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TAMIL NADU ARCHIVES

GOVERNMENT OF TAMIL NADU

Public DEPARTMENT

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Not to be folded or roughly handled

655/7. Subject: - An estimate for repairing the principal structures at the seven pagoda

GOVERNMENT OF MADRAS.

PUBLIC WORKS DEPARTMENT.

12th April 1881, No. 967 W.

Buildings and Roads.  
Civil Works.

Read again—

No. 41. Proceedings of the Madras Government in the Public Works Department, dated 11th February 1881, No. 390 W.

Read the following papers:—

No. 41-A From Captain A. AWDRY, R.E., Superintendent of Works, Buckingham Canal, to the Chief Engineer, Public Works Department, dated Madras, 27th November 1880, No. 2,259.

With reference to paragraph 3 of your No. 1,652, of the 6th July 1880, I have the honor to forward, herewith, an estimate for repairing the principal structures at the Seven Pagodas to prevent their further deterioration by the action of the weather and to restore as far as practicable the damage done to them during the course of years.

2. I regret that my duties, more particularly in connection with the Canal, have prevented my preparing these estimates from my detailed notes, taken some months ago, at an earlier date.

3. If you approve of the estimates and sanction them, I have the honor to solicit an allotment of funds to carry out the work.

SEVEN PAGODAS.

*Replacing broken piece of granite off corner (S.W.) of Bhima's Ratha No. 42.*

The total contents of the fallen piece is about 81 cubic feet, or 8 cubic yards, at 42\* cwt. per yard = 126 cwt. or 6 tons 6 cwt. This is a heavy weight to be lifted up and hung on to iron bars fastened in the rock of the main structure as the latter is full of cracks.

There is a cornice projecting 8 inches on west face and 5 inches on east face under which a front support could be placed, but the back is sloping very nearly vertically and so could not keep in place without iron bars or some other such arrangement.

It will be best, I think, to clear this piece of the sand about it and leave the block where it is.

The size of the *Ratha* is about 45 feet long and 27 feet wide and about 12 feet is the height of that part of the wagon-shaped roof which is above the pillar level. Probably not one-third of the weight of this mass will have to be supported as one crack is across the building at about one-third of its length and the other two-thirds may be considered to be half supported by the natural rock below it. The weight to be supported is then one-third of a mass of granite the size of the roof or  $\frac{1}{3} \times 45 \times 27 \times 6$  cubic feet = 2,430 cubic feet = 90 cubic yards and weighs at 42 cwt. per cubic yard about 189 or say 190 tons.

A crack runs longitudinally along the verandah, not quite straight, but a beam a foot wide would cover it and support both sides. There are four verandah pillars and corner pillars.

I propose to place a set of five iron pillars in the positions *a, b, c, d, e*, with a teak beam 1 foot wide over them. This beam must be 28 feet long and have its upper side cut exactly to fit the under surface of the roof to be supported, and its thickness will be 12 inches. It will be supported at its ends and three intermediate points by iron pillars behind each verandah pillar. The floor of the verandah is solid rock, which will be dressed carefully to fit the footings of the pillars. The pillars will be screwed to the underside of the beam, which will be strutted up into its place tightly, lead will then be run into the dressed cavity at the foot of each pillar until the whole space between the rock and the iron is filled, after the lead has got cold the struts will be removed.

There being five supports the weight on each will be 18 tons.

The actual heights from present rock floor to roof as the position of the pillars is as follows:—

*a* = 8 feet 1 inch.  
*b* = 8 feet 1 inch.  
*c* = 8 feet.  
*d* = 7 feet 9 inches.  
*e* = 7 feet.

and the height at *f* = 7 feet, 4 inches.  
 and *g* = 7 feet, 4 inches.

The roof also requires support at *f* and *g* and teak beams 12 inches wide and 6 inches deep will run from *f* and *g* to the main beam (which will be halved to receive them) between *b* and *c* and *c* and *d*.

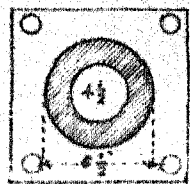
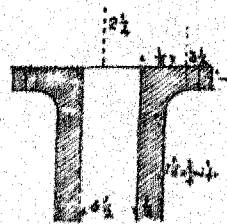
The actual height of the columns will at the outside be not more than 8 feet; they will be of cast-iron, hollow and cylindrical with flat ends, the outer diameter being  $5\frac{1}{2}$  inches. Required the inner diameter of the hollow cylinder. Result is  $4\frac{1}{2}$  inches, which gives—

$5\frac{1}{2}$  outside strength ... .. = 44.5 tons.  
 and  $4\frac{1}{2}$  inside strength ... .. = 24.14

Difference ... 20 tons.

Hence columns may be made

The top and bottom will be spread out to 1 foot square 1 inch thick with 4 holes each  $\frac{1}{4}$  inch in diameter to fix them to beam and floor.



The weight of each column will be—

Cast iron. { 1. Cylinder 8 feet long,  $5\frac{1}{2}$  inches outer diameter = ... .. 194 lb.  
                   {  $4\frac{1}{2}$  " inner  
                   { 2. Flat ends ... { 1 inch thick 1 foot square } C. inches.  
                                   less 1 hole  $5\frac{1}{2}$  diameter, } = 236.9,498 = 61.62 lb.  
                                   and 4,  $\frac{3}{4}$  inch holes.  
                   { 2. Thickenings between end and }  $1\frac{1}{4}$  inch wide on ends and  $1\frac{1}{4}$  C. inches.  
                                   cylinder. } inch along column slightly curved between two. } = 29 = 7.54 lb.

263 lb.

Wrought iron. { 4. Lower bolts with nut heads  $\frac{3}{4}$  inch diameter 6 inches long }  
                                   roughed for running in with lead. }  
                   { 4. Upper bolts with nut heads below and bolt head above 14 inches } 13.28 lb.  
                                   long  $\frac{3}{4}$  inch in diameter.

Lead—

Fixing 4 lower bolts 4 inches each  $1\frac{1}{2}$  foot at 1:6 per foot, being weight of lead piping  $\frac{3}{4}$  inch bore ... .. = 2.13 lb.  
 Bedding the bottom of the pillar say  $\frac{1}{4}$  inch thick below and  $\frac{3}{8}$  inch round sides for depth of 1 inch—  
 1 square foot of  $\frac{1}{4}$  inch lead ... .. = 14.8 lb.  
 $\frac{1}{2}$  " of  $\frac{3}{8}$  inch lead ... .. = 7.4 lb.

Lead ... 24.33

Hence the material required is—

|                                                                                                                                                                                                                         |             | RS. A. P. | lb.      | RS. A. P. |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-----------|----------|-----------|
| 7 cast-iron pillars, each 263 lb. ... ..                                                                                                                                                                                | = 1,841 lb. | 0 2 3     | lb.      | 258 14 3  |
| 5 sets of lower 6 inches and upper 14 inches bolts and nuts at 13.28 lb. ... ..                                                                                                                                         | = 66.40     | ...       | ...      | ...       |
| 2 sets of lower 6 inches and upper 8 inches bolts and nuts at 10.33 lb. ... ..                                                                                                                                          | = 20.66     | ...       | ...      | ...       |
| Wrought iron lb. ... ..                                                                                                                                                                                                 | 87          | 0 4 3     | lb.      | 23 1 9    |
| 7 pillars, &c., with lead at 24.33 lb. each. ... ..                                                                                                                                                                     | = 170       | 0 8 0     | lb.      | 85 0 0    |
| Teak beam 28' x 12' x 14' ... ..                                                                                                                                                                                        | = 32.67     | ...       | ...      | ...       |
| to be dressed to fit. ... ..                                                                                                                                                                                            | 4.09        | ...       | ...      | ...       |
| Teak beam 7' x 12' x 7' ... ..                                                                                                                                                                                          | ...         | ...       | ...      | ...       |
| Cubic feet teakwood wrought and put up ... ..                                                                                                                                                                           | 37          | 3 8 0     | a. feet. | 129 8 0   |
| Labor, carriage, fire-wood, stone, dressing and fixing ... ..                                                                                                                                                           | ...         | ...       | ...      | 70 0 0    |
| Contingencies at 5 per cent. ... ..                                                                                                                                                                                     | ...         | ...       | ...      | 23 8 0    |
| Special superintendence ... ..                                                                                                                                                                                          | ...         | ...       | ...      | 50 0 0    |
| Total for supporting the roof of No. 42 or Bhima's Ratha ... ..                                                                                                                                                         | ...         | ...       | ...      | 640 0 0   |
| Refixing three masses of stone-covering which have fallen from <i>L, M, and N</i> .                                                                                                                                     |             |           |          |           |
| The piece fallen from <i>L</i> is about $5\frac{1}{2} \times 4 \times 2\frac{1}{2}$ feet = 49 C. ft. = 76 cwt. ... ..                                                                                                   | ...         | ...       | ...      | ...       |
| Do. do. <i>M</i> is about $5 \times 3\frac{1}{2} \times 1$ foot = 18 " = 28 " ... ..                                                                                                                                    | ...         | ...       | ...      | ...       |
| Do. do. <i>N</i> is about $7 \times 2\frac{1}{2} \times 1$ " = 16 " = 25 " ... ..                                                                                                                                       | ...         | ...       | ...      | ...       |
| I should propose to bore about four holes in each piece and having fixed similarly-situated iron pegs of 1 inch in diameter in the positions required to hold the detached pieces up on those pegs. Estimate Rs. ... .. | ...         | ...       | ...      | 50 0 0    |
| Total for Bhima's Ratha ... ..                                                                                                                                                                                          | ...         | ...       | ...      | 690 0 0   |

The group of antiquities about Bhima's and Dharmaraja's Rathas indicated by Nos. 36 to 43 on the survey of the Seven Pagodas are buried in sand for some feet above the proper ground line and sand-hills to the east are encroaching on them.

I propose therefore to clear the sand away to the proper ground level over a space of 200 feet long by 150 feet wide; this will take in the whole group and should be surrounded by a compound wall 4 feet high so that cattle could not get in and the drift sand might be checked.

The sand-hills to the east should also be planted with "Rabbit wort" to prevent them shifting.

| No. | Length. | Breadth. | Depth. | Contents. | Rate.                                                                                                                                        | Per       | Amount.      |
|-----|---------|----------|--------|-----------|----------------------------------------------------------------------------------------------------------------------------------------------|-----------|--------------|
| 1   | 220     | 150      | 5      | 165,000   | Clearing sand to be carried to an average distance of 100 feet ..                                                                            | Rs. A. P. | Rs. A. P.    |
|     |         |          |        | 6,111     | C. yards .. ..                                                                                                                               | 0 1 3     | 477 6 9      |
|     |         |          |        |           | <i>Concrete Foundations.</i>                                                                                                                 |           |              |
| 58  | 2 1/2   | 2 1/2    | 2      | 587 1/2   | Pillars all round .. ..                                                                                                                      | ..        | ..           |
| 1   | 665     | 1 1/2    | 2      | 1,977 1/2 | Wall between pillars .. ..                                                                                                                   | ..        | ..           |
|     |         |          |        | 2,564 1/2 | C. feet concrete foundations ..                                                                                                              | 13 0 0    | 333 6 8      |
|     |         |          |        |           | <i>Brick in Chunam.</i>                                                                                                                      |           |              |
| 58  | 1 1/2   | 1 1/2    | 4 1/2  | 554 1/2   | Pillars all round .. ..                                                                                                                      | ..        | ..           |
| 1   | 608 1/2 | 1 1/2    | 4      | 2,738 1/2 | Wall between pillars .. ..                                                                                                                   | ..        | ..           |
|     |         |          |        | 3,292 1/2 | C. feet brick in chunam .. ..                                                                                                                | 14 13 0   | 487 12 1     |
|     |         |          |        | 695 1/2   | R. feet of stone coping 1 1/2 feet broad over wall and 2 feet over pillars and 9 inches in depth ..                                          | 50 0 0    | Do. 347 12 0 |
|     |         |          |        | 4         | Granite stones passing through the wall projecting 1 1/2 feet each side, 1 1/2 feet wide, and 3 inches thick, to serve as steps over wall .. | 2 0 0     | Each. 8 0 0  |
|     |         |          |        |           | Plastering all round .. ..                                                                                                                   | ..        | ..           |
| 58  | 6       | ..       | 1/2    | 87        | Pillars all round above wall ..                                                                                                              | ..        | ..           |
| 1   | 739     | ..       | 8      | 5,912     | Pillars and wall all round both sides .. ..                                                                                                  | ..        | ..           |
|     |         |          |        | 5,912     | Sq. feet plastering .. ..                                                                                                                    | 2 8 0     | 147 12 9     |
|     |         |          |        | 15,000    | Planting Rabbit wort .. ..                                                                                                                   | 0 6 0     | Do. 56 4 0   |
|     |         |          |        |           | Contingencies .. ..                                                                                                                          | ..        | 40 0 0       |
|     |         |          |        |           | Superintendence and sundries ..                                                                                                              | ..        | 51 9 9       |
|     |         |          |        |           | Total Estimate .. ..                                                                                                                         | ..        | 1,950 0 0    |

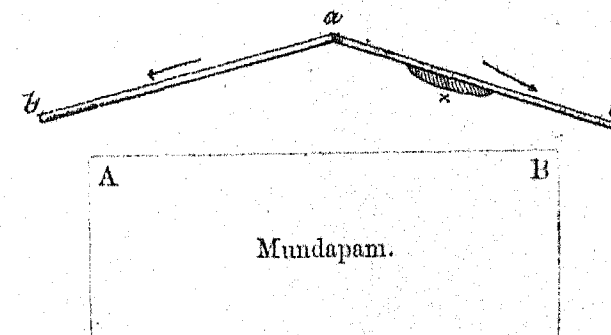
No. 34, or Isvara Temple on the top of the hill requires the following work to protect it from further damage:—

| No. | Length. | Breadth. | Depth. | Contents. | Rate.                                               | Per     | Amount. |
|-----|---------|----------|--------|-----------|-----------------------------------------------------|---------|---------|
| 1   | 8       | 2        | 2      | 32        | <i>Brick in Chunam.</i>                             |         |         |
|     |         |          |        |           | Replacing where fallen out, south-east corner .. .. | ..      | ..      |
| 1   | 2       | 2        | 2      | 8         | Replacing where fallen out, north-east corner .. .. | ..      | ..      |
|     |         |          |        | 40        | C. feet brick in chunam .. ..                       | 14 13 0 | 5 14 10 |
|     |         |          |        |           | Clearing away roots from masonry. Sundries .. ..    | ..      | 2 0 0   |
|     |         |          |        |           | Total Estimate .. ..                                | ..      | 8 0 0   |

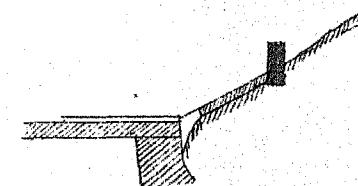
No. 45, or Arjuna's Pennance (unfinished)—

| No. | Length. | Breadth. | Depth. | Contents. | Rate.                                                                                                                 | Per    | Amount. |
|-----|---------|----------|--------|-----------|-----------------------------------------------------------------------------------------------------------------------|--------|---------|
| 2   | 45      | 1/2      | 1      | 45        | Closing figures in the stone on the top and south end so as to prevent water running down the face of the carvings .. | ..     | ..      |
|     |         |          |        | 45        | C. feet concrete of gravel well rammed in .. ..                                                                       | 13 0 0 | 5 13 7  |
| 1   | 70      | 20       | 3      | 4,200     | Clearing sand at base of sculpture. ..                                                                                | ..     | ..      |
|     |         |          |        | 150       | C. yards .. ..                                                                                                        | 0 1 0  | 9 12 0  |
|     |         |          |        |           | Sundries .. ..                                                                                                        | ..     | 0 6 6   |
|     |         |          |        |           | Total Estimate .. ..                                                                                                  | ..     | 16 0 0  |

No. 15, or Krishna Mundapam.—In this there are very bad leaks down the back over the sculptures, the roof is stone slabs with earth over them, and where it abuts against the rock behind there is no proper drain.



Small drains *a b, a c* should be made sloping downwards the face *A B* of the Mundapam being cut out of the rock and the roof being about the level of the top of the rock which slopes upwards to *a*.



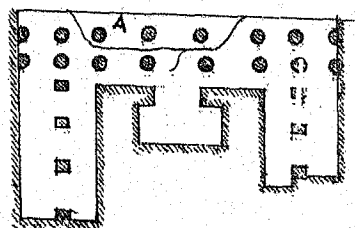
There should be a small wall built on the lower side, a notch being cut as a footing. The work will be—

Stone slab on edge fixed in a groove to be cut in the rock.

| No.                                                                             | Length. | Breadth. | Depth. | Contents. | Rate.                                                            | Per       | Amount.   |
|---------------------------------------------------------------------------------|---------|----------|--------|-----------|------------------------------------------------------------------|-----------|-----------|
| 2                                                                               | 35      | 1/2      | 1 1/2  | 52 1/2    | Stone in mortar .. ..                                            | Rs. A. P. | Rs. A. P. |
|                                                                                 |         |          |        | 52 1/2    | C. feet roughly dressed slabs ..                                 | 75 0 0    | 39 6 0    |
| 2                                                                               | 35      | 1/2      | 1/2    | 17 1/2    | Cutting in rock for its footing ..                               | ..        | ..        |
|                                                                                 |         |          |        | 20        | Do. at X about .. ..                                             | ..        | ..        |
|                                                                                 |         |          |        | 37 1/2    | C. feet rock cutting .. ..                                       | 150 0 0   | 56 4 0    |
| The end walls of the Mundapam require to be built up to prevent further damage. |         |          |        |           |                                                                  |           |           |
| <i>At South end.</i>                                                            |         |          |        |           |                                                                  |           |           |
| 1                                                                               | 13      | 2 1/2    | 4      | 130       | West section .. ..                                               | ..        | ..        |
| 1                                                                               | 11      | 2 1/2    | 9      | 272 1/2   | Centre do. .. ..                                                 | ..        | ..        |
| 1                                                                               | 10      | 3        | 12     | 360       | East do. .. ..                                                   | ..        | ..        |
| <i>At North end.</i>                                                            |         |          |        |           |                                                                  |           |           |
| 1                                                                               | 4       | 2 1/2    | 2      | 20        | West section .. ..                                               | ..        | ..        |
| 1                                                                               | 11      | 2 1/2    | 6      | 132       | Centre do. .. ..                                                 | ..        | ..        |
| 1                                                                               | 10      | 2 1/2    | 11 1/2 | 316 1/2   | East do. .. ..                                                   | ..        | ..        |
|                                                                                 |         |          |        | 1,230 1/2 | C. feet rebuilding with half new and half old cut stones ..      | 50 0 0    | 615 4 0   |
|                                                                                 |         |          |        |           | Lintel at south-east end requires south end moved in 4 inches .. | ..        | 1 0 0     |
| <i>Over the Roof.</i>                                                           |         |          |        |           |                                                                  |           |           |
| 1                                                                               | 48      | 31       | 1      | 496       | Brick jelly and gravel concrete well rammed .. ..                | 15 0 0    | 74 6 5    |
|                                                                                 |         |          |        |           | Clearing bushes on top and at north-east corner .. ..            | ..        | 3 0 0     |
|                                                                                 |         |          |        |           | Contingencies .. ..                                              | ..        | 23 2 9    |
|                                                                                 |         |          |        |           | Superintendence and sundries ..                                  | ..        | 27 8 10   |
|                                                                                 |         |          |        |           | Total Estimate .. ..                                             | ..        | 840 0 0   |

No. 16, between the Krishna Mundapam and Arjuna's Pennance, is an unfinished excavation, but is worth preserving as it extends a considerable distance into the rock and has a good front.

Water running down the rock above oozes through a crack which extends, as shown in the sketch, over three pillar spaces, and one of these pillars at A is broken, the capital and pediment of it only remaining efficient with a height of 6 feet 2 inches without support out of a total height of 10½ from floor to lintel. This portion of the pillar should, I think, be restored to prevent the block of stone which is cracked from the rest from falling down. The crack should be closed at top and two pieces of stone fallen from the ornamental cornice and lying in front about 20 yards away should be replaced, each stone is about 2½ × 2 × ¾ feet. A drain should also be provided on the top similar to that required over No. 15 to divert the water running off the rock above from falling over the front of this excavation.



Grass, &c., requires clearing from the roof.

| No. | Length. | Breadth. | Depth. | Contents.                                              | Rate.     | Per        | Amount.   |
|-----|---------|----------|--------|--------------------------------------------------------|-----------|------------|-----------|
| 1   | 1½      | 1½       | 6½     | 14 Out stone in pillar A ..                            | Rs. A. P. | ..         | Rs. A. P. |
| 1   | 32      | 1½       | 1½     | 1½ Closing crack above with jelly in chunam ..         | 20 0 0    | 100 C. ft. | 0 4 3     |
| 1   | 56      | 1½       | 1½     | 41½ Drain on top slab stones set on edge ..            | 75 0 0    | Do.        | 30 15 0   |
| 1   | 56      | 1½       | 1½     | 13½ Cut groove in rock for do. ..                      | 150 0 0   | Do.        | 20 10 0   |
|     |         |          |        | Resetting two fallen stones in cornice 15 feet high .. | ..        | ..         | 20 0 0    |
|     |         |          |        | Clearing grass and bushes, &c., for roof ..            | ..        | ..         | 2 0 0     |
|     |         |          |        | Superintendence and sundries ..                        | ..        | ..         | 6 2 9     |
|     |         |          |        | Total Estimate ..                                      | ..        | ..         | 116 0 0   |

No. 17, or Arjuna's Pennance.—In the fissures all loose stones and bushes must be cleared with great care so as not to break any figures.

The elephant's tusk is broken and the piece lying below it is about 9 inches in diameter broken with a vertical fracture, so, though the pieces would fit together exactly, they must be bored and provided with iron pegs to keep them up; this will have to be done with very great care and with small finely-pointed chisels to avoid splitting the stone. Two iron bars should be used not less than half inch diameter run three inches with lead into the stump of the tusk and slightly inclined with their ends upwards so as to allow the end of the tusk to keep in place of itself on them.



The most important work is the putting on of the Naga's head, which is lying about fifteen yards in front of the sculpture. This must be bored with two holes vertically so as to allow of the holes in the head resting on two corresponding pins to be fixed in the trunk of the Naga. The pins must be of iron ¾ inch in diameter and running at least 9 inches into the trunk and head; in the former they will be fixed by running with lead: the job will be expensive as the holes must be most carefully chiselled out with very finely-pointed tools for fear of splitting the stone. The head, which is of very considerable weight, must be raised to a height of about 20 feet from the ground, for which it will be necessary to employ a pair of shear legs. Scaffolding will also be required to work on.

The water which falls on the rock above the sculpture must be prevented from running into the fissure in which the Naga is situated and also from running over the face of the rock,

The fence requires slight repairs.

### Estimate of Cost.

| No. | Length. | Breadth. | Depth. | Contents.                                                                                                              | Rate.     | Per        | Amount. |
|-----|---------|----------|--------|------------------------------------------------------------------------------------------------------------------------|-----------|------------|---------|
|     |         |          |        |                                                                                                                        | Rs. A. P. |            |         |
|     |         |          |        | Clearing out loose stones and bushes from fissures, access very difficult ..                                           | ..        | ..         | 5 0 0   |
|     |         |          |        | Fixing elephant's tusk—tools, labor, iron, lead, scaffolding, &c. ..                                                   | ..        | ..         | 20 0 0  |
|     |         |          |        | Fixing very heavy Naga's head—tools, labor, iron, lead, scaffolding, shears, &c. ..                                    | ..        | ..         | 50 0 0  |
|     |         |          |        | Drain from point above north side of figure to south end of sculpture joining into the drain 56 feet long over No. 16. | ..        | ..         |         |
| 1   | 52      | 1½       | 1½     | 39 Slab stones on edge ..                                                                                              | 75 0 0    | 100 C. ft. | 29 4 0  |
| 1   | 52      | 1½       | 1½     | 13 Groove cut in rock for setting slab stones for drain.                                                               | 1 8 0     | Foot.      | 19 8 0  |
| 1   | 6       | 1½       | 3      | 27 Concrete wall where fissure is crossed to go down to rock everywhere.                                               | ..        | ..         | ..      |
| 1   | 10      | 2        | 6      | 120 Concrete wall across top of fissure 6 feet back from face of sculpture.                                            | ..        | ..         | ..      |
|     |         |          |        | 147 Cubic feet. Concrete wall ..                                                                                       | 13 0 0    | 100 C. ft. | 19 1 9  |
|     |         |          |        | Repairing fence ..                                                                                                     | ..        | ..         | 10 0 0  |
|     |         |          |        | Special superintendence ..                                                                                             | ..        | ..         | 20 0 0  |
|     |         |          |        | Sundries ..                                                                                                            | ..        | ..         | 2 2 3   |
|     |         |          |        | Total Estimate ..                                                                                                      | ..        | ..         | 175 0 0 |

No. 6, or Aliva Temple on the Shore.—In this building the stones are much rounded by the action of the weather; some have fallen and some are loose now, while others will become so before long. What is required is to employ masons of judgment to wedge up with chips of stone the rounded stones of which the building is formed, working carefully round each course of the structure from the bottom upwards and thus securing from any movement all the stones still in their places. After this the fallen stones must be put back into their proper places and wedged up so as to be immovable: chunam need not be used at all in the work.

The roots of trees wherever found winding through the masonry to be cut away and, if possible, traced to the ground and grubbed out there.

### Estimate.

|                                                                                                            | Amount, RS. |
|------------------------------------------------------------------------------------------------------------|-------------|
| For skilled and unskilled labor and materials in wedging up existing stones and replacing fallen stones .. | 110         |
| For clearing roots of trees ..                                                                             | 10          |
| Skilled superintendence ..                                                                                 | 30          |
| Total Estimate ..                                                                                          | 150         |

### General Abstract.

|                                                                 | Estimate Amount, RS. |
|-----------------------------------------------------------------|----------------------|
| No. 42, or Bhima's Ratha ..                                     | 690                  |
| Group from 36 to 43, clearing and protecting from sand drift .. | 1,950                |
| No. 34, or Isvara Temple ..                                     | 8                    |
| „ 45, or Arjuna's Pennance (unfinished) ..                      | 16                   |
| „ 15, or Krishna Mundapam ..                                    | 840                  |
| „ 16, a fine unfinished excavation ..                           | 115                  |
| „ 17, or Arjuna's Pennance ..                                   | 175                  |
| „ 6, or Aliva Temple ..                                         | 150                  |
| For petty repairs as found desirable to other structures ..     | 156                  |
| Total ..                                                        | 4,100                |

(Signed) A. A WDRY, Captain, R.E.,  
Superintendent of Works,  
Buckingham Canal.

From F. C. PUCKLE, Esq., Acting Superintendent of Madras Survey, to the Chief Engineer, Public Works Department, dated Madras, 13th December 1880, No. 1,246-M.

With reference to your memorandum of 11th instant, No. 2,791, I have the honor to forward as per Invoice No. 70-A enclosed a copy each of the photographs of the Seven Pagodas Views Nos. 17 and 45 (in three prints), and to state that Nos. 6 and 42 were not taken by this department as prints of these were found in the Government Album.

#### NOTE BY THE CHIEF ENGINEER.

In paragraph 312 of the Public Works Code it is enjoined that "the attention of the Executive Engineer will be constantly directed to the condition of all public monuments or buildings of architectural or historic interest, &c."

It is needless to say that the injunctions thus conveyed are especially applicable to the "Rathas and other works at the Seven Pagodas (or Mahavallipur) which (executed between A.D. 650 and A.D. 700) are now recognized as being the mustard seed from which all the existing forms of Dravidian temples appear to have been derived.

The attention of the Superintendent of Works, Captain Awdry, having been drawn to the requirements of these works, he now submits estimates of which the following is an abstract:—

| Abstract.                                                    | Estimate Amount. |
|--------------------------------------------------------------|------------------|
| No. 42, or Bhima's Ratha                                     | Rs. 690          |
| Group from 36 to 43, clearing and protecting from sand drift | 1,950            |
| No. 34, or Isvara Temple                                     | 8                |
| " 45, or Arjuna's Penance (unfinished)                       | 16               |
| " 15, or Krishna Mundapam                                    | 840              |
| " 16, or a fine unfinished excavation                        | 115              |
| " 17, or Arjuna's Penance                                    | 175              |
| " 8, or Aliva Temple                                         | 150              |
| For petty repairs as found desirable to other structures     | 156              |
| Total ...                                                    | 4,100            |

To facilitate reference the index map printed by the Revenue Survey Department of the Seven Pagodas is annexed. Also the following plans of some of the works concerned and lately finished in the Lithographic Branch of this office, viz:—

|                                                         |
|---------------------------------------------------------|
| No. 6, Plan, &c., of the Alaivay Kovil or Shore Temple. |
| " 15, do. of the Krishna Mundapam.                      |
| " 16, do. of the unfinished excavation.                 |
| " 34, do. of the Isvara Temple.                         |
| " 42, do. of the Bhima's Ratha.                         |

Also photographs of the great rock tableau known as "Arjuna's Penance" and of another unfinished one of the same subject.

As regards the proposal made in the first item to expend Rs. 690 in lifting and placing in its original position the portion of the rock (weighing over 6 tons) which has fallen out of the west face of the Bhima Ratha, and in supporting the rest of the shaken portion by iron columns as shown by Captain Awdry, the first question that presents itself is whether it is necessary to carry out any restoration here.

The following extract from page 119 of "The Cave Temples of India" shows clearly that the design of the Bhima Ratha as applied to the material out of which it was chiselled was defective, viz:—

"So little experience, however, had the Pallavas, or whoever undertook these works, in the material they were employing, that they actually set to work to copy literally a wooden building in granite. The consequence was that even before they had nearly completed the excavation of the lower story, the immense mass of material left above, settled and cracked the edifice in all directions, and to such an extent as to necessitate the abandonment of the works while they were in even a less finished state than those connected with the other Rathas. Not only is there a crack of some inches in width right through the rock, but several of the little simulated cells have slipped down for want of support and give the whole a ruined, as well as an unfinished, aspect."

It is thus perhaps open to question whether it would on the whole be advisable to do anything just now to this Ratha without further and fuller consideration as to propriety of attempting to restore it to as nearly as possible what may be supposed to have been the intention of the original designers. If, however, it be decided to carry out the work, it may also be open to question whether instead of the proposed iron columns, &c., it would not be more appropriate to introduce a simple block of masonry, without any special form, and merely with the direct object of taking the strain and nothing more. It is thought that such an obvious and unpretentious arrangement would better suit the general character of the Ratha.

The second item of Captain Awdry's estimate, amounting to Rs. 1,950, for clearing away the sand, especially from the east side of the group of Rathas (36 to 43) and surrounding the same by a compound wall seems to be necessary, but in executing the work care should be taken to secure and preserve any coins or other objects of value that may now be in the debris, although it is hardly to be expected from the way in which the sand has accumulated that much will be found.

Mr. Fergusson in speaking of the Draupadi Ratha (the most northern of the groups) observes that above the roof "there evidently was a finial of some sort, but being formed from a detached stone it has been removed or fallen down, and its form cannot now be ascertained, unless indeed the original could be found by digging in the sand where it now probably remains." There is thus one object to be searched for, and there may be others in carrying out any clearances here. Not only, however, should the site so far be cleared of sand, but it would also be very desirable to plant the "dunes" at the east with "rabbit wort," sea pink and other vegetation to prevent as far as possible future accumulations of sand by the action of the wind.

The following items of work all seem desirable:—

|                                                   | Rs. |
|---------------------------------------------------|-----|
| No. 34, or Isvara Temple                          | 8   |
| " 45, or Arjuna's Penance, the unfinished tableau | 16  |
| " 15, or the Krishna Mundapam                     | 840 |
| " 16, unfinished excavation                       | 115 |

The Krishna Mundapam, especially as an object of interest, should be protected as far as may be possible from the action of the weather.

This and the cleansing of the surfaces of the tableau from weather stains by diluted acid or other ready means could certainly do no harm, and would in all probability be very desirable as bringing out the forms distinctly and rendering them more suitable for being photographed as well as interesting to visitors.

The photographs herewith sent up show how seriously the black weather stains now obscure and render unintelligible a large proportion of the carvings.

The next item is Rs. 175 proposed to be spent on the large tableau known as Arjuna's Penance, generally recognized as the finest of its kind in India (No. 17 of the map, photograph herewith).

There can be little doubt here that it is very desirable (1) to cut off the runs of water from above and which have occasioned the weather stains adverted to, (2) to replace the end of elephant's tusk which has fallen off, (3) to replace the head of the Naga Rajah.

This last is the most important as may be assumed from the following extract from a foot-note to page 156 of the "Cave Temples" of India (*supra*), viz:—

"It was evident that the head of the Naga Rajah had fallen from the accident of its position, the artists having placed it in the centre, where it could have a shadow behind it, but where it had no support. I consequently wrote to my friend Dr. Hunter to try and find it. With the assistance of the then Madras Government he removed the sand, and found it lying where it fell. I afterwards made application to the Government to have it replaced, which could easily be done, and so give meaning to the whole bas relief. This I understood from my friend Mr. Campbell Johnstone, who took out my application, was also sanctioned and ordered to be carried out, but from photographs recently received it appears not only that this has not been done, but that the bust has been removed from where it originally stood after its recovery."

The Naga Rajah's head covered by a seven-headed cobra here mentioned is now lying in apparently excellent preservation on the ground east of the tableau, and can be

replaced in its position on the top of the body which will be observed to stand out in the cleft between the two large rocks close in front of the great elephant's head (see photograph).

A sufficiently strong iron strut should be supplied in order to secure it to the rock at back and thus prevent all chance of displacement in future.

The next item is No. 6, the Alaivay Kovil or Shore Temple, Rs. 158. Mr. Fergusson considers this temple to be "not only one of the most elegant but one of the oldest examples of the style." The fine form of this building, which unlike most of its class has its spire entirely of stone, will be readily recognized from an inspection of the accompanying plan; but unfortunately from the ceaseless action of the spray to which it is exposed, most of the stones of which it is built have become rounded and weather-worn, and it seems hopeless to attempt to do more than secure as proposed the blocks which are now in a tottering state and replace such of the fallen ones as may be possible.

Leaving out for the present at least the proposed work to Bhima's Rathas (Rs. 690), the total amount required for carrying out Captain Awdry's programme would be Rs. 3,410, of which it would be sufficient to assign Rs. 500 for the current official year leaving the rest to be met from 1881-82. As this is a class of work which will be all the better for being carried out quietly and deliberately this method of meeting the outlay will be rather beneficial than otherwise.

In conclusion, it may be as well to note that 50 copies of the plans of the works at the Seven Pagodas (see linked file) have now been completed in this office, one complete set with map in a portfolio having been forwarded to His Grace the Duke of Buckingham and Chandos just before leaving. The rest, comprising 50 sets, are now being prepared for distribution in portfolios.

The plans it is thought have (see accompanying specimens) been executed in a very creditable manner by the Draftsman, Mr. Pope, who was engaged for six months in drawing them on the spot, and with the approval of Government an honorarium of Rs. 200 might it is thought be awarded for his share in the work.

It must at the same time be submitted that being of a very special character in which Mr. Pope had no professional officer to guide him, it remains to be decided what may be the precise value of the work so turned out from an archaeological point of view. This it is particularly desirable to ascertain before the drawings are distributed to learned Societies as it may be possibly be found on close professional scrutiny that some of the work done has been superfluous, or again, on the other hand, that supplementary drawings, &c., are quite essential to complete the information for archaeological purposes.

If it could be arranged to have the work examined on the spot jointly by Mr. Robert Sewell and Mr. Chisholm, there would, it is believed, be sufficient guarantee from the high professional reputation of both officers in their respective lines that the work as issued would be reliable and such as might without any hesitation be circulated by Government for general information. Now that so much expense and trouble have been undertaken, it would apparently be undesirable that Government should incur the risk of unfavorable criticism in a matter of this kind.

In connection with this it may not be out of place to remark that Her Majesty's Secretary of State appeared specially desirous that Mr. Chisholm's services should be devoted to the work of illustrating these important ancient monuments, and as will be observed from the foot-note, page 106, of "The Cave Temples of India," this officer has as a fact already at his own expense made a complete set of illustrations of the Monolithic Rathas for Mr. Fergusson; it would therefore appear the more desirable that he should now be placed in a position for the more effectually complying with the wishes of the Secretary of State.

It is understood, moreover, that in the forthcoming number of the *Madras Journal of Literature and Science* a paper will appear by Colonel Branfill, Deputy Superintendent, Great Trigonometrical Survey of India, giving a minute account of each of the buildings and monoliths at the Seven Pagodas, so that the present would seem to

be the proper time for completing the work of illustration that has been so well commenced on the part of Government.

Very great interest, it need hardly be observed, is now being directed to all work of this class. Captain Carr's compilation, published by the Madras Government in 1869, though very useful as drawing attention to the subject, is acknowledged to be a very imperfect work, and Mr. Fergusson's notice in "The Cave Temples of India" is somewhat more of a general disquisition than a special account of each of the numerous works at Mahavallipur. The illustrations in this latter work are, moreover, necessarily very limited.

Accurate and complete plans under professional architectural and archaeological guidance are therefore apparently the desiderata at present.

(Signed) R. H. SANKEY, Colonel, R.E.,  
Chief Engineer, P.W.D.

7th January 1881.

The papers in question will be referred to Mr. Chisholm, Consulting Architect to Government, and to Mr. Robert Sewell, C.S., who will report, after personal joint inspection of the remains and consideration of the papers, as to the further measures to be adopted.

2. The Right Honorable the Governor in Council sanctions the payment of an honorarium of Rs. 200 to Mr. Pope, Draftsman in the Lithographic Branch of the Public Works Secretariat, in consideration of the work done by him in the preparation of the drawings.

(True Extract.)

(Signed) J. PENNYCUICK, Major, R.E.,  
Under Secy. to Govt. P.W.D.

Read also—

No.41-B From R. SEWELL, Esq., Archaeological Reporter to Government, and R. F. CHISHOLM, Esq., Consulting Architect to Government, to the Chief Engineer and Secretary to Government, Public Works Department, dated Madras, 22nd February 1881, No. 644.

We have the honor to report that, in obedience to the orders of the Right Honorable the Governor of Madras, we accompanied His Excellency to Mahavallipuram and Salivān Kuppam on Tuesday, 15th instant, and together inspected the ancient remains at both these places. We beg to lay before you the following report.

2. Except in the case of the Shore Temple, we do not apprehend any immediate deterioration to the remains from the force of gravitation. As it is very essential just at present to leave these important monuments in the exact condition in which they have been known for the past century, so that they may be subjected to competent archaeological investigation, we would confine all work for the present to—

- 1st,—Clearing away sand.
- 2nd,—Cutting catch-water drains.
- 3rd,—Raising and replacing the Naga's head of the great bas relief called "Arjuna's Penance."
- 4th,—Underpinning the Shore Temple.

3. With regard to the prevention of sand accumulation, we think it would be better for the present not to build walls, but to clear a space of, say, 20 feet around each specimen down to the rock, and then to slope the sand off in all directions to such an inclination as will offer the least possible opportunity to its refilling the cleared space. The surface of the slope and so far as is found practicable, the sand around should be planted with rabbit wort, as proposed by Colonel Sankey, C.B.

4. All the cracks in "Bhima's Ratha" should be carefully "buttoned" with chunam in the usual way; and the buttons dated and watched. So long as there is no actual movement, no danger is to be apprehended.

5. A portion of the Shore Temple has fallen since Mr. Chisholm's last visit. This should be replaced and supported by a column of stone 9 inches square, and the whole of the masonry from the lowest courses wedged up with stone work laid dry.

6. It might not be out of place to observe that no iron should ever be used when dealing with works executed in stone. Simple pins, dowells and cramps might be made of gun metal, brass or copper, and, where it is necessary to introduce a support, it should be constructed of the same material as the mass supported.

7. The cost of the above-mentioned works according to Captain Awdry's estimate will be approximately as follows:—

|                                                                                                                                    | Rs.   |
|------------------------------------------------------------------------------------------------------------------------------------|-------|
| 1. Clearing the sand accumulations from around the southern group of Rathas and planting the surfaces of slopes ...                | 650   |
| 2. Executing similar work to the unfinished bas relief called Arjuna's Penance ...                                                 | 20    |
| 3. Draining the Krishna Mundapam and the adjoining unfinished Mundapam, say ...                                                    | 120   |
| 4. Replacing the Naga Rajah's head and the elephant tusk and other works connected with the bas relief called Arjuna's Penance ... | 250   |
| 5. Underpinning and wedging Shore Temple ...                                                                                       | 150   |
| Total ...                                                                                                                          | 1,190 |

8. In addition to these works it would seem desirable to clear the debris away from the Rayala Gopuram on the top of the hill (No. 27 in Carr's book), and also to clear from sand the temple and tiger cave at Salivān Kuppam. Captain Awdry might be requested to estimate for these works. A good deal of sand clearing would seem to be required.

9. With regard to the plans drawn out by Mr. Pope, which are fair general representations of these remains, we are afraid that they will be found wanting in practical utility. As illustrations to a popular hand-book like Mr. Carr's work they would be extremely valuable, but the form in which they are issued precludes the possibility of so applying them. They have been spread over an unnecessarily large surface—thus, the three illustrations on Sheet No. 41 of the bound volume before us occupies, with the large title, a space 26½ inches by 20 inches, where as it could easily be compressed into a page of 11 inches by 8 inches (see Appendix A). It is quite useless to repeat the large title on each separate page. The form of the volume is clumsy and awkward to use in consequence of the mass of paper and cloth employed, and could never therefore be popularized. Viewed, on the other hand, from a scientific stand-point, the work is almost useless as a guide to archaeological research, as it does not go far enough. No details are given and therefore no generalizations regarding style or development of ornament could be deduced from these drawings. So far as the work goes it is, of course, useful, as it represents ground which must some time have been gone over, but much more is wanted.

10. We recommend that the lithographed stones should be kept, the large and unnecessary Draftsman's titles expunged, and the whole sheet hereafter filled with architectural details. If this is done the scientific world will then be in possession of really valuable volumes illustrating these interesting monuments, but we think it undesirable to multiply them in their present form. We enclose a sheet of a published book which will illustrate our meaning (Appendix B).

11. It seems that the book of lithographs under consideration is to be augmented by a series of photographs; if this is the case, we beg that a volume may be sent to us in its complete form.

12. We inspected the quarries on the works adjacent to the remains, as Messrs. Fergusson and Burgess in their recently-published work, the "Cave Temples of India," apprehend disaster from the close proximity of these quarries. The operations

as carried on now appear to be perfectly harmless, but we think that a constable or peon might be permanently placed at Mahāvellūram, not only to watch the quarrying, but to prevent defacement of the sculpture.

13. We would recommend the clearance of sand and the replacement of the Naga's head, &c., to be taken in hand as soon as possible, and that a grant of Rs. 300 be made for this purpose to Captain Awdry, for employment during the current official year.

No. 42.

ORDER THEREON, 12th April 1881, No. 967 W.

THE Right Honorable the Governor in Council considers that the protective works recommended by Messrs. Sewell and Chisholm in connection with the remains of the Seven Pagodas are all that will be required at present. The works will accordingly be put in hand at once under arrangements to be made by the Executive Engineer, Chingleput Division, and sum of Rs. 1,190 is appropriated from the Provincial Reserve.

2. Estimates should also be framed for carrying away the debris from the Rayala Gopuram and sand from the temple and cave Salivān Kuppam.

3. In reference to the remarks on the plan of the Seven Pagodas, it is understood that there was no intention of issuing the plates to serve the purpose of a hand-book or to illustrate any existing descriptive account of the remains. They were, it is believed, intended to supply plans and sections of these ancient works not hitherto extant, and, with the photographs, to furnish substratum on which to graft details which might be valuable for either architectural or archaeological purposes.

4. It would appear from the observations at the end of paragraph 9 of the joint report that this object has been attained. The details still required to render the plates more useful as a guide to archaeological research can, it has been ascertained, be added to 38 out of 50 sets already printed off.

5. The requisite arrangements for completing the plates will now be made under the joint supervision and instruction of Messrs. Sewell and Chisholm.

6. One complete set of the photographs of the structures of the Seven Pagodas will be furnished to Mr. Sewell by the Superintendent, Madras Survey. Of the three sets of the photographs received by the Chief Engineer, one has been supplied to the Right Honorable the Governor, a second will be sent to Mr. Chisholm, and the remaining set will be retained for record.

7. Paragraph 12 of the report will be considered in the Judicial Department.

8. This sanction has been registered: Provincial No. 12 B. of 1881-82 and classified as Civil Buildings, Original Work.

(True Exct.)

Captain, R.E.,  
Ag. Under Secy. to Govt., P.W.D.

To R. Sewell, Esq.  
" R. F. Chisholm, Esq., with photographs.  
" the Superintendent, Madras Survey.  
" the Public Department.  
" the Judicial "  
" the Revenue "  
" the Examiner of Public Works Accounts.  
" the Superintending Engineer, Second Circle.  
" the Superintendent of Works, Buckingham Cal.

, Exd. A. S. Rodgers.

7 Spare Copies

DISPOSED OF

12 MAY 81

BY G. O. No. 967  
BUILDINGS AND ROADS.  
CIVIL WORKS.

Gobt. of (1881) Madras.

PUBLIC WORKS.

(7)

12 MAY 81

To

R. SEWELL, Esq.

&c., &c., &c.

CURRENT No. 967

Dated April, 12th.

Issued

Recd.

Encl.

G. O., 12th April 1881, No. 967 W.

APRIL

Nos. 41-42.

Seven Pagodas.—Directs the immediate execution, funds being appropriated, of the protective works recommended by Messrs. Sewell and Chisholm in connection with the remains of the —.

Enter 13 May 1881 No 967

6000