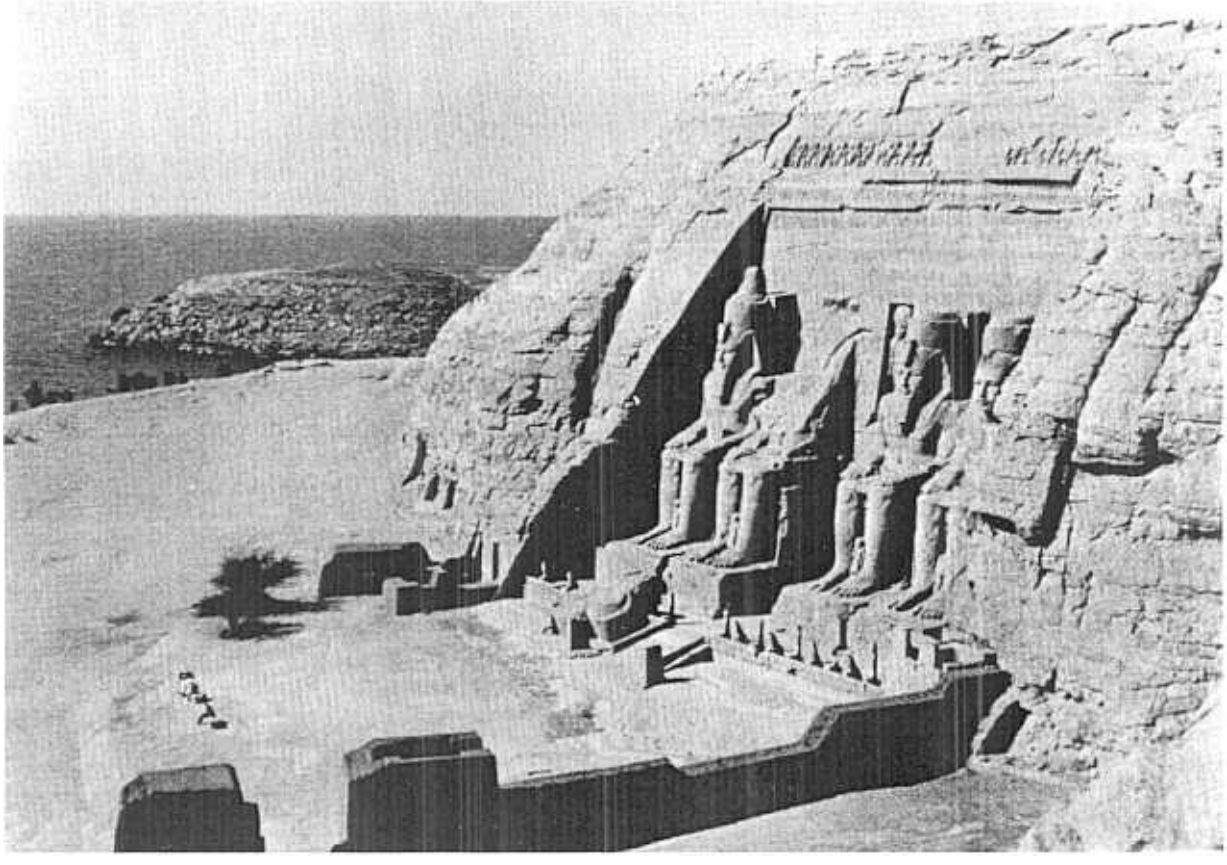
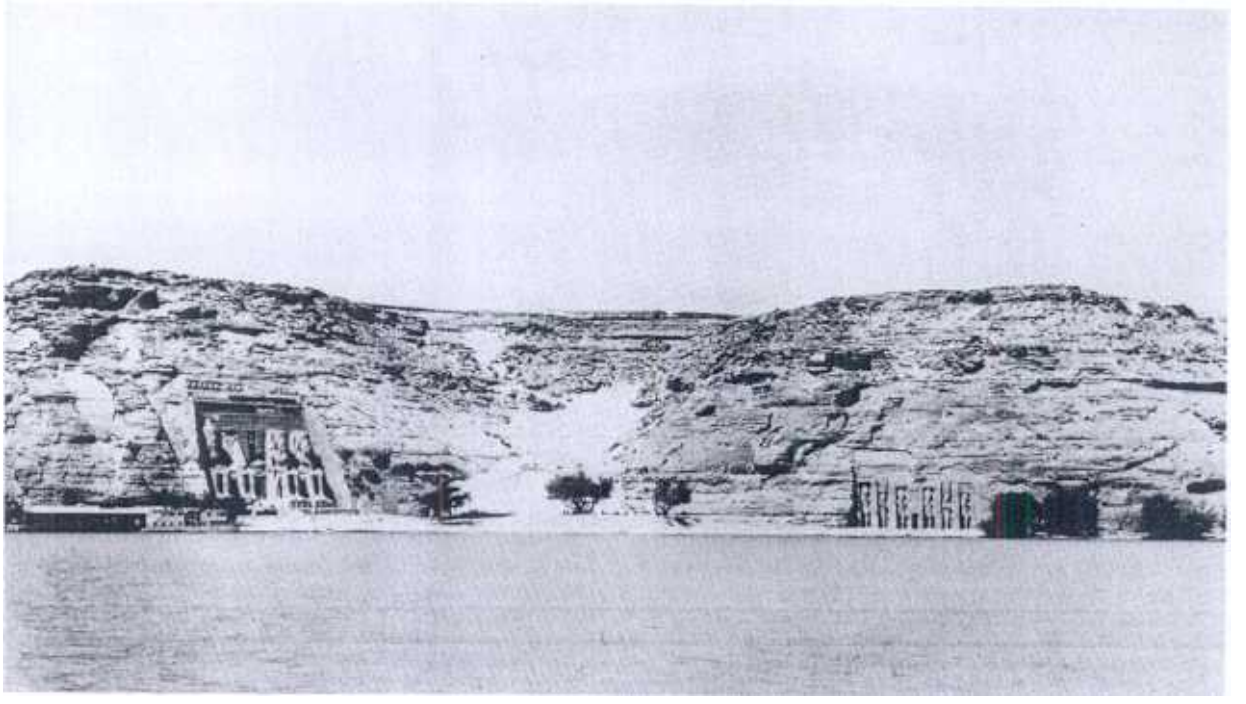
THE SALVAGE OF THE ABU SIMBEL TEMPLES

INTRODUCTION

The salvage of the Abu Simbel Temples in southern Egypt constitutes an outstanding example of a grand ancient monument handed down to posterity. Much has also been written about the Abu Simbel Temples, especially during the nineteen-sixties when the salvage operation took place. It was not until last year, however, that a publication appeared giving a description covering the whole of this operation. It was VBB who published their Concluding Report on the Salvage of the Abu Simbel Temples, a richly illustrated volume of more than 200 pages. The article below endeavours to present the contents of this book in a concentrated form, while still describing the entire salvage procedure. Moreover, at the end some words will be said about experience subsequently gained.

Fig. 1. - The Great Temple of Abu Simbel — now in safety, beyond the reach of Lake Nasser.





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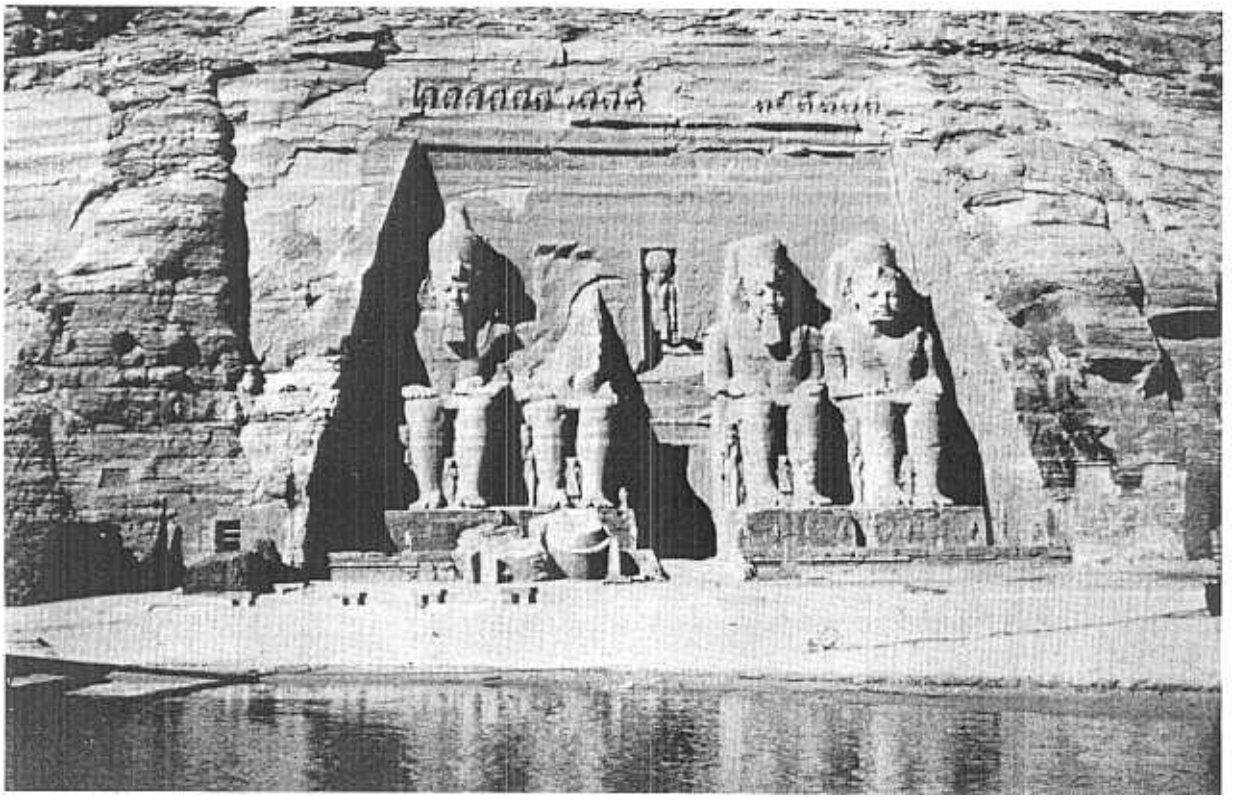
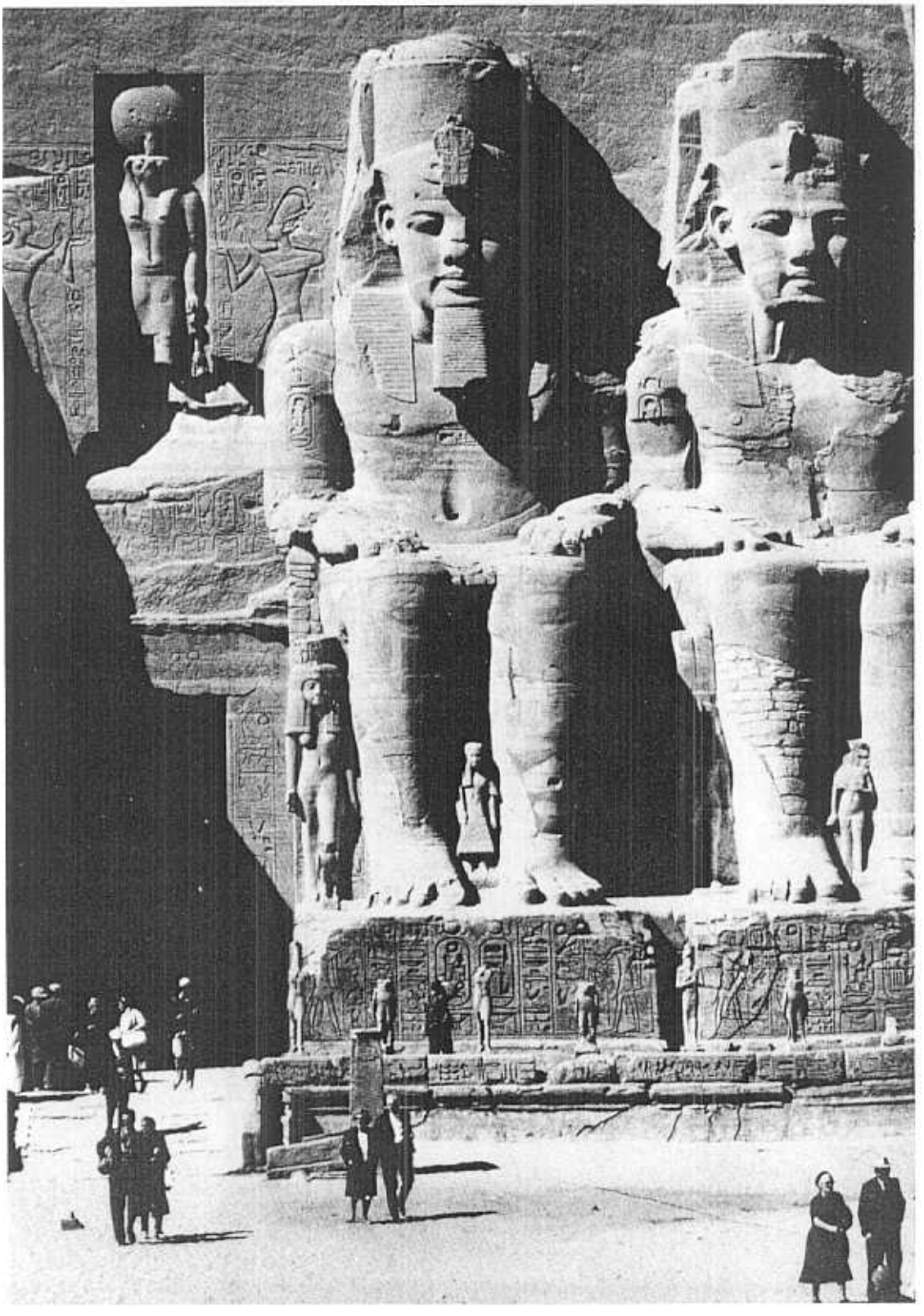


Fig. 4. - The more closely one approaches the Temple façade, the more impressive it becomes.



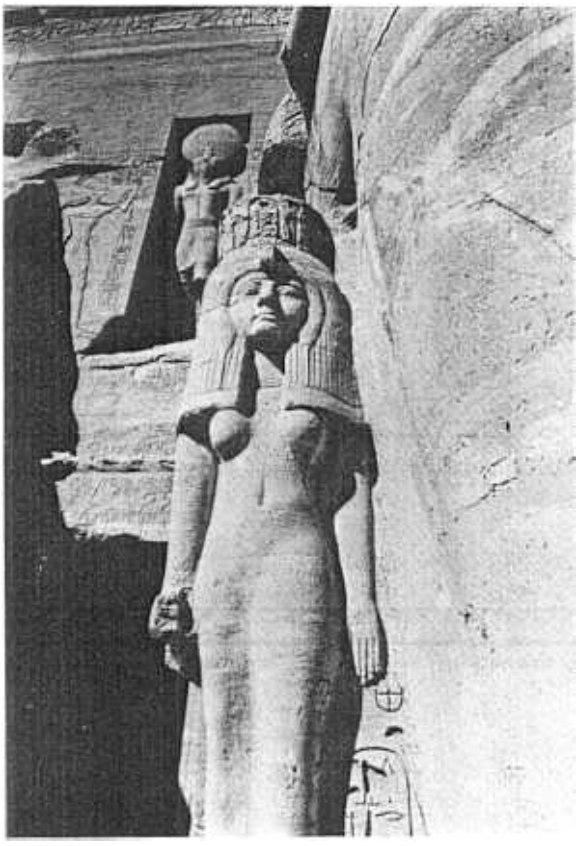


Fig. 5. - Queen Nefertari, the favourite consort of King Ramesses II, but here not even allowed to reach his knee, is, however, depicted in a dignified, majestic manner of her own.

THE ABU SIMBEL TEMPLES ON THEIR ORIGINAL SITES

Since the two Abu Simbel Temples had to be removed from their original sites — beyond the reach of Lake Nasser — a careful documentation of the Temples on those sites was carried out, mainly by numerous measurement drawings and photographs. Some pictures of the Temples on their old sites are shown in Figs. 2-9.

The Abu Simbel Temples were created by King Ramesses II during the 12th Century B.C., in Lower Nubia, some 280 kilometres south of the first cataract of the Nile (at Aswan). They were hewn out in the rock proper, consisting of sandstone, on the western bank of the Nile, below the desert plateau (Fig. 2).

The Great Temple, executed for the King himself, consists of an outer façade and 14 rooms in the interior of the cliff (Figs. 3-7). The façade is dominated by four colossal statues of the King, each about 20 m. high. The biggest room, the Courtyard Hall, is 18 m. long, 16 m. wide and 8 m. high. The innermost room, the Bark Sanctuary, is located about 60 m. into the cliff, as counted from the original mountain surface. The walls, pillars and ceilings of the Temple rooms are beautifully sculptured and painted.

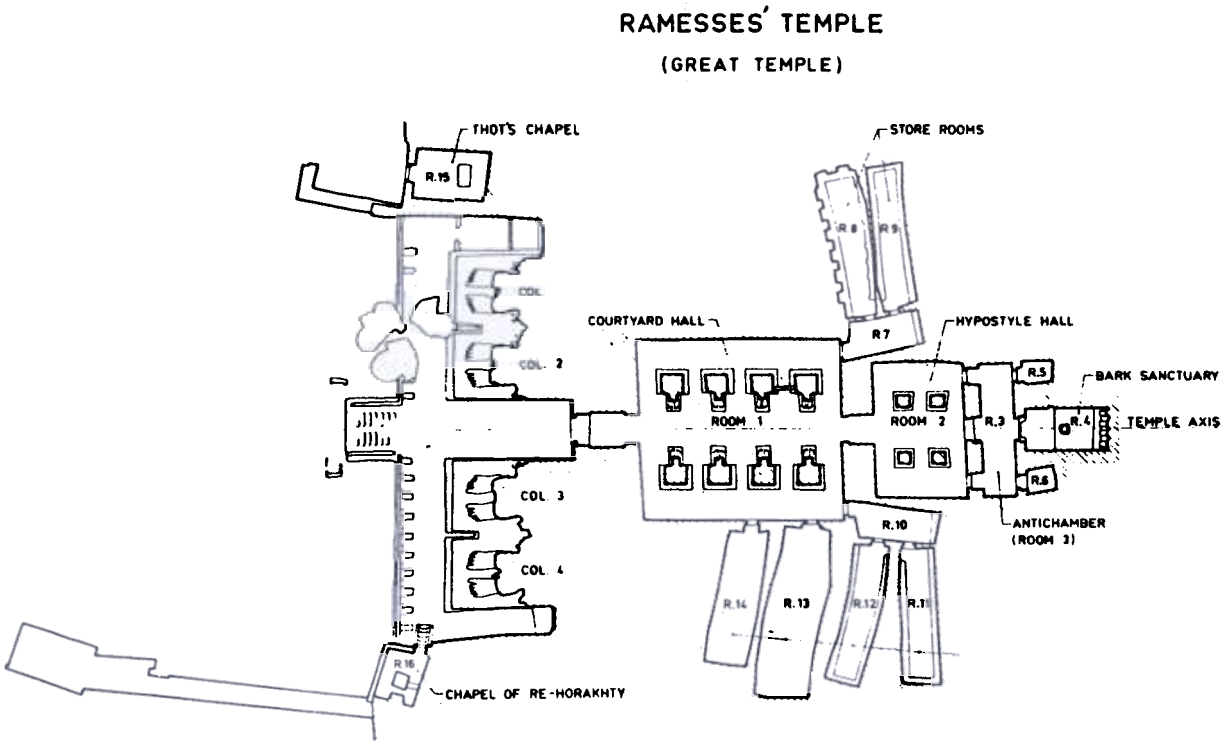


Fig. 6. - Horizontal section through the façade and the rooms of the Great Temple.

Fig. 7. - Four of the eight pillars in the Courtyard Hall (Great Temple) with their statues of Ramesses in the form of Osiris, the god of the underworld.

The Small Temple, dedicated to Queen Nefertari, the favourite consort of the King, consists of an outer façade and 5 rooms inside the cliff. The façade is dominated by four statues of Ramesses and two of Nefertari. The Temple rooms are richly decorated here also, although in a somewhat different style, less martial than that of the Great Temple, more feminine, inspired by love and beauty (Figs. 8-9).

MENACE FROM THE HIGH DAM

Construction of Sadd El Aali, the High Dam on the Nile 7 km south of Aswan, was started in 1960. From 1964 on, the water level of the Nile was to be gradually raised, in order to create an enormous reservoir — the Lake Nasser — with a maximum water level some 60 metres higher than previously, see Fig. 10.

If the rising Nile waters had been allowed to flood the temples, the latter would soon have deteriorated, since the sandstone in the temple region suffers considerable losses in strength and durability when submerged. From 1964 on, this menace from the High Dam had become a very real fact. The Abu Simbel Temples had to be salvaged while time still permitted.

THE SALVAGE OPERATION

The task of salvaging the Temples, carved in the rock proper, was a unique one. The grandiose scale of the entire enterprise also made it fascinating. Numerous ideas and projects * were submitted from persons and institutions in various countries to the Egyptian Government and UNESCO, the latter organization having promised to assist in the planned operation to

Fig. 8. - View from the Nile of the Small Temple on its original site.

* Bibliography, Nos 1 and 5.

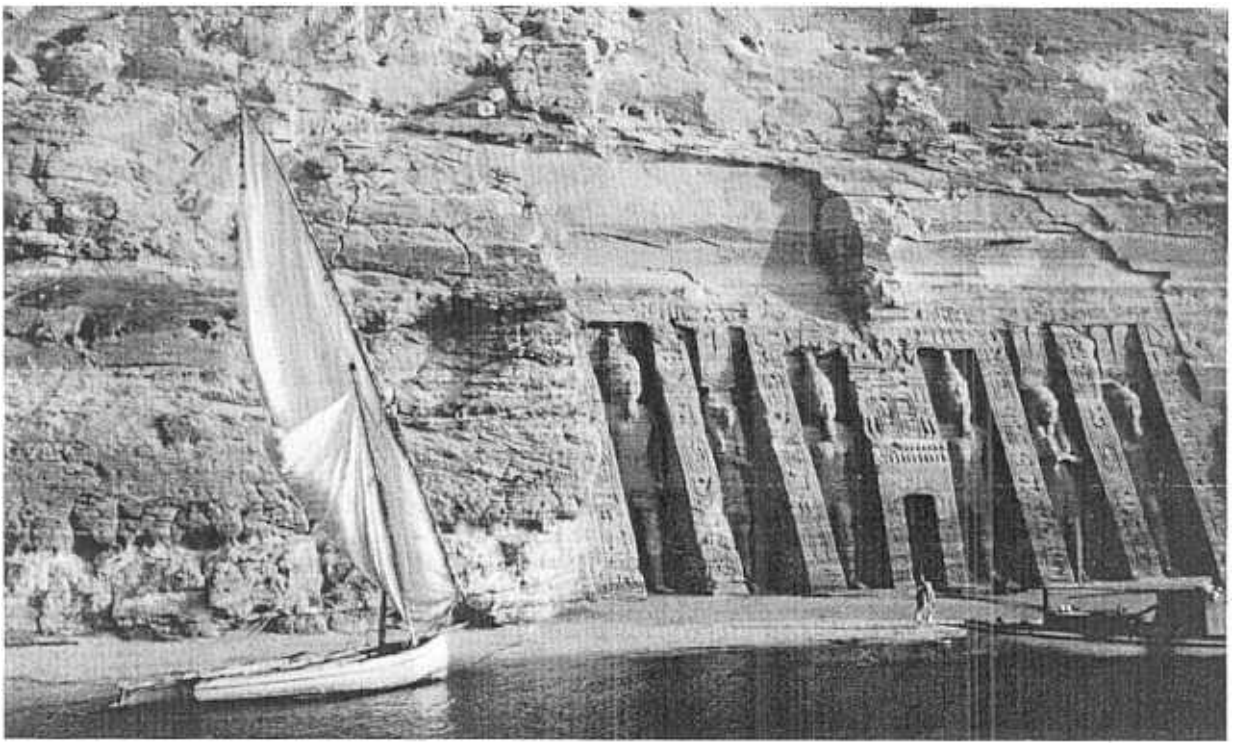


Fig. 9. - Queen Nefertari being crowned by Isis and Hathor, both goddesses of beauty and love. (In the vestibule of the Small Temple.)

salvage the temples. In the end, a project scheme as elaborated by VBB was chosen, which meant that VBB also received the commission to act as Consulting Engineers and Architects for the whole Salvage Operation, a commission which actually lasted for about ten years and was completed by the above-mentioned Concluding Report.

In broad outline, VBB's scheme is demonstrated in Figs. 10-12. The basic idea of the scheme was to have the temple façades and walls cut into big blocks, which would be transported to a safe place above the highest future water level, where they would be rebuilt. Part of the natural rock around the Temple façades would also be arranged in the same way. To give the rebuilt temples an appropriate setting, hills would be built up, which, though not exact copies of the cliffs where the Temples originally had been hewn, would nevertheless preserve the memory of these.

The problems which had to be solved in connection with the Salvage Operation were numerous. In this article, only some six of the more difficult problems will be — briefly — mentioned.

Problem No. 1 was the extraordinary task of *organizing and financing* this extensive and unique operation. This problem had to be solved by the Egyptian Government, through its Ministry of Culture, and with the assistance of UNESCO, Paris.

The remaining five problems were of a more or less technical nature and had to be solved by the Consulting Engineer and the Contractor, in close collaboration with the Ministry of Culture together with the Egyptian and international experts it appointed.

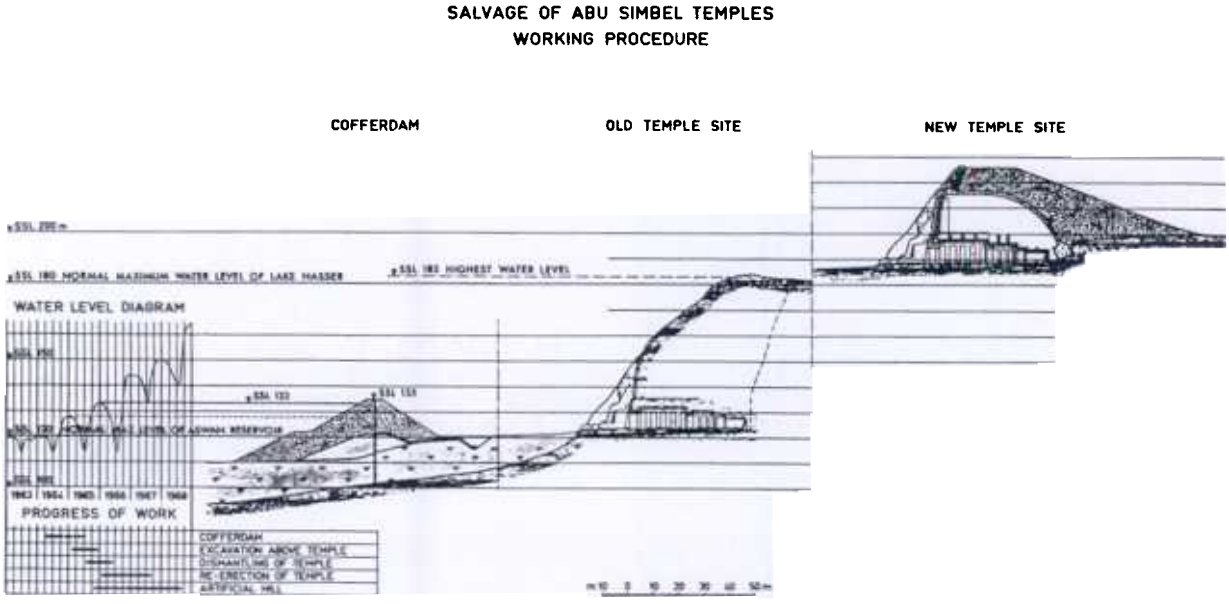


Fig. 10. - Originally the temples were situated a few metres above the Nile waters, but from 1964 onwards the water level was to rise gradually each year. The temples were to be dismantled behind a temporary cofferdam and re-erected at a higher level.

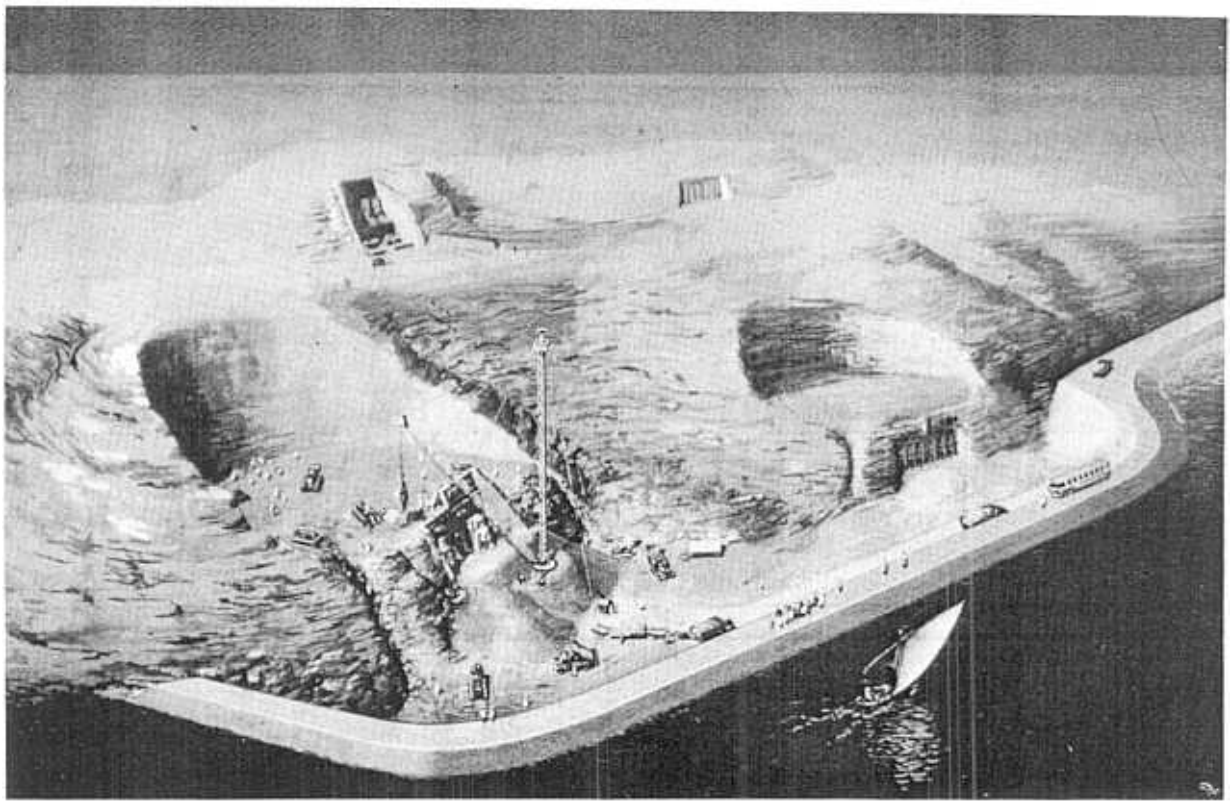
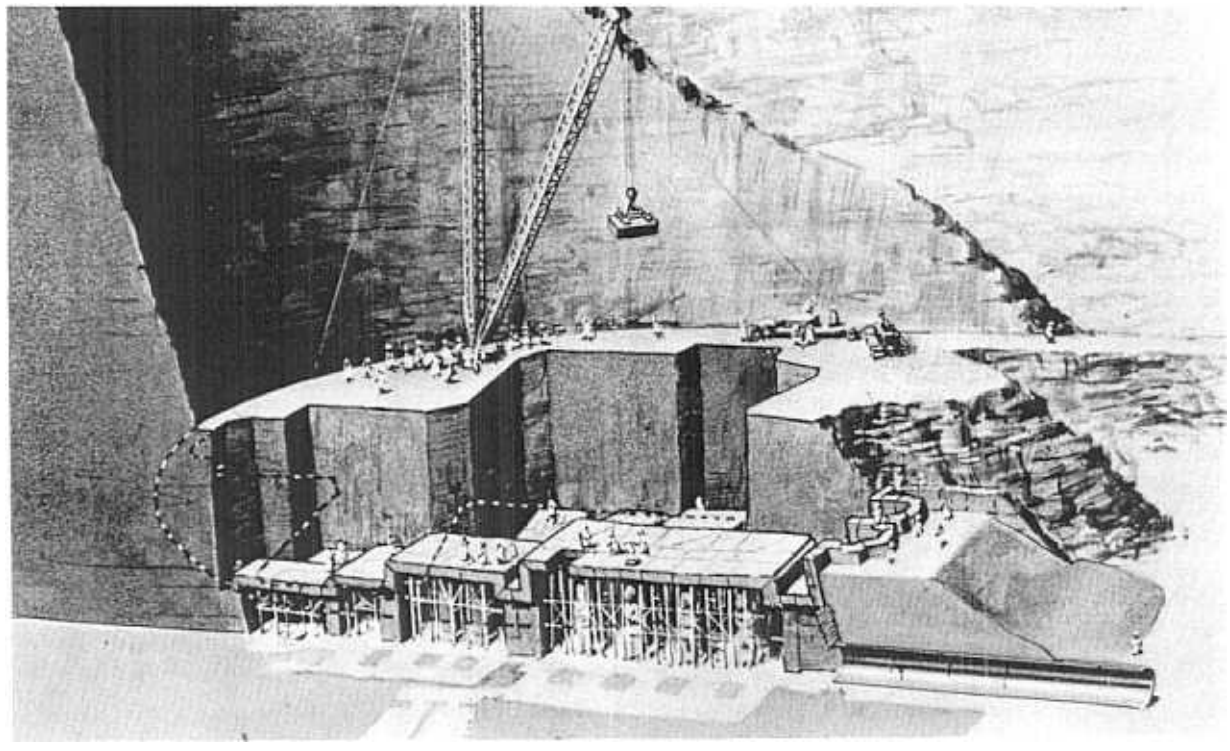


Fig. 11. - The artist's advance vision of the salvage operation. In principle the actual works were identical.

Fig. 12. - The artist's advance sketch of the dismantling of the Great Temple. This too proved to be well in keeping with the reality. (Cf. also Figure 15.)



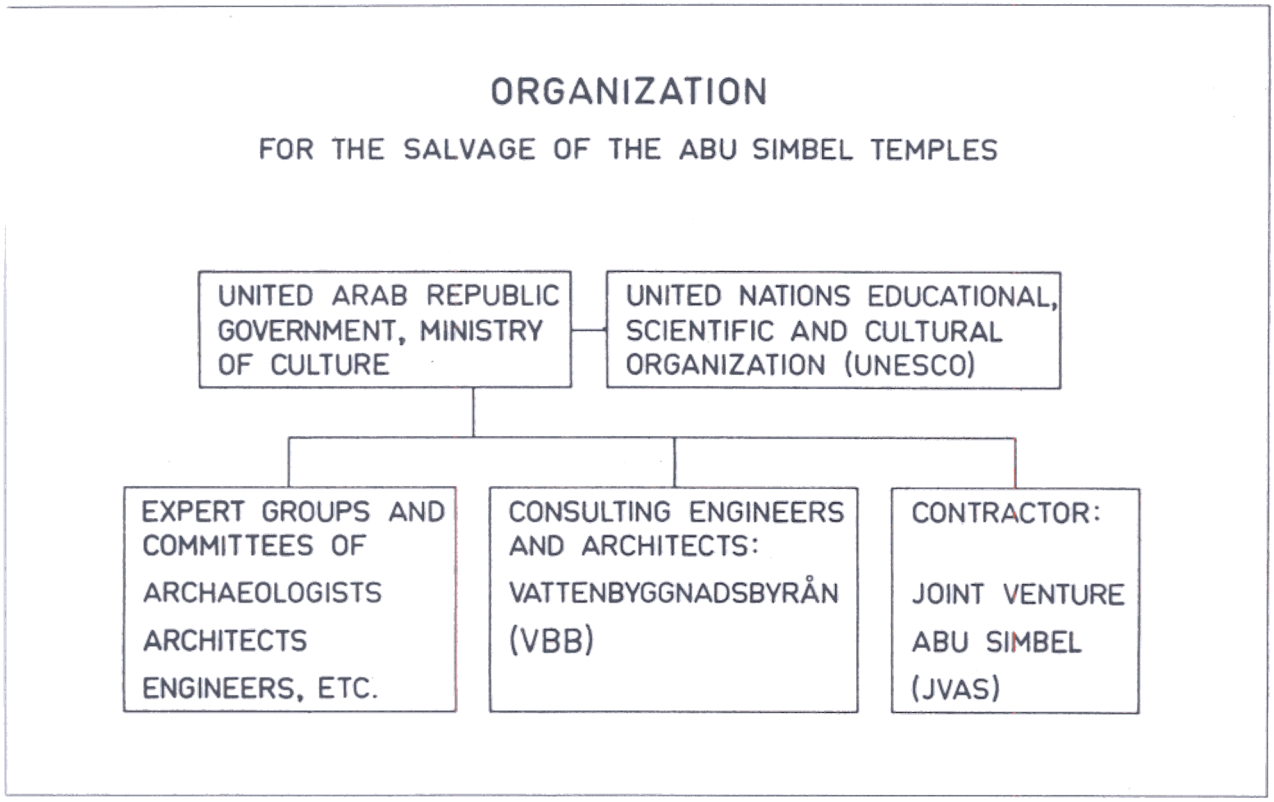


Fig. 13. - Plan of organization for the salvage of the Abu Simbel temples.

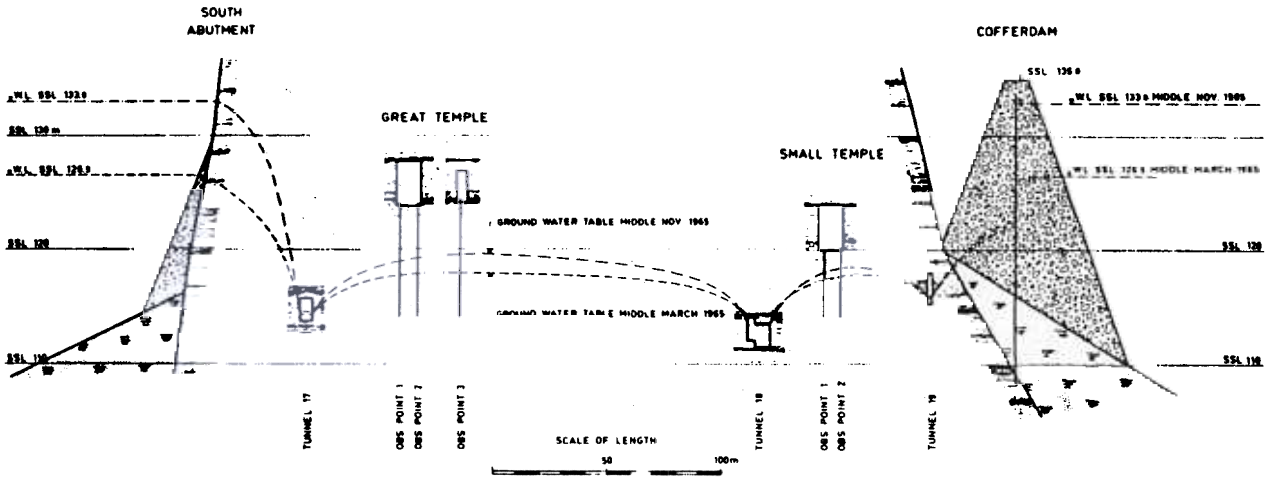


Fig. 14. - Longitudinal section of the temple site, indicating how the ground water table was being kept below the temples proper, before their dismantling.

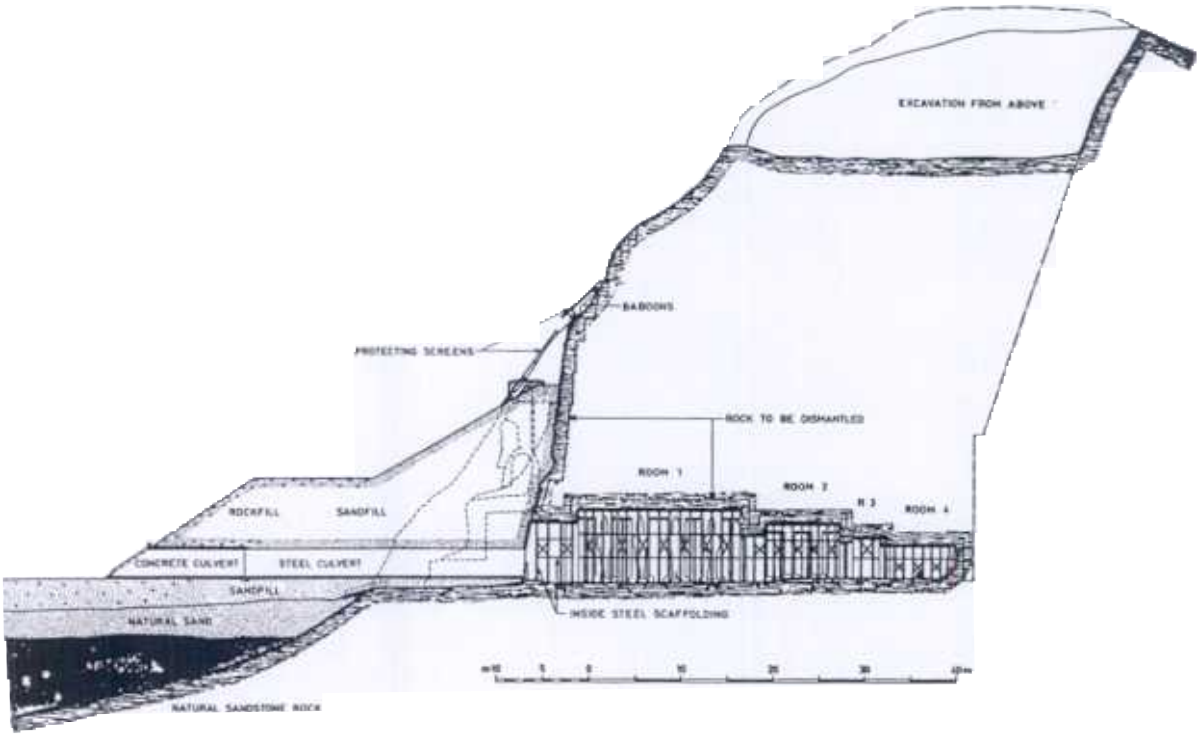


Fig. 15. - Various preparatory and protective works were executed for the excavation of the rock above the temples, such as sandfill in front of the façades, provisional access culverts to the interior of the temples, protection screens above certain upper parts of the Great Temple façade, steel scaffolding inside the temple rooms for the support of roofs and walls until they were dismantled, etc. (Cf. also Figure 12)

Problem No. 2, the construction of the *cofferdam*, was of a technical as well as of an organizational nature, and, last but not least, a very hard and thrilling fight against time.

Problem No. 4, the *re-erection of the temples*, can be said to be to a great extent what the Germans call "Hochbau" work.

Problem No. 4, the *re-erection of the temples*, can be said to be to a great extent what the Germans call « Hochbau » work. However, the re-erection proper of the dismantled sandstone blocks, the fixing of these blocks to supporting concrete structures and the final treatment of the joints between the blocks, formed quite a unique complex of part problems.

Problem No. 5, the *setting for the temples*, was first and foremost a delicate and unique architectural task, but a number of technical difficulties were also involved.

Problem No. 6, the *concrete domes*, carrying the hills above the temples, was originally part of the problem of the setting of the temples but also turned out to constitute a unique achievement of its own.

ORGANIZATION

The main features of the organization of the Salvage Operation are shown in Fig. 13.

The U.A.R. Government, represented by the Ministry of Culture, was at the head of the organization. The Government was from start to finish, and in many different ways, assisted by UNESCO.

Various groups and committees of international experts were invited to give advice and recommendations, first in the matter of the choice to be made between the various proposals and afterwards during the actual operation.

Messrs. Vattenbyggnadsbyrån (VBB), Stockholm, were appointed Consulting Engineers and Architects for the whole project, and an international consortium of Contractors, Joint Venture Abu Simbel, carried out the work.

The Salvage Operation proved to be an outstanding example of collaboration between people of different categories and professions and also of many different nations. The engineers had to learn to understand the archaeologists. They had to learn to understand the meaning of their delicate task, with respect and even reverence, to be able to deal with this legacy from the past, too precious to be lost. The archaeologists had to learn to understand that technology, naturally, has its limitations and that re-building a monument of this nature can never be achieved with absolute perfection.

ig. 16. - In November, 1964, a steel culvert through the sandfill in front of the Great Temple was erected, to form an access to the temple rooms. The ulvert access was in use until the beginning of 1966.

Iowever, the engineers and the archaeologists had a common oal. They had to coordinate their efforts to come as close as ossible to perfection.

INANCING

When the work on the Salvage Operation started, the total osts of the Operation had been estimated to amount to approximately 36 million US dollars, of which more than 40 per ent had to be paid in convertible currency. An agreement had een reached between the U.A.R. Government and UNESCO hat UNESCO would pay up to 20.5 million dollars and that he U.A.R. Government would be responsible for the rest.

Some 50 nations contributed to the saving of the Abu Simbel Temples as well as other monuments in Nubia. The largest ontributor, after the U.A.R., was the U.S.A., who subscribed 12 million dollars to the Abu Simbel account alone and additional funds for the Nubian Campaign as a whole.

Final costs amounted to about 40 million US dollars, exceeding the originally estimated costs by about 10 per cent.

PREPARATORY INVESTIGATIONS

It may be emphasized that before an operation of this sort is actually started elaborate and careful preparatory investigations are essential.

At an early stage, the temples were measured and photographed by the Centre of Documentation of Ancient Egypt, Cairo. The drawings and photographs of the Centre were used as a first basis for various construction drawings needed during the Salvage Operation.

In 1959 the French National Geographic Institute prepared a photogrammetric map of a certain area around the temples to be used for the planning of the site and of a new Abu Simbel community. The French Institute also made drawings of the two temple façades, with equidistant curves photogrammetrically measured in relation to vertical planes. These drawings were of great value, among other things for the preparation of cutting plans (Cf. Fig. 17).

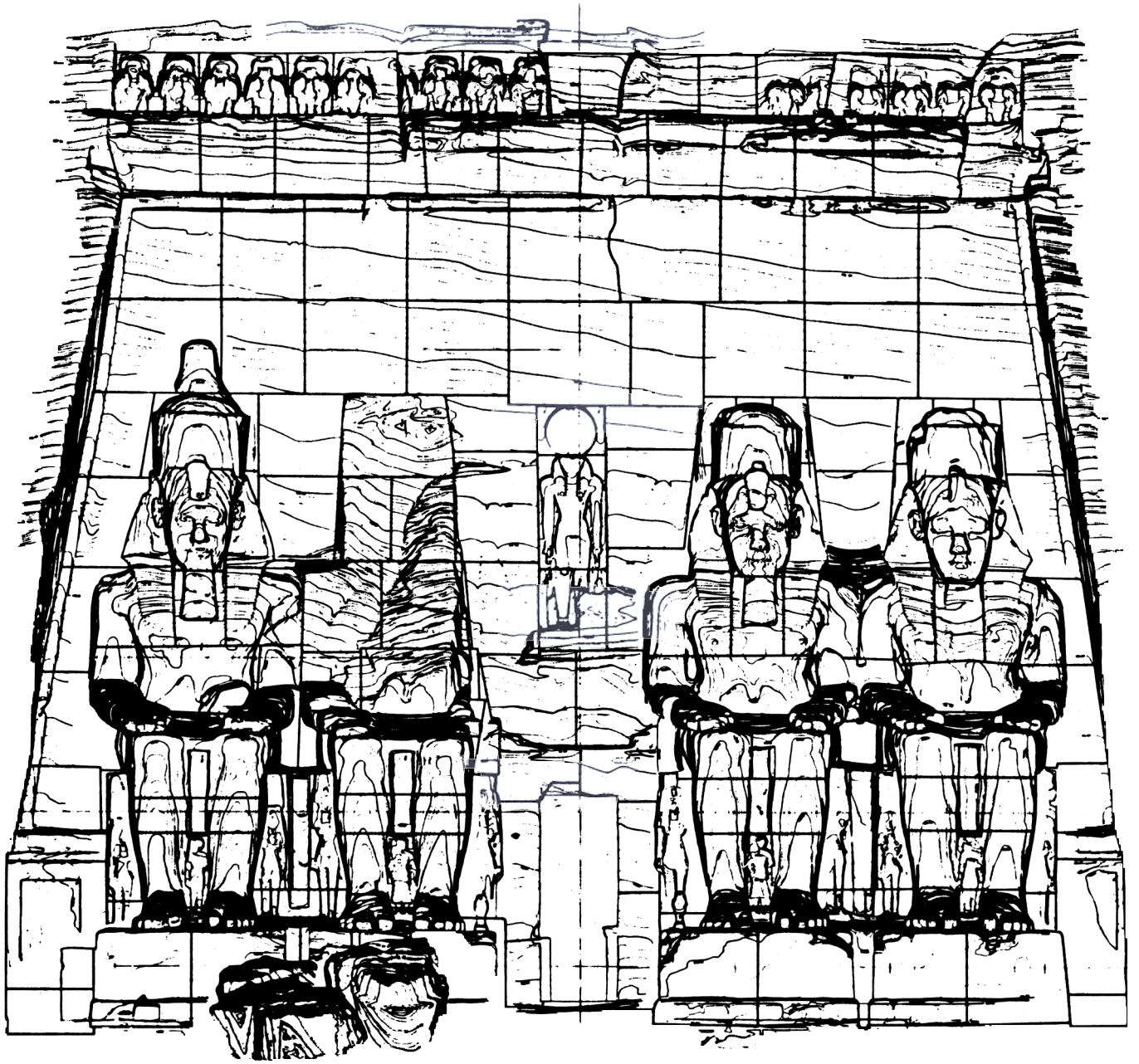


Fig. 17. - The cutting of the temples into blocks was studied thoroughly. The above cutting drawing of the Great Temple façade was supplemented by numerous other drawings with vertical and horizontal sections, etc., so that every single cut was determined in detail before the cutting actually started.

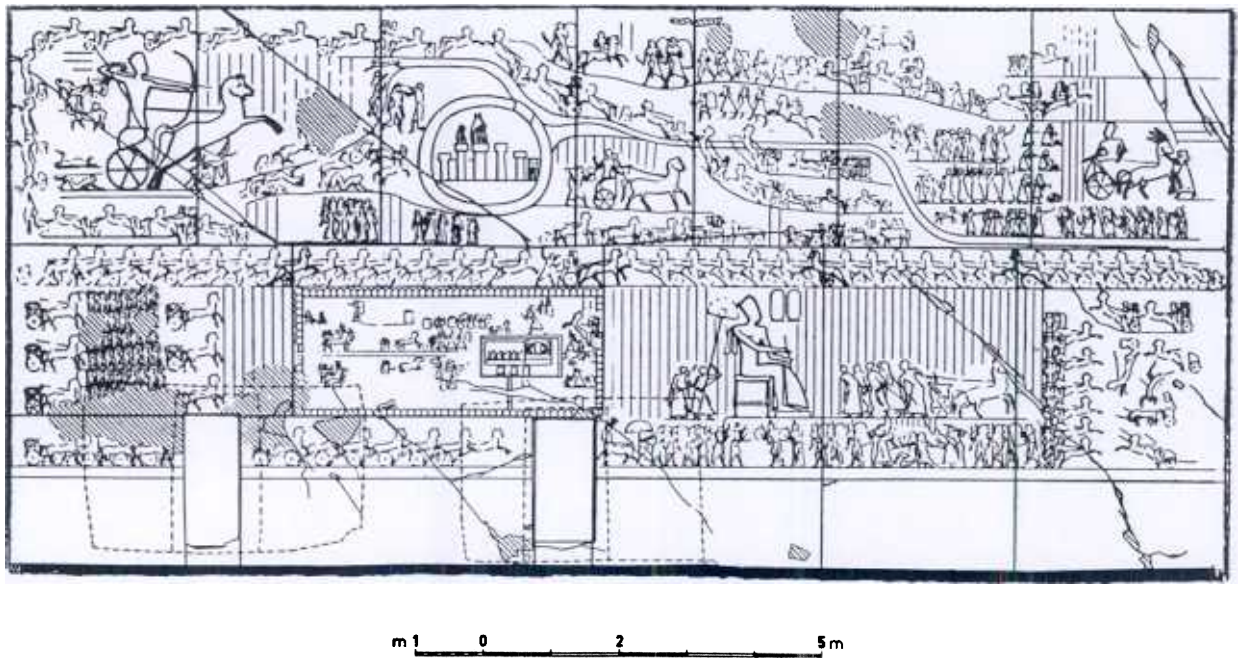


Fig. 18. - Great Temple, Courtyard Hall, northern wall, with "The Battle of Kadesh divided into blocks. Sometimes the reliefs of the temple walls allowed very suitable cutting lines.

Among other activities during the preparatory stage we may mention the relatively extensive geological and geotechnical investigations, determination of internal stresses and location of fissures in the sandstone rock surrounding and actually forming the temples, studies of ground water and drainage conditions below the temples (Cf. Fig. 14), tests on rock excavation, tests on cutting of sandstone, tests on strengthening of sandstone, tests on anchorage of iron bars in sandstone, etc.

It is not possible here to give a more detailed account of all these preparatory investigations, however important they may have been for the actual salvage work. Reference is made instead to No. 1 in the Bibliography.

COFFERDAM IN FRONT OF THE TEMPLES

The salvage work on the site started in 1964, the same year as the Nile course was definitely closed at Sadd El Aali and the Nile waters started to rise; according to existing plans they were to rise 8 metres already during 1964 and a further 5 metres the following year, that is up to SSL 133, Cf. Fig. 10.

It was absolutely necessary to keep the water away from the temples until these had been fully dismantled during the spring of 1966, which is why a cofferdam had to be built in front of the Temples, as shown in Fig. 10 and 11.

A drainage system behind the cofferdam as well as below the temples was also arranged. By means of continuous pumping, the ground water level could be kept well below the temples during the whole dismantling period, as demonstrated by Fig. 14.

PREPARATORY WORKS

Before the cutting of the temple blocks could actually be started, a number of preparatory works — besides the preparatory investigations and tests and the cofferdam already mentioned — had to be performed. Among these works may be mentioned, Cf. Fig. 15:

a steady steel scaffolding inside the temple rooms;
a provisional sandfill in front of each of the temple façades;
a steel culvert through the sandfill to the temple entrance;
protecting screens above the Great Temple façade;
excavation and removal of all the rock above the temples;

The main function of the steel scaffolding was to take over the load of the rock above the temple room ceilings, as the previous bearing arch effect in the rock would vanish during the excavation of the rock from above.

The sandfill would serve first as protection during the rock excavation and then as a working platform during the dismantling of the façade.

The steel culvert — cf. also Fig. 16 — would of course serve as an access to the interior of the temples during the period of time in question.

For more details of these works, if wanted, see under No. 1 in the Bibliography.

DISMANTLING THE TEMPLES

Since the Temples were not buildings constructed of stones or other materials with built walls, roofs, etc., but were shaped in

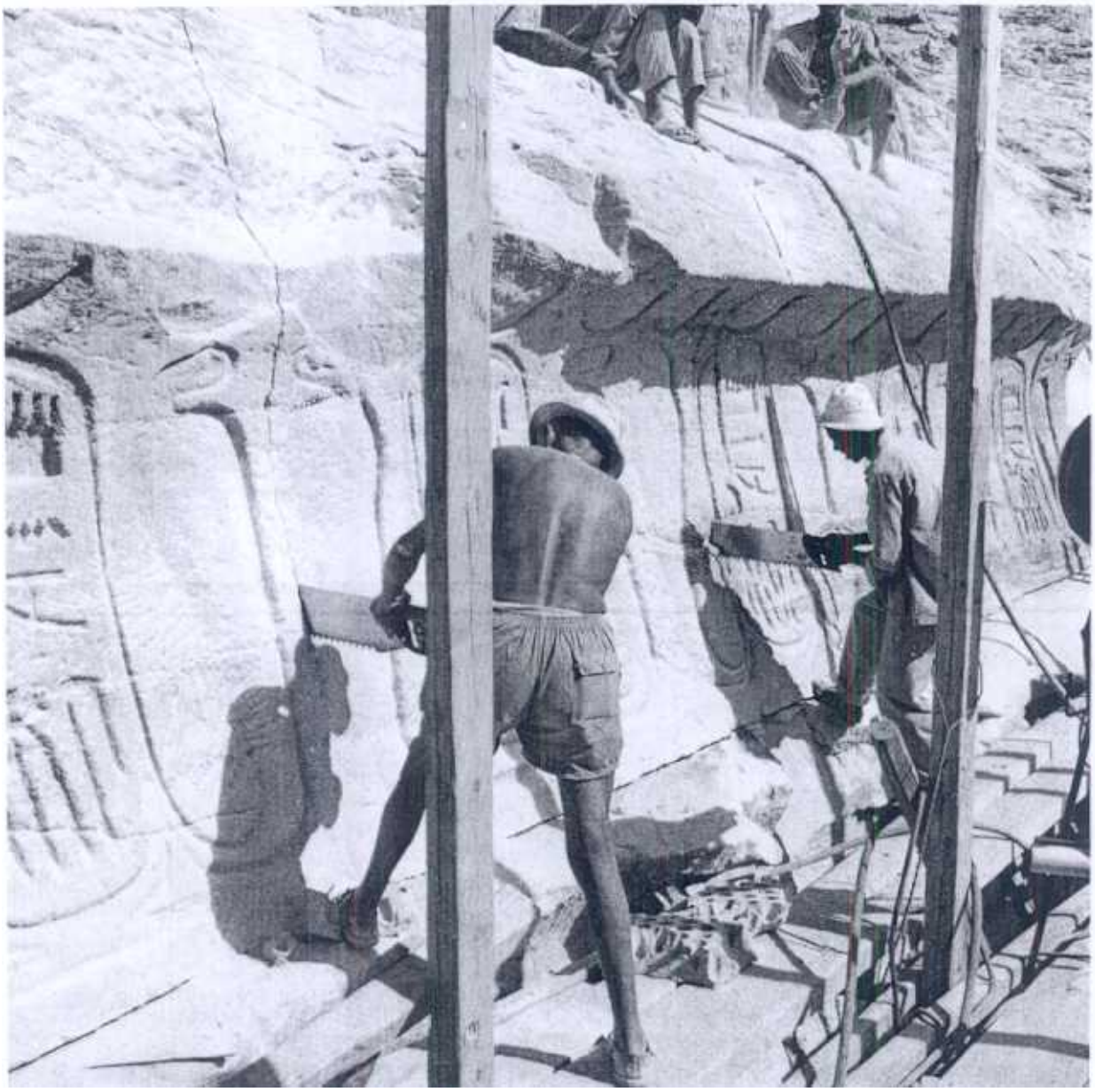


Fig. [illegible] surface part [illegible] rock was divided [illegible] hard metal tipped hand-saws

Fig. 20. - The roofs of the temple rooms were to some extent divided into blocks by boring and wedge-splitting. In this case, shallow cutting in the visible ceiling surface had to be made in advance, by means of hand-saws.

the natural rock, it was the rock itself that had to be cut loose and « dismantled », for practical reasons only to a certain depth behind the visible temple surface, cf. Figs. 12 and 15. Around the temple rooms it was usually suitable to dismantle the rock to a depth or thickness of about 80 cm. The temple façades being more irregularly shaped, the thickness of the dismantled rock here varied considerably, but was generally between 60 and 120 cm.

It was of course requested that the dismantled temples should be rebuilt with exactly the same configuration as they had originally. Moreover, it was both essential and specifically requested that the positions of the two rebuilt temples in relation to one another and to the cardinal points should be exactly the same as previously. In order to make this possible, very elaborate *measurements* were performed by the Contractor.

All the cutting of the temple blocks had to be determined in advance and in great detail, by means of numerous *drawings* executed by VBB.

The *location of the cuts* to be made had to be chosen and determined with allowance for many factors, archaeological and aesthetic as well as technical and economic. It was specified in the Contract that the weight of the blocks taken from the façades was not to exceed 30 tons, while the weight of the blocks from the temple rooms was limited to 20 tons. On the basis of these figures and of the desirable thickness of the blocks (see above), certain maximum measurements for their other dimensions were also determined. When deciding on the dimensions of the blocks, due allowance also had to be made for convenient handling during transport, etc., for instance by avoiding excessively oblong shapes.

With the conditions for the block dimensions thus given, the cutting lines in the visible temple surfaces then had to be so located that they would disturb the future appearance of these surfaces as little as possible. For instance, no cuts could be permitted across the faces of statues, etc. and cuts through other especially beautiful and delicate parts of sculptured and decorated surfaces were also to be avoided. Examples of cutting lines finally chosen are given in Fig. 17 for the Great Temple façade and in Fig. 18 for the northern wall of Room No. 1 in the Great Temple, with the famous description of the Battle of Kadesh.

By previous tests, as mentioned above, suitable *cutting equipment* and *cutting methods* had been selected.

Cutting in the visible temple surfaces, where the cuts had to be very thin (maximum 8 mm), was done practically exclusively by means of hand saws, see Fig. 19. The larger part of each cut between the blocks was however executed from the rear by means of motor-driven chainsaws, which gave cuts 15-20 mm. wide, which would not be visible.

Part of the roof blocks were divided by boring and wedge-splitting (see Fig. 20). Wire cutting was another method used at the beginning of the works. It was however found rather slow and too complicated for the dismantling of the temples proper. It was more suited to the dismantling of the natural rock around the temple façades.

Some idea of the dismantling procedure, as regards the temple rooms, may be had from Fig. 21.

With few exceptions, each dismantled block had to undergo the following *lifting and transportation cycle*:

a) Lifting from its original position, by means of a derrick crane, to a « low loader ».
b) Hauling by the low loader to a storage area.
c) Lifting from the low loader, by means of a gantry crane, and placing in the storage area.
d) Lifting from the storage area, by means of the gantry crane, and placing on the low loader.
e) Hauling by the low loader to the new temple site.
f) Lifting, by a derrick crane, from the low loader to its final position.

Because of the fragility of the sandstone (despite all the strengthening work) as well as the delicacy of the sculptured and often painted temple surfaces, many problems were involved in the lifting and transportation operations. Three main rules were specified from the outset:

I. Each block was always to be kept in the same relative position vertically, i.e. it could only be turned on a vertical axis, never tilted.
ii. Each block was to be lifted and handled in a manner causing as slight internal stresses in the block as possible.
iii. No lifting devices of any kind were to be allowed to come

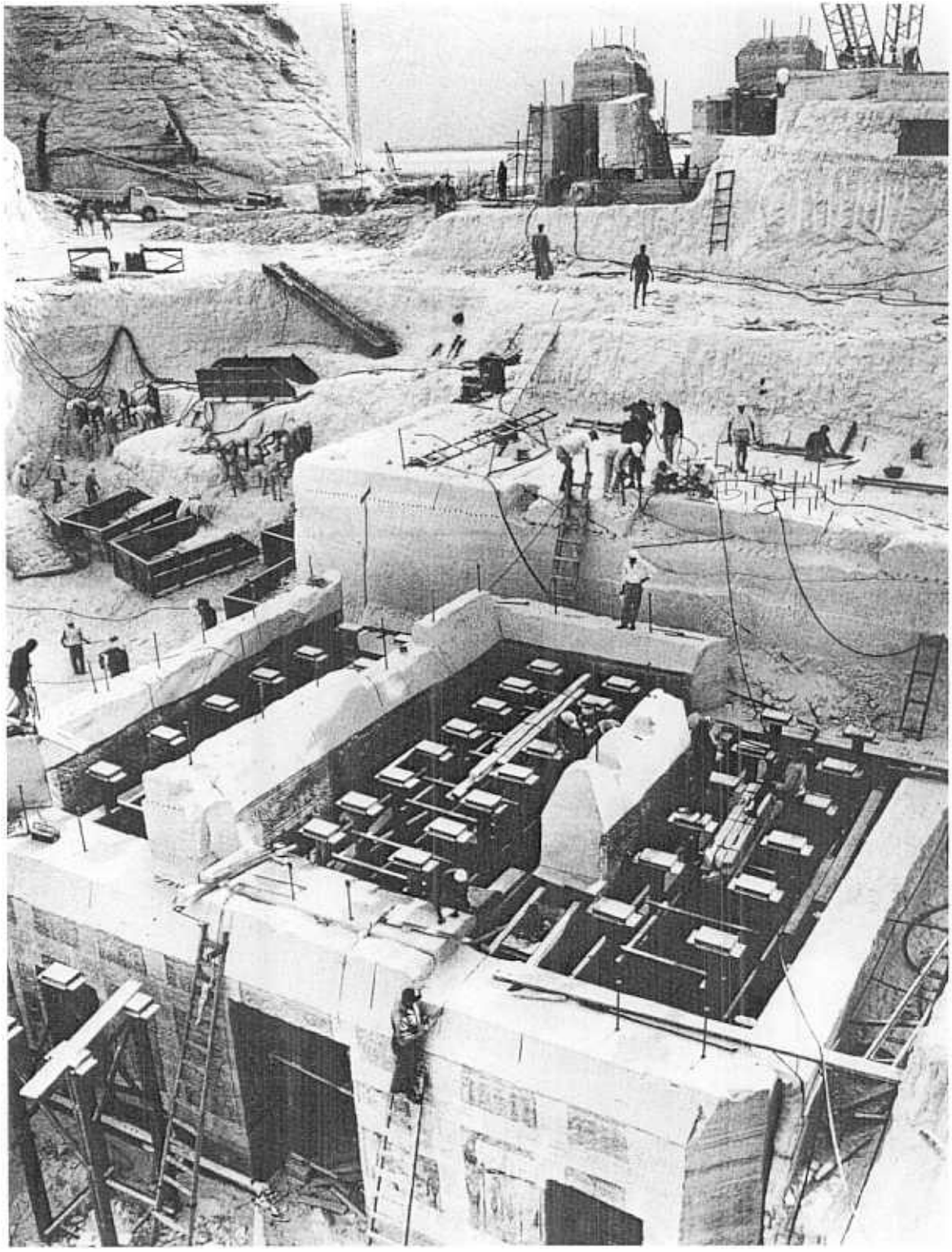


Fig. 21. - Dismantling of the Hypostyle Hall (Great Temple). The roof blocks and some of the "roof-beam" blocks have already been taken away. In the foreground, the wall towards the Antichamber (Cf. Figure 6).

g. 22. - Queen Nefertari (Cf. Figures 4 and 5) as now temporarily osened from her place at the leg of her royal consort. To support her ender figure, a substantial amount of rock was kept behind it in the me block.

g. 23. - Pharaoh's knees being lifted after being cut loose. The lifting uipment is arranged so as to distribute the load of the block evenly the four lifting-bars inserted (Cf. also Figure 25).

into contact with the decorated temple surfaces or with the edges of the blocks.

The three conditions *i.* - *iii.* above were all complied with by the introduction of vertical *steel lifting bars*, inserted at suitable places in the interior of the blocks and protruding about 0.8 m. above the upper surface of the blocks. Deformed steel bars, 32 mm. in diameter, with a minimum yield point of 40 kg/mm^2, were used for the purpose.

For the insertion and fastening of the lifting bars, vertical holes were rotary-drilled from the upper surface of the block down to about 0.2 m. from the bottom surface. The bars were fastened to the sandstone by being embedded, at the bottom of the holes, with epoxy mortar to a length of 0.3 to 0.5 m. only. In this way the lifting force was applied to the bottom of the block, ensuring that the whole block would be kept together during the lifting procedure. Moreover, initiation of tension cracks, along the remaining length of the bar, was avoided.

The number of lifting bars inserted in each block varied from two to four, depending on both the form and the weight of the block.

Between the lifting bars of a block and the lifting hook of the crane, *a lifting yoke* was arranged in such a way that the load of the block would be as evenly distributed on the bars as possible. Furthermore, the lifting yoke had to be so designed as always to make it possible to place the lifting hook with great precision above the gravity centre of the block, in order to avoid tilting.

Examples of rather irregular blocks as well as of their lifting can be seen in Fig. 22 and 23.

Fig. 24 shows the dismantling of the Great Temple nearing completion.

STORAGE OF THE TEMPLE BLOCKS

The dismantling of the temple blocks began, naturally, with the uppermost blocks of the façades and with the roof blocks above the temple rooms, and finished with the blocks in the lowest regions. The re-erection of the blocks had to be done in the opposite order. Therefore, only a few bottom blocks could be taken directly from the old site to the new one, while all other blocks had to be stored for longer or shorter periods in an area especially arranged for the purpose (Fig. 25).

Arrangements for the *protection of the blocks* during the storage period proved to be quite a problem. Fortunately, it was found that the need for protection was not as great as had been feared in advance.

The risk of damage from rain was practically negligible. In fact only one heavy rain shower fell during the entire period, and no resulting damage was observed.

The painted surfaces of the blocks from the temple rooms, being the most delicate, were protected from radiation from the sun and erosion by the wind, mainly by placing the blocks so that they could protect each other. Due to the great risk of fire, most of the available covering materials could not be accepted for use. To some extent, covering was arranged by means of asbestos-cement sheets.

Fig. 24. - In February 1966, the dismantling of the temples was not far from completion. Of the Great Temple façade only the lowest parts remained.

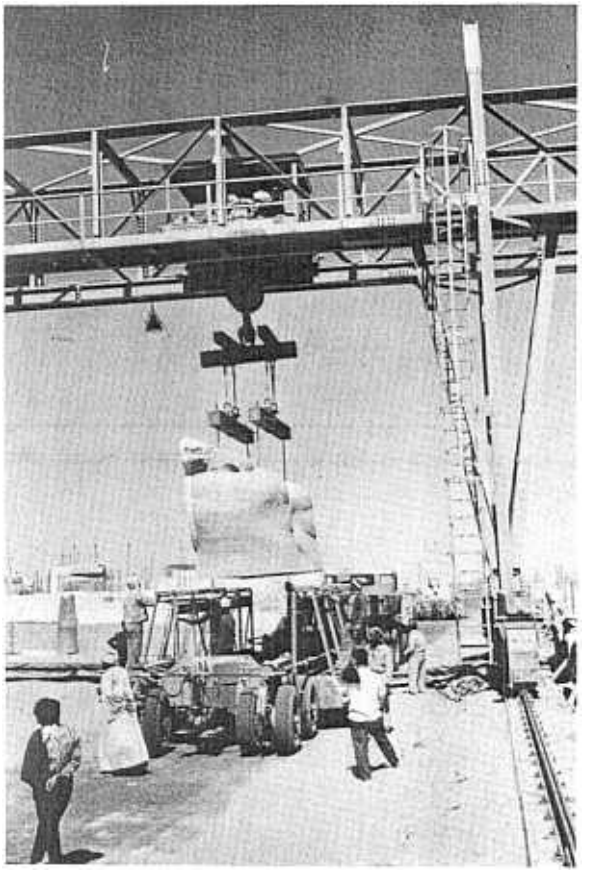


Fig. 25. - On arrival at the Storage Area, every block is carefully lifted by a gantry crane and moved to its provisional place while awaiting re-erection.

Fig. 26. - Pharaoh in the Storage Area, apparently facing his situation with serenity.

Fig. 27. - The four pillars in the Hypostyle Hall of the Great Temple, now temporarily in the Storage Area. On the pillar sides, one can see Pharaoh being welcomed by a divinity, in fact a scene exquisitely portraying terrestrial love and tenderness.

The period of storage offered excellent possibilities for suitable *preparation of the blocks* before their re-erection.

Although a great deal of stengthening had been carried out already before the first lifting of the blocks, each block was once more carefully inspected and, wherever required, further strengthened. Some blocks had been damaged on various occasions but could be repaired successfully.

In this connection it can be mentioned that not one temple block was lost during all the different operations.

All blocks were also provided with anchor bars for attachment to their future supporting concrete structures. The rear surfaces of the blocks were treated with resin so as to avoid seepage of water or damp into the sandstone from the concrete to be placed against them.

The storage of the blocks, so near the open ground and in full daylight, also offered a unique opportunity of admiring the beautifully sculptured surfaces. Some examples of this are given in Figs. 26 and 27.

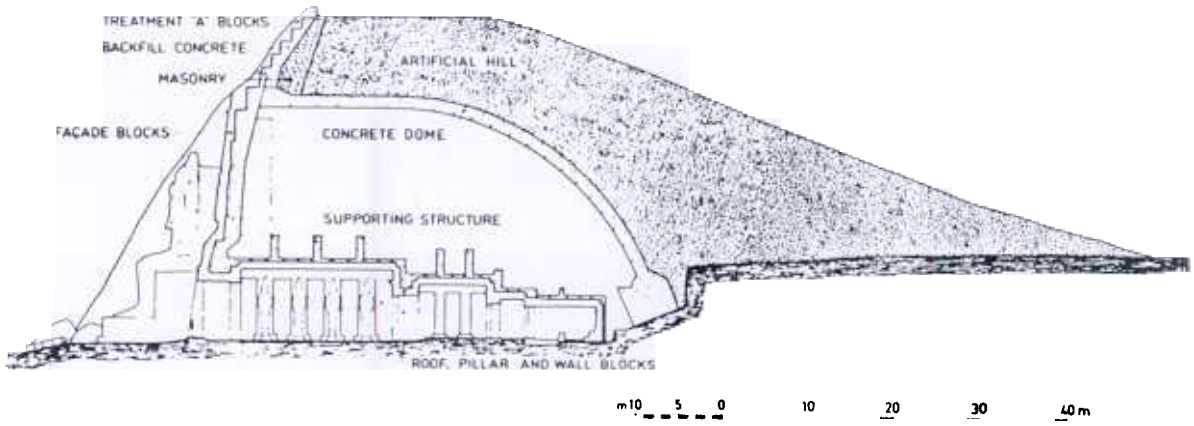


Fig. 28. - The re-erected Temples consist of four main elements:
1:0 The sandstone blocks with the visible surfaces of the temple façades and rooms.
2:0 The concrete structures supporting the temple blocks.
3:0 The artificial hill around and above each temple, replacing the original cliff into which the temple had once been carved.
4:0 The concrete dome protecting each temple and bearing the load of the artificial hill above.

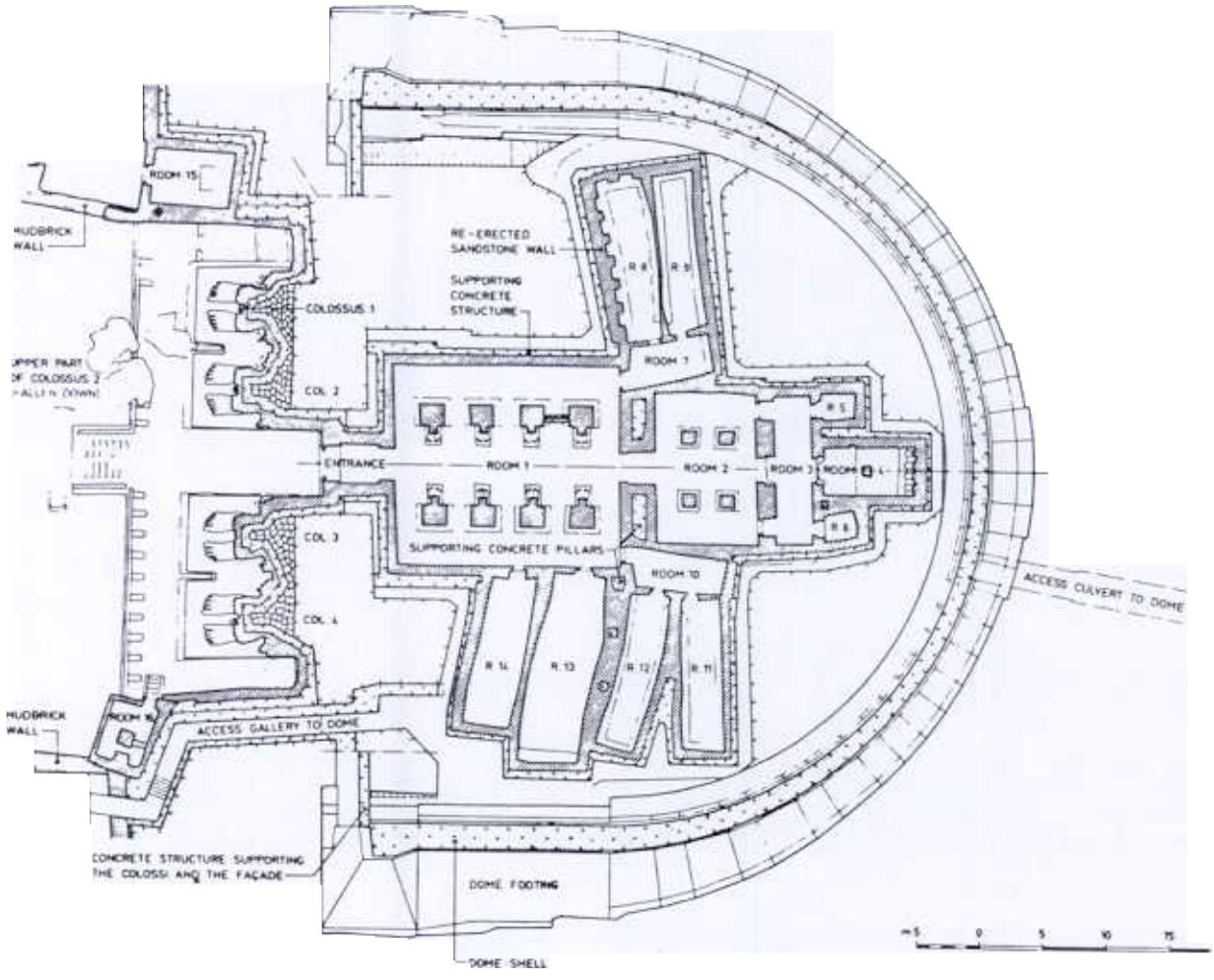


Fig. 29. - Horizontal section of the Great Temple showing the re-erected façade and rooms with their supporting concrete structures, as well as the surrounding concrete dome.

Fig. 30. - Pharaoh regains his face.

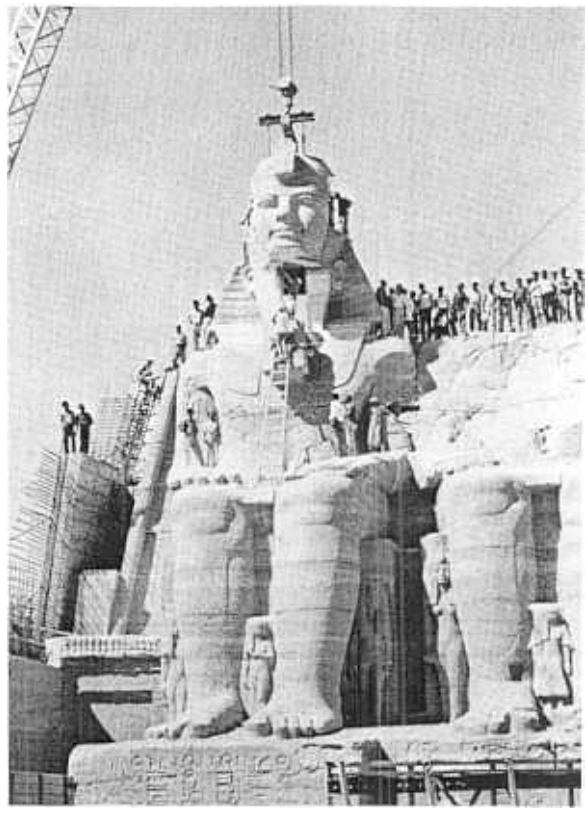


Fig. 31. - Pharaoh is now soon re-shaped in his majestic position, surrounded by wife and daughters.

RE-ERECTION OF THE TEMPLES

As previously indicated, the two temples were moved up on the desert plateau above their old sites to a place sufficiently high never to be reached by Lake Nasser.

The horizontal transfer of the two temples was 208 metres, approximately to the north-west. Vertically, the Great Temple was lifted 65 metres and the Small Temple 67 metres.

As prescribed, the movement of each temple was exactly the same, in direction as well as in (horizontal) distance. In this way the positions of the two temples in relation to one another remained the same. Moreover, the orientation of each temple in relation to the cardinal points was also kept exactly the same as on the old sites.

The dismantled temple blocks were re-assembled to form the two temple units as before. For the spectator, the re-erected temples now look exactly the same as on their old sites. However, behind the temple blocks the original rock could not be re-used, nor could it be replaced by new rock. Instead, supporting concrete structures had to be built up immediately behind the blocks.

The *general design* of the re-erection of the Great Temple can be seen in Figs. 28 and 29. The text to Fig. 28 explains the four main elements of the re-erected temples: the reunited temple blocks, the supporting concrete structures, the concrete dome and the artificial hill above each temple.

A comparison between Fig. 29 and Fig. 6 above may also be of interest in this connection.

The temples as now re-erected will be exposed to conditions which partly differ from the original ones. It was thus of special importance, during the re-erection procedure, to take precautions with regard to future stresses in the comparatively fragile sandstone of the temple blocks. Such stresses might occur due to the weight of loads as well as to temperature and shrinkage effects. In order to keep the inevitable new stresses as low as possible, the following *main principles for the support of the temple blocks* were adopted:

1. The temple façades and walls were to be self-supporting from below but braced laterally by concrete structures. With regard to the arrangement of the temple sandstone blocks, it had to be assumed that these structures would carry no load from vertical walls and thus only the load component originating in the somewhat sloping façades.

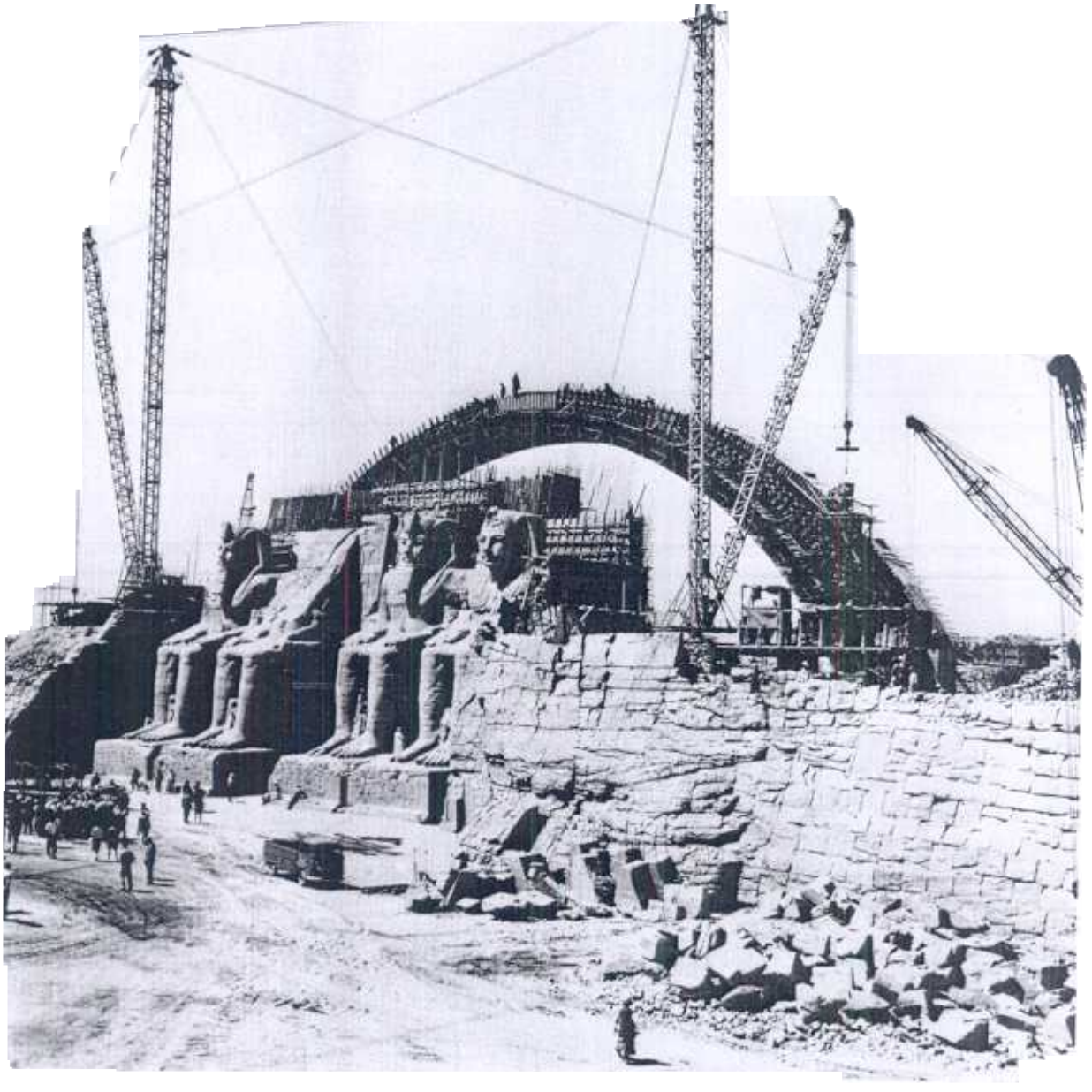


Fig. 32. - Behind the re-erected statues of King Ramesses, the first arch element of the great dome above the temple rooms is under construction. O both sides of the statues the build-up of the cliff walls has been started.

Fig. 33. - The façade proper of the Great Temple has now been completely re-erected. All the baboons at the top again greet the rising sun every morning — as they had previously been doing for about 3,200 years.

Fig. 34. - The construction of the dome above the Great Temple nearing completion. The supporting concrete structures over the temple rooms proper are, however, still visible.

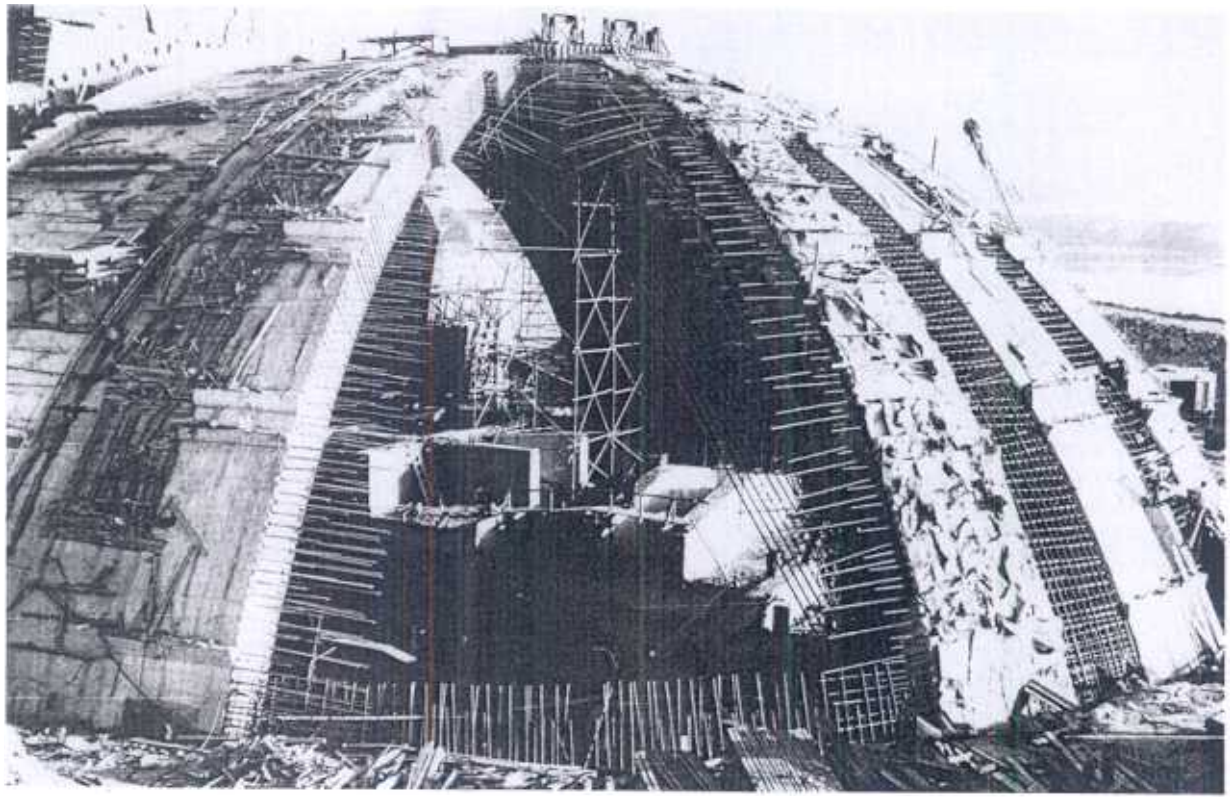


Fig. 35. - Aerial view of the Great Temple, with the re-erected façade and with the completed dome behind. The build-up of the artificial hill is the only work that remains to be done; the front stone walls have, however, already attained some height, as has also the rockfill to the rear.

2. The partition walls and the columns inside the temples were to be self-supporting from below and braced horizontally in their connections to the respective roofs, cf. point 5 below.

3. The temple roofs were to be supported by overlying concrete roofs, to which they would be attached by closely-spaced anchor bars.

4. The concrete roofs, consisting of slabs and beams, were to be supported by the concrete walls. Together, the concrete walls and roofs would form quite a rigid structure, keeping all the temple blocks in firm and definite positions.

5. However, although the concrete roofs were made very stiff, some vertical displacement — maximum two millimetres — would occur when the roofs took over full load. In order to prevent the transfer of loads on to the temple walls and columns, horizontal open spacings were left everywhere on the tops of the walls and columns. The upper lateral support of the partition walls and the columns mentioned in point 2 above had to consist of vertical steel bars, fastened in the uppermost parts of the walls and columns and acting as dowels with their free ends sliding in vertical holes in the roofs.

In practice, the above principles were closely followed, but it would be taking us too far to account in detail for the many various practical arrangements involved. (Again reference is made to No. 1 in the Bibliography.) In some cases, very particular arrangements had to be made, an example of which is shown in Fig. 30.

The gradual re-erection of the Great Temple façade is demonstrated by Figs. 31-33.

During the re-erection of the temple blocks and the filling of the joints between them, a 5-cm. deep strip of the joints, inside the visible temple surfaces, was left open for subsequent filling. This last superficial filling of the joints was carried out by restorers from the Antiquities Department of the Ministry. The basic material in the filling mortar was crushed natural sand-

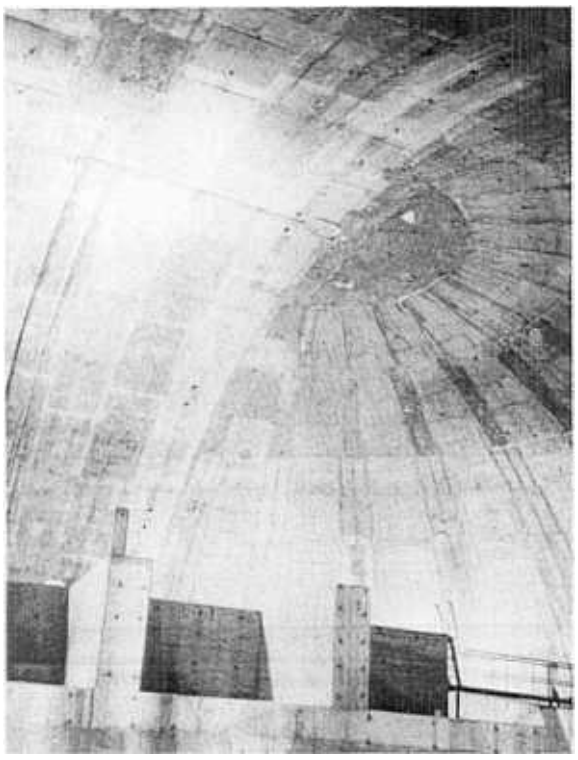


Fig. 36. - The inside of the dome over the Great Temple. In the foreground, part of the supporting structure over the Courtyard Hall.

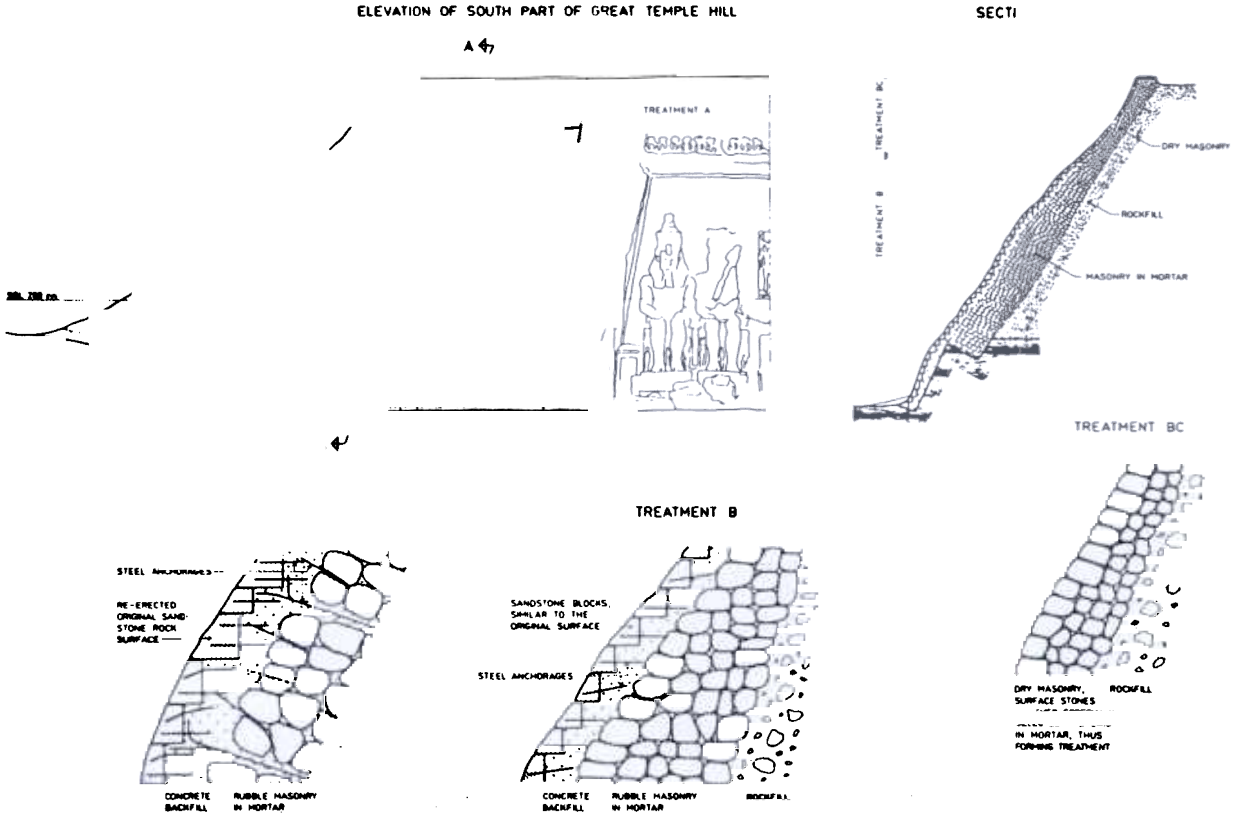


Fig. 37. - The masonry walls, along the fronts of the temple hills, had two tasks, one to support the rockfill behind, the other to carry the superficial natural rock as dismantled from the old site and re-erected at the new site.

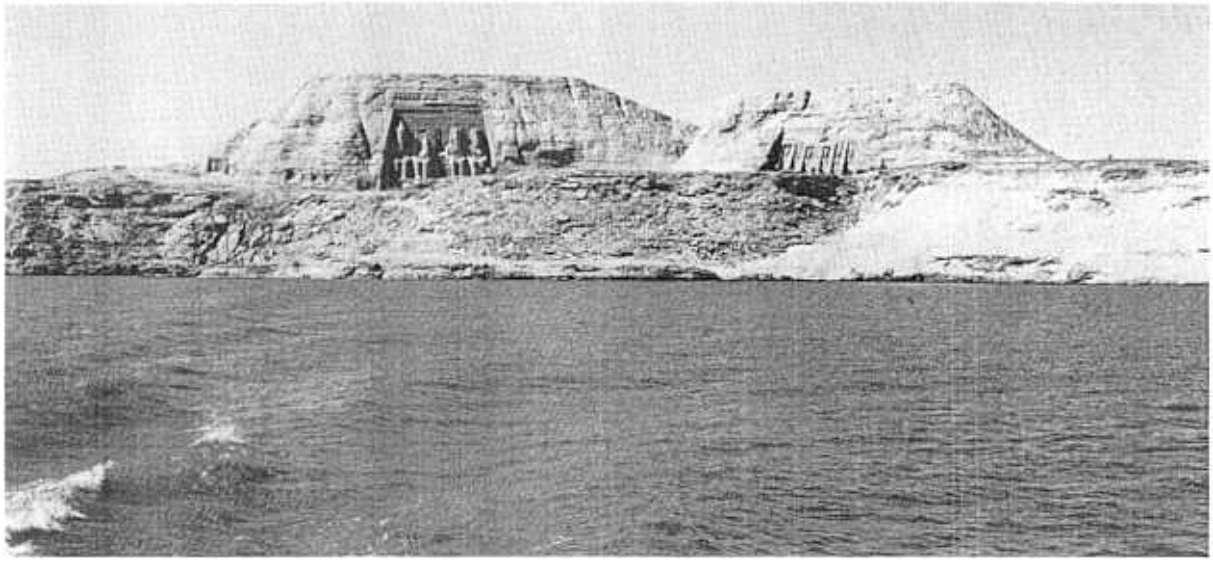


Fig. 38. - The two Abu Simbel temples as they can now be seen from Lake Nasser on their new sites, about 62 m. above the old ones.

stone, with a colour always corresponding to that of the temple blocks. Lime and white cement were used as binding agent in the mortar, colourless resin being also used in the interiors.

After filling, the joints in the temple rooms, as well as those in the façade statues, were almost impossible to distinguish. Only in the upper, very smooth surface of the façades did they remain faintly visible.

THE CONCRETE DOMES OVER THE TEMPLES

As already shown in Figs. 28 and 29 above for the Great Temple, the rock masses of the hills above the temples were prevented from resting directly on these by dome-shaped concrete structures, one over each temple. The main functions of these concrete domes are as follows:

1. To relieve the temples themselves from the very heavy load of the overlying rock walls and rockfill.
2. To diminish the quantities of rock walls and rockfill required.
3. To make it possible to inspect and repair the temple structures from their rear sides if required.

The domes had other advantages as well. The various arrangements for the lighting and ventilation of the temples, cf. below, were, for instance, greatly facilitated.

The dome over the Great Temple has a free span of about 60 m. and a height of 25 m. Carrying in all about 100,000 metric tons in a single span, it can be regarded as unique in the world.

However desirable it might be to describe the great dome in more detail here, reference must instead be made again to the Concluding Report, where more than three full chapters are devoted to this unique subject. Only a few words will thus be said here, accompanied by some more figures.

Each dome consists of a "shell" and a footing. The great dome shell has a thickness varying between 1.4 and 2.1 m. The footing has generous dimensions, aiming at distributing the heavy load over the sandstone with as favourable stresses as possible.

In order to diminish the effects of heat and the shrinkage of the fresh-cast concrete as much as possible, both the footing and the shell were cast in a great number of blocks. The construction of the dome shell was also divided for the same purpose into a considerable number of arches, each arch in its turn consisting of a number of casting blocks.

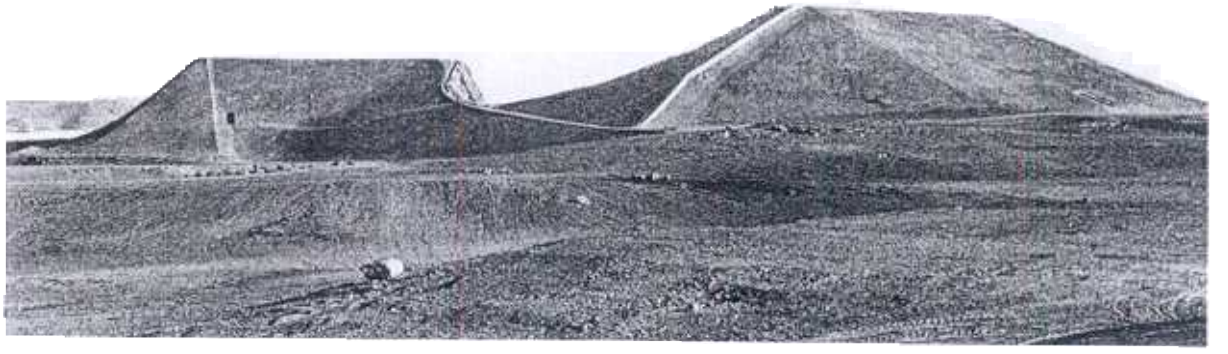
Fig. 32 shows the construction of the first arch of the great dome. In Fig. 34, the front cylindrical part of the dome has been completed, while the construction of the arches in the rear spherical part is still going on.

As can be seen from Fig. 35, an aerial photograph was taken of the Great Temple façade and the dome behind, at the very moment the latter had been completed but before it was to be concealed by rock masses.

The inside of the great dome can however still be seen, as shown in Fig. 36. For tourists visiting Abu Simbel, the great dome has become an extra attraction. With its mighty dimensions and beautiful shape, it gives the visitor an impression of a temple of its own. Although quite unintentionally, it has in fact become a monument to the engineering skill of today, which has both threatened and finally salvaged those exquisite monuments to ancient mastery in both art and technique which are the temples of Abu Simbel.

THE TEMPLE HILLS

It is but natural that in the beginning attention should have been concentrated on the overwhelming task of the transfer of



g. 39. - At the start of the works some consideration was given to making the rear of the temple hills assume a " natural " appearance. However, it as soon found, among other things as a result of the construction of several test areas, that it would not be possible to obtain such an appearance. ather than creating a poor imitation of Nature, definitely " stylized " hills would be preferable. Such hills could also be made to harmonize with their ırroundings.

isitors arriving at Abu Simbel by air or staying there overnight will approach the temples from the rear. The design of the hills should therefore also m at giving the approaching visitors a growing sense of anticipation and the first feeling of the proportions between the King's Temple and the ueen's Temple.

ig. 40. - View from north-east of the two rebuilt Abu Simbel temples. It is true that the old close contact with the River Nile has been lost. But stead new aesthetic values have been gained. Formerly the temples were in a way somewhat dwarfed by the overlying cliff; today they offer a agnificent sight on the top of the same cliff, on the edge of a vast lake.

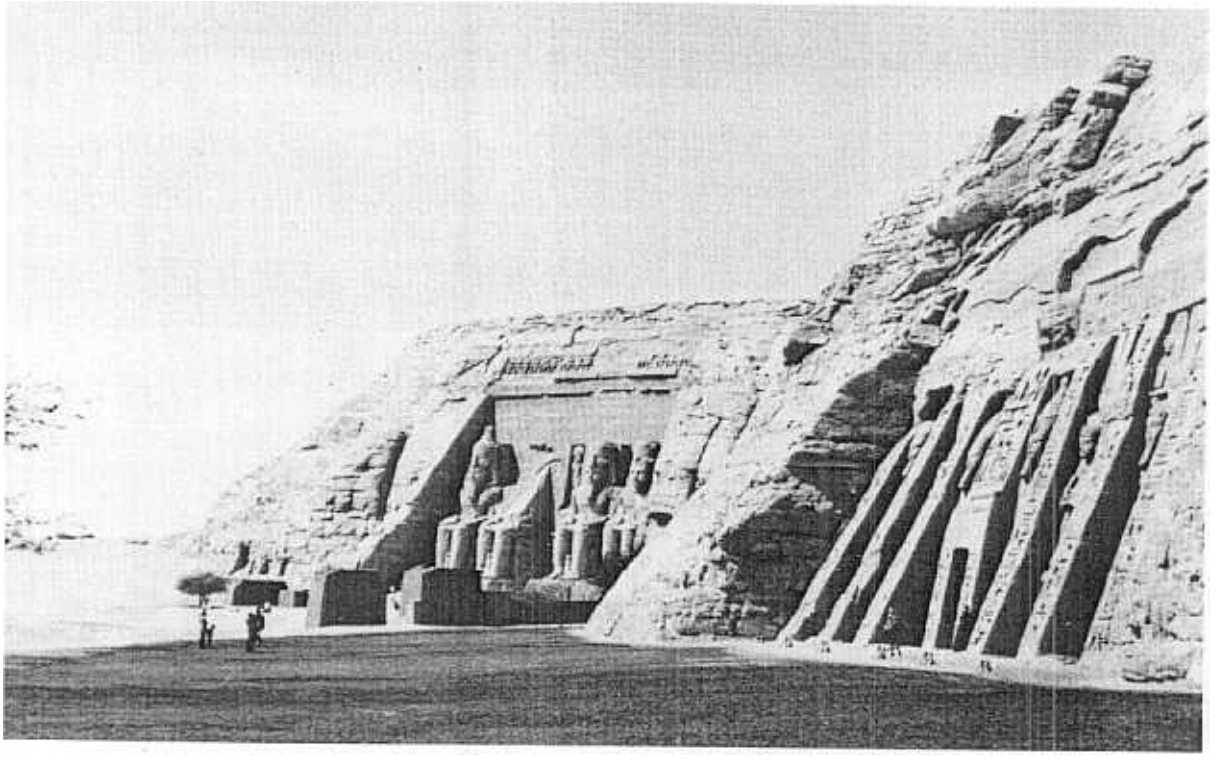


Fig. 41. - The Great Temple of Abu Simbel, with its surrounding rock hill, forming together with the Small Temple part of a new fascinating landscape.

the temples as such, with all the problems this involved. However, it gradually became clear that a complete and successful salvage operation also demanded a *setting for the temples* worthy of the temples themselves.

It is also clear that the last-mentioned task offered scope for still more varying approaches, if possible, than the first, where technical conditions laid down certain limits. VBB's architects were therefore obliged, first of all, to define and specify a lengthy series of prevalent factors and necessary considerations, thereby drawing up a sort of *programme* for the temples' new setting. This programme was worked out and approved side by side with the preparation of several proposals and the final selection of one of these.

The setting for the temples, as finally executed, is best illustrated by Figs. 37-43. The "programme" accepted for the setting may briefly be described as follows:

1. Since the surroundings of the temples on their new sites must differ considerably from their original ones, a new landscape must be created, of which the temples should very visibly form the centre (Fig. 38).
2. The first condition for the new landscape must be maintenance of the special character of the Abu Simbel Temples as the cliff-temples they are, so as clearly to distinguish them from the more common type of temples built of blocks and columns prepared in advance (Figs. 41 and 42).
3. In the first place, the original setting immediately around the temple façades, consisting of the original natural rock, must be maintained (Fig. 43).
4. However, the rock surfaces around the temple façades must also be extended in such a way as to maintain the conception of the cliff sides into which the temples were once hewn (Fig. 41).
5. The idea of re-shaping the cliff sides, as said above, should also serve the purpose of preserving the monumental character of the Abu Simbel temples (Fig. 40).
6. The cliff sides with the temple façades must in their turn be supported by hills, in one way or another emerging from the surrounding desert plateau (Fig. 39).
7. The shore area in front of the temples, down to the waters of Lake Nasser, and the desert area behind the temples, at least to a distance of 500 metres from these, should together form a landscape, with a beauty of its own, at the same time serving as a setting worthy of the monuments inside it.

Besides the various aspects and aims of this programme, there was one more important conditign, namely, that of available funds. When the time came for the execution of the works involved, at a rather late stage of the salvage operation, it was quite obvious that economic means were strictly limited and that no excess expenditure could be permitted.

It was thus not possible to transfer the original rock proper from around the temple façades, except to a limited extent, since this transfer — called "Treatment A", cf. Fig. 37 — was rather expensive. Outside Treatment A, the cliff sides were built up instead from surface rock, wich, though still a natural rock, was cut out and re-built in a manner less costly ("Treatment B"). With means starting to peter out, the uppermost parts of the cliff-sides were given a still more simplified treatment, B ("TreatmentBC").

To begin with, the cliff sides thus built up looked very much like the masonry walls they actually were (Fig. 32). However, when the joints had been filled in a way similar to that used for the temple blocks and the rock surface had been somewhat "modelled" by hand chiselling, their appearance was greatly improved (Figs. 41 and 42).

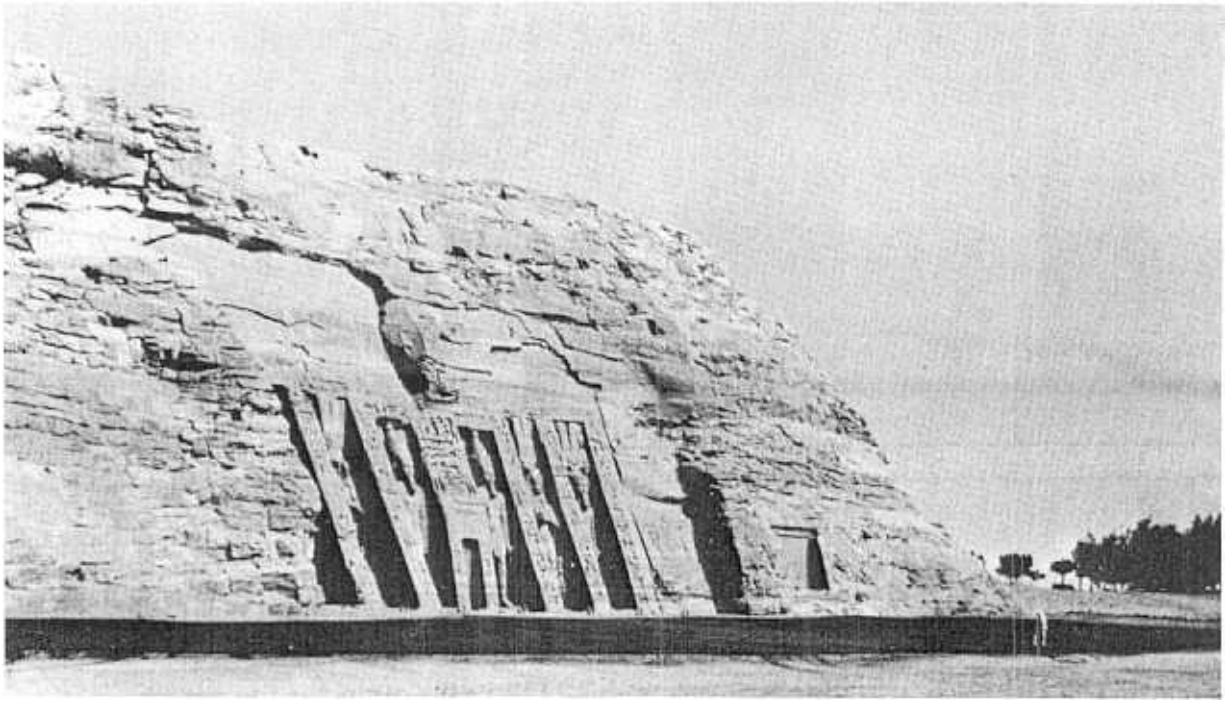


Fig. 42. - Queen Nefertari's Temple at Abu Simbel

In a way, the treatment of the *rear sides* of the temple hills proved to offer more intricate problems than the fronts. Originally, a Treatment C was prescribed here, with the aim of imitating the surrounding desert area with its dune sand and its stony slopes. It was however gradually found, after several "test areas" had been completed, that it was necessary to abandon this idea. Thus, VBB's architects decided to avoid what would most likely become a poor imitation of Nature and to create, instead, clearly stylized hills with architectural and aesthetic values of their own (Fig. 39).

It is easily understandable that to start with the idea of stylized hills caused some people to raise their eyebrows. To-day, visiting the Abu Simbel Temples, one cannot but find that the temple hills form a magnificent setting around the temples proper, enhancing their monumental character and their beauty.

The landscape around the temple hills, as defined in point 7 in the above programme, was proclaimed a "protected area", in order that buildings belonging to the new Abu Simbel village to the rear should be kept at a certain distance and that other alien elements near the temples should be avoided. After the construction works had been completed, the Contractor removed all his provisional buildings, storage yards, materials, etc. from the protected area and restored it, so that it assumed the characteristics of the desert area it originally was. In the latter work, the Contractor received valuable help from nature; sand storms with both erosion and accumulation of sand are in this respect very efficient!

MODERN MATERIALS IN ANCIENT MONUMENTS

That modern materials, like concrete, steel and plastics, must be used for the re-erection and restoration of the temples was always obvious to the engineers. But it is also natural that the archaeologists felt some disinclination to introduce these modern materials into the ancient monuments.

The archaeologists thus put forward three main requirements in connection with the use of modern materials.

a) they must not disturb the appearance of the temples,
b) they must not, when used, in any way affect any elements of the temples,
c) they must not be destroyed by ageing and so endanger the durability of the temples.

Thus the engineers had to devote much care to complying with these requirements. Although this is another important aspect of the subject of this article, a detailed discussion on it would take us much too far. Reference is thus again made to the Concluding Report, but a brief summary of the engineers' measures and considerations in this respect is given here:

a) the modern materials were always so placed as not to be visible at the same time as the temples proper;
b) the temple sandstone was always protected by plastic coating from the water or moisture in the concrete;
c) all plastics used were carefully tested in advance;
d) all plastics were also applied in such a way as not to endanger any temple element, in the event of disintegration as time went on;

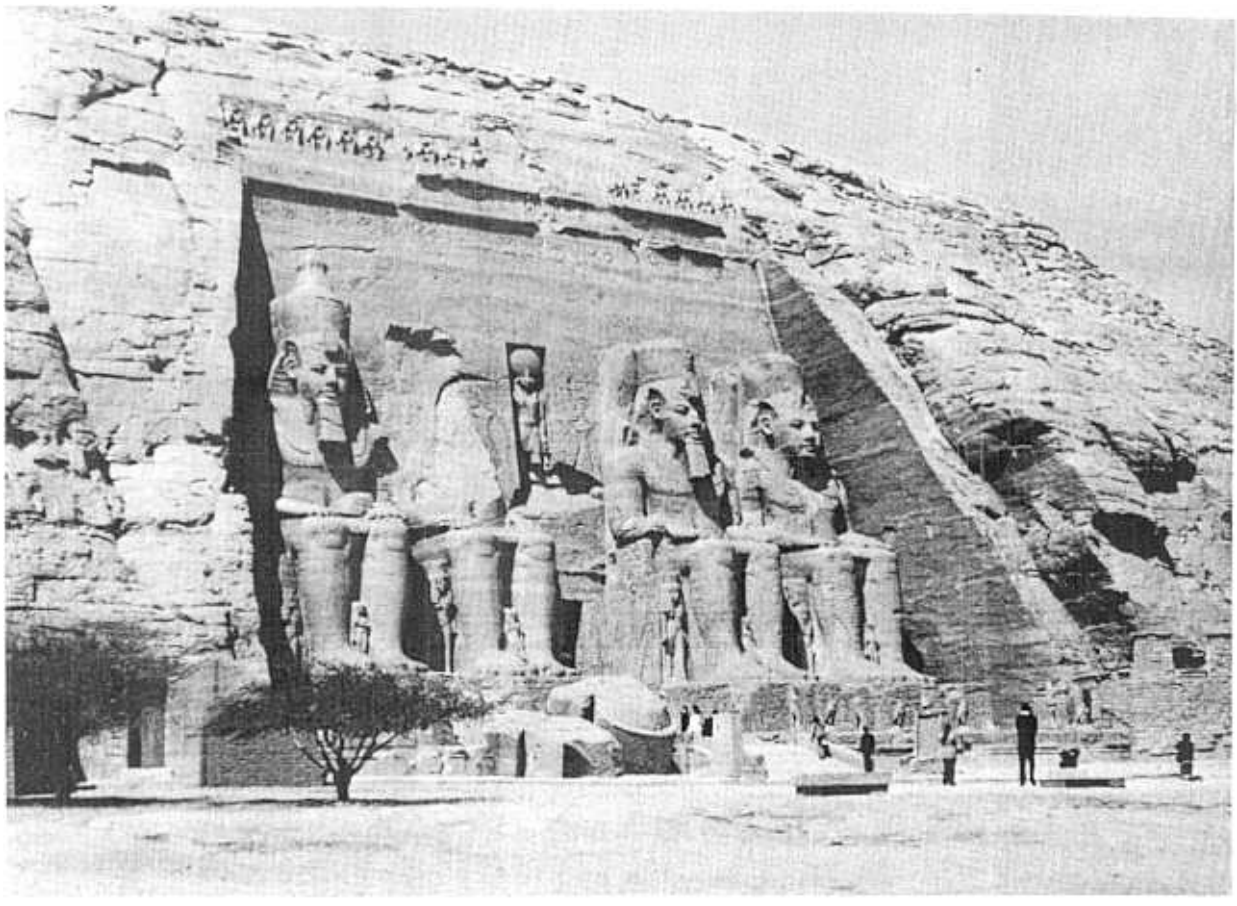


Fig. 43. - When approaching the Great Temple, the visitor feels almost overwhelmed by its beauty and grandeur.

e) all steel used was embedded so as to exclude corrosion;
f) the concrete was given a very high quality and hence a durability far surpassing that of the sandstone in the temples.

MODERN INSTALLATIONS IN THE TEMPLES

It is also understandable that the archaeologists should feel somewhat reluctant about modern installations in the temples, such as electric lighting and mechanical ventilation. But this was *not* a question for the engineers to decide; the salvage operation proper could be carried through without such installations. It soon become clear, however, that the Abu Simbel Temples could no longer be reserved for archaeologists and a few other visitors; instead, a growing number of visitors was to be expected — largely because of the Salvage Operation as such — and the installations had thus to be provided.

In actual fact, the modern lighting installed now enables the visitors to study, admire and enjoy the interiors of the temples in a way that was never dreamt of previously.

Ventilation was also provided — in such a way that visitors are never conscious of it (although the absence of ventilation would indeed have been noticed !). The purpose of the ventilation is twofold: to serve the comfort of the visitors and at the same time to protect the temples from a dangerous degree of atmospheric humidity.

MAINTENANCE OF THE TEMPLES

When the salvage operation proper had been successfully carried through, there still remained one essential task to be performed — namely, the establishment of a complete programme for the future maintenance of the temples. No doubt this important subject might also be worth a chapter — or even an article — of its own. Again, however, reference must be made to the Concluding Report.

The above programme — which was likewise drawn up by VBB — deals with all conceivable circumstances which might influence the temples and their condition, and how to cope with these. Among such circumstances may be mentioned temperature changes and wind erosion (for the outer parts of the temples), atmospheric humidity (in their interiors), physical and chemical changes in some of the materials in the temple structures, settlement, human wear and tear, damage through

accidents or caused by living creatures such as birds, reptiles and insects, etc.

Even if there are seemingly many potential — and actual — influences liable to affect the condition of the temples, provided the maintenance programme is carried out efficiently there is very little risk of any harm to them.

FOR WHAT PURPOSE HAVE THE ABU SIMBEL TEMPLES BEEN SALVAGED?

For many people, especially at the early stage of preparations for the salvage operation, this question scarcely arose; it was just self-evident that the Abu Simbel Temples must be salvaged from what would otherwise have meant their destruction for ever.

However, especially during the time when the salvage operation was going on and much interest was focussed on it in all parts of the world, voices were naturally raised to ask whether the operation was worthwhile, whether the money involved should not go to the poor instead, and so on.

Today, about eight years after the rescue of the temples, more experience has been gained which might throw further light on this question. To give an objective answer is of course very difficult. People will always have different opinions on how best to use available resources. And what is most essential for some people leaves other people unconcerned.

It is also necessary to state the fact that in whatever way the temples were saved it would never have been possible completely to preserve their original atmosphere. They had to be located in other surroundings, and various arrangements were necessary to make these unique monuments accessible to visitors.

This of course brings us to what was the whole point in salvaging and preserving the monuments: that as many people as possible should be enabled to visit them. They must function as a museum. And indeed it can be claimed that the Abu Simbel Temples now constitute one of the most magnificent open-air and indoor museums in the world.

And it can now further be stated that, as eight years of experience have shown, in the consciousness of the world, and for many people, Abu Simbel has become one of the places to which a visit has become almost a «must».

Naturally, there are also other practical problems to be solved in this connection, as regards the transport and reception of the many visitors, etc. For their comfort and enjoyment, their number must of course have some upper limit, reckoned for instance per hour or per day. Fortunately, there is still a considerable «free capacity» left, from a technical point of view, but administrative and financial problems remain to be solved.

Generally, museums cannot be financed — except to some limited extent — by their visitors. Naturally, this is also the case as regards Abu Simbel, if the whole cost of the salvage operation were to be included in the calculation. However, since the non-recurrent cost of the operation proper has been paid once and for all, the actual problem is focussed on the running costs. For Egypt, it is naturally of great importance that these costs should be paid by the visitors. Moreover, some current net revenue would also be justified, if one considers the great sacrifices previously made for the salvage operation by the Egyptian people as well as by other nations through UNESCO. In fact, UNESCO has recently started an economic investigation in this connection, with regard to the Abu Simbel Temples as well as, in principle, to other ancient monuments all over the world.

Lennart BERG
VBB VATTENBYGGNADSBYRAN
Stockholm

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RESUME

Les célèbres temples d'Abou Simbel ont été créés par le Pharaon Ramses II, au XII^e siècle avant J.-C., à l'extrême sud de l'Egypte. Ils ont été taillés à même le roc — du grès — sur la rive ouest du Nil.

Après quelque 3200 ans d'une existence assez paisible, bien conservés grâce aux conditions climatiques favorables, les temples d'Abou Simbel ont été menacés de disparition avec la construction du barrage d'Assouan, sur le Nil à 280 km au nord des temples, qui allait élever le niveau des eaux du fleuve de près de 60 m, submergeant toute sa vallée nubienne.

Une opération de sauvetage gigantesque et unique en son genre a, toutefois, permis de déplacer les temples et de les conserver, près de leur milieu d'origine, mais en sécurité au-dessus du niveau des eaux du Nil.

L'opération de sauvetage a été organisée par le Ministère de la Culture, au Caire, en étroite coopération avec l'UNESCO, à Paris. Les travaux sur le terrain ont été menés par un consortium international « Joint Venture Abu Simbel », sur un projet et sous le contrôle du Cabinet VBB — Vattenbyggnadsbyrån, architectes et ingénieurs conseils, Stockholm.

Lennart Berg, expert-conseil en chef du Cabinet VBB décrit dans cet article les diverses phases de l'opération de sauvetage du point de vue technique et en expose aussi d'autres aspects importants, au plan architectonique, archéologique et financier.

Fig. 1. - Le Grand Temple d'Abou Simbel tel qu'il apparaît aujourd'hui, en lieu sûr, hors de la portée du Lac Nasser.

Fig. 2. - Les deux temples tels qu'on les voyait autrefois du Nil.

Fig. 3. - Le Grand Temple sur son emplacement d'origine, vu du Nil.

Fig. 4. - Plus on s'approche de la façade du temple, plus elle devient impressionnante.

Fig. 5. - La reine Néfertari, épouse préférée de Ramsès II. Bien qu'il ne lui ait pas été permis d'atteindre la hauteur du genou de son mari, sa statue possède une dignité et une majesté qui lui sont propres.

Fig. 6. - Coupe horizontale de la façade et des salles du Grand Temple.

Fig. 7. - Grand Temple : quatre des huit piliers du pronaos, chacun portant sa statue de Ramsès représenté en Osiris, dieu des enfers.

Fig. 8. - Le Petit Temple sur son emplacement d'origine, vu du Nil.

Fig. 9. - La reine Néfertari couronnée par Isis et Hathor, toutes deux déesses de la beauté et de l'amour (antichambre du Petit Temple).

Fig. 10. - A l'origine les temples se trouvaient à quelques mètres au-dessus du niveau des eaux du Nil, mais à partir de 1964 ce niveau devait progresser annuellement. Il allait donc falloir les démonter, après les avoir mis à l'abri derrière un batardeau, pour les reconstruire à un niveau supérieur.

Fig. 11. - Le résultat de l'opération de sauvetage tel qu'il avait été imaginé par l'artiste. En fait les travaux donnèrent un résultat sensiblement identique.

Fig. 12. - Croquis imaginaire du démontage du Grand Temple. Ici encore, l'œuvre d'imagination s'est révélée suffisamment proche de la réalité (voir également à la Fig. 15).

Fig. 13. - Schéma des structures de base de l'entreprise de sauvetage des temples.

Fig. 14. - Coupe longitudinale de l'emplacement des temples illustrant le système adopté pour maintenir le niveau de la nappe phréatique en dessous de celui des temples proprement dits en attendant leur démontage.

Fig. 15. - Le creusage du rocher pour l'aménagement des nouveaux emplacements fut précédé de divers travaux préparatoires, tels que la protection des façades par un remblai de sable, le perçage de tunnels d'accès provisoires, la pose d'écrans de protection devant certaines parties de la façade du Grand Temple situées vers le haut, la construction d'échafaudages métalliques à l'intérieur des salles pour le maintien des toitures et des murs en attendant le démontage, etc. (Voir aussi à la Fig. 12).

Fig. 16. - En novembre 1964 on mit en place un tunnel métallique permettant d'accéder aux salles du Grand Temple en passant par le remblai de sable. Ce tunnel d'accès fut utilisé jusqu'au début de 1966.

Fig. 17. - Le découpage en blocs fit l'objet d'une étude préalable approfondie. En plus du schéma ci-dessus on exécuta de nombreux autres dessins, coupes verticales et horizontales, etc., de manière à définir à l'avance le détail de chaque opération.

Fig. 18. - Plan de découpage du relief représentant la « bataille de Kadesh », sculpté sur le mur septentrional du pronaos du Grand Temple. La composition des différents reliefs était parfois de nature à faciliter leur découpage en blocs.

Fig. 19. - La coupe de la zone superficielle du rocher se faisait au moyen de scies à main à dents rapportées en acier dur.

Fig. 20. - Le découpage de la toiture des salles impliqua un certain travail de perçage et parfois l'emploi de coins à fendre. Dans ces cas il fallait auparavant préparer la surface apparente des plafonds à l'aide d'une scie à main.

Fig. 21. - Grand Temple : démontage de la salle hypostyle. Les blocs découpés dans la toiture et une partie de la « poutre » ont déjà été enlevés. Au premier plan, le mur qui fait face à l'antichambre (Cf. Fig. 6).

Fig. 22. - La reine Néfertari (Cf. Figs. 4 et 5), provisoirement détachée de sa place contre la jambe de son royal époux. Etant donné la minceur de sa silhouette, on a prévu une épaisseur de rocher assez importante à l'arrière lors du découpage de ce bloc.

Fig. 23. - Les genoux du pharaon, dégagés, sont soulevés du sol. Le matériel de levage a été conçu de manière à permettre une distribution régulière du poids de ce bloc sur les quatre barres de levage (Voir également à la Fig. 25).

Fig. 24. - En février 1966 le démontage des temples n'était pas loin d'être terminé. De la façade du Grand Temple seuls demeuraient en place les éléments proches du sol.

Fig. 25. - A son arrivée dans la zone de stockage chaque bloc est soulevé précautionneusement par une grue à portique et transporté vers son lieu de dépôt provisoire en attendant sa remise en place.

Fig. 26. - Assis dans la zone de stockage, le pharaon semble contempler son sort avec sérénité.

Fig. 27. - Les quatre piliers de la salle hypostyle du Grand Temple tels qu'on les voyait dans la zone de stockage. Sur les reliefs on aperçoit le pharaon accueilli par une divinité; en fait c'est la représentation — exquise — d'un amour et d'une tendresse parfaitement terrestres.

Fig. 28. - Leur reconstruction terminée, les temples comportent quatre éléments principaux, à savoir :

- *1 : o Les blocs de grès portant les façades, ainsi que les surfaces apparentes des parois intérieures,*
- *2 : o Les ouvrages en béton sur lesquels reposent ces blocs,*
- *3 : o La colline artificielle construite autour de chaque temple et au-dessus pour remplacer la falaise dans laquelle les temples avaient initialement été taillés,*
- *4 : o Les deux dômes en béton protégeant les temples et supportant le poids de la colline artificielle.*

ig. 29. - Le Grand Temple vu en coupe horizontale après reconstruc-on. On voit les ouvrages en béton qui renforcent la façade et les murs s salles, ainsi que le dôme en béton qui protège le tout.

ig. 30. - Le pharaon récupère son visage.

ig. 31. - Le pharaon va rapidement retrouver la plénitude de sa ajesté, entouré de sa femme et de ses filles.

ig. 32. - Construction, à l'arrière des statues reconstruites du roi amsès, du premier arc de la série composant la voûte du grand dôme ui abritera les salles du temple. La reconstruction de la falaise de part d'autre des statues a déjà commencé.

ig. 33. - La façade proprement dite du Grand Temple, entièrement construite. Au sommet, tous les babouins saluent de nouveau quotiennement le soleil levant, comme ils le faisaient auparavant depuis viron 3.200 ans.

ig. 34. - Les travaux de construction du dôme au-dessus du Grand emple peu avant leur achèvement. Les ouvrages en béton au-dessus es salles proprement dites demeurent toutefois encore visibles.

ig. 35. - Vue aérienne du Grand Temple, après reconstruction de la ıçade et achèvement du dôme. Il ne reste plus, ici, qu'à terminer la onstruction de la colline artificielle; les murs en pierre à l'avant, ainsi ue les enrochements à l'arrière, ont déjà atteint une certaine hauteur.

ig. 36. - L'intérieur du dôme recouvrant le Grand Temple. Au premier lan, une partie de l'ouvrage de soutien construit au-dessus du proaos.

ig. 37. - Les murs de pierre recouvrant la face avant des collines ont ne fonction double : maintenir les enrochements mis en place à l'arière et supporter la couche superficielle de rocher en provenance de ancien emplacement.

Fig. 38. - Les deux temples d'Abou Simbel sur leurs nouveaux emplacements, à 62 m au-dessus de l'ancien site, vus du Lac Nasser.

Fig. 39. - Au début on avait un moment envisagé d'imprimer un aspect « naturel » à la partie arrière des collines, mais l'entreprise s'est rapidement révélée impossible, notamment à la vue des résultats des essais tentés dans plusieurs zones différentes. On estima donc préférables à une mauvaise imitation de la nature, des collines nettement stylisées que l'on allait pouvoir intégrer au cadre environnant. Etant donné que les visiteurs arrivant en avion à Abou Simbel ou y ayant passé la nuit abordent les temples de l'arrière, on a cherché, par la conception de ces collines, à éveiller un sentiment croissant d'émerveillement à venir et à faire sentir de loin la différence d'échelle entre le temple du Roi et celui de la Reine.

Fig. 40. - Les deux temples reconstruits, vus du nord-est. S'il est exact que leur lien étroit avec le Nil a été perdu, il est non moins vrai que de nouvelles valeurs esthétiques ont été créées. Alors qu'autrefois ces temples paraissaient dans une certaine mesure écrasés par la falaise qui les surmontait, aujourd'hui ils offrent, de leur situation au sommet de cette même falaise et sur les bords d'un énorme lac, un spectacle absolument magnifique.

Fig. 41. - Le Grand Temple d'Abou Simbel et sa colline d'enrochements, qui composent aujourd'hui, avec le Petit Temple, un paysage nouveau et d'un attrait certain.

Fig. 42. - Le temple de la reine Néfertari à Abou Simbel.

Fig. 43. - La beauté et la grandeur du Grand Temple exercent sur le visiteur un effet presque bouleversant.

RESUMEN

Los famosos templos de Abu Simbel han sido creados por el Faraón Ramsés II, en el siglo XII antes de Cristo, al extremo ur del Egipto. Fueron excavados en la misma roca — una renisca que se prestaba a esta obra — en la orilla oeste del Nilo.

Después de unos 3200 anos de una existencia bastante soseada, y bien conservados dado a propicias condiciones climácas, los templos de Abu Simbel fueron, de repente, amenados de desaparición con la construcción del embalse de Asuán, sobre el Nilo a 280 km al norte de los templos, que iba a evantar el nivel de las aguas del río de unos 60 m, submeriendo pues todo el valle nubiano del Nilo.

Gracias a una gigantesca y única operación de salvaguardia, os templos fueron sin embargo cambiados de sitio, quedando cerca de su lugar original pero en seguridad encima del nuevo nivel de las aguas del Nilo.

Esta operación de salvaguardia fue organizada por el Ministerio de la Cultura, El Cairo, en estrecha cooperación con la UNESCO en Paris. Las obras fueron realizadas por un consorcio internacional — « Joint Venture Abu Simbel » — sobre el proyecto y bajo el control de la firma VBB — Vattenbyggnadsbyrån, ingenieros y arquitectos, Estocolmo.

Lennart Berg, Consultor Jefe de la VBB, describe en su artículo las diversas fases de la operación de salvaguardia, no solo del punto de vista técnico, sino también presentando otros importantes aspectos, arquitectónicos, arqueológicos y financieros.