of the Colonel's quarters, where this terrace has been removed, uninhabitable during the monsoon. To prevent the water passing through the ceiling a layer of concrete 8 inches thick was laid over the ceiling boards, and over it Portland cement about quarter inch thick was plastered. This, I think, would have proved successful, had the concrete been well rammed

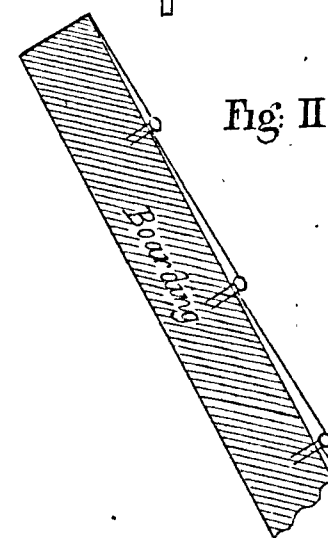
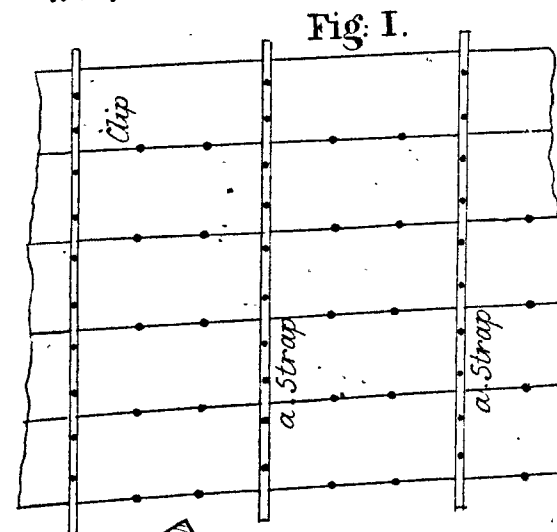


Fig. II.

and consolidated; but from the spongy appearance it presents now, it is quite evident that this essential part of the work was not done. The layer of Portland cement being exposed to the great heat in the confined space below the roofing showed very soon cracks, which apparently were repaired, but opened again either in the same or in the other places. Through these the water finds its way into the concrete which allows it to percolate into the rooms below. The places in which the ceiling leaked were pointed out to me by the Officer Commanding and the Station Staff Officer, 8th Regiment, Native Infantry, but since then heavy rains having fallen, I had an opportunity of examining them myself. I discovered that the water percolates, not only through the places previously shown to me, which are all situated near the main walls, but also over the whole outer terrace and in several other places in the mess-room and the rooms adjoining it. The provisions made in the estimate forwarded under cover of my No. 61-371 of 1st March 1872 are, therefore, insufficient, and the piping proposed by you (sketch returned) would not meet these new requirements. How these leaks have sprung up since the last monsoon, I am unable to state, but I imagine that Portland cement expands and contracts to a greater extent than concrete, and as the variations of temperature must be considerable below the iron roofing, this may be the cause of the appearance of fresh cracks and consequent leaks.

3. In the above mentioned estimate, provision was made to asphalt the terrace over the balcony (marked B. in plan No. III.), but now it will become necessary to lay a coat of this material all over the terrace, covering a part of the mess-room and Colonel's quarters (A. in plan I). This surface is nearly seventeen squares, and at Rupees 50 per square would cost Rupees 892 inclusive of contingencies.

4. To make the portion of the building situated below the roof watertight, two plans may be adopted:—

I.—To repair the roof and make it sound; or

II.—To make the ceiling impervious to water.

Both of these plans I think could be executed with equal facility, and I shall be glad to receive your instructions with regard to the plan approved of by the Chief Engineer.

5. I.—To repair the roof and make it sound, I would first remove the clips, insert between

the sheets a piece of wooden stuff 2 inches wide soaked in white lead paint, and nail the lap down with galvanized wire nails one inch apart. This procedure is recommended by the manufacturers of the continuous iron sheeting (Morewood and Co.); and as this work could be done without disturbing the present roof covering, I beg to recommend it for your favourable consideration. The only objection that could be raised against this procedure would be that the iron is rigidly fixed and does not allow of expansion. Molesworth in his pocket book, page 181, gives the expansion of wrought iron between 32° and 212° as .0012. Taking

Fig. III.

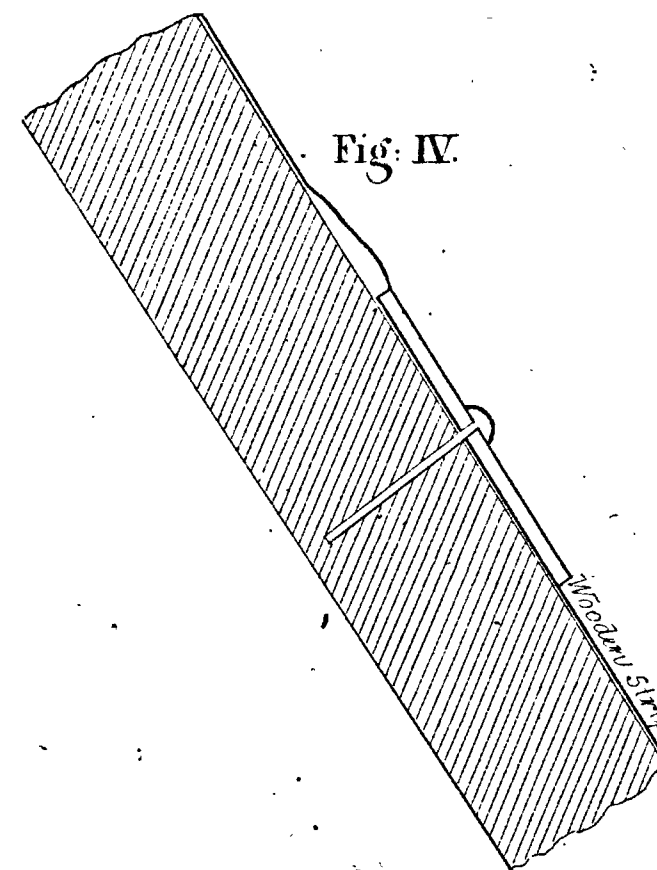
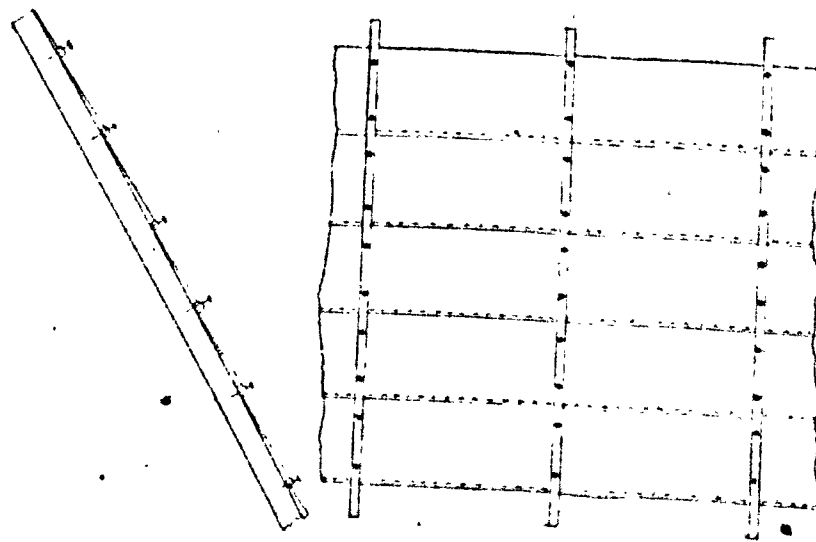


Fig. IV.

Fig. V.

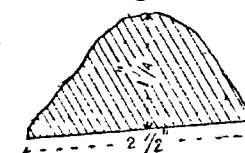
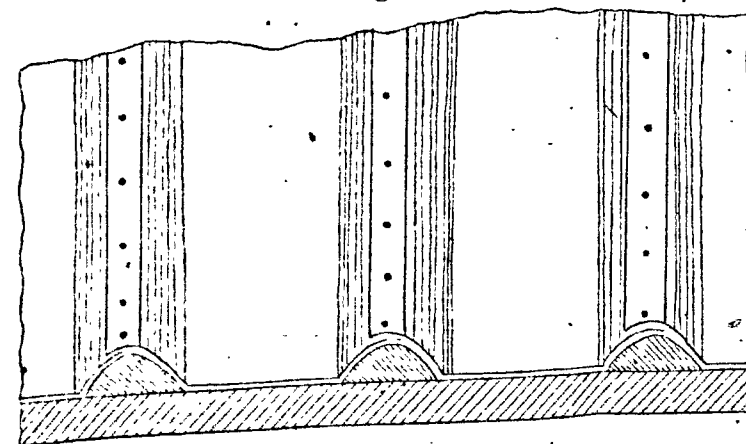


Fig. VI.



now the variation of temperature in Mercara at 60°, which is in excess of the actual variation, and the length which expands at 150 feet, the expansion would be .06 feet; but if the sheets are fixed in the centre, reducing the length by half, this will also be reduced to .03 or about $\frac{3}{100}$ inch.

6. Should the above not meet with your approval, I would propose to take the sheeting off the roof and to relay it at right angles to its present position, placing underneath a wooden batten $2\frac{1}{2} \times 1\frac{1}{4}$ " (Fig. V). These pieces will be 1 foot 9 inches, distance from centre to centre. Over them I would bend the continuous sheeting which is 2 feet wide, fastening it the whole length with wire nails 2 inches apart. The roof would form a succession of flat gutters, Fig. VI., and as the nails are driven in the highest portions, the water is thrown off at once, the length of the sheets being only 29 feet will make the expansion about $\frac{1}{8}$ of an inch. I have tried this plan and found it successful, but, in the present case, objections may be raised against it. Moles has been made in the sheeting for the bolts 6, Fig. I., and these would have to be soldered up. In dismantling, no matter how carefully this operation is conducted, some of the sheets are sure to be damaged, and will have to be replaced by new ones. I have no data upon which to base a calculation of the probable cost of this work, but I should say that it will cost certainly not less than 3,000 or 4,000 Rupees.

*Proceedings of the Madras Government, Public Works Department,
23th August 1872.*

7. II.—To make the ceiling impervious to water. As stated in paragraph 2, the ceiling of the north, west, and south sides consists of a terrace 2½ or 3 feet thick, and as these portions of the building do not leak, I would leave them in their present state and confine the repairs to the east side. Portland cement having proved itself an unreliable material in this situation, I propose to spread over the concrete and cement a layer of asphalt or of pitch and sand, I should prefer the former, as it withstands the heat better, but economical reasons may make it advisable to choose the latter. The cost for asphalt would be—

Fifty-three squares, at Rs. 50 ...	...	...	...	...	...	Rs. 2,650
Contingencies (5 per cent.) ...	...	...	...	...	...	133
						<u>2,783</u>

And for pitch and sand—

Fifty-three squares, at Rs. 30 ...	...	...	...	...	...	1,590
Contingencies (5 per cent.) ...	...	...	...	...	...	80
						<u>1,670</u>

8. How long continuous iron sheeting will last I am unable to state. A roof I constructed seven years ago stands well, and shows no signs of deterioration, and I have no hesitation in saying that the roof over the palace at Mercara would have answered had it been better constructed.

9. I also beg to bring to your notice that a portion of the roof timber, which is "Sampangi wood," is attacked by dry rot. If this happened before the repairs executed by the Madras Department Public Works were undertaken, I am unable to say, but it is very probable that in a few years some of this timber will have to be renewed. I should have liked to furnish more details regarding this, but the space below the high roof being quite dark, all examination has to be conducted by candle light, and defects which would be apparent in day light at once escape detection. Should you, however, require further information, I request permission to take up a small portion of the roof covering, which will enable me to give all details.

10. The terrace situated round three sides of the interior square (marked C in plans I. and III.) has been plastered with Portland cement, but here also this material has proved itself unsuitable and it has been broken up in large patches. Below this terrace are situated the godowns belonging to the officers' quarters, and they are now nearly useless on account of the extensive leakage. This flat roof is the main passage to the officers' quarters, and it will be impossible to plaster it with polished chunam, as the mortar would not get time to settle, for this reason I propose to lay asphalt on it. The surface to be covered is forty-two and a half squares, which would cost, at Rupees 50 per square, Rupees 2,175 inclusive of contingencies.

No. 480.

ORDER THEREON, 28th August 1872, No. 2,062.

ACCOUNT, No. 40.

ORDERED that the following letter

be sent.

(Here enter, No. 2,063 dated 28th August 1872.)

(True Extract.)

(Signed) G. W. WALKER, Colonel, R.E.,
Secretary to Government.

Ed. F. C. ...

All communications
to be addressed to the
Secretary.

No. 297 A. B.

GOVERNMENT OF INDIA.

PUBLIC WORKS DEPARTMENT.

ACCOUNT.

Building & Roads.

*The Secretary to the Government of Madras.
Public Works Department.
Sindia, 1st Aug 1872.*

*note by Chief Engr
Mysore 2/12 May 72.
Extract paras 1 to 10 of letter
from Asst Engr Mysore
No 113 2/7 May 1872.*

*I am directed to forward herewith
the papers noted in the margin
in which the necessity for an
expenditure of Rs 10,000 during 1872/73
on military buildings in Mercara is
urged, and to request that the Government
of Madras may be moved to state
whether the needful funds can be
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works for the current official year.*

*2. It will be seen from the papers
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struction followed in the re-roofing
of the old palace at Mercara a large
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remedying the defects. The Governor
General in Council would be glad
to receive any explanation on this
subject which the Government of
Madras may desire to afford.

I have the honor to be,
Sir,

Your most obedt. servt.

William Coll R A
Secretary to Govt of India.

14
3
2
Note on requirements under the head⁵⁰
Military to be provided from the
Department Public Works Grant for
Coorg

These requirements have always here-
before been met from the Madras
Public Works Budget Grant, but
in the orders passed by His Excellency
the Governor General on the Coorg
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required for Military Buildings at
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the Coorg allotment for the current
official year.

One of my first steps on finding
this Department charged with these
Military buildings, was, to ascertain
their present condition and immediate
requirements, and Mr Gramatzki's report
of the 8th instant, herewith attached,
gives a full and at the same time
fair statements of the present condition
of matters.

I may here observe that the placing
of

of an iron roof on the Mercara palace (which is the work of most pressing importance alluded to by the Assistant Engineer) was undertaken originally by the Madras Government in consequence of my bringing to notice, after my inspection-tour of 1864 - the highly dangerous state of the old native roof, and especially of the terrace immediately over the mess-room and officers quarters.

It appears that for economy's sake, the Madras Government decided to employ continuous iron sheeting in lieu of the old tiles, and in place of the terrace, a ceiling of 8 inches in depth of concrete resting on boards. This new roof, which cannot have cost first and last, much under Rs 50,000, has in many respects failed and we are now called on to deal with it.

M^r. Gramatyki thinks that "it would have answered had it been better constructed;" but of this I have my doubts, continuous iron sheeting is so thin that, under certain conditions,

3
conditions, it must very soon rust through, and the difficulties of fixing it (so as to prevent the rain being carried through by strong winds in an exposed position like that of the Mercara Fort) are, as shewn by the present example, serious objections. The placing of an 8 inch-thick ceiling of concrete resting on boards, I conceive to have been wholly wrong, as even thick beams had before in a similar position been found rotted through, and I have little hesitation in saying that sooner or later, this ceiling will have to be removed as dangerous.

These observations were called for as they will explain my decided preference (if the work of repair have to be undertaken by this Department) of dealing with the iron of the outer pent roof, and not with the ceiling, although this plan will doubtless cost more money - M^r. Gramatyki's guess-estimate is between Rs 3000 and
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Rupies 4000 - It would be safer to take the latter amount, as evidently, from his report, the roof timbers will have to be examined and sundry work executed which he has not provided for.

His other estimates and statement of requirements, which I may assume to have been drawn up in immediate correspondence with the Officer Commanding here, speak for themselves; and I need only therefore here observe that, while possibly the charge of Rupies 7300 may be doubtful as an immediate requirement, most of the rest appears so far emergent, that, if now neglected or postponed, much greater outlay will be required before very long. On the whole then, I should say that the immediate requirements amount to about Rupies 2000, of which at least one half ought to be spent in the current official year.

In addition to the above, the Secretary to the Government of Fort Saint George

George Military Department called on the Chief Commissioner in No. 680 of the 26th February 1872, to provide a sum of Rupies 7000 per annum for the completion of new lines for the Native Infantry Regiment at Mercara, and again as per Proceedings No. 2110 of the 30th June 1871, to supply Rupies 1500 as a grant-in-aid for improving the water-supply.

As regards the cost of these new lines, it would appear that their estimated cost is Rupies 38,219, and that out of this Rupies 13871 were spent in 1869-70 and 1870-71. The accounts not having been as yet rendered for the past official year, I can only assume the outlay to have been Rupies 7000. Deducting the probable outlay from the estimate, it may at least be assumed that we should have to provide in all Rupies 17,348, distributed as follows:- Rupies 7000 to the grants for 1872-73, and 1873-74 severally; and Rupies 3348 for 1874-75.

It is incidentally mentioned in

in the correspondence that eventually. Rupees 15,246 will be recoverable from the Regiment, but whether by the revenues of Coorg or Madras is not stated. The matter is however immaterial so far as concerns this Department as any such recoveries or payments could in no wise affect the Budget Grant.

Taking the whole position of matters as they now stand, I should consider that the sums shown as totals

Requirements	Years Budgets			in the
	1872-73	1873-74	1874-75	
Palace and other buildings at Mereana as per Executive Engineer's Estimate	10,000	10,000	8,500	marginal
New No. 1 Regimental Lines	7,000	7,000	3,350	table
Grant-in-aid to Water-supply	750	750	"	are the
Salaries in sanctioned Budgets	3,200	"	"	least
				that would
Totals	20,950	17,750	11,850	have to be
				provided

in the Coorg Budgets, under Military, for the current and two following official years. Nothing, however, is allowed in this for small current repairs, and other possibly pressing requirements that may arise from

from time to time.

The Government of India has not seen fit to accord its assent to the earnest representation put forward by the Chief Commissioner in this office No. 1 S.G. of the 6th January 1872, as to extreme difficulties of making any provision for Military out of the Budget Grant for Coorg, reduced as it had been from Rupees 20,000 to Rupees 9,000 per annum; but it must be admitted that the apprehension expressed in para 7 of that communication, that the provision for Military works having no longer to be made from the Budget Grants for Madras, the tendency of the requirements under this head would be to increase rather than to diminish, has been fully borne out by the correspondence I now submit for the Chief Commissioner's orders.

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to do so, under every consideration. I have in fact been obliged to ask the Officer Commanding to arrange with the Assistant Engineer for making the Budget allowance, as sanctioned by the Government of India, go as far as possible, though of course it is absurd to say that this can be done with any chance of satisfaction.

The demands are clearly beyond the means at disposal in Bangalore, yet if not very soon attended to, very serious loss must be looked for by Government.

Over and above this, difficulties of another nature, and which it would be desirable to avoid, will more than likely follow. However anxious one may be to avoid discussion with the Madras Government, we are almost certain to be drawn into it. On this very note I have reluctantly been obliged in our own self-defence to point out the

the inherent defects of the plan adopted by the Madras Department in re-roofing the Mercara palace, and to allude to requirements which are only the growth of previous inability to meet them or of neglect.

Again the Commander-in-Chief in his natural anxiety for the welfare of the Regiments at Mercara, cannot fail to make demands, which, as in the present instance, and under a strictly limited Budget, it will be quite out of our power to meet.

The above observations I venture to commend for the Chief Commissioner's consideration with a request for instructions as to the immediate action to be taken in regard to all the demands above set forth.

Bangalore }
12th May 1872 }

Sd/ R. H. Sastry Lt. Col. R.E.
Chief Engineer of Mysore

977
Extract from a letter No. 113 dated 7th May 1872
from the Assistant Engineer, Coorg Division
to the Assistant Chief Engineer of Mysore.

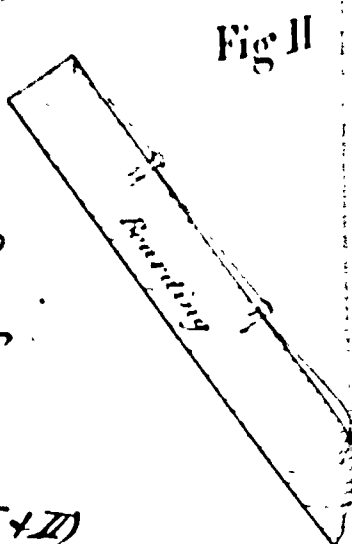
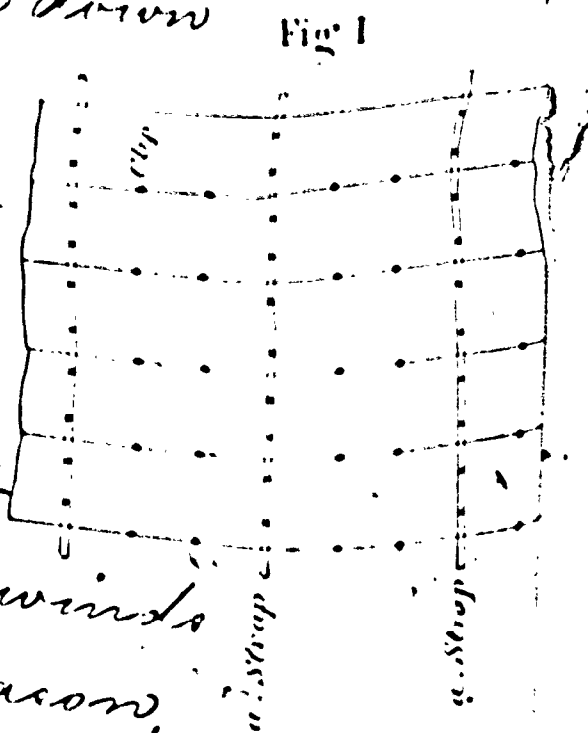
P. W. 3876/72.

Chief Eng^r's Docket No. 473 dated 11th
March/72, forwarding a sketch plan
of repairs to be executed to the roof
of the Palace at Mercara, and calling
for a report on the suitability and
probability of duration of the present
Iron roof; also for a general
report on Military Buildings.
Chief Engineers No. 789 dated 12th March
1872 directing the submission of
a complete statement of the
requirements for Military Buildings.

I have the honor to acknowledge
the receipt of the
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respondence, and in
reply, beg to submit
the following statement
2. About 3 or 4
years ago, the covering
of the old roof of the
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make

make provision for the expansion and contraction of the sheeting occasioned by the variation of temperature; for this purpose, the sheeting was held down by straps 5-feet-apart, fixed with bolts, as shown in annexed sketch Figure I. At first no other fastenings whatever were fixed between the straps, but it was found that the high winds blowing during the rainy season, lifted up the lower edge of the sheeting, and drove the rain below the Iron sheeting, on to the boarding, which occasioned considerable leakage on to the ceiling of the Upper Storey. To remedy this, galvanized clips were inserted between the straps (vide Figs I & II) which have lessened the evil but not obviated it, as the roof is still unsound to a great extent. The percolation of water through the roof is of little consequence on the north, west, and south side of the Palace Quadrangle, where it falls over a terrace $2\frac{1}{2}$ or 3 feet high



thick, which is provided with suitable outlets for it, but it makes the east side mess room and part of the colonel's quarters, where this terrace has been removed, uninhabitable during the monsoon. To prevent the water passing through the ceiling, a layer of concrete 8 inches thick, was laid over the ceiling boards, and over it Portland Cement about $\frac{1}{4}$ inch thick was plastered. This I think would have proved successful, had the concrete been well rammed, and consolidated; but from the spongy appearance it presents now, it is quite evident that this essential part of the work was not done. The layer of Portland Cement being exposed to the great heat in the confined space below the roofing, showed very soon cracks, which apparently were repaired, but opened again either in the same or in the other places. Through these, the water finds its way into the concrete which allows it to percolate into the

rooms below. The places in which the ceiling leaked were pointed out to me, by the Officer Commanding and the Station Staff officers 8th Regiment A. S. but since then, heavy rains having fallen, I had an opportunity of examining them myself. I discovered that the water percolates not only through the places previously shown to me, which are all situated near the main walls, but also over the whole outer terrace, and in several other places in the Mess Room and the rooms adjoining it. The provisions made in the estimate forwarded under cover of my No. $\frac{61}{37}$ of 1st March 1872 are therefore insufficient and the repairs proposed by you (sketch returned) would not meet these new requirements. Since these leaks have sprung up since the last monsoon, I am unable to state, but I imagine that Portland Cement expands and contracts to a greater extent than concrete, and as the variation of temperature must be considerable below

below the iron roofing, this may be the cause of the appearance of fresh cracks and consequent leaks.

3. In the above mentioned estimate, provision was made to asphalt the terrace over the balcony (marked B in plan No. III) but now it will become necessary to lay a coat of this material all over the terrace, covering a part of the Mess Room and Colonel's Quarters (A in Plan I). This surface is nearly 17 squares and at Rs 50--- per square would cost Rs 892 inclusive of Contingencies.

4 To make the portion of the building situated below the roof watertight, two plans may be adopted.

I. To repair the roof and make it sound or

II To make the ceiling impervious to water.

Both of these plans I think could be executed with equal facility, and I shall be glad to receive your instructions with regard to the plan

plan approved of by the Chief Engineer.

5. I. To repair the roof and make it sound, I would first remove the lips, insert between the sheets a piece of wooden stuff 2" wide soaked in white lead paint and nail the lap down with galvanized wire nails one inch apart.

This procedure is recommended by the manufacturers of the continuous iron sheeting (Horswood & Co.) and as this work could be done without disturbing the present roof covering, I beg to recommend it for your favorable consideration. The only objection that could be raised against this procedure would be, that the iron is rigidly fixed and does not allow of expansion. Horsworth, in his Pocket book, page 181 gives the expansion of wrought iron between 32° and 212° as .0012. Taking now the variation of temperature in Mercator at 60° which is in excess of

Fig III

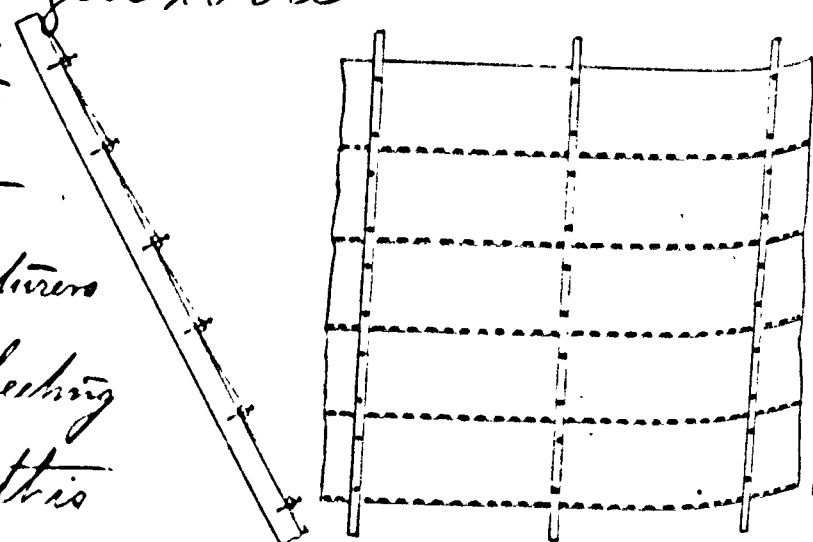


Fig IV

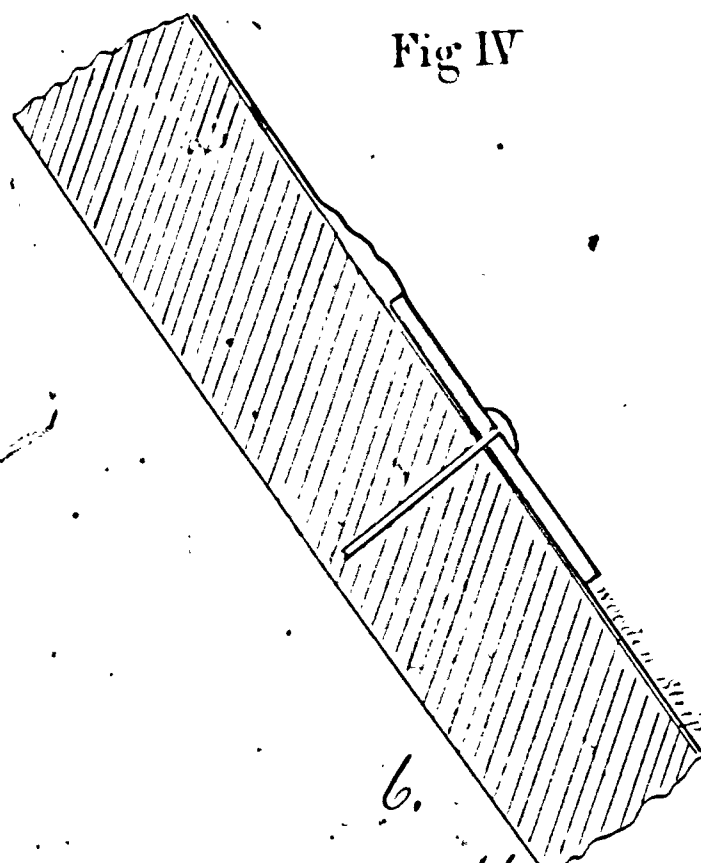


Fig V

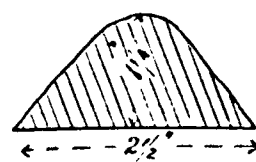
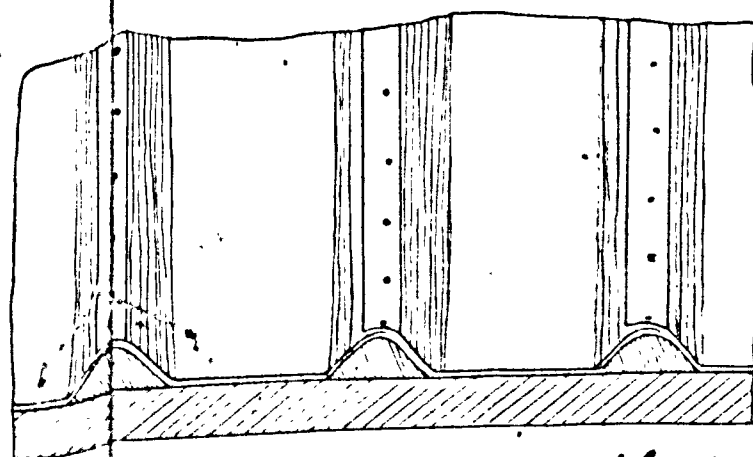


Fig VI



of the actual variation, and the length which expands at 150 feet the expansion would be .06 ft.; but if the sheets are fixed in the centre, reducing the length by half, this will also be reduced to .03 or about $\frac{3}{8}$ inch.

Should the above not meet with your approval, I would propose to take the sheeting off the roof and to relay it at right angles to its present position, placing under each lap a wooden batten $2\frac{1}{2} \times 1\frac{1}{4}$ (Fig V).

These pieces will be 1-7" distance from centre to centre. Over them I would bend the continuous sheeting which is 2 feet wide, fastening it the whole length with wire nails 2" apart. The roof would form a succession of flat gutters, Fig VI, and as the nails are driven in the highest portions, the water is thrown off at once, the length of the sheets being only

29 feet, will make the expansion about $\frac{1}{8}$ of inch. I have tried this plan and found it successful, but in the present case, objections may be raised against it. Holes have been made in the sheeting for the bolts, Fig I, and these would have to be soldered up. In dismantling, no matter how carefully this operation is conducted, some of the sheets are sure to be damaged, and will have to be replaced by new ones. I have no data upon which to base a calculation of the probable cost of this work, but I should say that it will cost certainly not less than 3 or 4,000 Rupees.

7. II. To make the ceiling impervious to water. As stated in para 2 the ceiling of the north, west, and south side consists of a terrace $2\frac{1}{2}$ or 3 feet thick, and as these portions of the building do not leak, I would leave them in their present state, and confine the

the repairs to the east side. Portland Cement having proved itself an invisible material in this situation, I propose to spread over the concrete and cement, a layer of asphalt or of Pitch and sand, I should prefer the former, as it withstands the heat better, but economical reasons may make it advisable to choose the latter. The cost for asphaltting would be

53 squares at Rs 50/-	-	Rs 2650
Contingencies 5 percent		133
		2783

and for Pitch and sand.

53 squares at Rs 30/-	..	1590
Contingencies 5 percent		80
		1670

8. How long continuous Iron sheeting will last, I am unable to state. A roof I constructed seven years ago, stands well, and shows no signs of deterioration, and I have no hesitation in saying, that the roof over the Palace at Mercara, would have answered, had it been better constructed.

9. I also beg to bring to your notice

2. notice, that a portion of the roof
1/8 timbers which is "Sampangi wood"
is attacked by dry rot. If this happened
before the repairs executed by the
Madras Department Public Works
were undertaken I am unable
to say, but it is very probable that
in a few years some of this timber
will have to be renewed. I should
have liked to furnish more details
regarding this, but the space below
the high roof being quite dark, all
examination has to be conducted by
candle light, and defects which would
be apparent in day light at once,
escape detection. Should you however
require further information, I request
permission to take up a small portion
of the roof-covering which will enable
me to give all details.

10. The terrace situated round
3 sides of the interior square (marked
C in plans I + III) has been plastered
with Portland Cement, but here also,
this material has proved itself

12
unavoidable, and it has been broken
up in large patches. Below this terrace
are situated the godowns belonging
to the Officers quarters, and they are
now nearly useless on account of
the extensive leakage. This flat
roof is the main passage to the
officers' quarters, and it will be
impossible to plaster it with polished
chunam, as the mortar would not
get time to settle; for this reason
I propose to lay asphalt on it. The
surface to be coated is $4\frac{1}{2}$ squares, -
which would cost at Rs 50 per square
Rs. 225 inclusive of Contingencies.

P. W. 1872 Depart.

N^o 3876.

From.

The Government of
India.

Dated 1st } Aug 1/72.
Recd 10. }

N^o 296 A.B.

En: 2. ✓

N^o 2062-28-Sept/72.

Forwarding
papers relative to the
necessity for an ex-
-penditure of Rs 10,000 during
1872-73 on Military build-
-ings at Mercara, & re-
-questing to be informed
whether the money can be
provided by the Govt of
Madras, & desiring any
-plan or scheme on the roof
of the old Palace at that
station.

With an order

Letter to Govt.

Indra Nath Roy Senary

N^o 2062

Recd to Govt, 12th Aug 1/72

C/23876

Govt. of 1872 Madras.

PUBLIC WORKS.

To

Immediate

Recd.

Encl. 2

G. O. 28th April 1872. N. 2012 ✓

Nos. 1,88-1,89

Military Buildings at Mercara.

Many orders on letter from
the Hon. Secy. to Govt. of Madras
relative to the
estimate of Rs. 10,000 for
1872/73 on Military Buildings
at Mercara and requesting
to be informed of the money
which is provided by the
Madras Govt. & desiring an
explanation as to the defective
construction of the roof of the
old Palace at that station.

12th Aug 77