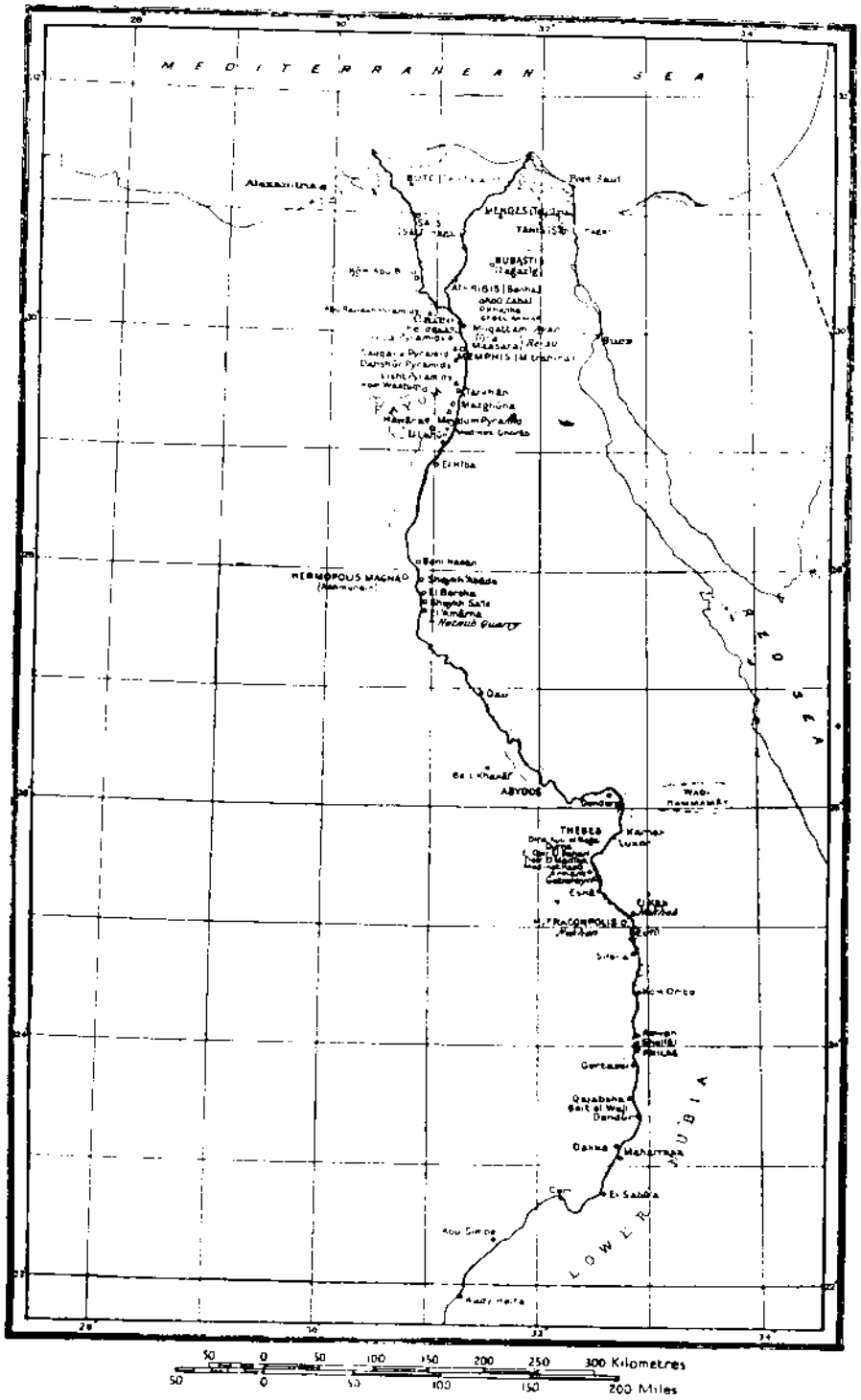
A HISTORY OF EGYPTIAN ARCHITECTURE

Vol. I

FROM THE EARLIEST TIMES TO

THE END OF THE OLD KINGDOM



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ANCIENT EGYPTIAN ARCHAEOLOGICAL SITES

from S. CLARKE - R. ENGELBACH - *Ancient Egyptian Masonry*

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FROM THE EARLIEST TIMES TO
THE END OF THE OLD KINGDOM

by

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PREFACE

Since Perrot-Chipiez's volume about Egyptian Art no comprehensive treatise dealing with Egyptian Architecture has been written. Some excellent books such as W. Fl. PETRIE, : *Egyptian Architecture,* 1938 ; S. CLARKE - R. ENGELBACH : *Ancient Egyptian Masonry,* 1930, G. JEQUIER: *Manuel d'archéologie égyptienne. I. Les éléments de l'architecture,* 1924, cover but a restricted area of the field. That of B. SMITH : *Egyptian Architecture as cultural expression,* 1938, studies the question from a special point of view.

In an effort to meet this need I have undertaken to write this book, the first in a series which will include other volumes on Egyptian Architecture in the Middle Kingdom, the New Kingdom, the Late Period, and on Materials and methods of construction employed in each of these periods. As much material as possible, most of it from specialized publications which are not within reach to the student of Architecture and History of Art, has been gathered and illustrated with about 380 line drawings and some photographic plates. Use has been made of graphical evidence, both from drawings and hieroglyphs, as was done in my thesis: "Le dessin architectural chez les Anciens Egyptiens" and which was published by the Service of Antiquities in 1948. The main results of this research study, including the theories about the origin and evolution of the basic architectural elements, have been embodied in the present volume. New data, some still unpublished, are also exposed here.

It is a pleasure to acknowledge the assistance I have received from others in the preparation of this volume. To Dr. H. RICKE I am indebted for helpful discussions of several technical points. He has also permitted me to publish his drawings of the mortuary temple of the rhomboidal pyramid at Dahshur (fig. 64). I have also made free use of his valuable publication "Bemerkungen zur Aegyptischen Baukunst des Alten Reichs, I-II". J. Ph. LAUER gave me his latest drawings of the mortuary temple of Userkaf (fig. 70). Professor V. VIKENTIEV lent me three excellent photographs appearing in the plates. Professor W. L. HANSBERRY of Howard University kindly read thoroughly my manuscript and made some valuable suggestions regarding the wording. J. ELLUL helped with practical information for printing and binding this volume. ZAKI Y. SAAD permitted to photograph three archaïc unpublished tombs in the Helwan excavations (pl. I a-b; II).

I hope this work will prove useful to the Egyptologist as well as to the Architect and Art historian.

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THE INFLUENCES

As any living manifestation architecture is influenced by the surroundings in which it flourishes. Such influences are due either to physical factors, geographical, geological, climatic, or human factors, religious, social and historical. No two countries have the same architecture and the differences are not so much due to the people who initiated these architectures as to the various factors which influenced their primitive aspects and governed their evolution into styles.

Egypt, together with Mesopotamia, were the earliest countries to acquire an architecture. Although very similar in the archaïc period, both architectures were soon to evoluate in different directions and Egypt created a style of its own, which, due mainly to conservatism, was to maintain its characteristic features till the Byzantine period.

I. GEOGRAPHICAL.— Egypt is a long, narrow valley in which flows the Nile, flanked by two sand plateaus. This part of the Nile valley widens to the North into a triangular stretch of flat country, called by the ancient Greeks "Delta"[1]. Evidence, graphical and literary, proves that the Northern country was a marshy district in historical times, a remnant of the sea which submerged it in the tertiary era. The Nile itself forked, at the apex of the Delta, into two main branches and numerous subsidiary ones and flowed in the Mediterranean through seven mouths[2].

Quite different was the valley part of Egypt, stretching from the first cataract to the apex of the Delta, along 900 km. with a width of 10-20 km. The vicinity of the spacious desert stretches on both sides influenced climate and living. Both countries were differently inhabited and records have preserved an echo of the wars which were waged between both peoples, in several attempts to unite both countries at the dawn of history. This differenciation into two countries was to mark the various aspects of Egyptian kingship and official life with a characteristic duality.

The Nile, the longest river known to the ancients, had also the peculiarity of rising annually and flooding the whole valley, leaving a deposit of slime which proved to be a fertile bed for rich harvests.

Herodotus records[3] that the Egyptian priests called Egypt a "gift of the river", a definition which recalls to the mind the deification of the flood by the Egyptians under the name of Ha'pi. The valley was "The Black" (Eg. *Kemt*), in opposition to the desert, known as "The Red" (Eg. *Desheret*). These barren stretches of sand, thought by the early Egyptians to be the

abodes of the powers of evil, served in a measure to protect the valley and keep its culture from foreign influences. The regularity of the flood and the invention of irrigation were perhaps responsible for the order and the conservatism characterizing the various aspects of Egyptian culture.

The Nile was the only easy means of communication and the earliest graphical records show boats with numerous oars and cabins, probably used as dwellings by predynastic man. Goods, materials for construction as well well as products of civilization could be transported up and down the valley in a short time. Granite from Aswan could be made available in the Northern Country and manufactured products could be acquired by the Southern people. Such an easy water-way was responsible for the unity which characterized Egyptian civilization, in spite of the diversity of its initial constituants.

When the country had dried up sufficiently the early inhabitants settled along the river banks, on natural mounds higher than flood waters and passed from the nomadic form of life to the sedentary state of agriculturists. As no water was available except from the Nile the settlements had to be near the river or a canal. Evidence proves that irrigation projects developed at an early date, with canals on a chessboard pattern. It has been found that agglomerations always stretched along the river, new quarters being added to the North, perhaps on account of the prevailing North winds, "the cool breeze from the North" mentioned by the Egyptian texts.

Egypt, situated at the cross-roads between Africa and Asia, and easily accessible from Europe was to become the melting-pot of many elements, racial and cultural. Resemblance between early architecture in Egypt and Mesopotamia is particularly striking. But in this, as well as in other fields, Egypt soon assimilated the foreign elements and kept unchanged its basic features.

II. GEOLOGICAL.— To the dry Paleolithic period succeeded a rainy Neolithic era and the plateaus bordering the valley were covered with vegetation. Wood seems to have been more common than nowadays and reeds and papyri grew wild and abundantly along water-courses and in the marshes of the Delta.

Light materials.— Primitive man used extensively light and pliable materials in constructing huts, vaulted or domed, as dwellings or shrines. The round plan of predynastic huts partially sunk into the ground is a result of the use of such pliable materials. These were also responsible for the creation of the vault, the dome, the light partition-walls, the fences, the ringed arches, and, among elements of decoration, the gorge-cornice, the kheker-

and the djed-ornament, and the torus. Palm and rush leaves were worked into mats. Such columns as are imitated from bundles of reeds, whether with concave or convex fluting, are directly suggested by light materials. Wattle-and-daub and mat architecture never passed into oblivion and was continuously used or transposed into faïence, stone or wood.

Wood.— Trees growing in Egypt do not produce construction timber. Acacia, sycamore and palm were however used in roofs, as beams, baulks and upright struts. From the earliest times the Egyptians had to import pine and cedar-wood from Lebanon. This scarcety of timber explains the poverty of architecture in wooden elements.

Mud. — In the quaternary period the Nile began to leave deposits forming, till nowadays, continuous layers of slime, a fine-grained compact material drying into a hard, dark mass. When rammed, the earth becomes a tough agglomerate. From texts and architectural remains we know that Egyptian builders used mud or rammed earth from the earliest times, and during the whole of Egyptian history, as filling between two facing walls of brick or stone and to construct ramps. Mud was daubed on wattlework and mat-partitions, providing impermeability to wind and rain and giving rigidity to light structures. It was applied in concave, slanting layers to avoid sliding. It was next worked into more or less quadrangular masses set into rubble walls.

Brick. — The next momentous step was the invention of crude brick, a small quadrangular mass of dried mud, very handy and which could be used with mud mortar in the building of walls of various thicknesses, with regular faces. As mud shrunk upon drying, sand or chopped straw had to be mixed with it. Predynastic structures began to use brickwork. The cheapness of the material caused it to be used extensively in domestic, military, funerary and even religious programmes. The influences of the use of mud are manifold and the characteristics of mud architecture were transposed in stone. The use of mud mortar, later complemented by gypsum for plastering, was universally adopted. Stone structures, with finely dressed and carved walls, were covered with plaster and painted. This allowed patching the masonry, according to a method borrowed from carpentry. Walls in mud had a pronounced batter (1:4 or 75°) on the outer face and slightly less on the inner, and were rounded in section at the top, to lessen the denudation action of wind and rain. Such a basic feature of Egyptian masonry is to be found in brick and even stone structures. With the use of brick the round plan was abandoned for a rectangular one, with outer thick walls and inner thin

partitions. Huge walls could be built with two facings of brickwork enclosing a filling of rammed earth.

The characteristic type of recessed wall panelling, also found in Mesopotamia, is considered as the outcome of a mixed architecture of brickwork encased in a wooden framework. As to masonry a further result of the use of brick is the invention of brickwork with sagging courses, concave or convex, in huge enclosure walls, to prevent sliding of one course upon another and cracking due to earth movement or temperature rises. Mats and layers of rushes were inserted at regular intervals between the courses to act as draining and reinforcing material. Trunks of acacia were used as reinforcement, being introduced in the process of construction.

Stone. Along the whole valley stone of different kinds was available fo building purposes. Limestone, of which an excellent quality is extracted from the Moqattam mountain at Tura and another at Thebes, was used for casing pyramids and superstructures of tombs (mastabas) since the second dynasty. Alabaster, a cristalline deposit of limestone, was mainly extracted at Hatnub (east of 'Amarna) and used for lining architectural work and for statuary and vases. Sandstone of poor quality was used extensively since the XVIIIth dynasty. Igneous rocks, such as red or grey granite found at Aswan and basalt (at Abu Za'bal) were used for lining and casing and for architectural elements such as lintels and doorways, pillars and columns. Quartzite extracted from Gebel Ahmar was popular in the XIIth and XVIIIth dynasties.

This great variety of stone suitable for every architectural purpose enabled architects to carry out building programmes, some of which were specially daring for their time. Spans of roofs could be increased with the use of granite for lintels and roofing slabs, carried on granite side-walls or pillars. Pent-roofs, unnecessarily built in three layers, carried the huge loads of superincumbant masonry in pyramids. Long monolithic columns, gateways, obelisks, as well as statues, could be worked in granite. For rich lining and paving use was made of granite, basalt and alabaster. Large scale building, which characterized Egyptian architecture was made possible through the quarrying of large blocks of stone and the various mechanical devices which were available for transport and erection.

III. CLIMATIC.— The climate seems to have been to that in modern times. Perhaps its main feature is the shining sun, providing warmth and light the whole year round, and assuring three crops a year. The Egyptians valued the sun so much that they deified it as one of their chief gods, Re' who ruled ever since the IVrth dynasty onwards. Sufficient warmth led to the

disappearance of the indoor hearth found in Neolithic houses. Braziers were used in different rooms and a hearth or oven was common in the kitchen, built usually outside the main body of the house. Sparse openings were left as windows, high under the ceiling, or doors. On the other hand pillared porticoes along the entrance façade or around the internal courts were intended to provide cool shade. Artificial ponds and gardens adjoined every rich house or tomb.

Light. — Profuse light was another factor enabling the use of scarce openings, sometimes even that of a single door. Temples had no side windows but were lighted through the doorways and clerestory or slot windows in the roof. Such large architectural masses contributed to simplicity in design and were covered with decoration, in carving and painting. Architectural sculpture in monumental buildings such as temples or palaces was directly influenced by the great amount of light and soon divided into two types: projecting low-relief scenes on internal walls and areas in the shade, and sunk low-relief to provide contrast with deep shadows, on walls exposed to the glaring sun.

Rain. — The rains of the Neolithic period soon subsided and in the rather dry climate the flat roof was used as a terrace inhabited during the hot summers. The open courtyard became a feature of the domestic plan. Although provision was made against the dripping of rain through the joints of the roofs, yet the external faces of walls could be carved with painted low-reliefs, and statues could be erected in open courts or in front of façades. Walls of monumental buildings became sculptured records of religious and historical interest, related to the purpose of the room they enclosed.

Wind. – In the prehistoric period, when the hearth was the essential feature of a settlement, screens of stone prevented the North wind from extinguishing the fire. However this same wind cooled down the temperature in sunny summer days. Texts wish for the living and the dead a "cool breeze from the North" and domestic programmes feature porticoes and façades set towards the North and an ingenious device consisting of a slanting ventilator shaft opening in the ceiling (Ar. *mulqaf*) to catch the North wind.

IV. RELIGIOUS. — Nowhere is the religion so intimately connected with architecture as in Egypt. The need for a shrine seems to have appeared at the earliest stage of Egyptian culture. Graphical evidence proves the existence of shrines for deities, dating back as far as the predynastic period. Local gods were superseded in importance by cosmic ones, served by a powerful priesthood. The king himself embodied divine power and had

alone the authority to minister to the deity. In practice this authority was confered upon the high-priests or others. Although basically monotheistic in character the religion was crowded with a multitude of deities of different origins, amalgamated into various religious systems. Popular religion was particularly endued with petty customs, mostly magical and superstitious.

The priesthood of the great gods soon acquired power and riches which enabled it to undertake and direct huge architectural programmes. Temples were actually the main buildings they erected, normally provided with vast dependances, magazines and dwellings for the priests.

Cult-temples. — The cult-temple was essentially a dwelling for the deity and therefore presented numerous features borrowed from domestic achitecture. The basic elements of the simple temple plan, the court, the hypostyle hall and the sanctuary are copied from those of the house : court, public quarters for receptions and private rooms for dwelling. The deity used to dwell in its wooden statue, which was kept in a shrine or naos at the back of the temple, far from the eyes of lay people and was served by the king, the high-priest or the priests on duty.

Sun-temples. — Quite different from other cults was the cult of the sun-god. This god was one of the earliest of the deities and soon the most influential cosmic god in the whole country. Originally from Heliopolis, Re' superseded all other deities, whether cosmic or local, and absorbed them in his cult. The rites of this cult were not performed in the darkness of a sanctuary, but in an open court, with an altar in front of the sun-emblem, an obelisk. Such requirements could only be met by a temple quite different from the ordinary cult-temple.

Funerary religion. — The Egyptian religion was not only a religion for the living, but also for the dead. Man was thought to live eternally in the way in which he had lived upon earth. One condition was essential : his body should be preserved from corruption and he should be aware of the prescribed ritual to be observed when dressing the gods and genii in the afterlife. Such conditions gave rise to a funerary architecture which would guarantee the preservation of the body and its funerary equipment from the climatic denudation and the human depredations. The burial chamber was accordingly excavated deeper and deeper underground and various devices were invented to block up the way to it. In order that the funerary cult should be performed adequatly a place was reserved for the offerings, as near as possible to the stela or false-door which would enable the dead to partake of these offerings. Later the interior of this offering-place or chapel was planned to embody other elements such as would serve for the ritual

commemoration of the purification and mummification of the dead. Texts of spells in pyramids and scenes of daily life in tombs of individuals, as a complement to the daily offerings, were carved on the walls to be at the disposal of the dead, in the superstructure, and later also in the burial apartment underground (Middle Kingdom). All these requirements had to be met by the architects and the tomb evolved according to the funerary beliefs. Kings of the Old Kingdom, who merged with the gods after their death, had the largest and most elaborate burial complexes on high western plateaus, with a pyramid (since the IIIrd dynasty), a mortuary temple and valley-temple on the border of the desert. Such elements were soon imitated on a reduced scale by people of different classes, in relation to the gradual democratization of the various religious prerogatives of the king (Middle Kingdom).

As the tomb was supposed to be, at one stage in its evolution, an eternal abode for the dead, its architectural features were adapted from those of the house.

That both temple and tomb had to endure eternally induced architects to use the best materials available, stone, wood and gold, while domestic and military projects were carried out in brick and plaster. This accounts for the extraordinary richness of Egypt in tombs and temples.

V. SOCIAL. — Prehistoric times are still veiled, although considerable knowledge can be derived from the settlements recently excavated. It seems that, as early as the Merimde settlement, some kind of social laws had been established. This is reflected in the townplanning agreement to erect the huts along one main road. The attachment to the dead is also indicated by the custom of burying under the dwellings.

Religious attachment and the care for the dead are exemplified by the extraordinary development of religious and funerary architectures, ever since the predynastic times.

Science and arts. — Egypt was probably the first country to take the lead in the field of science and invention. Agriculture, mathematics, astronomy had attained a most satisfactory level, using empiric methods, and architecture was to profit by the development of various arts and crafts. A remarkable feature of the Egyptian mentality was to assign every achievement in progress to the earliest generations, when gods still ruled on earth. Plans of temples and elaborate architectural devices were sought in secret chambers of the temple of Thot, the god of learning, where they were kept. Tradition played an outstanding role in keeping the style within certain settled ranges, subject to immutable canons.

Government and organization. — The government was autocratic and

was centralized in the person of the king, son of Re'. He could levy armies of workmen for public works or soldiers for wars. The huge architectural projects of the kings were made possible, in the main, by the large supply of cheap labour and the excellent way in which it was organized.

Nothing but the simplest mechanical devices were available yet such masterpieces in structural and building craft as the pyramids could be achieved. Although the royal builders would seem to have had a fairly large supply of slave labour at their command it is doubtful that most of the work on the buildings was done by slave labour. On the contrary, there are good grounds for believing that the great building projects were undertaken for the purpose of supplying work by which the free-population could earn a living during the period when the people at large and particularly the *agricultural workers were rendered idle by the flood. Prisoners of war may* have worked quarries and transported building materials.

The government machinery seems to have been already well balanced in the first dynasties. From the titles of officials it may be gathered that they were set in various departments dealing with special fields. Such a frame-work comprises Public works, Justice, War Administration[4]. An organization which prescribed a census every second year and recorded the levels of inundation every year, as far back as the Ist dynasty[5], is likely to be responsible for such achievements, when the people offer their labour for building temples and royal tombs, as a boon through which they would benefit.

The religious and funerary beliefs which appeared at the dawn of history were to remain as long as Egyptian civilization endured and were the strongest incentive towards architectural achievement, the more so that conscience was formal and welfare in the afterlife was mainly dependant on the material preparation for the tomb. These consisted of the tomb and its chapels, endownments for the priesthood and offerings, funerary equipment. Subject to such conditions architecture was not an æsthetic pursuit of art, but an adequate means to achieve certain practical programmes.

VI. HISTORICAL.— PREHISTORIC AGES.— The prehistoric ages begin in the Quaternary period, when the great Nile had receded in its valley bed and man used to wander with his stone implements, in search for game. The Paleolithic period was followed by the Neolithic, when artifacts grew smaller but fine rand man used bone and invented earthenware and copper, and discovered agriculture and breeding. He settled along water-courses and began to build shelters, houses, magazines and granaries, and to bury his dead. No definite chronology of the period is available, and the system

of "sequence dates" proposed by Petrie, and which is employed for dividing the whole of Egyptian history into 100 parts, where Sequence date 78 marks the Ist dynasty, is still followed. The various cultures which flourished in Egypt were named after the villages where they were found[6].

	Upper Egypt		Lower Egypt
	Tasian		Merimdian
			Early Fayumic
B.C. 4,000	Badarian		
	Naqadian	Semanian	
		Gerzean	Late Fayumic
		'Amrian	

Protodynastic times. — Petty rulers seem to have governed various districts in Lower Egypt, especially the Eastern and the Western Delta, and in Upper Egypt. The marshy Delta was unified long before history under the supremacy of Heliopolis. Later, after several attempts at unifying the whole country, this finally took place somewhere about 3,000 B.C. and was marked by the apparition of writing.

HISTORICAL TIMES. — An Egyptian priest, Manetho (300 B.C.), compiled an Egyptian History in Greek and grouped its rulers into thirty dynasties. These are now conveniently divided in three main kingdoms, separated by two Intermediate periods of disorder.

The Old Kingdom (Dynasties I-XI: 3,000-2,060 B.C.). — When Upper and Lower Egypt were finally united a series of kings ruled both countries from their capital at Thinis, near Abydos. These rulers make up the first two dynasties. The government seems to have assumed its definitive frame and architecture, although still of light materials or brick for the tombs, shows a development, both in style and construction, which marks a stage before stone will be extensively used in the IIIrd dynasty.

The capital was transferred to Memphis, a city founded in the Ist dynasty at the apex of the Delta. The various government departments were served by a host of officials according to a well organized hierarchy. The king exercised an autocratic rule, helped by a vizier or prime minister, himself often a member of the royal family. Local governors administered the districts or "nomes" of Egypt. A period of prosperity helped a high culture

to flourish. To the most powerful IVrth dynasty succeeded an era which saw a weakening of the royal power, due to the gradual growth of the priesthood of Re' and the tendency of the nobles to assert their independance. Such was the dwindling of the royal authority that religious prerogatives of the Pharaoh were usurped by the commoners, with, as direct consequence, the imitation of the royal tombs and funerary temples by them.

Stone was first used on an extensive scale in Djeser's complex at Saqqara. Architecture reached its apex during the IVrth dynasty, with the creation of a proper style based upon sound structural principles, using adequate materials. No decorative effect was aimed at through the use of secondary elements, as was the case in the V-VIth dynasty. The main building activity found expression in the pyramids and their complexes, temples and tombs. But whereas in the IVth dynasty tombs of the nobles who served the king were built round the pyramid, in the VIth dynasty such tombs were built in the nome where the deceased nobleman had lived.

Egypt depended on foreign trade and relations with neighbouring countries, ever since the dawn of history and trading expeditions to the country of Punt or quarrying in the Sinaï are recorded. Libyans and Syrians were kept from raiding the frontiers by punitive wars.

The First Intermediate Period saw the vanishing of royal power and the division of the country between princes waging civil war. The IXth and Xth dynasties ruled at Herakleopolis (Ehnasya), helped by the princes of Asyut, but were defeated by the Intefs and Mentuhoteps of the XIth dynasty, who ruled at Thebes. No marking monument could be erected in this era of disorder and poverty. Art shows the influence of popular trends.

The Middle Kingdom (Dynasties XII-XVII : 2,060-1,785 B.C.). — Order and prosperity were restored by the energetic Amenemhat I, the first king of the XIIth dynasty, who ruled from the capital he founded on the west bank of the Nile, south of Memphis. He worked again the quarries at Tura and founded the temple at Karnak. Of his successors, named Amenemhat or Senusert, king Amenemhat III was surely one of the most prominent, fostering irrigation works in the Fayum province and permanent exploitation of the Sinaï mineral quarries. A second Intermediate Period followed this era of prosperity and was marked by the invasion of the northern country by the Hyksos, a foreign people who ruled over Egypt as far southwards as the city of Qus, during the XVth-XVIth dynasties. Although they tried to adopt local customs they were never accepted by the Egyptians, and they were driven out of the country by the XVIIIth dynasty rulers of Thebes.

Art in the Middle Kingdom shows a refinement in style. Pyramids for kings were built at Lisht, showing intricate devices against tomb-robbers. Huge architectural projects were carried out, such as a sun-temple, now destroyed, at Abydos and the famous Labyrinth at Hawara.

The New Kingdom (Dynasties XVIII-XXX : 1,580-332 B.C.). — Ahmes, who drove the Hyksos out of the country, founded the new dynasty (XVIIIth), with Thebes as capital. This era begins the Empire, during which Egypt will spread its dominion over Palestine, Syria and part of Mesopotamia, Libya and Nubia. Amenhotep IV (Akhnaton) tried to check the growing power of the priesthood of Amon and promoted a new creed, founding a new capital in Middle Egypt at 'Amarna ; but his movement subsided at his death.

The XIXth dynasty was marked by great conquerers and builders, of the names of Ramses and Seti. This spread of power was fatal to the royal rule and government deteriorated in the XXth dynasty. The priesthood of Amon-Re' took over the rule and were followed by Libyan princes (XXIIth-XXIVth dynasties) and Ethiopian generals (XXVth dynasty). Assyrians invaded the country, but were repelled by Psammetik, who founded the XXVIth dynasty and reigned at Sais. Saitic period initiated a "renaissance" featured by a trend to imitate the Old Kingdom culture in art and favoured the settlements of Greeks. Persians invaded the country (XXVIIth dynasty) and tried to adapt themselves to national customs. Darius reopened the canal between the Nile and the Red Sea, already begun by Nechao. The XXVIIIth-XXXth dynasties staged petty rulers who had to wage constant war against the Persians. These ruled over Egypt again from 341-332 B.C. and were defeated by Alexander the Greet.

Building projects were characterized by large scale and deterioration in style, although some show originality and boldness. Queen Hatshepsut built her wonderful rock-cut temple at Deir el Bahari, with terraces and porticoes on polygonal columns, and decorated with beautiful low-reliefs. Work at Karnak was carried out by Thotmes I, Amenophis III, Ramses I, Ramses II. At Abydos Seti I built his magnificent temple, covered with fine reliefs. Ramses II busied himself with projects of dubious taste all over the country, but is responsible for the impressive rock-cut temples at Abu Simbel. A new style with realistic trend was inaugurated by Amenhotep III (Amenophis III) and brought to its apex by Amenhotep IV at his capital 'Amarna.

Art is featured by refinement and elegance, although architecture shows general deterioration. In the Saitic period imitation of the Old Kingdom produces valuable pieces in sculpture.

The Ptolemaic Period (332- B.C.-30).— After Alexander the Great Egypt was ruled by his general Ptolemy Lagos and his successors, till the Roman conquest in 30 B.C. Culture is a mixture of Egyptian and Greek elements, especially conspicuous in non-religious art. Classical architecture seems to have prevailed at Alexandria, the capital of Egypt and the world. The Egyptian temples were still built in the traditional style, although they were decorated with low-reliefs showing an evolution in sculpture. The Ptolemies patronized Egyptian customs and religion and organized a deep financial exploitation of the natural ressources of the country.

Ptolemy II inaugurated the lighthouse on the island of Pharos at Alexandria. Besides the famous buildings at Alexandria, which have completely disappeared, huge temples in the Egyptian style were built at Dendera, Esna, Edfu and Philae.

Towards the end of the dynasty nationalistic uprisings took place repeatedly in Upper Egypt and the temple of Edfu was used as stronghold by the movement. Roman influence in Egypt began to wax strong and kings had recourse to Rome for the settlement of their constant family struggles. At the death of Cleopatra Egypt became a Roman province.

The Roman Period (30 B.C. - 395 A.D.). — Egypt kept its government although the aim of Roman administration was to exact as much as possible from the country. It became the granary of Rome, and its people were subject to all kinds of liturgies and charges. Severus (200 A.D.) and Diocletian attempted to reform the deterioration resulting from the drain of Egyptian wealth.

Religion shows a mingling of Greek and Egyptian creeds, and emperor-worship was in honour in various cities. Christianity developed in the second century and the numerous persecutions led to the growth of cenobitism, a form of religious retirement in the ancient tombs of the mountainous ranges skirting the valley. It was not until the proclamation of Christianity as the official religion by Constantine (234 A.D.) that it could establish churches in the disaffected Egyptian temples.

With the disappearance of Egyptian religion, native architecture, which had managed to keep alive although sadly degenerate, come to an end.

PREHISTORIC TIMES

Domestic Architecture

NEOLITHIC TIMES

THE FAYUM SETTLEMENTS

The Fayum depression was occupied by a lake whose level continuously lowered since Paleolithic times. In the Neolithic period the most ancient settlements were situated around the shores of the 180 ft. lake, while more recent ones depend from the 160 ft. lake. Although the settlements on the northern shore show only hearths and granaries, yet they were occupied by sedentary people. They can be considered as the earliest remains of domestic architecture.

On one site (kom W)[7] fireplaces only were found: these had the shape of elongated holes excavated in the compact sand and varying between 0.30m and 1.50m in diam., 0.15-0.30m in depth. Most of these fireplaces contained nothing but a dark deposit; some however still retained the vessels with animal - and fish-bones.

Two groups of granaries, contemporaneous, although at different levels, consist of holes varying from 0.30m to 1.50m in diameter, and 0.30-0.90m in depth, containing baskets formed of superimposed rings of straw, fixed by means of vertical straps. These baskets were set in the excavations and kept adhering to the sides by means of a layer of mud[8]. Sometimes the sides are covered with reeds, instead of straw[9]. A circular mat seems to have been used for covering the grains.

Other bare holes were intended as magazines for vessels or implements.

THE SETTLEMENT OF MERIMDE-BENI SALAME[10]

To the South-West of the Delta a Neolithic settlement showed huts and magazines neighbouring with tombs. It seems that the huts had been arranged in two rows, on both sides of a sinuous lane directed S.W. to N.E. (*fig.* 1) (5-6m in width, 80m in length). This is, very likely, the earliest attempt yet known in town planning.

The huts. — The huts were oval in plan (3.2 x 2m to 1.5 x 1m) excavated under the level of the surrounding soil (abt.0.5m), with no trace of a door in

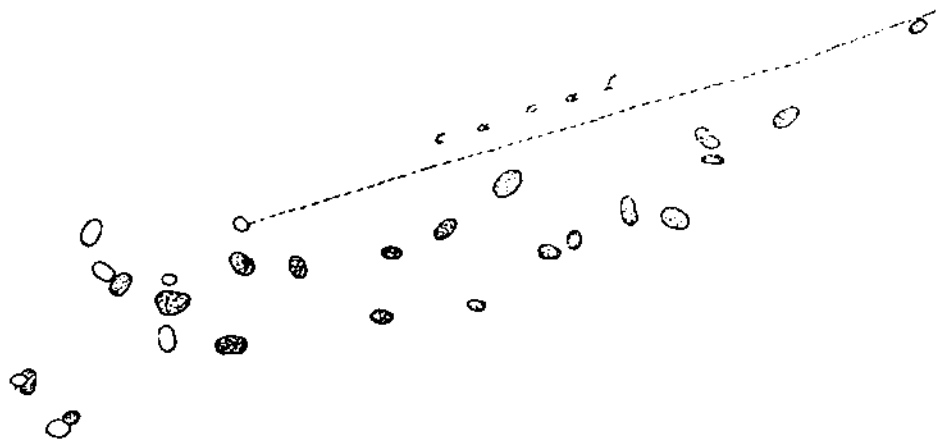

Fig. 1. Plan of the neolithic settlement at Merimde.

their walls (*fig.* 2). These were built in the excavation, around the sides, on foundations consisting of débris, sometimes also prismatic mud bricks rammed into the soil. Large irregular mud and chaff blocks similar to the "*galus*" of second-rate modern huts, were also used. The walls must not have been carried up very high but were very likely continued as partitions in light materials, carrying a reed mat as ceiling. Traces of two wooden posts were found at the extremities of the oval plan. The soil of the hut was plastered with a mud layer and sometimes provided with an underground vessel where rain-water could gather[11]. Access to the low interior was through an opening under which was a step consisting of an hippopotamus tibia or a stick fixed in the sand, reclining upon the inner face of the wall and sufficiently embedded in mud to be able to carry a man (*fig.* 2)[12].

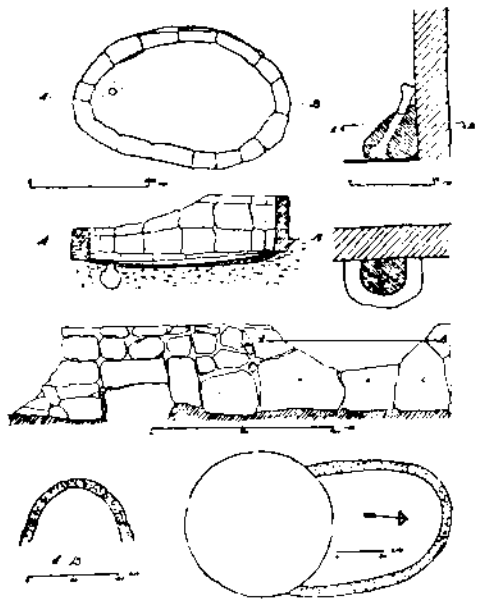

Fig. 2. Plan and section of a hut with underground vessel and detail of step with hippopotamus bone (Merimde-Beni Salame).

The shelters. – Besides the huts used as habitations there were shelters built of light materials, on a oval plan (abt. 3-4m wide), open to the S.E. (*fig.* 3). Holes containing remains wooden posts would suggest that the partitions in reeds fastened by two balks were fixed to wooden posts. A piece of such a reed partition (abt. 7.5m long) was found buried in the ground[13]. Such a shelter containing vessels, baskets and remains of ashes, derived from the Paleolithic wind-screen, could have been used as workshop or cattle-enclosure.

Fig. 3. Plans of two shelters with posts (Merimde-Beni Salame).

The granaries, silos, threshing-floors, mortars.— The granaries were not grouped, as in the Fayum, outside the settlement, but depended from the houses and consisted either of a reed basket (0.3-1.8m in diameter, 0.3-0.6m in height) or a huge earthenware jar (1m ht.), inserted in excavations in the ground[14]. As in the Fayum silos the baskets were stuck all round to the sides of the hole by means of a layer of mud mortar and covered with mats.

It seems that wide circular shallow excavations (abt. 4m diam.) whose floor was sometimes covered with mats, were used as threshing-floors. According to Junker this would be represented in plan by the Old Kingdom hieroglyph *spt "threshing-floor"*[15].

Holes whose bottom had been prepared with stamped earthenware fragments and bones, covered with a thin layer of mud (1cm), seem to have been intended for mortars[16].

THE SETTLEMENT AT EL 'OMARI.— This Neolithic settlement to the North of Helwan is provided with the same types of huts, with wickerwork walls and partly underground granaries, covered with mats, as at Merimde[17]

ENEOLITHIC TIMES

The district of Badari, in Upper Egypt, which shows remnants of eneolithic civilisation (before S.D. 30), reveals no trace of habitations, but only tombs.

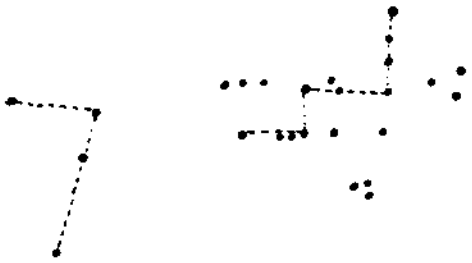

Fig. 4. Plans of two shelters of wattlework in the eneolithic settlement at Mahasna.

From the later civilisations (S.D. 30-80), called Amrian or First Naqadian, and Gerzean or Second Naqadian, after the modern villages occupying the sites of the prehistoric settlements, we have remains of habitations showing a marked evolution towards the types of dwellings occuring in historic Egypt. Such remains were found at Hemamiya, Mahasna, Abydos and Ma'adi.

HEMAMIYA[18].— The hut is on a circular plan (1-2.3m diam.), with walls (0.3-0.37m thick), in mud mixed with stones and covered internally with straw or reeds. As at Merimde the floor was sunk into the ground (0.32-1.97m deep), but neither a door nor a step has been traced. One or two rough wooden posts were fixed in the floor, near the walls, possibly to support the ceiling of light materials, the only type which could be adapted on mud walls, of relatively small thickness. According to the finds in these huts the settlement could date from the end of the First Naqadian Period (S.D. 38-40).

MAHASNA[19].— The shelters at Mahasna show the first occurence of a different plan, neither oval nor round, but quadrangular in shape (*fig.* 4). Although built of posts and interlaced branches and plastered with mud, the walls intersect at right angle in plan. This marks a stage in the development of the habitation plan, parallel in the evolution in tombs, which shift from circular to rectangular types (S.D. 38-40)[20].

Fig. 5. Plan and transversal section of an oven in the eneolithic settlement at Abydos.

Ovens were found at Mahasna, in groups or isolated.

ABYDOS[21]. — Huts and ovens occur also at Abydos. These were rows of two parallel series of

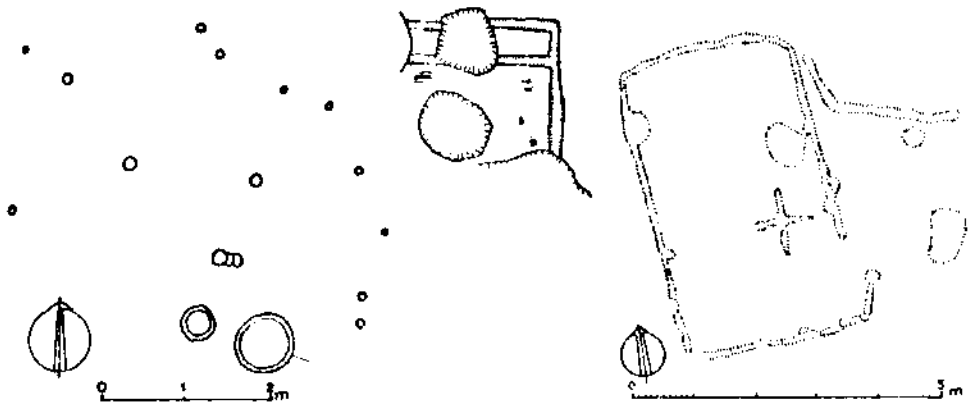

Fig. 6. Plans of a shelter and two houses in the eneolithic settlement at Ma'adi.

earthenware vessels, plastered externally with mud, enclosed between two brick walls (*fig.* 5). The vessels, conical in shape, were partly sunk into the ground and supported by series of triangular bricks, somewhat inclined towards every vessel. A small vessel of the same shape as the bottom of the large one was inserted in it. The empty space between one series of vessels and the adjoining wall was covered by inclined bricks and apertures were left between every two vessels in this covering. Fuel was introduced through these apertures and the oven which numbered seventeen or eighteen vessels, seems to have been used for drying corn.

MA'ADI[23].— This settlement, about ten kilometres South of Cairo, is the latest and can be considered as protohistoric in date. Besides different types of fireplaces, it provided shelters, huts and granaries, all of which give evidence of a combined evolution of types, similar to those at Merimde, El 'Omari and the Naqada culture.

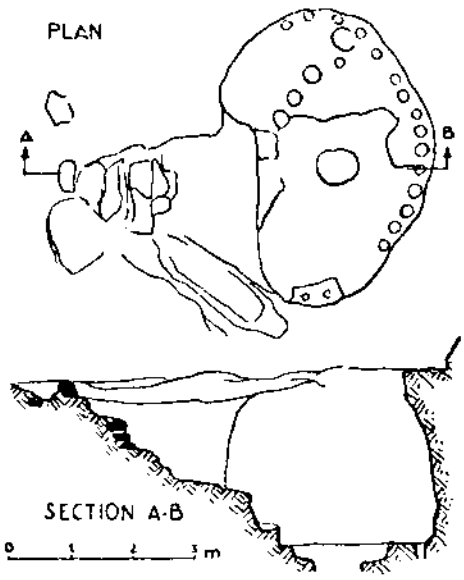

Fig. 7. Plan and section of a partly underground hut (Ma'adi).

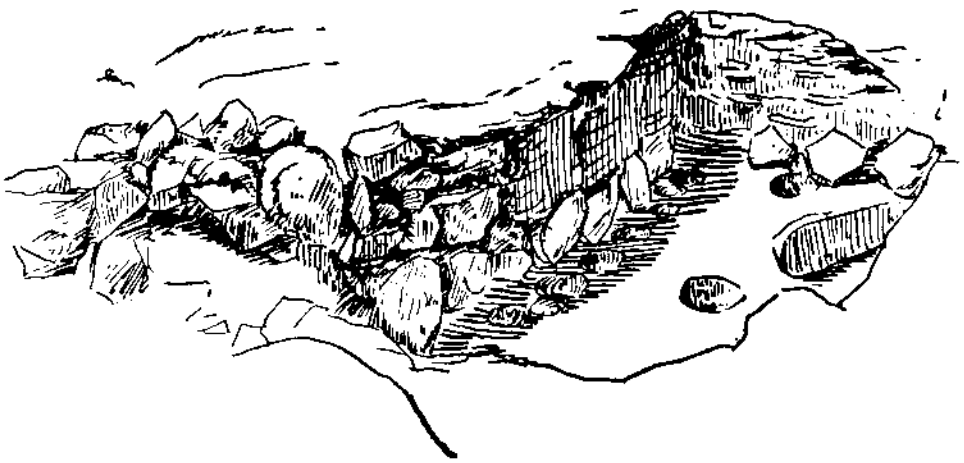

Fig. 8. Magazine with walls of mixed masonry (rubble and mud-blocks) in the retaining walls (Ma'adi).

Shelters.— About nine tamarisk wooden posts fixed in holes 0.3m diam.) excavated in the soil along an oval plan (4m diam.) formed the skeleton of one of Ma'adi shelters. Opening widely on the S.W. side it contained a fireplace and had two large earthenware jars (0.9 x 1m) sunk in the ground nearby. The walls were of interlaced branches, plastered on one side (*fig.* 6).

Huts.— Here, as at Mahasna, the rectangular plan has been used in the building of two huts or cattle-enclosures. A shallow trench was filled with mud and in it were fixed the walls of reeds or straw, propped externally by wooden posts. The plan is thoroughly rectangular (3 x 4.8m), the shorter sides set towards North and South, and has a door opening in the eastern wall, near the South corner. A wind-screen protected the entrance from the northern winds. Junker has proposed to compare this type of hut with the hieroglyph of the "castle".

Certain excavations, reaching deeply under ground (2m) by means of primitive steps of boulders and stones, are of irregular shape, mostly oval, and sometimes of two combined compartments (4m diam.), at different levels. Holes in the floor around the sides of the excavations were probably intended for wooden posts (*fig.* 7). The sides are mostly slanting and the whole resembles an underground domed hut[23]. Fragments of mats seem to prove that the walls were lined, as in other settlements.

Magazines.— Other smaller excavations (1-2m diam.) were clearly intended to be used as magazines, since vessels were fixed in their floors. Huge earthenware jars (0.9 x 1m) were sunk up to their rim in the ground and

contained grain or other materials. Holes in the sides, near ground level, prove that a kind of ceiling upon beams covered the magazine. Mortars, similar to those at Merimde, were dug in the ground.

One of the excavations is rectangular in plan and has one of its long sides (3.8m) built up in boulders and huge blocks of mud (*galus, fig.* 8). Thus the straight walls in wattle-and-daub technique have evolved into retaining walls of blocks of stone and mud. This is the prelude to the brick wall of dynastic times.

THE GRAPHICAL EVIDENCE

Archaeological evidence for domestic architecture in the prehistoric ages can happily be supplemented by evidence derived from the study of contemporaneous drawings showing buildings. These drawings occur mostly on pottery of the Naqada period, on the Gebel el 'Araq knife (S.D. 60), in the Hierakonpolis building (S.D. 63) and on a few slate palettes.

The scenes painted on pottery, mostly from the Gerza culture (before S.D. 46 to protohistoric times) show mainly boats surrounded by people and animals. A constant feature of these boats (*fig.* 9) is the cabin, often reduplicated, which is erected in their middle. Architecturally these cabins can be considered as replica, if not the actual prototypes, of the habitations of the dwellers along the Nile. At a certain stage in cultural developement the Egyptian must have dwelt in boats[24], as these proved to be the most practical means of circulating easily and rapidly on the inundation waters or the numerous water-ways left after the high Nile, and in the marshes of the Delta. Moreover a boat provided the safest home against the enemy. The persistant recurrence of this element in predynastic decoration, as well as in the numerous mural scenes of dynastic tombs and temples, seems to point out that it was not due to a funeral custom. In the Egyptian of the Old Kingdom there always was something of the propensity of his neolithic ancestor for gaming and fowling and sailing boats.

It may be surmised that settlers on both sides of the Nile erected their shelters and huts in the style of the cabins[25]. A study of the main features of these cabins will prove of great help for the reconstruction of domestic buildings.

The cabins, like the boats themselves, were built of papyrus stalks and mats. On a square plan, with corner posts, they occur in pairs in the middle of the boat and are usually connected below ceiling level by a shed bridging over the gap between them. A ramp leads from the shore to this entrance gap. Later the two cabins will be coupled.

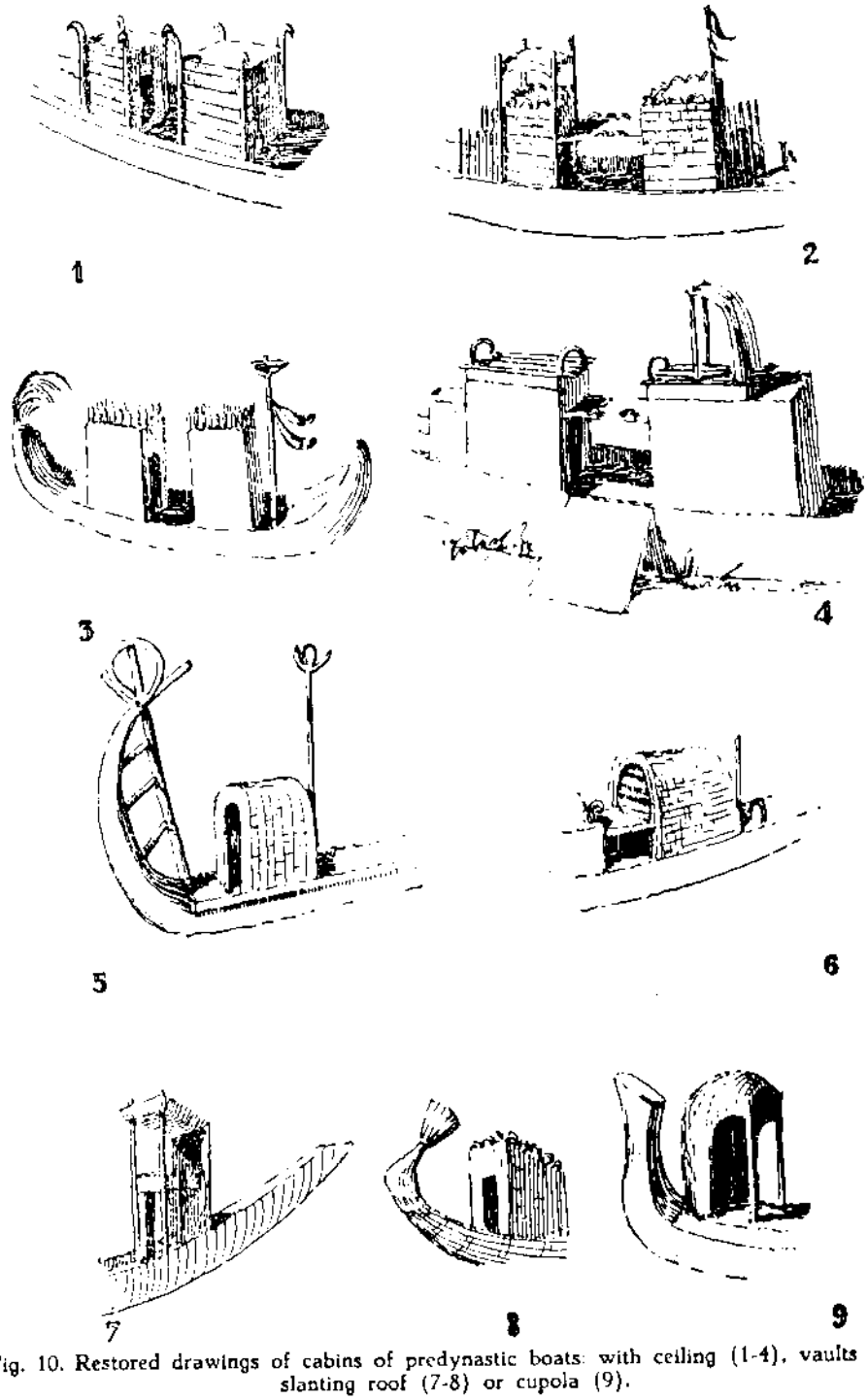

Fig. 10. Restored drawings of cabins of predynastic boats: with ceiling (1-4), vaults (5-6), slanting roof (7-8) or cupola (9).

The main architectural feature differenciating these is the roof (*fig.* 10)[26]. No less than four different types occur:

a.— The flat roof seems to be the oldest covering and appears as a series of stems set upon the top frame. The four corner posts nearly always reach higher and bend in semicircular loops. When the vertical stems forming the wall of the cabin protrude their top ends are either bent into a continuous series of loops, or are bound up in groups of three or more into a decorative bundle. These two treatments form the prototypes of two distinctive types of dynastic architectural decoration : the scalloped parapet and the kheker ornament.

b.— The vault, mostly of the barrel type, covers directly the cabin or is used as an awning above it Models of boats corroborate this graphical information.

c. - The roof, sloping in one direction, a type known afterwards in the Heb-Sed kiosk, is sometimes decorated with a kheker-frieze.

d.— The half-cupola occurs only on a first dynasty drawing ('Aha tablet), and may be the prototype copied as full brick domes in the Old Kingdom.

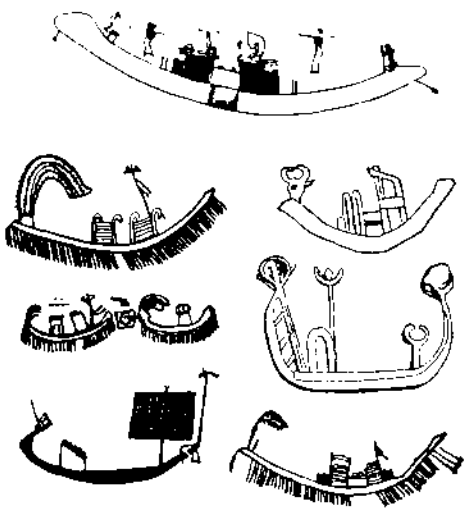

Fig. 9. Predynastic drawings of boats with cabins.

Cupolas of papyrus stalks and rushes or mats could have covered the huts of predynastic settlements. A tablet from the time of king Men or earlier shows the elevation of a hut on circular plan, with a door and a hemispherical dome[27].

At Hierakonpolis, near the village, a subterranean brick chamber on a rectangular plan (4.5 x 2 x 1.5m), has on one of its walls a decoration of scenes of boats and personages. This building, described as "tomb", has been considered lately as a sanctuary or the house of a chief (Brunton)[28]. The chamber is divided into two by a partition wall and the roof could have been in wood.

The prehistoric domestic architecture : a review

In the light of the archaeological and graphical evidence an idea of the dwelling and its dependances can be formed on sound bases. Comparative elements can be found in the domestic architecture of primitive tribes in Africa.

The paleolithic man, making his living through hunting and fishing, does not seem to have known a sedentary life. He has left fireplaces screened with blocks of stone against the prevailing North wind, but no remains of shelters or huts can be traced.

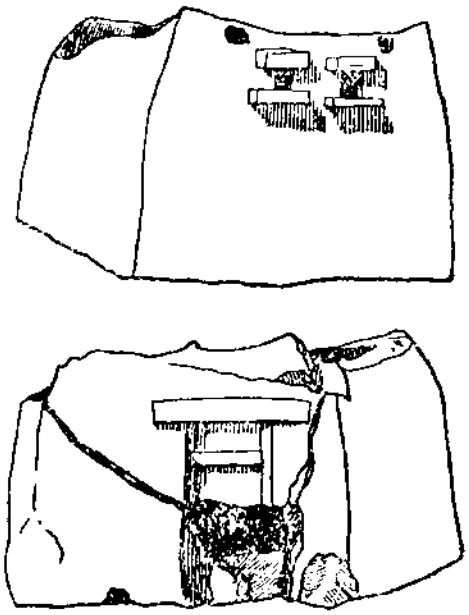

Fig. 11. Protodynastic mud-model of a house from El 'Amra.

The neolithic man, however, settled in the valley in sedentary communities living in shelters or huts, and storing harvests in granaries (Merimde, El 'Omari). Both types of buildings were sunk under ground, a procedure which afforded greater security against the wind and the animals.

Walls in straw or reeds lined the sides of the excavation and were carried up above ground level, in the same technique shown in the Naqada boat-cabins or in the modern African huts. The oval or circular plan, the most primitive and occuring in nature in biards' nests and other animal habitations, could have been covered with a cupola. It is highly probable that such primitive huts continued to be erected as dwellings for the poorer classes in historical times. It is no mere coincidence that whenever a characteristic Egyptian dwelling is represented in the Nilotic scenes of Roman mosaïcs or frescoes it assumes the shape of such huts. These must have been an outstanding feature of the Egyptian landscape at the time.

In some settlements walls have been erected in more durable materials. blocks in a mixture of mud and chaff (Merimde) were intended to carry a lighter structure. The notion of the foundation is already known and used for such masonry.

But is is in the eneolithic times that evidence abounds and allows a

thorough picture of domestic architecture. The plan can still be circular, but also rectangular, a novelty which is to be found again in the development of the tomb (Mahasna, Ma'adi, S.D. 38-40). The floor of the hut is still sunk in the ground (Hemamiya, Ma'adi). Materials are still the same as formerly, though a larger use of blocks of mud and stone, even bricks points towards the invention of rubble masonry. A contemporaneous model of a house (S.D. 44-64, from El 'Amra, *fig.* 11)[29] can be considered as representing the type of dwelling for a chief. The plan is rectangular, as that of actual shelters (Mahasna, Ma'adi) or huts (Ma'adi), with walls battered inwards, a peculiarity proprer to mud - or brickwork technique. A door with wooden lintel and transom opens at the end of the façade, while two small windows with wooden frame are set at the top of the opposite wall. The roof is not preserved but could have been a flat covering of rushes, as was usual in dynastic small houses.

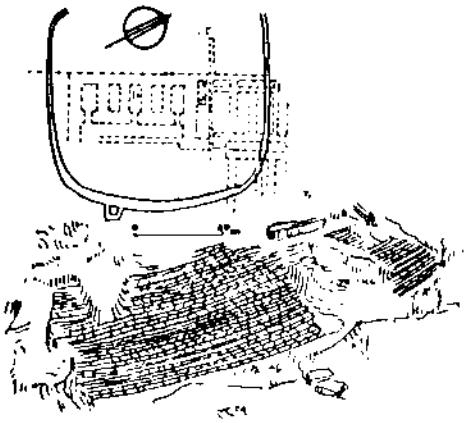

Fig. 12. Plan of the predynastic platform of the temple at Hierakonpolis and perspective view of its retaining wall, built in steps.

From contemporaneous architectural drawings (Gerza pottery) we presume that the shelters and huts could have been covered with flat or slanting roofs, as well as with vaults and cupolas of light materials. From late evidence such technique for the vault is copied in brick structures, coated with coloured plaster (superstructure of Irst dynasty tomb[30], ribbed arches and vaults from the Old Kingdom at Giza[31].

Besides dwellings and magazines new types of dependances are built. These are ovens, consisting of double series of earthenware ves-

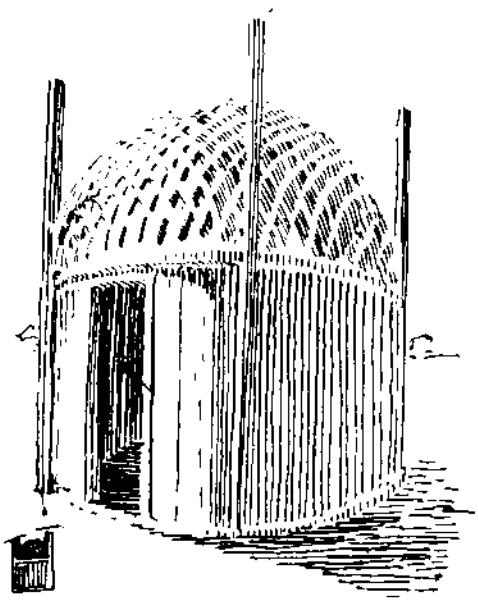

Fig. 13. Representation of a wattlework building on a predynastic palette and restored view of the same.

sels inserted in a brick frame (Abydos). No evidence of such over has been found in historic architecture, although they might still have been used.

Religious architecture

No reliable evidence is available for the study of prehistoric religious buildings. However, considering the importance of religion in Egyptian life and the fact that most of the temples were erected upon the remains of much earlier buildings, it can be safely surmised that the prehistoric man already had sanctuaries.

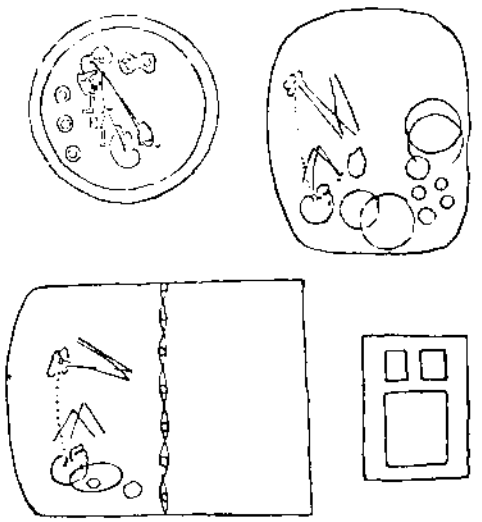

Fig. 14. Plans of tombs, some with wattle or brick partition (El 'Amra).

At Hierakonpolis, in the middle of the archaïc temple, an earlier quadrangular platform with rounded corners and enclosed within a stepped retaining wall of sandstone blocks, seems to have formed the podium for a sanctuary (*fig.* 12)[32] Similar podiums were found at Heliopolis and Tell el Yahudiya.

A palette represents a building in wattle-and-daub, on a circular plan, with a low wall supporting a cupola. Four corner-posts reach higher than the dome and a door opens at one end of the façade (*fig.* 13). This building has been identified as the prototype of the Delta sanctuary (*per-nw*)[33].

On another palette, inside the plan of a fortress, the elevation of a similar building is represented (*fig.* 36). Nothing proves that it its a sanctuary[34], although it must be considered as an important public building.

Funerary architecture

The importance attributed by the Egyptian to the afterlife is conspicuous, even at the prehistoric period, from the provision he made to shelter the body and its *ka* and to supply this ka with its daily necessities[35].

Numerous necropoli in Upper and Lower Egypt give us an adequate picture of the funerary architecture before dynastic times and the complete lack of graphical evidence is accordingly unimportant.

MERIMDE-BENI SALAME[36].— The grave was an oval pit containing a body, mostly in the contracted position, dug near the hut, in the village.

EL 'OMARI.— The tombs are already covered with a tumulus of limestone blocks and chips, on a circular plan (7m diam.). The pit is an oval, about 1-1.3m in depth in one necropolis, and 0.35-0.8m, in the second. Two pits, one of which is for an extended body, were lined with blocks of stone. Besides both necropoli interments had been prepared in the village itself, under the huts or nearby[37].

DEIR TASA[38].— The pit, as a rule, is oval, about 1m in depth, with a small niche in its western wall, and is dug in a necropolis.

BADARI[39].— The pit, round or oval, sometimes also rectangular (at Mostagedda), whose sides are lined with mats, seems to have been covered with a roof of wooden poles engaged in holes at the top of the pit, or placed upon posts and supporting a mat and boughs. Graves are arranged in a necropolis.

EL 'AMRA[40].— This necropolis of Naqadian culture has a variety of types which shows a marked development towards the dynastic tombs. Besides round and oval pits (*fig.* 14), reaching about 1-1.9m in depth, a quadrangular pit is provided with a wattle partition separating the body from the funerary equipment or even forming a space reserved for the burial, the pit itself remaining empty. This is already the embryo of the Old Kingdom type of tombs for individuals, known as the "*mastaba*".

Tombs are also constructed on a rectangular plan, in brick walls with a single chamber to which one or two separate compartments can be added at one or both ends. All these tombs were covered with bricks or boughs set on beams and posts. These protohistoric tombs are similar to the archaïc tombs.

MAHASNA[41].— Besides the various types known from El 'Amra, certain tombs had a wooden frame along the four walls to protect the body, and roofs could be ascertained from the actual remains. Oval or rectangular graves, some with a niche are also found at Naqada[42]. To the North of Abydos[43], most of the graves are oval, some rectangular with a niche and walls lined with clay, bricks or wood, some covered with a roof upon posts. Similar tombs have been excavated at Badari and Hemamiya[44].

The prehistoric funerary architecture : a review

The earliest type of grave consisting of a round or oval open pit evoluates towards a rectangular pit, with rounded or sharp corners, an evolution parallel to that of the house. The sides of the excavation were left bare or lined with the ends of a mat placed on the floor. In the Middle Predynastic a wooden frame or lining protected the burial. To the pit was sometimes added a niche for the equipment, then for the whole burial, the pit itself being left empty and separated by a wattle partition. In the tomb of the Old Kingdom the shaft and its funeral chamber will assume the same disposition.

The latest protodynastic tombs were built as a chamber in brick on a rectangular plan, sometimes with end compartments, an arrangement similar to that of the archaïc tombs of the Irst-IInd dynasties at Abydos.

Due to denudation the superstructure of the earliest types has usually left no trace, but it may be presumed that it consisted of a tumulus of gravel and chips of stone, dug from the pit and perhaps enlarged, as at El 'Omari (7m diam.).

From evidence afforded by the Old Kingdom superstructures and wooden sarcophagi of the same period it may be supposed that the rectangular graves had a superstructure in the form of a rectangular mound encased in wattle-and-daub retaining walls[45].

Military architecture

As no archaeological evidence is available one has to rely upon the representations of forts on two protodynastic palettes. They show a wall on a square plan, with rounded corners and bastions on the external face. The external edge is provided with a rim, which can be interpreted as representing the parapet running along the top of the wall, a feature known in later times.

Towns seem to have been surrounded by a wall on a square plan with rounded corners. Such is the case for the earliest settlement at El Kab (*fig.* 20). Later the plan becomes polygonal or rectangular (Hierakonpolis).

The achievement of prehistoric architecture

The earliest attempts at architecture in the Valley, even before historical times, display some vital features which were to characterize Egyptian architecture till its final stage. Apart from the circular and oval plans, being borrowed from nature, the prehistoric Egyptian devised a rectangular plan which he adapted to the wattle-and-daub as well as to the mud or brick techniques.

His activity covered all fields of construction. In domestic architecture he achieved shelters, dwellings, granaries and ovens. For religious architecture documents are lacking, although we can surmise that he knew at least one type of shrine. In military architecture graphical evidence allows the reconstitution of a type of fortress with bastions, which type was to be maintained throughout Europe, till the Middle Ages. Lastly funerary programmes know two types of tombs: the open pit type, with rectangular brick superstructure, used in archaïc tombs, and the pit with its underground funerary chamber, which form the essential features of the tomb for individuals.

As to the elements of construction walls already show the tapering characterizing Egyptian architecture in brick or stone, throughout the ages. Doors and windows have been devised and bastions protrude from the external faces of fortresses. The technique of wattle-and-daub is used in walls and cupolas and will remain in the archaïc period. Bare walls are coated with plaster or lined with wooden planks, reeds or mats, a custom which will be carried on or give rise to an imitation in painting in the Old Kingdom.

The feeling for ornament is already alive since, in such humble constructions as cabins in boats, the top ends of the upright stems are fastened into bundles (prototype of the kheker ornament) or arranged in a row of loops (prototype of the scalloped parapet).

THE ARCHAIC PERIOD

Domestic architecture

For the Archaïc Period we must rely solely on graphical evidence, such drawings and architectural hieroglyphs as have been yielded by the funerary equipment in tombs of the Ist and IInd dynasties. Although no exact data is supplied by these documents, yet a general picture of the achievement of architecture can be derived.

Architectural hieroglyphs[46] are simplified drawings showing in one projection (plan or elevation), or two (combination of plan and elevation, sometimes with rabatment) the most usual types of contemporaneous buildings. Most of the hieroglyphs related to domestic architecture are already known in the Archaïc Period.

The sign for the house (*fig.* 15, 1) is the plan of a rectangular enclosure with an entrance gap in the middle of one of the longer sides. It is usually coloured in grey or blue, an indication that the material is clay. It has been described as a mat hut[47] or an enclosure[48] and it can be safely surmised from evidence of the simplest Intermediate Period and Middle Kingdom models of habitation (*fig.* 43), that it was supplied with a shed at the back part. In writing, the sign determines generally a "building".

The sign for a courtyard (*fig.* 15, 2), represented in plan, with an entrance at one corner and a narrow passage bordered by a fending-wall seems to be an evolved stage of the oval cattle-enclosure drawn on archaïc monuments[49]. Such an arrangement, intended to hide the interior and to master intruders is a characteristic feature of military, religious and even domestic architecture. The colours of grey and blue suggest clay as material.

The sign for the "castle" (*fig.* 15, 3) shows the plan of a rectangular court with elements of the entrance gate in one corner. It may represent a castle or a fortified enclosure, such as the contemporaneous fortresses of Hierakonpolis or Abydos (*fig.* 35).

For the "city" the sign is the plan of a settlement with cross-roads

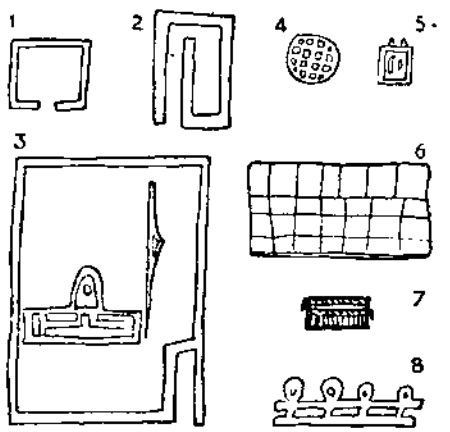

Fig. 15. Archaïc architectural hieroglyphs: showing the plan of a house (1), a courtyard (2), a castle (3), a city (4), or the elevation of a palace-tower (5), wicker-work walls (6-7) and a stockade (8).

and surrounded by a circular enclosure (*fig.* 15, 4). Sometimes the roads are already stylised into two main cross-roads, as it will always be maintained later. The sign determines generally an inhabited area.

A variante showing only two cross-roads seems to point that even at this early age the basic principle governing every town-planning project in Egypt is already active. Thus in the workmen city of Kahun, in the Eastern Village at 'Amarna, in Sesebi in Nubia, the blocks of houses are divided from one another by streets on a chess-board pattern, with two main streets running N.S. and E.W., the whole being enclosed by a square wall. That the classical town plan in Greek architecture affords also two main cross-roads cannot be by mere chance.

The sign for "palace" (*fig.* 15, 5) shows an elevation of a tower with a frieze of kheker ornament at the top and perhaps two windows in the ground-floor, or the but-ends of the beams in the ceiling. From the fact that the sign determines "palace" it may be inferred that this archaïc building was the royal palace. This is corroborated by a contemporaneous scene where the palace is represented in the same aspect[50]. The cabins of the predynastic boats, some being two-storied, already assumed this tower-like elevation, and this will be maintained in the townhouse of all periods.

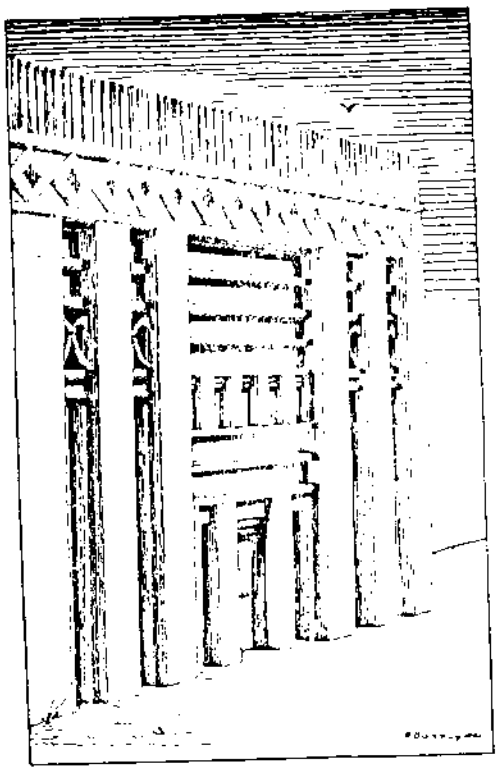

Fig. 17. Restoration of the palace-façade motive with rectilinear top.

The sign determining "fix", sometimes wrongly drawn, shows the elevation of a fence consisting of upright posts protruding above a wickerwork wall (*fig.* 15, 6).

The sign for "boundary" is a similar, although more primitive, fence or wall of upright reeds bound in the middle with two ropes (*fig.* 15, 7). Such was the construction of prehistoric hut walls at Merimde.

The sign determining "to seize" shows the elevation of a stockade of uprights bound at their top by ligatures to a horizontal bar (*fig.* 15, 8). It is set on both sides of the entrance to the primitive shrine.

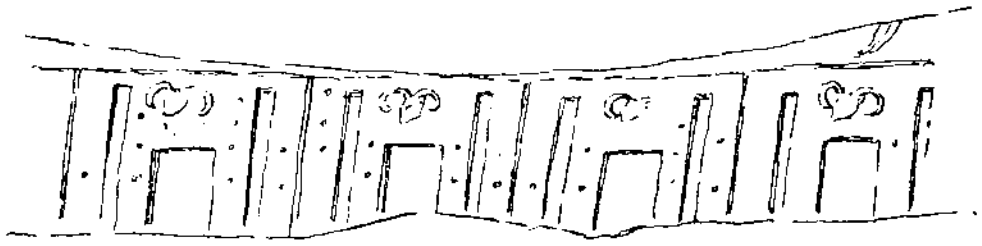

Fig. 16. Archaïc drawing of a wall with recessed panelling (palace-façade motive).

One tablet bears the representation of two huts seen in elevation. They are round in plan, consisting of a lower half in wattle, with a side door and an hemispherical cupola. Such would have been the aspect of a hut in prehistoric and archaïc times. It may be safely deduced, from the occurence of IInd dynasty tombs (Saqqara) imitating houses with a latrine and bathroom, that such accomodation really existed in actual houses.

The study of the façades of buildings can be helped by that of a motive commonly engraved on royal archaïc monuments. This is an upright rectangle enclosing the royal Horus-name in its upper part and showing, in its lower part, long vertical pannels. This element is the Egyptian *serekh*. It has been called the "palace-façade" motive (*fig.* 16), but it seems that it represents only the ceremonial double gate of the palace. It shows two doorways flanked by three towering protruding bastions, which in their turn, can also be panelled in narrow vertical strips. Two types of "palace-façades" can be recognised : the one with a continuous horizontal top (*fig.* 17), and the other with the towers higher than the door-tops (*fig.* 18). In both cases a frieze with lozenge-shaped ornament and a cornice with vertical

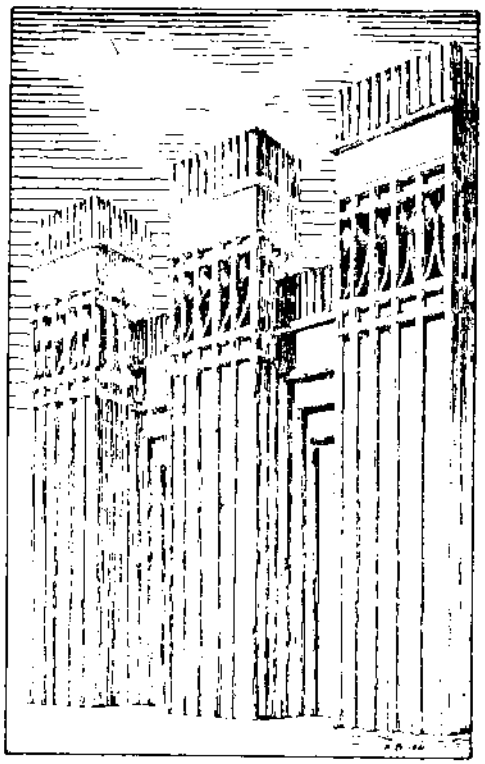

Fig. 18. Restoration of the palace-façade motive with battlemented top.

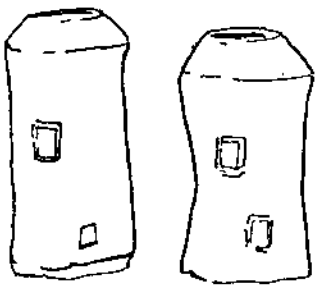

Fig. 19. Mud-models of silos (Irst dynasty, Tarkhan).

elements run at the top. This motive is also found on the external façades of contemporaneous mastabas, enclosure walls and sarcophagi, as recesses and projecting pilasters, quadrangular in section, and will remain in favour throughout the Old Kingdom.

The incentive to the invention of such a motive cannot be purely aesthetic, although it surely helps to break the monotony of huge glaring façades. As this motive is chiefly used in mastaba-façades it seems that the numerous recesses were as many dummy-doors for the *ka* of the deceased, to enable him to go out and partake of the offerings. These will later be replaced by one "false-door" (*fig.* 107).

The origin of this motive has been attributed to the use of various techniques. Some, in the light of the discovery of wooden planks that would have lapped one over the other when adjusted to form a wall, would consider the possibility of a wooden prototype (Petrie, Perrot-Chipiez, Balcz, Clarke-Engelbach). It seems however probable that a mixed technique using wood for the framework and brick as filling, in replacement of the earlier mat-

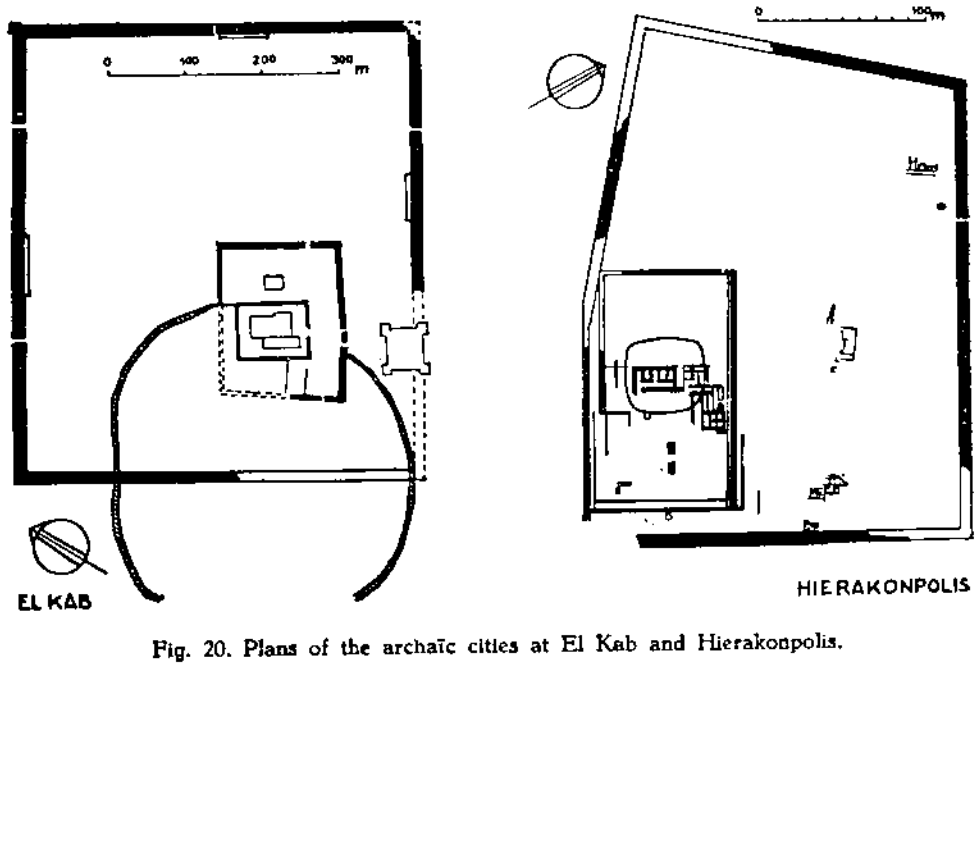

Fig. 20. Plans of the archaïc cities at El Kab and Hierakonpolis.

hangings, would be more practical in a country as poor in timber as Egypt (Jéquier, Choisy). Later mural decoration (Hesy-Re', IIIrd dynasty) imitates such mats spread inside a wooden frame (Djadja-m-'ankh, Vth dynasty, *fig.* 45).

A similar treatment of the façade having been found at Ur, in Mesopotamia and in the Yemen, it has been suggested that it came thence in Egypt[52], although a parallel development in both countries seems more logical.

Nothing definite is available for the study of archaïc houses. As to granaries Ist dynasty models (*fig.* 19)[53] show cylindrical bins or silos, with concave sides and chamfered top edge, with two square openings at different levels. The actual structure was very likely in mud. Besides the cubical store or chamber is also represented. Both types will be subsequently commonly used.

Townplanning.— The circular plan for a city, as suggested by the hieroglyphic sign, is found at El Kab (*fig.* 20). Other early plans are rectangular in shape (Hierakonpolis, Heliopolis). That the interior of the town was arranged, as early as the Ist dynasty, about two main intersecting roads, is proved by the plan of the prehistoric settlement at Merimde, set with the houses on both sides a road. As shown in later times (Kahun, 'Amarna), projects conceived and carried out by the government were geometrically planned on a chess-board pattern, imitated in the plan of the royal necropolis (Giza). It may however be assumed that townplanning was not subject to such control and a city grew more or less haphazard inside an initial framework, bounded by a surrounding wall[54].

Religious architecture

Data relating to religious archaïc buildings are of archaeological as well as graphical nature.

At Abydos[55] the remains of a second or third dynasty brick temple dedicated to Khentiamentiw show a rectangular plan consisting of two equal parts (*fig.* 21). The fore-part aims at hiding, by means of a transversal screen wall, the back part. The latter has an anteroom leading into a sanctuary on

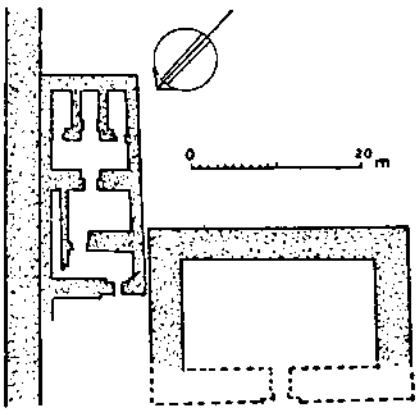

Fig. 21. Plan of the archaïc temple of Khentiamentiw at Abydos (IInd or IIIrd dynasty).

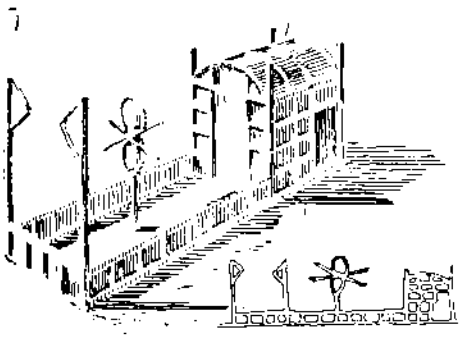

Fig. 22. Egyptian drawing representing the archaïc shrine of Neith and perspective restoration of the same.

the longitudinal axis and two side-chambers. This simple plan could be a direct transposition in brick of a wattle type[56].

From the temple built by king Kha'sekhem on the earlier platform at Hierakonpolis only parts of the floor and pillars have been identified[57]. A door-jamb from Hierakonpolis bears an engraved scene of foundation of a temple by king Kha'sekhemwy[58]. At Heliopolis and Tell el Yahudiya a similar artificial mound on a square plan with rounded corners, may have served as terrace for archaïc temples. Pyramid texts describe "Atum-Kheprer, thou art high on the mound"[59].

From contemporaneous scenes engraved on tablets or mace-heads three different types of shrines can be recognized, all of wattlework:

1.— The most important type is that of the shrines dedicated to Neith, Khnum, Sebek or the heron(?). According to the clearest scene, a juxtaposition of front-and side-elevations[60], a rectangular court enclosed by a wattle fence, is marked on its front corners by two primitive sacred flags, the later symbol of God, *neter*, and at the back, by a hut with four corner-posts, a side- or back-door and a vaulted roof (*fig.* 22). In the middle of the court is erected a stand carrying the emblem of the deity: a shield and two arrows for the goddess Neith, the ram for Khnum, the crocodile for Sebek, the ibis for Thot or the wading bird for the sanctuary at Buto[61]. This same type of sanctuary will be represented as a front-elevation in Middle Kingdom drawings.

2.— Two instances of representation of round wattle sanctuaries agree in showing the same type of hut: a lower circular wall with a door carries a hemispherical cupola (*fig.* 23). One of the sanctuaries has four posts reaching higher than the apex of its cupola (*fig.* 13)[62].

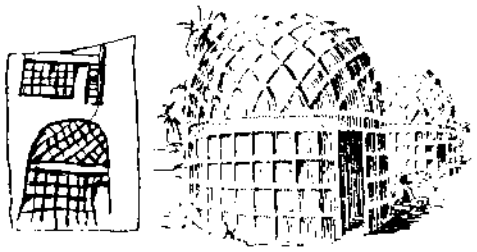

Fig. 23. Drawing of an archaïc wattle building and its restored perspective.

3.— A series of Ist dynasty seals represent a peculiar hut, shown in front elevation with side-elevation rabated (*fig.* 24). Certain examples (from the tomb of 'Aha) convey

clearly the resemblance of a crouching animal, which could be identified with the desert-hound of Anubis, rather than the rhinoceros or the elephant[64]. The side-elevation shows unmistakably the hunch-back and the long bushy tail and is built of a wall carrying an irregular vault. The front-elevation is a high arched aperture, with three horn-shaped elements protruding in rabatment, at the top. In later stages of evolution forms are stylized and the hunched irregular vault gives birth to this unique, irregular vault which was to remain the characteric roof of Egyptian shrines and naoi till the end of the Roman period.

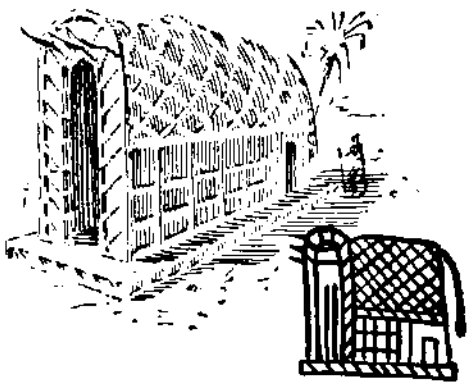

Fig. 24. Drawing of an archaïc shrine-hut from seal and restored view.

A type of building depending from religious architecture is a pavilion where the king used to sit during the Sed-festival (*fig.* 25)[65]. Upon a

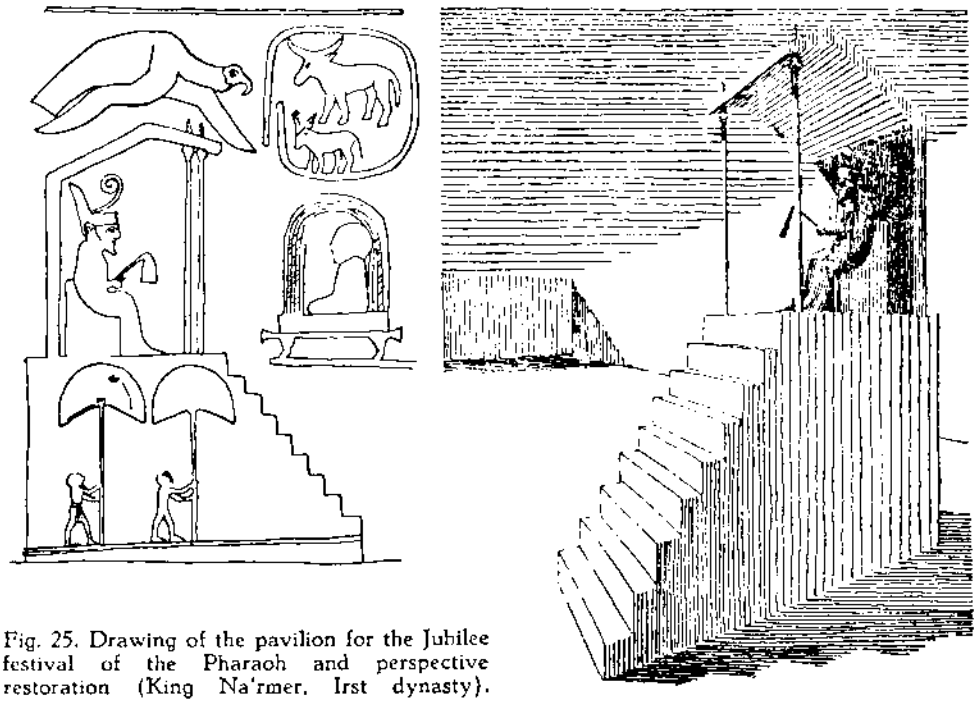

Fig. 25. Drawing of the pavilion for the Jubilee festival of the Pharaoh and perspective restoration (King Na'rmer, Irst dynasty).

platform in rammed mud, brick or stone, with some steps at its front, a shed is raised on two poles on the façade and a wall at the back. Its ceiling is in the form of a two-ways sloping roof or a flat vault. This shed will be reduplicated and maintained throughout the whole history of Egypt.

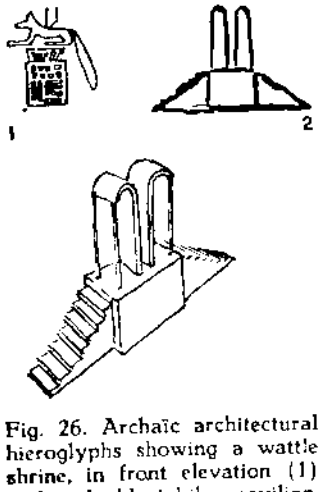

Fig. 26. Archaïc architectural hieroglyphs showing a wattle shrine, in front elevation (1) and a double jubilee pavilion, in side-elevation (2), restored in perspective.

Two drawings show a shed covered with a two-ways sloping roof. This shed seems to have been used during the religious ceremonies, and may have been on a rectangular plan[66].

As to contemporaneous hieroglyphs two of them represent buildings already known from drawings :

The one (*fig.* 26, 1) is the façade of a wattle-work hut with battered faces, a door in the axis and a cornice at the top. It has been proved elsewhere that it is the front-elevation of the same sanctuary represented in side-elevation in another hieroglyph, an evolved form of the shrine-hut of Anubis[67]. The roof is not flat but an irregular vault and is never shown in the hieroglyph. It appears however in an XVIIIth dynasty drawing, where both elevations are drawn side by side[68].

Religious architecture : an appreciation

Religious architecture in the archaïc times has already devised no less than three different types of wattlework sanctuaries, two of which, that hut erected at the back of a large court and the shrine-hut, will remain as traditional national sanctuaries for the North and the South. The main scheme of the later Egyptian cult-temple can already be recognized in the fenced court and sanctuary type, set about a longitudinal axis. The two flagstaves erected symmetrically at the corners of the shorter façade will be later replaced by the two pylons with their flagstaves and obelisks. The court itself will be maintained in the forecourt, to which will be added a hypostyle hall, while the sanctuary will keep its position at the back of the building surrounded by dependances.

The Heb-Sed pavilion will retain its general form, although the two sheds will be erected back to back.

The attempt to ensure secrecy of cult is indicated by the setting of the

sanctuary at the back of this plan and hiding this part behind a screen-wall (temple at Abydos), a feature which will be kept in many cult-temples, by means of wooden porches or screens at the doorway, along the main axis.

Funerary architecture

Unlike other types of architecture the archaïc tombs can be studied from numerous remains in the necropoli of Abydos, Saqqara, Tura and Helwan.

Royal tombs are to be differenciated from tombs of commoners, not only through differences in scale but also through the types, certain ones as the the pyramid being the prerogative of the king or the members of the royal family. That the king leads in fashion is shown by the fact that other tomb-owners try to follow in his suite. Some tombs of individuals (Hemaka, Nebetka) are almost as large and elaborate as those of the kings.

The main incentive in the evolution of the tomb was the fear from plunderers[70]. Even in the archaïc period such a factor seems to have been important since the burial chamber is excavated deeper and deeper and the ways of access to it are more securely stopped up. The substructure tends to separate from the superstructure in this process of being set at greater depth.

Types of tombs and their stages of development have been elaborately studied and classified[71]. Three of these types derived from the open pit graves of protodynastic necropoli, with modifications: lining with crude brick and roofing with wood, increase in the number of chambers, side-entrance with stairway. The open pit grave came to an end in Lower Egypt at the beginning of the IInd dynasty, but continued in Upper Egypt until the IIIrd dynasty, with the introduction of brick corbel roofs. This development was helped by the parallel advance in building technique, such as the universal use of brick and the beginning of stone-carrying. The main leaders in this progress were to be found in the royal workshops and such inventions were used by individuals as they could afford through their restricted means.

TYPES OF SUBSTRUCTURES.—[72] The development of the substructure into a more elaborate type and its increase in depth follow chronological sequence. Differentiation is to be established between royal and private tombs, the former benefiting from the skill and technique of the best craftsmen.

Type I.— *a*) ROYAL TOMBS AT ABYDOS AND SAQQARA.— Deriving directly from the protodynastic brick tombs the substructure of this type consists of a brick rectangular chamber covered with a roof of poles and reeds or mats.

coated with mud. Poles were set along the two main interior walls, perhaps to fix a wooden lining (Tombs of Men-'Aha, Na'rmer and three queens).

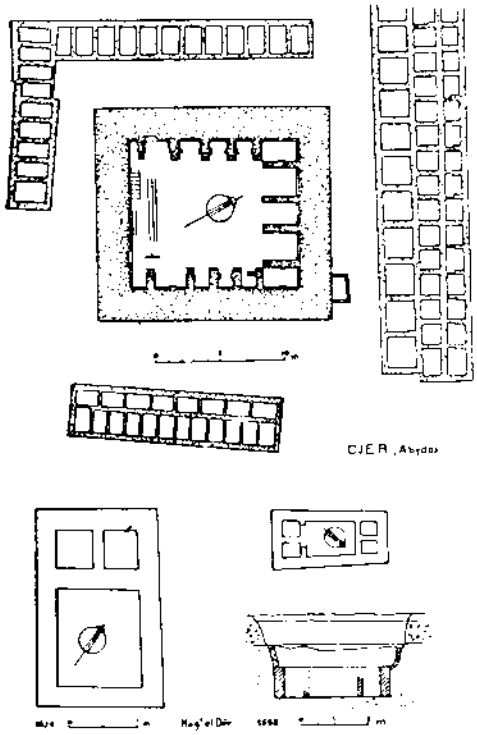

Fig. 27. Plans of archaïc tombs (type I. King Djer at Abydos and two private tombs).

This simple chamber is soon replaced by a square one, deep in a large pit, with an appartment lined with wood and fixed to brick partition walls (tomp of Djer, *fig.* 27). The tomb of king Djet, similar to the preceding one, had a mud floor upon which was set a square frame of wooden beams carrying planks. As in the tomb of Djer the walls of the compartments used as magazines were panellld with niches, painted red. Of the same type is the tomb of queen Merneit, but with double walls. To this type must be attached the large Naqada tomb of queen Neithotep and the tomb of Hor-'Aha at Saqqara.

b) PRIVATE TOMBS. - The courtiers at Abydos were buried in tombs surrrounding that of their king, while common people were set in separate cemeteries enclosed by rectangular walls. The grave is a rectangular chamber lined with bricks and covered with poles and planks set at right angles to them. This is the commonest type already known in the protodynastic period (Naqqada II) and to be found in all archaïc necropoli : El Kab, Naqada, Ballas, Nag' el Deir, El 'Amra, Tarkhan, Tura, El Ahaiwa, Zawyet el 'Aryan.

The single chamber can be subdivided at one end or at both ends into two (*fig.* 27) or more (usually five) compartments.

A secondary type goes back to the Gerzean period and consists of an unlined pit with a lateral chamber, sometimes separated by a partition (El Ahaiwa, Ballas).

Type II.— a) ROYAL TOMBS.— As a result to the increase in depth of the brick grave with the wooden roof and built in a large pit, a short stairway

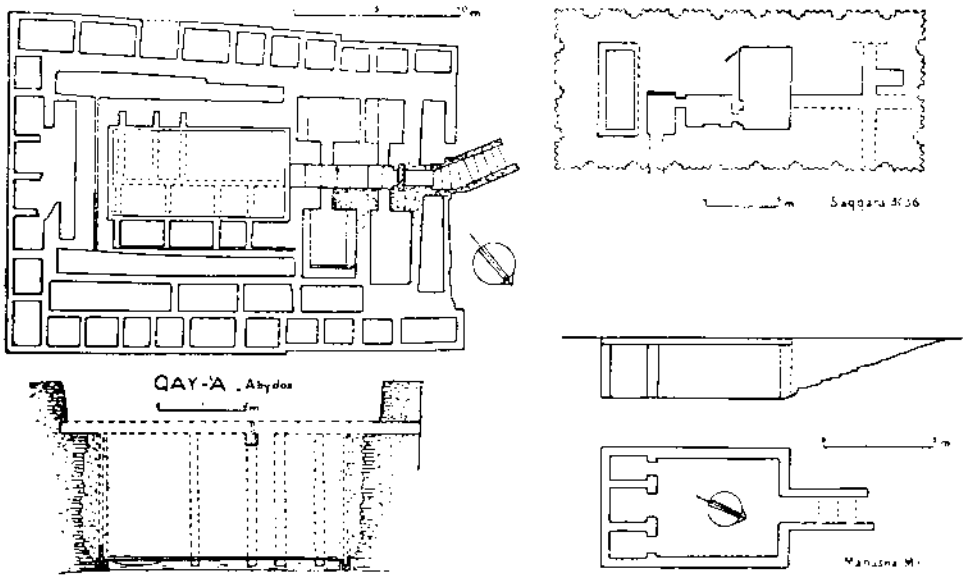

Fig. 28. Plans and sections of archaïc tombs (type II. King Qay-'a, and two private tombs).

usually on the northern shorter side was found necessary to give access to the substructures. In the tomb of king Udimu, the walls of the stairway are lined with brick and the floor of the chamber is in granite. It seems that the thickly walled brick chamber was lined with a double wall in wood, enclosing compartments. The other tombs of this type at Abydos show slight variations : that of 'Adjib has two chambers and a stairway set at right angles at one end of the longer side; Semerkhet's tomb is accessible through a ramp and its chamber is lined and paved with wood. The large tomb of Qay-'a (*fig.* 28) shows new features in the four corbelled magazines on both sides the stairway leading to the funeral chamber, itself surrounded with long corridors.

b) PRIVATE TOMBS.— The characteristics of royal tombs are to be found in private ones : the number of chambers and the access through a ramp or stairway. Some pits are excavated in the limestone subsoil (Memphis, tombs of Hemaka, Nebetka; Helwan); others are in the gravel (Upper Egypt : El 'Amra, Mahasna, Nag' el Deir). Sometimes one single subterranean chamber lined with a wooden roof is separated from the stairway by a portcullis.

Type III.— *a*) ROYAL TOMBS.— The corbel brick roof is usual in the stairway tombs (IInd dynasty). Such a roof could assume the aspect of a vault or a dome.

In the tomb of Peribsen at Abydos the development of the magazines and dependances with respect to the funeral chamber itself is conspicuous (total area: 128.09m. sq. funeral chamber: 18.76m. sq.) (*fig.* 29). A ramp leads down to the substructure which consists of a funeral chamber surrounded on four sides by a series of communicating magazines, itself surrounded on four sides by a corridor. It has been surmised that the whole tomb was corbelled.

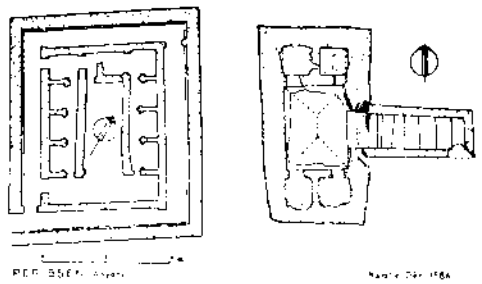

Fig. 29. Plans of archaïc tombs (type III, King Peribsen and private tomb).

In the tomb of Kha'sekhemwy the relative increase of the substructure with respect to the funeral chamber attains its maximum (total area: 1001. 81m. sq. — funeral chamber: 17.55m.sq.). The plan is long, with roughly rectangular series of magazines or graves with two entrances on the North and the South, and a funeral chamber in the middle. This was lined and covered in limestone.

b) PRIVATE TOMBS.— Most of the substructures have five rooms (Nag' el Deir, Tura, El 'Amra), a central funeral chamber with paired end rooms covered with corbelled cupolas plastered on the inside with mud.

Type IV.— This type, marked by a deep stairway and subterranean chambers cut in the rock does not occur before the IIIrd dynasty except at Memphis, where an intermediate stage is known since the early IInd dynasty (Saqqara, pyramid at Zawyet el 'Aryan).

The tomb of Ruaben at Saqqara (*fig.* 30) is entirely cut in the rock, with chambers paired on either side of a longitudinal N-S axis, marked by a corridor stopped up by three portcullisses. The funeral chamber is at the end of the corridor, and in front of it is the dummy appartment of the deceased, with latrines, water-storage niche. Several other tombs at Saqqara are on the same pattern.

This type develops as single-chamber tomb (Saqqara), generally in small scale projects.

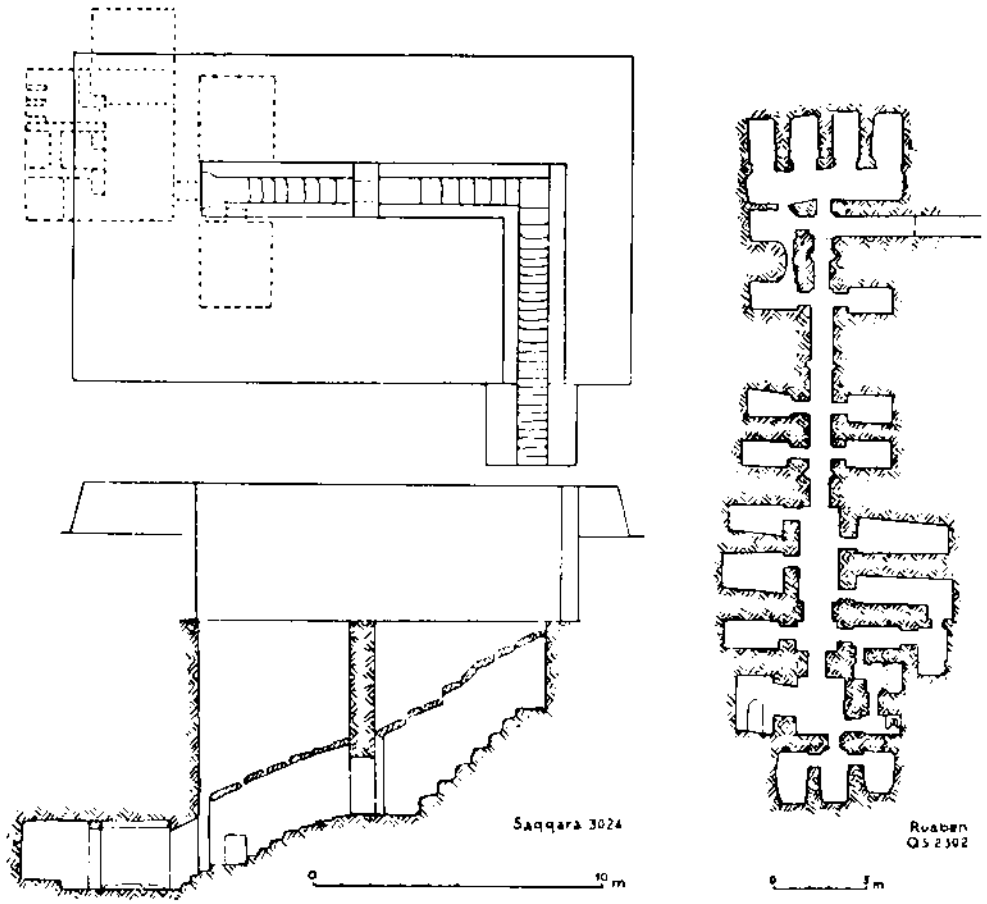

Fig. 30. Plans and section of two archaïc deep stairway tombs (type IV).

TYPES OF SUPERSTRUCTURES[73].— Every substructure is surmounted by a superstructure to mark the grave and to serve as chapel for the funerary cult. The remains which have survived denudation and the destruction by diggers are enough to allow a study of the types (*fig.* 31).

The simplest superstructure is a mound of gravel with curved top, coated with mud (Nag' el Deir), probably an evolution of the predynastic wattle-encased mound.

BRICK SUPERSTRUCTURE WITH TWO NICHES.— The simple type is soon superseded by a brick enclosure built after the burial round the grave-pit or even above its filling, with two open niches, each at one end of the western façade. It can be considered as the prototype of the Old Kingdom "mastaba"

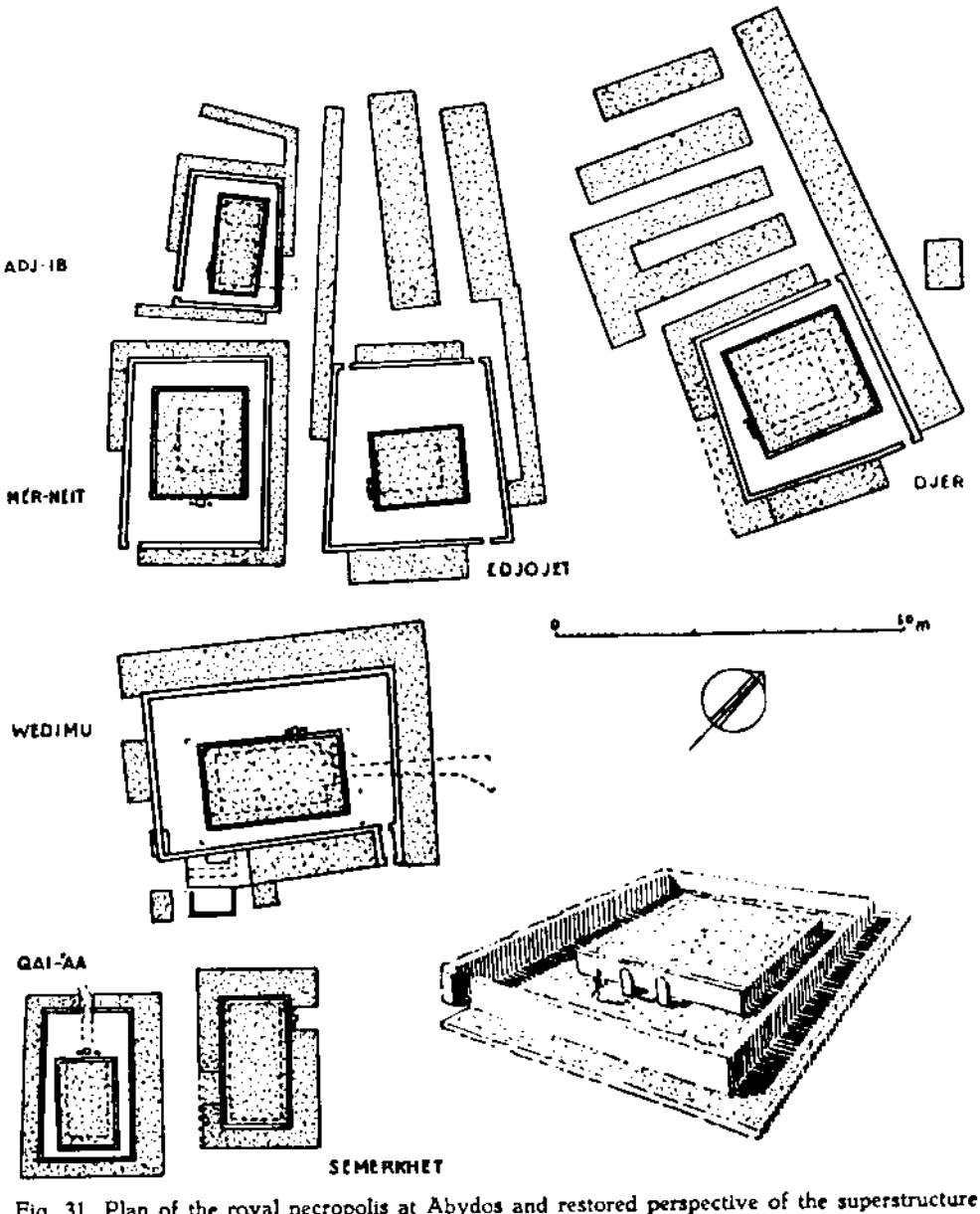

Fig. 31. Plan of the royal necropolis at Abydos and restored perspective of the superstructure of Merneit (Ricke)

superstructure. The niches were either simple or compound, painted red and in front of them an open-air offering-place was prepared by paving a corridor with brick and enclosing it with a low parapet wall.

Another type of superstructure (*fig.* 32) has two neighbouring slots opening at one end of the East or West façades of the wall enclosing the pit area. A small court surrounded by a wall with indirect entrance served for the funeral offering ceremonies in front of the niches.

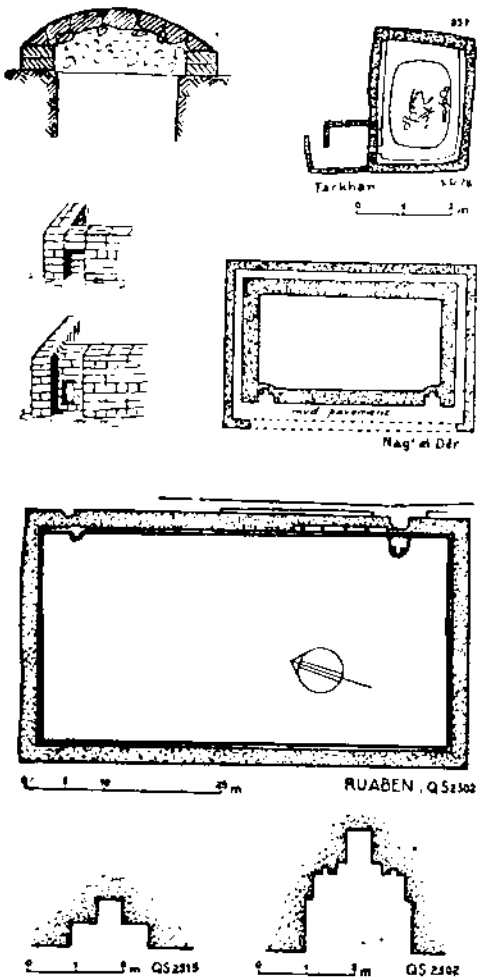

Fig. 32. Archaïc superstructures and details of niches.

LARGE MASTABAS WITH TWO NICHES.— This type is common in the IInd dynasty. The mastaba of Ruaben (*fig.* 32) has two niches in its eastern face, the South one being larger and imitating a door. The niche can assume three different forms which have been called: plain compound niche, great door and palace-façade niche.

MASTABA WITH PALACE-FAÇADE PANELLING.— Certain large mastabas known since the Ist dynasty have a continuous series of niches on their four faces (*fig.* 33). This so-called "palace-façade" motive, imitating the large ceremonial doorway, was no real copy of the façade of a palace. In a mastaba the numerous imitations of doors could have served to enable the *ka* of the deceased to partake from the funeral offerings placed outside the mastaba. The niche itself consists of an inner and an outer recess, on both sides of which there is a small simple niche. Also each of the two sides of the same outer recess contains a similar niche. Huge mastabas of this type, dating from the Ist dynasty, have been discovered at Saqqara, Helwan, Giza, Abydos and Nag' el Deir (IInd dynasty).

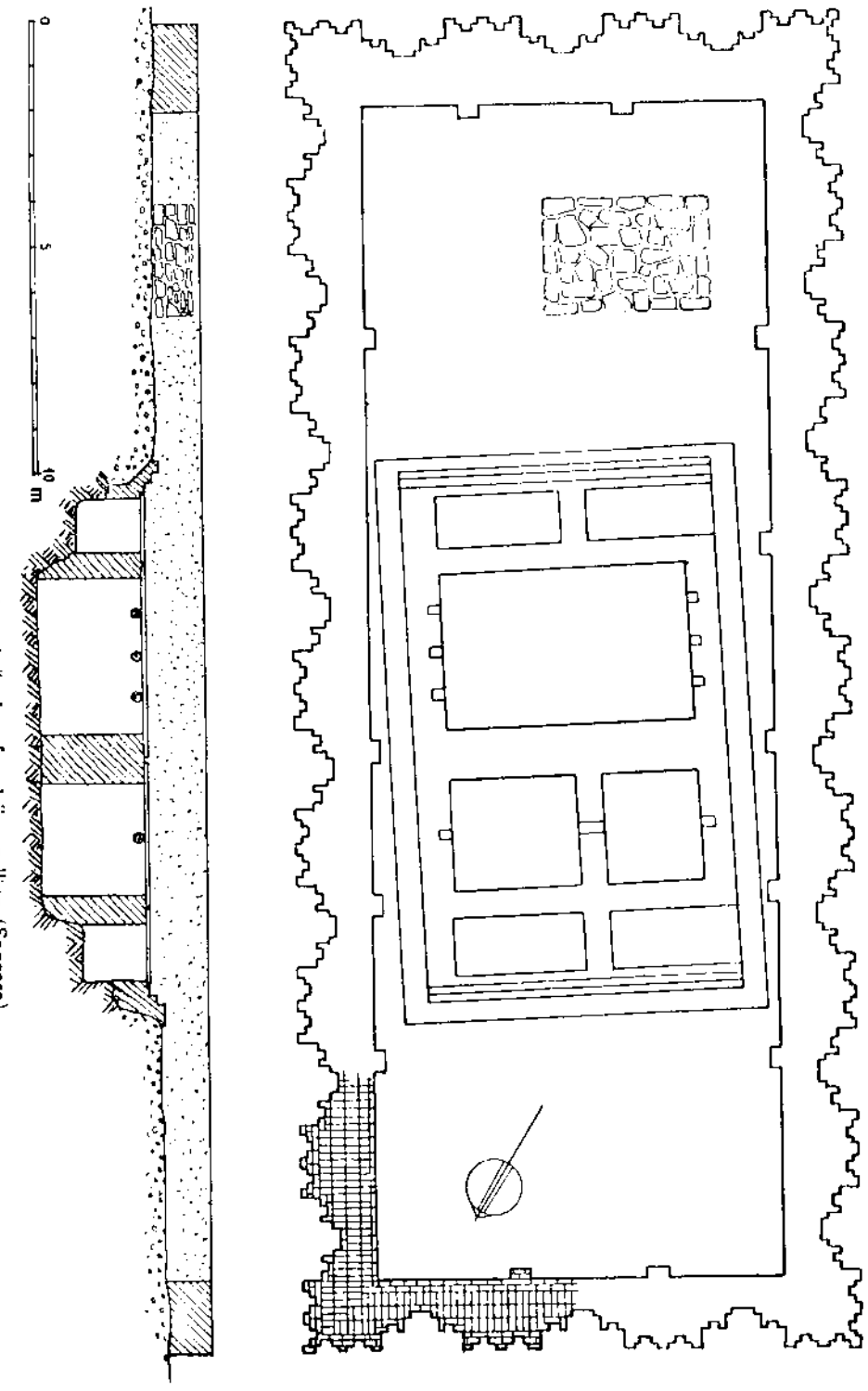

Fig. 33. Ist dynasty tomb with "palace-façade" panelling (Saqqara).

Funerary architecture : an appreciation

On account of their substructure, tombs, unlike houses, could withstand denudation. Besides they were built in brick with stone elements and were intended for eternity. Even at the archaïc period does this notion (*per djet* = house eternal) take the form it shall assume so conspicuously later.

In Upper Egypt the prehistoric Egyptian buried his dead in special burial grounds, outside his habitation. In Lower Egypt the deceased continued to live under his own house and to partake of the meals so that there was no need for funeral offerings. It is natural, therefore, that at Saqqara some tombs of the IInd dynasty show a dummy apartment in the substructure, complete with eighteen rooms, latrine, bath, bedroom, vessels in chambers. Contemporaneous wooden sarcophagi are also copies of houses. This conception is not met with in Upper Egypt (Naqada, Abydos, Nag' el Deir). This strong reminiscence of the house in the Memphite tomb seems to go back to Merimde and El 'Omari[74].

The recessed façade of certain large archaïc tombs (Naqada, Saqqara) has been explained as a reproduction of the palace-façade. In the tomb itself the elements of the palace have been identified: central sarcophagus roof surrounded by numerous chambers, and second enclosure with small rooms[75]. That numerous tombs of the same style have been lately unearthed at Saqqara and Helwan, belonging to kings and individuals, seems to point out that the funerary monuments at Abydos were only cenotaphs[76].

Apart from this idea of copying domestic buildings in tombs, whether in the substructure or the superstructure, setting the underground chambers deeper and deeper in the soil and stop-

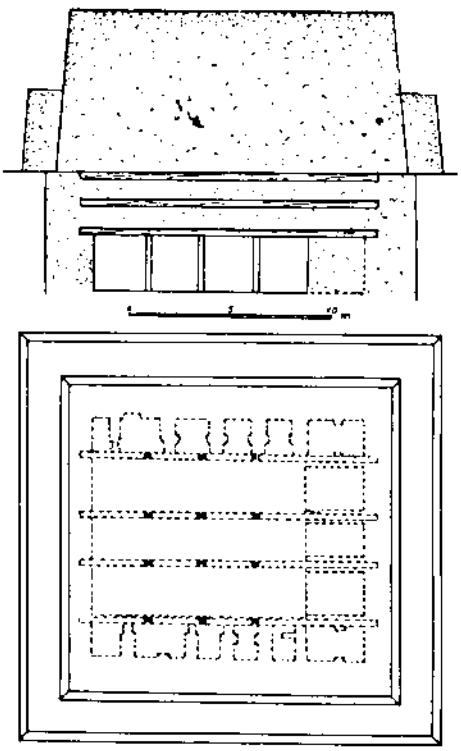

Fig. 34. Restoration of the tomb of king Djer (Irst dynasty at Abydos, according to Reisner).

ping the ramps and stairways with gravel show that fear of plunderers had already become the main incentive affecting the evolution. Development in technique and workmanship will help to cut deep stairways and underground apartments in the gravel and the limestone, replacing the open pit type (dynasty II). At the end of the IInd dynasty the deep stairway type will be modified by an additional shaft cut at the foot of the stairway (F S 3043)[77]: this will form the distinctive IIIrd dynasty type for large tombs at Memphis.

According to Reisner the superstructure of the earliest royal tombs should be restored as a stepped high mass of brickwork, built in battered layers set around a nucleus (*fig.* 34). If this were the method of construction used it would be the prototype of pyramid construction from the IIIrd to the VIth dynasty.

Military architecture

Three fortresses are known from the archaïc period (*fig.* 35). At Hierakonpolis[77], on the outskirts of the valley, are the remains of a rectangular double brick wall, set with the corners towards the cardinal points. The external wall (2.34m thick) was lower than the internal wall (4.87m thick) and perhaps separated from it by a moat (2.23m wide). The entrance gateway in the western corner projects from the North façade and was probably protected by two towers, on both sides of a narrow vestibule. The internal wall was recessed and one can safely restore the two towers from palace-façade representations. The original height of the internal wall could have reached ten metres. Such a fortress, dating from the IInd dynasty, could have been the royal residence[79], or intended to defend the neighbouring village.

Similar to this fort, but much larger (440ft long) is one at Abydos[80], known as "Shunet el Zebib", on a rectangular plan, with double walls in brick and four entrances, of which the largest one at the northern corner has two doorways on both sides of a small vestibule engaged in the masonry, but not set to face each other. This is a device to hide the interior of the court. The internal wall is recessed. In the S.E. of the court is a building on a square plan, with an entrance door on the East side at one end and a false-door in its middle. Could it be a fortified palace[81] ?

A neighbouring smaller enclosure, with recessed faces, known as the "Middle Fort", contains a building erected on a rectangular plan, with a recessed outer face, one doorway and three rooms[82].

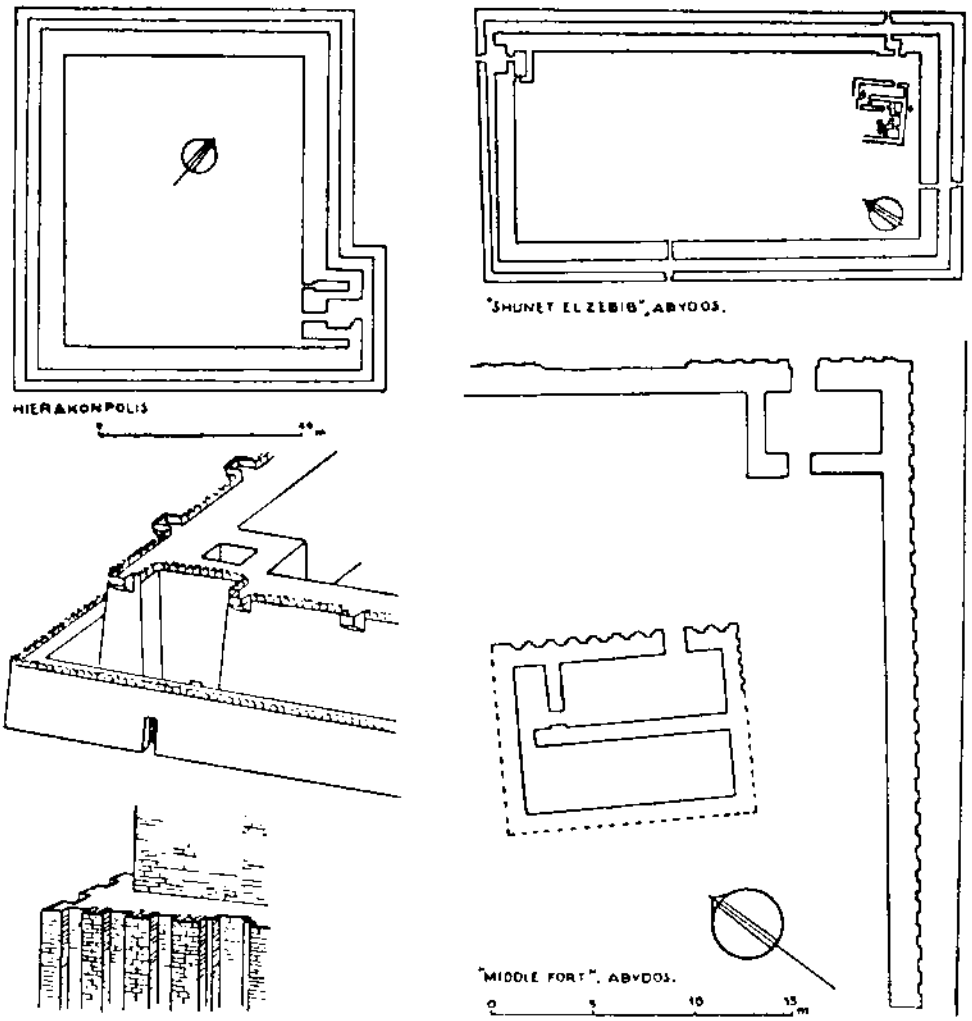

Fig. 35. Plans of three archaïc fortresses and restoration of the North entrance of the Shunet with detail of the wall construction in the palace.

Drawings (*fig.* 36)[83] and hieroglyphs show oval or rectangular enclosures with bastions, rectangular, semi-circular or even triangular in plan, on the outer faces. That such projections form a regular feature in fortresses shows that even at that remote date strategic defense had invented such a device to spread the line of soldiers on the top of the walls. The triangular plan for bastions does not occur later, although the rectangular and semi-circular ones are casually found in monuments.

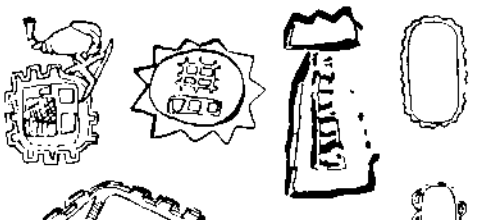

Fig. 36. Archaïc drawings of fortresses in plan and elevation, with model of tower, three hieroglyphs of fortresses and restored bird's eye view.

On a protodynastic or first dynasty label (*fig.* 36)[84] a tower is represented in elevation with battered, slightly convex sides and topped with a balcony and scalloped parapet. No door is shown and it seems that access was gained by means of the rope ladder hanging from the underside of the balcony. This is corroborated by a first dynasty model of a similar tower[85], where the rope ladder rises to a square opening just under the balcony. Such an independant tower was probably intended as a stronghold along the boundaries.

Military architecture : an appreciation

Apart from the fortified wall on a square plan and rounded corners with rectangular bastions, already met with in the predynastic times, variations on rectangular or oval plans, with rectangular, semi-circular or triangular bastions appear. It seems that the rectangular plan was introduced nearly at the same time as the circular or oval one, for city enclosures in the plain[86].

Independant towers without entrance at ground level, but with a window set high up near the top and only accessible by a rope ladder must have been manned as strongholds by small garrisons, to guard the boundaries and desert roads.

Actual remains of three forts of different sizes, on a rectangular plan, with double brick wall surrounding a court, could have enclosed a royal palace. A building, which can be interpreted as such, occurs in the Abydos fort. The elevation of the entrance gateway can be restored from the elements shown in the so-called palace-façade motive.

The achievement of archaïc architecture

Architecture grows definitely from a wattle-and-daub primitive stage into a higher technical science.

As to the plan the rectangle has become the only unit used, whether for ensemble or detail. It features also devices for protection at the entrance of domestic and, consequently, military and religious buildings. With the use of the rectangle appears symmetry along a longitudinal axis, one of the most important characteristics of Egyptian architecture.

Townplanning, which had been initiated at Merimde settlement, has already become a mature science and villages and towns follow a chessboard pattern, with two main cross arteries.

Buildings can already be classified into types : in domestic architecture there are the house and the palace, beside their dependances; in religious architecture we find the cult-temple built in brick, the heb-sed pavilions; in funerary architecture tombs evolve towards several types for kings and individuals; in military architecture open enclosure walls and large fortresses on rectangular plan or independant towers are built.

Materials increase with the addition, to the primitive light wattle, of an important newcomer : brick, which will readily supersede others for large official buildings, such as palaces, temples and tombs.

The legacy of the earliest architecture is maintained and transposed in brick or wood. Perhaps one of the clearest cases is that of the hunched animal back of Anubis hut growing into an irregular vault of wood, eventually of brick, and later of stone. Such would also be the case of the palace-façade motive, were the prototype in wood.

In the realm of ornament a favourite element to be used as a typical topping for all façades is the so-called "gorge" cornice, a happy addition to the kheker-frieze, transposed from the predynastic wattle arched façades.

ARCHITECTURE IN THE OLD KINGDOM

DOMESTIC ARCHITECTURE

Material available for studying the house in the Old Kingdom varies greatly in value. In the IIrd dynasty the remains of houses at Hierakonpolis and Saqqara afford firm evidence. For more general information a few concise contemporaneous texts give the description of houses by their owners and hieroglyphs contribute to this item. More substantial data is supplied in the IVth dynasty "county-council" planned houses near Khentkawes' tomb at Giza. It is not till the end of the Intermediate Period, between the IXth and XIth dynasties, with a rich collection of mud models, the so-called "soul-houses" placed upon the graves as dwellings for the souls, that material is again available.

TEXTS. - In the Annals of the Old Kingdom kings, recorded on the Palermo stone[87], it is entered in the IIIrd dynasty the "making of thirty-five houses", which could refer to a project of county-council planned houses. In year x + 4 it is recorded that a southern and a northern gate were erected at the palace and that the doors were of cedar. Methen[88], who lived in Snefru's reign, was given "a house 200 cubits long and 200 cubits wide, built and equipped; fine trees were set out, a very large lake was made therein, figs and vines were set out". Even then the typical plan of the Egyptian home is already formed : the large orchard and lake were always considered as essential parts of a mansion. Later Herkhuf[89] of the VIth dynasty, will also boast : "I built a house, I set up the doors. I dug a lake and I planted trees". Little information can be gathered from the legal act of the sale of Kemapu's house (IVth dynasty), except that this was very small[90].

GRAPHICAL EVIDENCE. - Low-reliefs in tombs of the Late Old Kingdom represent dependances of large houses, such as granaries with columnated porticoes and offices, from which it can be inferred that the houses themselves were provided for.

Apart from the signs already known before, some hieroglyphs show evolved forms.

The plan of the courtyard has rectangular or rounded bastions on the external face of its walls, like those of the fortified enclosures (*fig.* 37, 1).

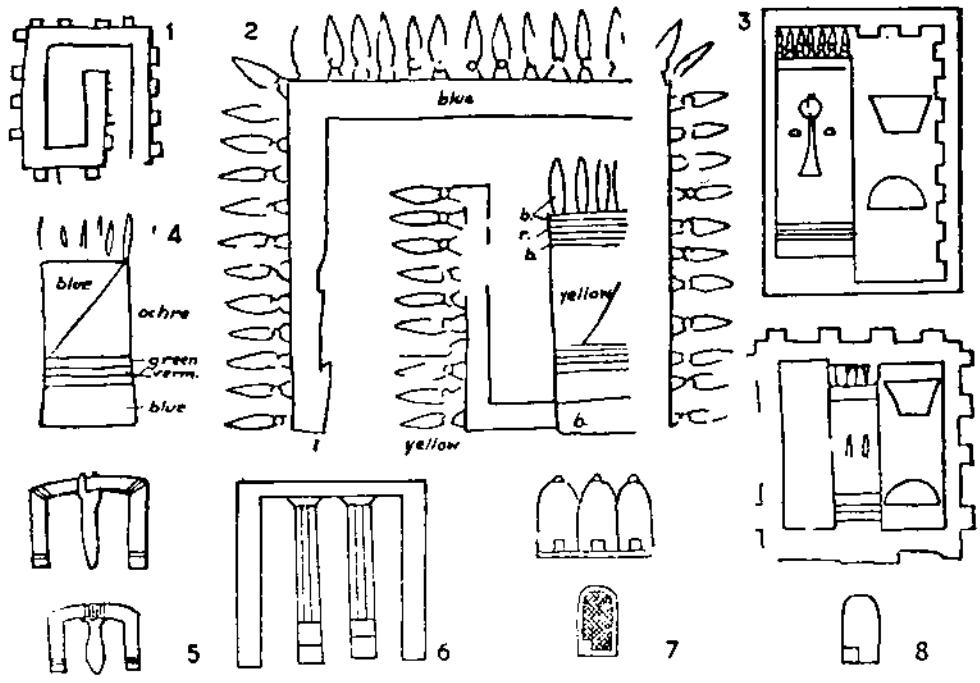

Fig. 37. Architectural hieroglyphs representing a fortified courtyard (1), with palace-tower (2-3), the palace-tower (4), a vaulted shed (5), the elevation of a hall with two protodoric columns (6), silos (7) and a harem building (8).

In another variante the outer face is bordered with kheker ornament rabatted, so that it must be restored as a crest at the top of the walls, in much the same way as the dura-stalks or piles of dried mud disks in oases or country mud architecture to-day.

The same courtyard[91], open (*fig.* 37, 2) or closed (*fig.* 37, 3) shows in its inner corner, the elevation of the palace tower. In some examples the same corner is shut into a square enclosure with a diagonal line, which could represent the same building in plan. The palace tower must be restored in the farthest corner of the courtyard, either on the entrance façade or on the opposite side. The enclosure wall has bastions on the external, sometimes internal face, or is topped with a row of kheker elements.

The elevation of the quadrangular palace tower (*fig.* 37, 4)[92] has now battered sides, a kheker frieze at the top which sometimes assumes the form of battlements and horizontal stripes at the base.

A sign[93] shows the elevation of a shelter in light materials, bent in the shape of a curved arch or vault on two side supports or partitions. Sometimes a bent pole is set in the middle.

Derived from the primitive shelter is a shed[94] with flat arch or vault (*fig.* 37, 5), resting upon a pole or column in the middle, and upon two side walls of bundles or stems, the bindings showing at the angles of the façade. Such a structure, built originally of reeds, could have later been transposed in wood as is shown in the cabin of a boat model (Cairo Museum)[95]. It is copied in the stone façades in Djeser's complex at Saqqara (IIIrd dynasty), and later in Hathor's chapel at Deir el Bahari. It has been called a tent and was the council-hall of the minister in the New Kingdom.

A sign represents the earliest attempt at trabeated architecture: it is the elevation of a hypostyle hall or porch, with two protodoric columns, with shafts sometimes tapering, supporting lintels (*fig.* 37, 6)[96]. The fluted column was originally in light materials and could have been transposed in wood and stone. Such a structure, originally in wattle-and-daub as shown by the houses of the IXth-XIth dynasties, was later copied in rock-cut tombs (Middle Kingdom).

Granaries (*fig.* 37, 7)[97], already known in the predynastic period, assumed the shape of a wattle hut, circular in plan and covered with a cupola. A small trap-door at the bottom allowed the grain to flow. Such are the silos, sometimes built in rows, as they are represented in scenes from Old Kingdom tombs. They were surely also built in mud and brick.

The sign for "harim" has been described as a hut with vertical sides and arched doorway. It has been surmised that such huts were originally built as dependances to the royal palaces, to shelter the women of the court (*fig.* 37,8)[98].

MONUMENTS.— At Hierakonpolis, within the N.E. corner of the main town-wall, foundations of houses ascribed to the IIIrd dynasty have been found (*fig.* 38)[99]. Small bricks houses seem to have been set in continuous rows along narrow streets (1m wide). The house is on a rectangular plan and consists of a courtyard and room of the same breadth, but somewhat deeper. In one case stone was used for the foundations and a threshold.

At Saqqara[100], in Djeser's enclosure, a small house of the IIIrd dynasty (5, 40m x 4m; *fig.* 39) has an entrance doorway at one end of the narrower northern façade, leading into an entrance hall with a lateral cubicula, described as porter's lodge. From the hall one door opens into a second hall and another into a large living-room.

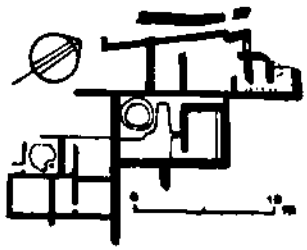

Fig. 38. Plan of IIIst dynasty houses at Hierakonpolis.

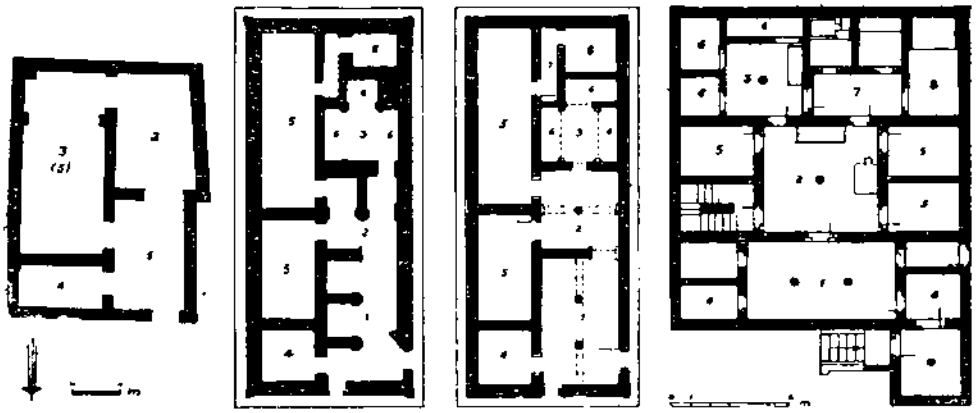

Fig. 39. Plans of a house and the royal pavilion in Djeser's enclosure and restoration of the actual pavilion with comparison to a villa at 'Amarna (XVIIIth dynasty, Ricke).

In the same enclosure of Djeser's pyramid a building has been recognized as representing the royal pavilion (*fig.* 39). Small variations have been introduced in the plan, due to the transposition of certain elements from brick into stone. The rectangular plan, although more elaborate, shows striking resemblance to the one of the neighbouring brick house. The long rectangle is divided into two long strips, the one consisting of the public part : vestibule, square hall and living-room, while the other deals with the living quarters : porter's lodge opening in the vestibule, two chambers and, quite at the back of the house, a bedroom. Columns are used in the vestibule and in the hall. Such a plan already contains the typical elements of the Egyptian mansion, as featured in the New Kingdom villas at 'Amarna.

From the IVth dynasty date a series of houses uniformly planned in one row bordered with two streets, near the mastaba of queen Khentkawes at Giza (*fig.* 40)[101] This is the earliest townplanning project for housing the priests of the necropolis, yet known. The plan of the unit is rectangular (*fig.* 41), approaching the square, of unsummetrical type, with a maze of long, narrow chambers, some L-shaped, with two entrances, a main one to the

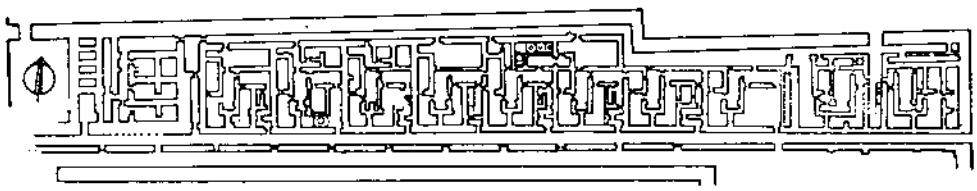

Fig. 40. Plan of a series of uniformly planned priests' houses (Giza, IVth dynasty).

South, on the sacred way, and a secondary for everyday use on the North street. Although there are three types of houses yet the basic elements are the same: from the main entrance a cachette, a first hall hidden behind a screen-wall, a second hall or reception-room. The central element seems to be a courtyard on the farther side of which are the private rooms: two communicating bedrooms, a latrine or bath, a magazine[102]. The roof could have been in vaults (*fig.* 41). The brick walls are plastered with salt-silica mortar.

To the West of the pyramid of Chephren at Giza huge brick vaults were used, according to Petrie[103], as barracks to house about four thousand men employed permanently on Cheops' pyramid. According to others they were only magazines (*fig.* 42). The walls are of rough limestone blocks with mud mortar and plaster, while the doors open in a continuous hewn stone façade.

MODELS.— The discrepancy in architectural drawings representing Old Kingdom houses is favourably supplemented by a rich collection of mud models, dating between

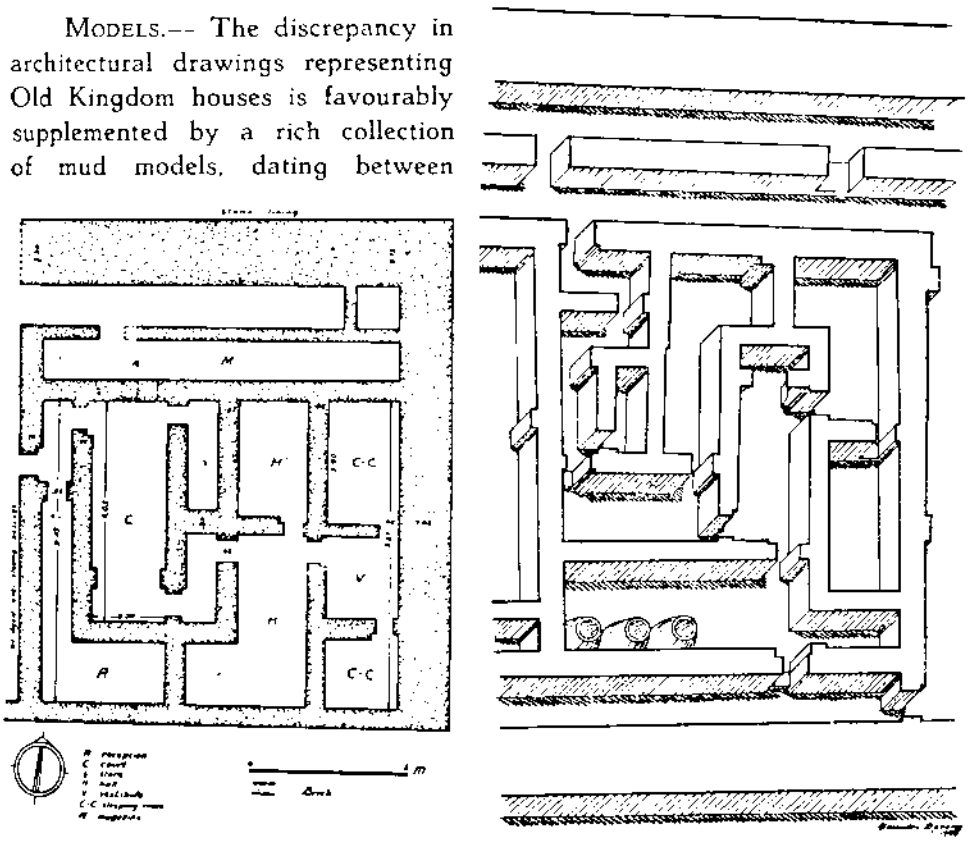

Fig. 41. Plan of the last house to the East of the priests' houses and axonometric view of a middle-unit, looking South (Giza).

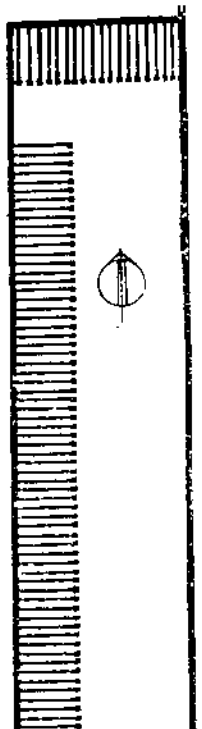

Fig. 42. Plan of vaulted magazines to the West of Chephren's pyramid (Giza, IVth dynasty).

the VIth and the XIth dynasties. These models, known as "soul-houses" (*fig.* 43), were placed in the superstructures of the tombs to enable the souls to partake of the funeral offerings set before them. They afford valuable information, being manufactured with relative accuracy and showing even details of architectural elements, such as doors or windows, tanks and inhabitants, people in chairs or at work[104]. Comparison of features and working details shown in the models with elements actually found in houses would tend to prove that the models are fairly realistic, so that they are an exceptionally useful source of information. Different types of houses are illustrated, the simplest dating back, according to the pottery it contains, to the VIth dynasty.

Type I.— The rectangular plan of an enclosure has a door in the middle of one of the longer sides and a shed on two posts along the opposite side of the court. It is the primitive house, pictured in the hieroglyph *pr* "house".

Type II.— Directly deriving from this simple installation is another type, showing a roof obviously used as terrace for storing or living, since it is surrounded by a parapet and is sometimes accessible through a winding stairway in a corner of the court. The awning, which can be promoted to portico, rests upon more than two columns. A rectangular tank in the court is covered by a shed erected on poles, a feature met with in the XIIth dynasty houses at Kahun.

Type III.— A chamber can be built in the middle of the portico, entered through a door in the main axis of the installation. Sometimes this chamber runs along the back of the portico and is furnished with ventilators in the roof (mulqaf), a device later represented in drawings of houses and taken over in Islamic architecture in Egypt.

Type IV.— The actual house plan with several rooms is also illustrated in many models. The rooms are arranged in a row at the back of the court, or on three sides of a hall, or on both sides a hall with a column, and preceded by a portico.

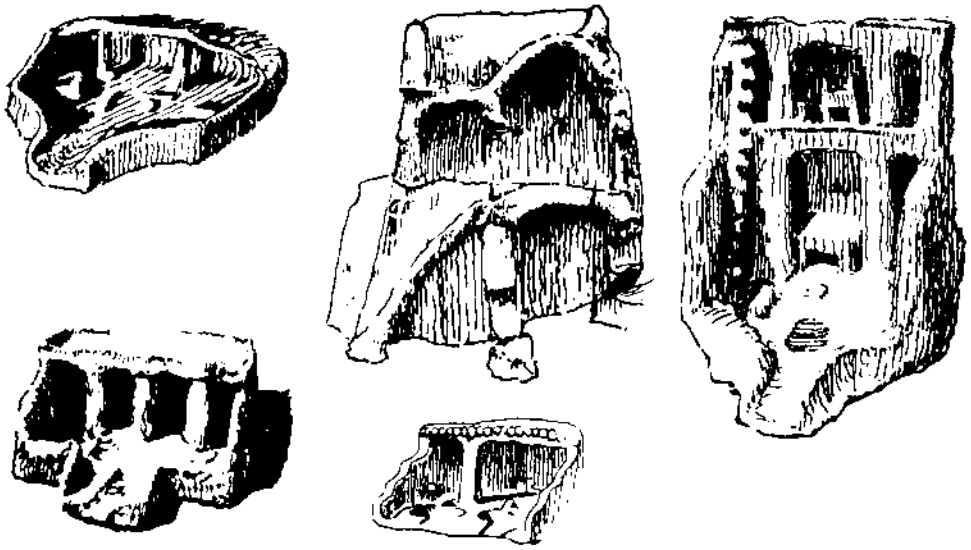

Fig. 43. Mud models of houses (VIth-XIth dynasties).

The terrace shows a variety of forms, due to the arrangement of air ventilators and even secondary porticoes and cloisters. The enclosure, which is usually only a parapet-wall, may assume sometimes the shape of a high wall, such as the ones shown in Egyptian drawings of mansions. Two-storied houses are also represented, with two columned porticoes in front of the chambers and a side-stairway rising along the side-wall.

As to the various elements of the structure valuable information can also be derived. The walls seem to have been of brick, with white and red horizontal stripes of colour-wash. Some of the later examples have a scalloped parapet. The roofs are usually flat, sometimes vaulted or domed. The underside of the vault may be ribbed in the style already known from early dynastic times, and copied from an arched roof in bundles of pliable stems. The curvature of the vault varies from the flat arch in ground-floors to barrel-vaults or higher catenary vaults. A square transom can also carry the weight of the ceiling.

Stairways rise along the side-wall of the court, usually to the left, in a winding or curving form, or are flung over half arches, a type otherwise commonly in use in actual houses at 'Amarna or later.

Windows are set high up in the side- or back-walls. In the ground-floor they are small, with vertical bars, but larger in the first floor, occasionally

decorated with a hood-moulding. Doorways are also sometimes topped with a cavetto cornice.

Columns are mere cylinders resting upon disc bases and having sometimes palm-capitals, with or without abacus.

GRANARIES[105].— Although a vital dependance to the house ever since the prehistoric period, the granary of the Old Kingdom is only known through the numerous representations on the walls of mastabas. They occur in scenes depicting the final stages in storing corn.

Two types of granaries can be differenciated (*fig.* 44) : a) The silo, or cylindrical tower covered with a cupola and built in rows, on a platform on both sides a court. They were to be filled from the top and emptied through a square sliding-door at the bottom. They recall the earlier examples represented in models of the Ist dynasty or even the alabaster vases found in the step pyramid (IIIrd dynasty).

Sometimes a conical stopper closes the top aperture. They could be built in wattle, mud or brick, and must not have reached higher than a man's stature.

b) A slightly varying form is a square tower with four corner-posts and covered with a flat cupola or slanting roof. The door opens near the bottom. They are also built in series. Such a shape recalls the aspect of the primitive shrine-hut pictured in archaïc drawings.

Towards the end of the Old Kingdom (VIth dynasty) a portico on columns runs along the rows of granaries, either in front or even above it, to protect it from wind and sun. In one example two porticoes with flat roof border two rows of granaries and are called in the accompanying text : "The hall for measuring, of the magazine".

Wood seems to have entered in the building of these structures, at least as a framework of posts and rafters.

HANGINGS (*fig.* 45).— Mats, which were used as lining in the prehistoric huts sunk underground, seems to have evoluated into a refined method of decorating walls. In tombs panelled brick walls were plastered and painted with an elaborate motive representig, at the top and bottom, wooden bars around which the throngs stretching the vertical hangings were bound. It is to be noticed that the wooden panels are shown at the back of the recesses while the coloured hangings are represented on the protruding pilasters, a fact which does not favour the hypothesis of restoring the structure as a framework of wood with hangings. Such a decoration is often found on palace-façade stelae and sarcophagi. At the bottom runs a yellow dado, which can

Fig. 44

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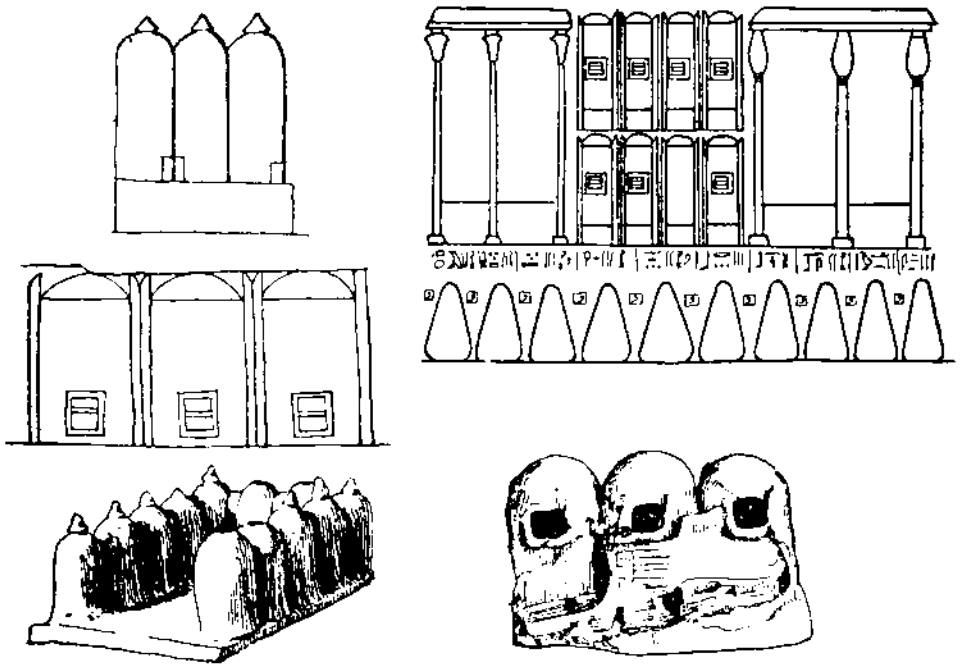

Fig. 44. Drawings of granaries (silos, towers with four corner-posts and porticoes) and mud models of series of silos (Vth-VIth dynasties).

be an evoluated form of the wooden beam set against the masonry at the base of archaïc brick walls.

It would prove an idle controversy, in the light of our present data, to attempt to define exactly where such hangings were used. It seems highly probable, when considering the prehistoric custom of lining internal walls, that hangings were still covering walls of Old Kingdom palaces and mansions, internally and perhaps also externally. If the palace-façade stela were to represent the ceremonial gateway of the palace it would be possible that such an important element of the palace was actually decorated with coloured mats.

The "false-door", when transposed in wood or stone, has as essential feature a drum set under the lintel of the doorway. This was actually a rolled mat which could be hung down to close the doorway. Such a system for closing would be efficient against sun, but only partly against wind and dust. It would accordingly be used only in daytime, for doors and perhaps for windows.

The decoration of the hangings shows a high standard in geometrical pattern design, based on the square, either in a chessboard motive, or on edge

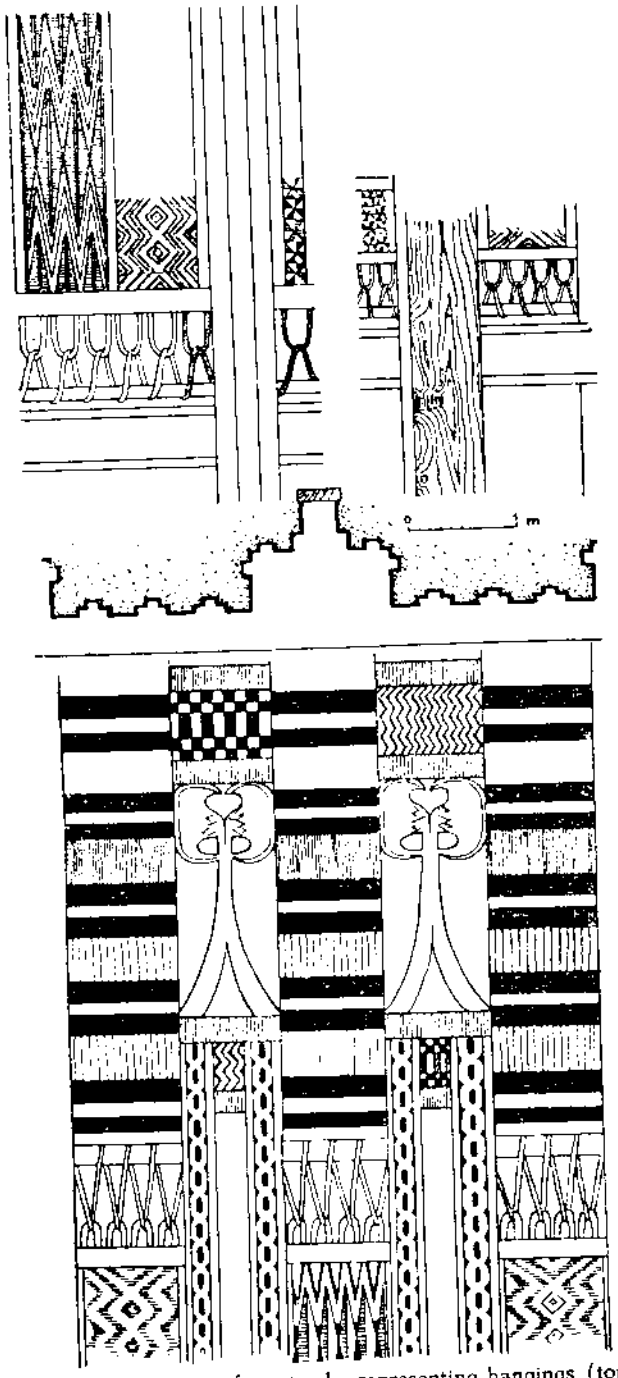

Fig. 45. Paintings from tombs representing hangings (top: Hesire', IIIrd dynasty: bottom: Djadja-m-'ankh, Vth dynasty at Abusir).

in lozenge-strings. Ever since the IIIrd dynasty (mastaba of Hesire') these motives seem to recur without sensible alteration (mastaba of Djadja-m-'ankh, Vth dynasty: *fig.* 45). The pattern points to the probality of woven mats, perhaps also textiles, being the actual prototypes. Rich colours of white, yellow, blue, red ochre and black were used.

The palace-façade.— Hangings are often represented on the whole façade with recessed panelling, whether on steles or sarcophagi. Could they picture buildings actually decorated externally on all their faces with hangings? Or was it only the decoration of the ceremonial gateway of the palace which was conventionally carried on with the panelled recesses themselves? No satisfactory answer can be put forward. There is no need to suppose the existence of a building, kiosk or veranda[106], consisting of a wooden framework with mat or textile hangings as partitions. Such a structure would be highly unpractical and is not corroborated by the actual decoration.

It rather seems possible that the palace-façade motive represents a mixed architecture of brickwork and wooden frames and that variegated hangings were used to hide the cold bareness of plastered walls, at conspicuous points, such as the ceremonial gateway or the festival hall of the palace. These hangings could eventually be removed for cleanning or storing.

The achievement of domestic architecture

Surveying the field, already prepared in the archaïc period, one finds that architects had mastered the main problems of housing.

On the scanty evidence available for mansions, illustrated by the royal pavilion at Saqqara, one can deduce that the type of plan devised already contains the main features which will be perfected in the XVIIIth dynasty villa at 'Amarna, the most developped in its line in Egypt. These are : a "wide hall" whose ceiling is supported on two columns, and to which a porter's lodge is annexed; a "deep hall" with one column, connected to side-chambers and living-room, itself surrounded by side-chambers. The strictly private part of the house, consisting of an antechamber and a bedroom could also be recognized at the back of the plan in both the IIIrd and the XVIIIth dynasty projects[107]. The choice of a wide hall followed by a deep one and the distribution of the rooms about both show a refined taste applied to a comprehensive solution of the programme of a mansion. The intimacy is secured by a separate set of rooms, culminating in the bedroom.

The middle-class house is illustrated in the unsymmetrical type of uniformly planned houses for the priests at Giza (IVth dynasty). The efficiency of the planning is strikingly low, due to the maze of corridors and the thickness of the walls. The reason that such a type of "dedalic plan" should be used in domestic programmes, even later (Senusert III), is not clear.

For housing the peasantry the symmetrical plan is used, varying from the simplest court and shelter to an elaborate modest family house. The habitation is always facing North. The devices invented show a practical sense to meet requirements. Such are the portico to provide cool shade in the long Egyptian summer, the terrace to be used as storing area with bins, or converted into an upper storey, windy in hot days, the ventilators (ar. *Mulqaf*) opening in the ceiling of the ground floor rooms to ensure a cool North breeze, the space under the stairs to shelter a woman grinding corn.

As brick was the current material, roofs were vaulted and the various types of curvatures are well adapted to the needs of the structure, flat arches in the lower floor, where haunches could take thrust, and higher arches above.

These diferenciations show an instinct for varying the structure in its details to suit the conditions[108].

Architectural elements such as doors, windows, columns are already typical for Egyptian domestic architecture. Doorways are topped with a cavetto cornice, open windows are set high up in the walls, or barred with vertical lattice-work, with hood-mouldings at the top. Columns have cylindrical shafts and palm-capitals, as the typical wooden column of later houses. Stairways assume a variety of forms and the flying type on half-arches will remain a feature of small houses in Egypt, even down to the Roman times (Hermupolis West).

Granaries deriving their silo-shape from prehistoric prototypes or their quadrangular tower-shape from primitive huts, are built as dependances to the living-quarters. These are the basic forms which will remain in use. Sometimes a portico on wooden fasciculated lotus or palm columns affords shade for the scribes and corn-measures.

Palaces and mansions had some areas of their walls, internal and perhaps also external, decorated with hangings.

RELIGIOUS ARCHITECTURE

EVIDENCE FROM TEXTS.— It is exceedingly interesting to know, from historical texts, the names of shrines and temples which have disappeared or have not yet been unearthed. On the Palermo Stone[109], giving the Annals of Old Kingdom kings, mention is made, in the Ist dynasty, of «the design of the House: "Mighty-of-the-Gods"», «Design of the House: "Thrones-of-the-Gods"», «Stretching of the cord for the House: "Thrones-of-the-Gods" by the priest of Seshat», «Opening of the Lake of the House "Throne-of-the-Gods"», all being various stages in the building process of a temple. The "stretching of the cord" is the surveying of the area and the laying out of the plan of the building. In the IInd dynasty we read about the "Stretching of the cord for the House Hor-Ren", and «the temple called: "The-Goddess-Abides" was built of stone"», and «Stretching of the cord for the House: "Shelter-of-the-Gods"». In the Vth dynasty king Userkaf erects for Horus "the shrine of his temple in Buto of the nome of Xois", a temple for Sepa and king Neferirkare' builds "the wall of the sun-bark at the south side of the sun-temple: Favourite-Seat-of-Re' ".

Mention of existing temples is to be found on the Palermo Stone: "Station at the lake of the temple of Harsaphis (*Hryshf*) in Herakleopolis", or other private texts such as the biographical inscription from Methen's tomb (IIIrd dynasty)[110], where it is stated that he is given an offering from "the mortuary temple of the mother of the king's children, Nimathap". The late stela of the Sphinx mentions a temple of Isis, Mistress of the pyramid, a temple of Osiris, Lord of Rosetau, as already existing before the construction of Cheops' pyramid[111].

Later texts give abundant evidence concerning the names of temples.

GRAPHICAL EVIDENCE.— *Hieroglyphs* contribute to the study of two primitive shrines which were considered as the national sanctuaries of Upper and Lower Egypt.

The stages of evolution of the shrine derived from the Anubis archaïc hut can be easily restored in the light of the various forms of the hieroglyph (*fig.* 46, 1)[112]. The body of the structure becomes higher while the covering in the shape of an animal's back, becomes an irregular vault of curved, later of rectilinear, transversal façade after having seceded from the original compound hieroglyphic sign, to form a separate sign. The tail assumes a stylized form, sometimes connected with a cornice of stiff upright elements.

The same essential features characterize another sign representing a still taller structure, deprived of the two flagstaves and the tail.

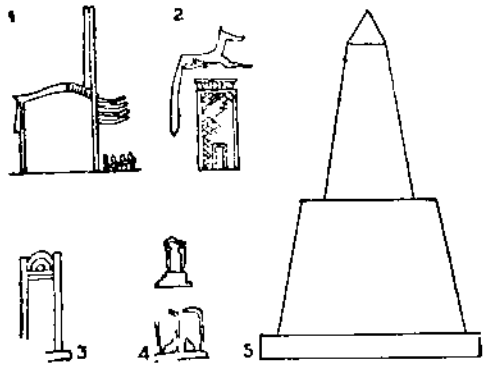

Fig. 46. Hieroglyphs representing the Upper Egyptian sanctuary (1), the façade of a shrine (2), the façade of the Osiris shrine (3), two pavilions for the royal jubilee (4), and the compound obelisk of a sun-temple (V-VIth dynasties).

The religious symbolism attached to such a shrine was so strong that it became the stereotyped model for the naos or sacred case enclosing the cult-statue of a deity. The irregular vault, so queer in shape, remained for such as in naoi, shrines, and was copied in wood, brick or stone till the end of the Egyptian architecture. The hieroglyph determines the word *itrt* "Upper Egyptian Sanctuary".

A hieroglyph related to the preceding shows the front elevation of the same shrine, after it had seceded from the side elevation (*fig.* 46,2) [113]. The rectangular façade with battered sides is in wattlework, with a door opening in the axis, a torus ornament running round the three edges and a cornice at the top. This cornice has actually stiff elements and a straight profile, in the earliest examples, but will soon curve in the shape of a cavetto. The hieroglyph reads *sh* and is used in the word *sh-ntr* "divine booth", sometimes supplemented or accompanied by a sign showing the section of an arch. The covering of such a structure was actually in the shape of an irregular vault, although the upper top of this is never projected in the elevation. This is corroborated by an XVIIIth dynasty working-drawing on papyrus, where both front and side elevations of a shrine of this type are projected[114].

A different shrine is known in archaïc drawings of temples, where it forms the main structure inside the sacred enclosure. It is a quadrangular hut with four corner posts, vertical sides and is covered with a barrel vault, presumably of wattlework. It is the national Sanctuary of Lower Egypt (*fig.* 46, 3) [115].

The study of the hieroglyph representing the heb-sed pavilion (*fig.* 46, 4) is supplemented by that of numerous drawings. This pavilion is double, consisting of a shed in the shape of two irregular vaults, set back to back upon light stand-poles of the wooden column type. This light structure is erected on a platform built in brick or stone with two flights of steps. That the two awnings are set back to back, rather than side by side, seems to be corroborated by the fact that such a pavilion with four sheds and four flights,

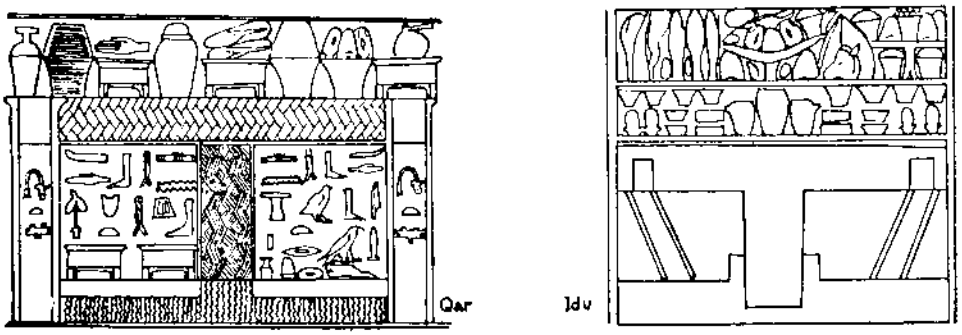

Fig. 47. Drawings from VIth dynasty tombs showing a purification hut.

each set towards one of the cardinal points, is represented in a drawing of Osorkhon II[116].

The main religious building of the Vth dynasty, the solar temple, is shown in elevation as an obelisk on a high base with tapering sides (80°, *fig.* 46, 5).[117] This hieroglyph found in contemporaneous inscriptions, proved invaluable for the restoration of Neuserre' solar temple at Abusir.

Drawings in tombs and temples represent some light structures connected with the religious ritual. A few VIth dynasty tombs at Giza (Qar, Idu) and Meir (Pepi'ankh) show funeral scenes in which two types of huts erected near the necropolis can be seen (*fig.* 47). They were used for purification and mummification rites to be performed upon the body of the deceased when landing on the Western side on his way to the tomb. The plan of the purification hut is T-shaped, with one main body accessible through two end-doors and an inclined aisle rising from the water-front to the middle of the structure (*fig.* 48). The structure is entirely in light materials.

Another hut (*fig.* 49), probably used for embalming the body, is also represented in a complex drawing of plan and elevation. The plan consists of a court and a chamber hidden behind an anteroom by screen-walls. As to the elevation it is simple: featuring a doorway, some-

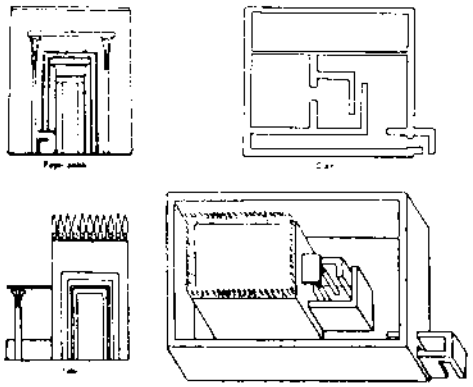

Fig. 49. Drawings from VIth dynasty tombs representing an embalming hut (two in elevation, one in plan) and restored axonometric view (Ricke).

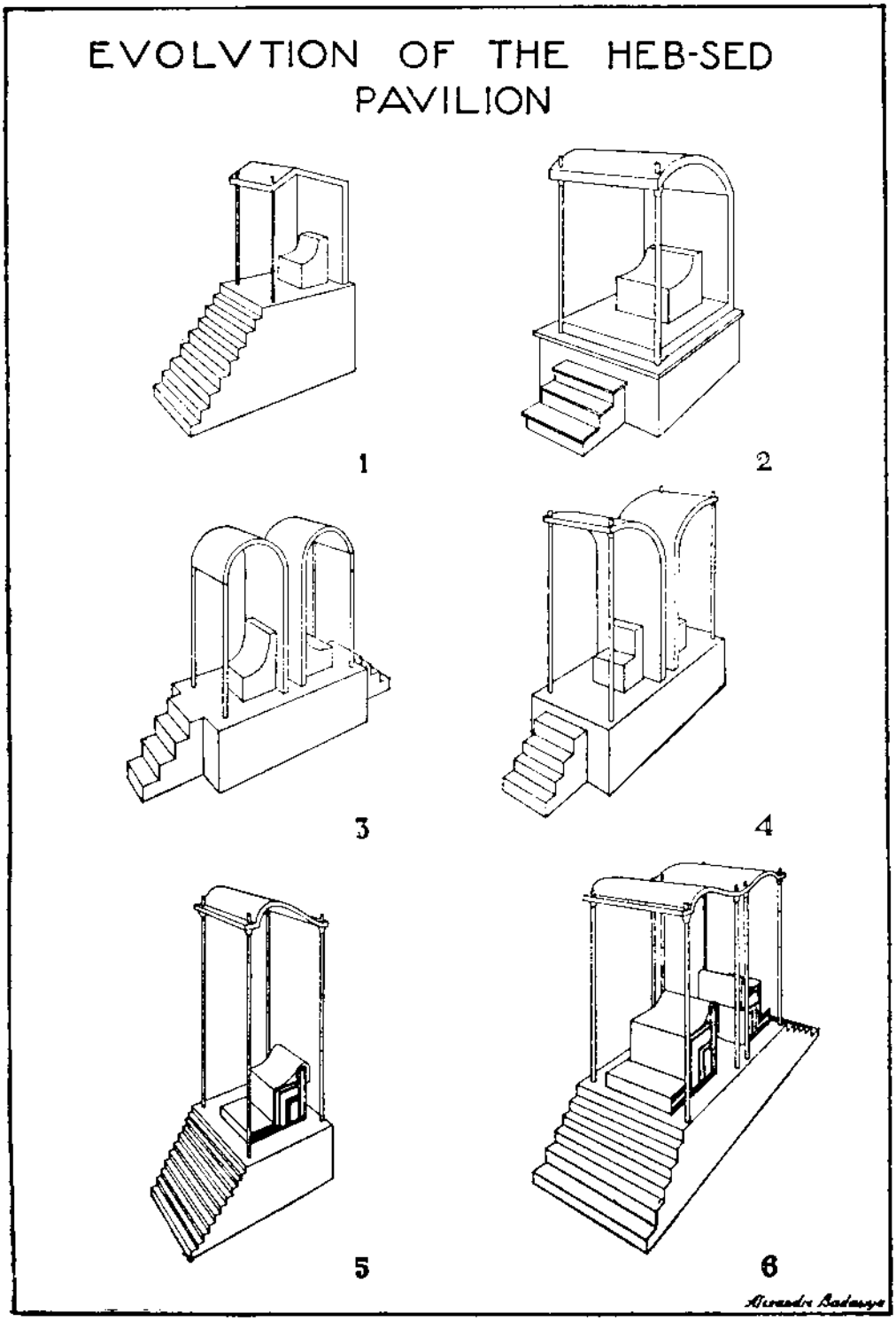

Fig. 51. The jubilee pavilion according to drawings from the time of king Na'rmer (1), king Den (2), the IIIrd dynasty (3-4) and king Neuserre' (5-6).

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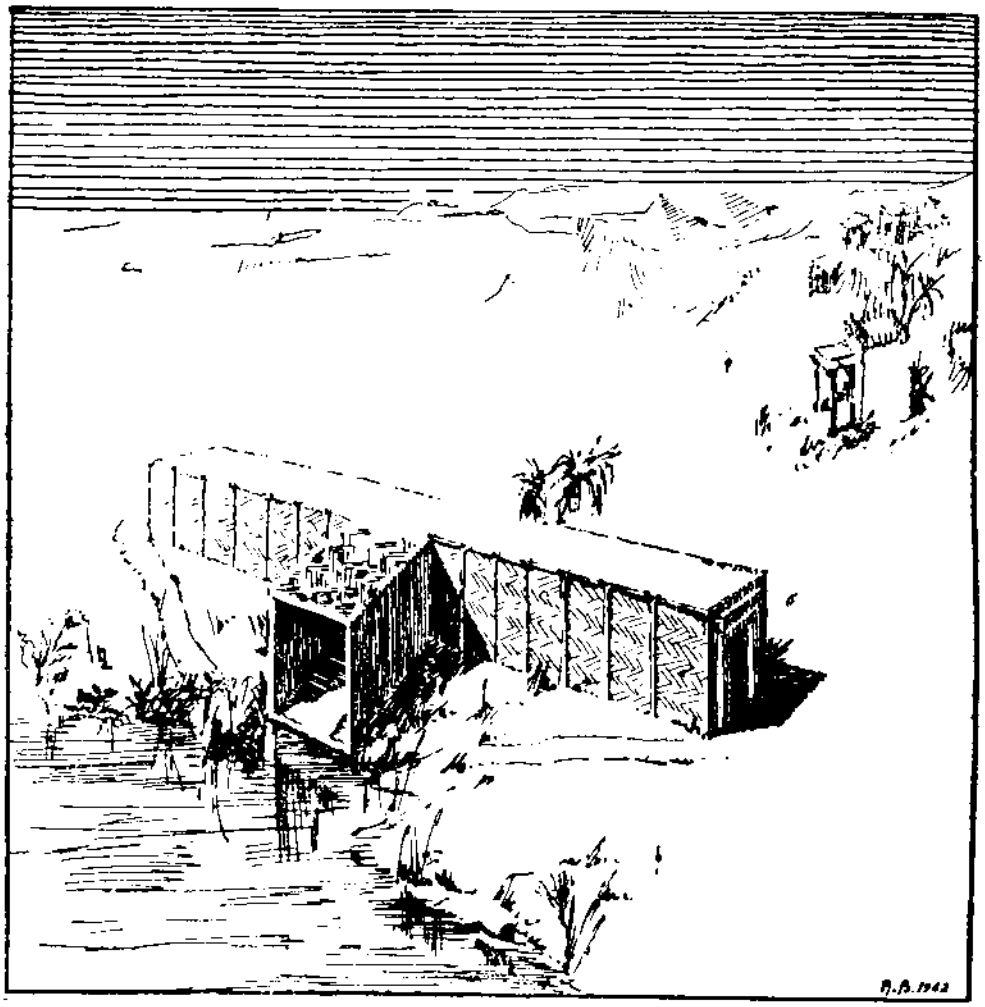

Fig. 48. Restored perspective of a purification hut.

times shaded by an awning on two palmiform columns. A frieze of kheker-ornament may crown the structure[118].

The heb-sed pavilion (*fig.* 50) is represented in Neuserre' funerary temple, in two types as single or double awning, shading one or two thrones set on a platform, with one or two flights of steps. In the latter case one of the awnings has been widened to afford more space for the figure of the king sitting under it. It seems probable that the double pavilion was built so as

to face South and North, for the performance of the ceremonies as king of the South and the North[119].

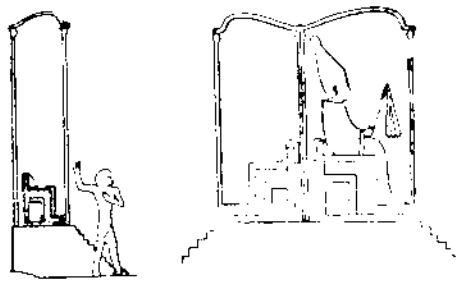

Fig. 50. Drawings of the single or double jubiles pavilion (from Neuserre' temple, Vth dynasty).

It is extremely suggestive to follow the evolution of the pavilion, according to Egyptian drawings (*fig.* 51). In the archaïc period single and double pavilions are represented, erected upon a platform and covered with a pent-roof or barrel-vault. The awning is open on three sides and rests at the front on two poles. A few steps lead to the platform. Later in the Old Kingdom the awning appears as an irregular vault, single or double, and resting on poles with bell-shaped capitals. The structure was probably in wood, on a rammed earth platform encased in brickwork or stone walls.

THE TEMPLES

Remains of temples are sufficiently preserved to allow a thorough investigation of the field. Beside the *cult-temple*, a new type appears, connected to the royal pyramid and in which the daily funerary rites were performed: this is the *mortuary temple*.

THE MORTUARY TEMPLES

Although every pyramid is supposed to have had an architectural complex attached to it, yet only in some have the temples been preserved for most of the buildings have disappeared through denudation and dilapidation. Usually this complex consists of a funerary temple adjacent to the North or East face of the pyramid, and connected by an inclined ramp or "causeway" with a vestibule, set on the border of the irrigated land. Old Kingdom pyramids all lie on the western edge of the valley, between Aburawash to the North and Meydum to the South.

THE TEMPLES AT THE STEP PYRAMID OF SAQQARA[120].— The unique complex of buildings belonging to king Neterirkhet, later known as Djeser, of the IIIrd dynasty and situated at Saqqara, includes a funerary temple on the

North face of the Step pyramid, but mainly consists of a group of buildings intended to represent palaces and shrines which were used by the king for the celebration of his jubilee or Heb-Sed festival in his after-life. Thus the majority are dummy-buildings, the façades acting as retaining walls enclosing a filling of débris and gravel.

Both the programme of construction, affording new types of buildings or plans, and the technique, being the first attempt to build on a large scale in stone, are without parallel. This explains the exceptional interest aroused by this huge complex due, according to tradition, to the architect Imhotep, later deified.

It is to the West of this complex that the remains of a step-pyramid, perhaps unfinished, are being excavated. This find corroborates the theory propounding the use of independant constructional narrow ramps ascending to the faces of the pyramid.

The plan (*fig.* 52). — The whole complex is surrounded by an enclosure wall (544.9m x 277.6m = 1,000 cubits in length), which was originally 20 cubits (10.48m) high, on a rectangular plan, set N-S along its longitudinal axis. The outer face of this enclosure, acting as retaining wall, is recessed like the façades of archaïc mastabas, with 14 bastions on its four sides, having 14 dummy doors. A larger bastion protects the only doorway at the southern end of the East face (*fig.* 52, 2). The wall which is built of fine limestone, may have been a reproduction on a reduced scale, of the "White Wall" surrounding the capital city of Memphis. The rectangular shallow recesses set in eight rows at the upper part of the walls could be an interpretation of the but-ends of wooden baulks inserted as reinforcement in brickwork. These same details appear on a low-relief representing the palace-façade name or *serekh* of the same king (*fig.* 52, 3).

The main buildings are the South tomb and the Step pyramid rising in the centre of the plan. Other dummy buildings are grouped round courts. A processional hall connects the entrance doorway with the great court, at both ends of which are the South tomb and the pyramid, on its western side the dummy terraces and on its eastern side the royal pavilion. A second court, farther East, is surrounded by dummy shrines used for the Heb-Sed festival. Two smaller courts are bordered on the North side, one with the façade of the Northern Palace. A last court on the North face of the pyramid contains the cachette (ar. *serdab*) for the funeral statue and abuts on the funerary temple. The N.W. areas are devoid of buildings and were originally filled in.

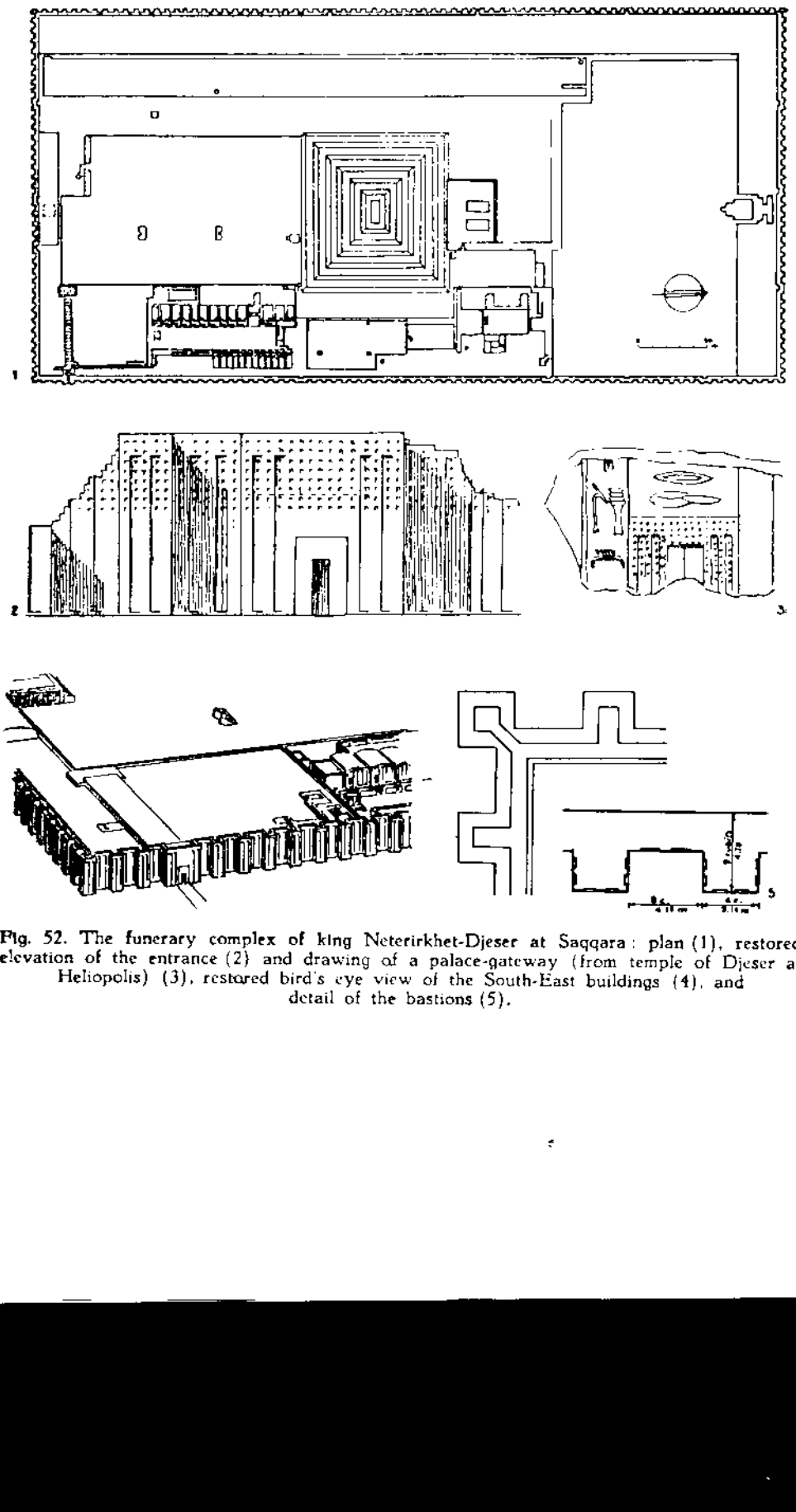

Fig. 52. The funerary complex of king Neterirkhet-Djeser at Saqqara: plan (1), restored elevation of the entrance (2) and drawing of a palace-gateway (from temple of Djeser at Heliopolis) (3), restored bird's eye view of the South-East buildings (4), and detail of the bastions (5).

The processional hall (*fig.* 53)[122], — This is the only entrance way to the large complex. From the doorway in the bastion a short corridor leads to a lobby with two dummy-leaves of a door represented in relief on the side-walls. The actual leaves, according to this transposed representation, would have closed one behind the other, thus providing a double thickness. A second short corridor, having at its end a dummy single-leaf door, leads into the processional hall, 54m long, bordered by two rows of twenty three-quarters columns engaged at the but-ends of short transversal walls. The axis of this hall is somewhat askew, and not at right angles to the entrance-façade. A transversal thick wall with a central doorway divides the hall at the 3/5 of its length, from the entrance. At the beginning of the first section, a long corridor opens on the right, after the first column and leads to the heb-sed court. On the left a passage may have contained a stairway to the top of the building. To the left, between the ninth and tenth columns, a small side chamber was intended perhaps for a statue in relation with the subterranean galery under it and accessible through a nearby shaft 25m in depth.

The columns (5.92m ht.) are built in courses, having two to six blocks each and imitate a bundle of reeds, with sharp taper, gathered at the top under a sheath and resting at the bottom upon a cylindrical base. The ceiling consisted of blocks of stone ribbed on the underside to imitate semi-circular elements, probably bundles of reeds set side by side, transversely to the longitudinal axis. The masonry of the columns was coloured red, conventionally for a dried reeds prototype. The middle nave was higher than the sides, allowing clerestory lighting.

The whole structure is an imitation of a reeds prototype transposed in stone. The transversal walls seem to be due to the inexperience of the architect at erecting free-standing stone-columns. The proportion of these columns, their sharp tapering as well as the technique of their construction corroborate this lack of experience.

At the western end of the processional hall a wide vestibule set transversely has eight columns erected in pairs on both sides the four connecting walls. A doorway, with a dummy single-leaf door set in a spool-like socket at the top and a pivot at the bottom, opens into the Great Southern Court.

The great court. — This is a large area of the same breadth as the pyramid and extending between it and the tomb engaged in the South enclosure wall. To the East are the Heb-Sed buildings, while to the West three terraces run along the side of the court. The nearest terrace, flat-topped was five metres high; the second was covered with a flat vault (7.5m ht., 25m wide, 400m long), similar in aspect to the superstructure of the South tomb.

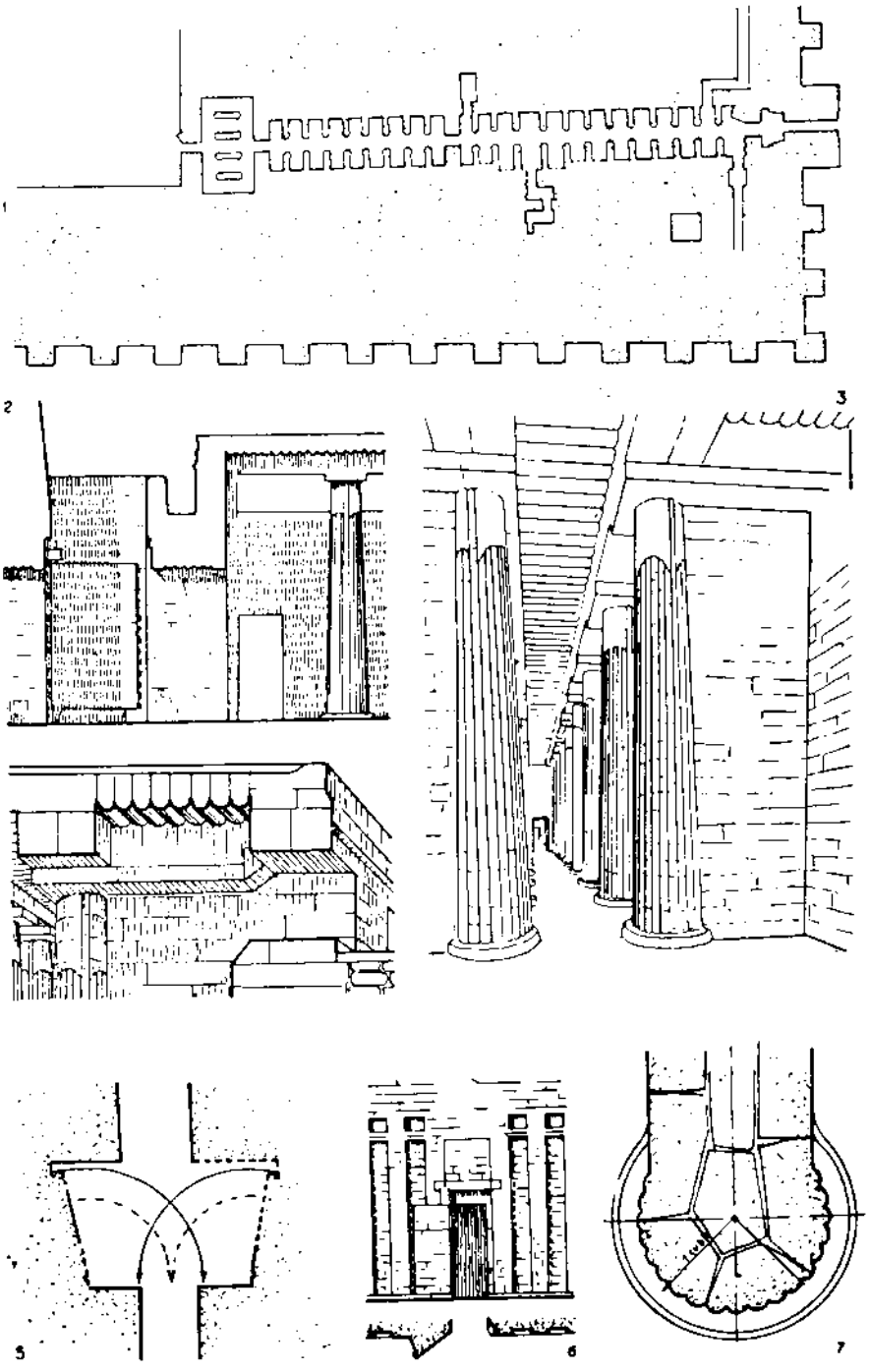

Fig. 53. The processional hall in Djeser's complex: plan (1), section at the entrance (2), restored perspective (3), detail of a window (4), assumed closing of door-leaves in prototype (5), restored elevation of western doorway (6) and detailed section of column (7).

It contained in its substructure galeries filled with human bones and thousands of vases. The third terrace abutted on the western enclosure wall and was flat-topped (17.6m wide) and covered the remains of a IIIrd dynasty house.

In the court three structures were very likely used during the ceremonial race of the king in honour of Apis. An altar, square in plan, with a ramp, is set near the South face of the pyramid. Two masonry filled-in blocks, B-shaped in plan, are set at one-third and two-thirds of the longitudinal axis of the court. These were apparently the milestones, round which the king had to run during the celebration of the heb-sed ceremonies. In the North-East corner, just in front of the South-East angle of the pyramid stands a small structure consisting of three adjacent rooms preceded by a double court with screen-wall. This is the earliest transposition of the Irst dynasty temple of the "First of the Westerners", at Abydos[123].

In the South wall of the court a small chapel is built so that the axis of its inner shrine coincides with that of a wine-cellar in the substructure of the South tomb. This chapel, which has been described as the House of the Crowns, is therefore connected with the Buto burial, represented by the South tomb for the internal organs of the king[124].

The heb-sed court. - Access to the heb-sed (*fig.* 54) court was gained through a long corridor from the beginning of the processional hall and, very likely also, from the great court. The long court is flanked on its western side by dummy shrines of Upper Egypt and on its western side by dummy shrines of Lower Egypt, intended to house the kings of Upper and Lower Egypt, when assisting at the jubilee festival.

The first shrine at the South end of the western row has a façade of the type of an Anubis-hut, rectangular with a torus-moulding running round three edges, a door in the axis and a cornice. Here again these elements are directly copied from pliable materials, the torus being an imitation of the bundles of reeds forming the edge posts and the cornice being the rigid stems of the ceiling parapet of a wattle-hut. The other shrines reproduce the façade of a three-columnated flat-arched hut, with stems-pillars at the angles. The fluted columns have been considered as copies of wooden posts worked with an adze[125]. A plinth (2.1m ht.) runs at the bottom of these edicules, every one of which is preceded by a small court with a dummy door-leaf, divided in two transversal compartments by a screen wall. A doorway opens in the plinth, with a dummy door-leaf, into a small cell having in the back wall a niche copying a small shrine roofed with an irregular vault. Flanking the door are two copies in relief of a wooden fence, resembling the one pictured in the primitive shrine-hut as seen in hieroglyphs or archaic

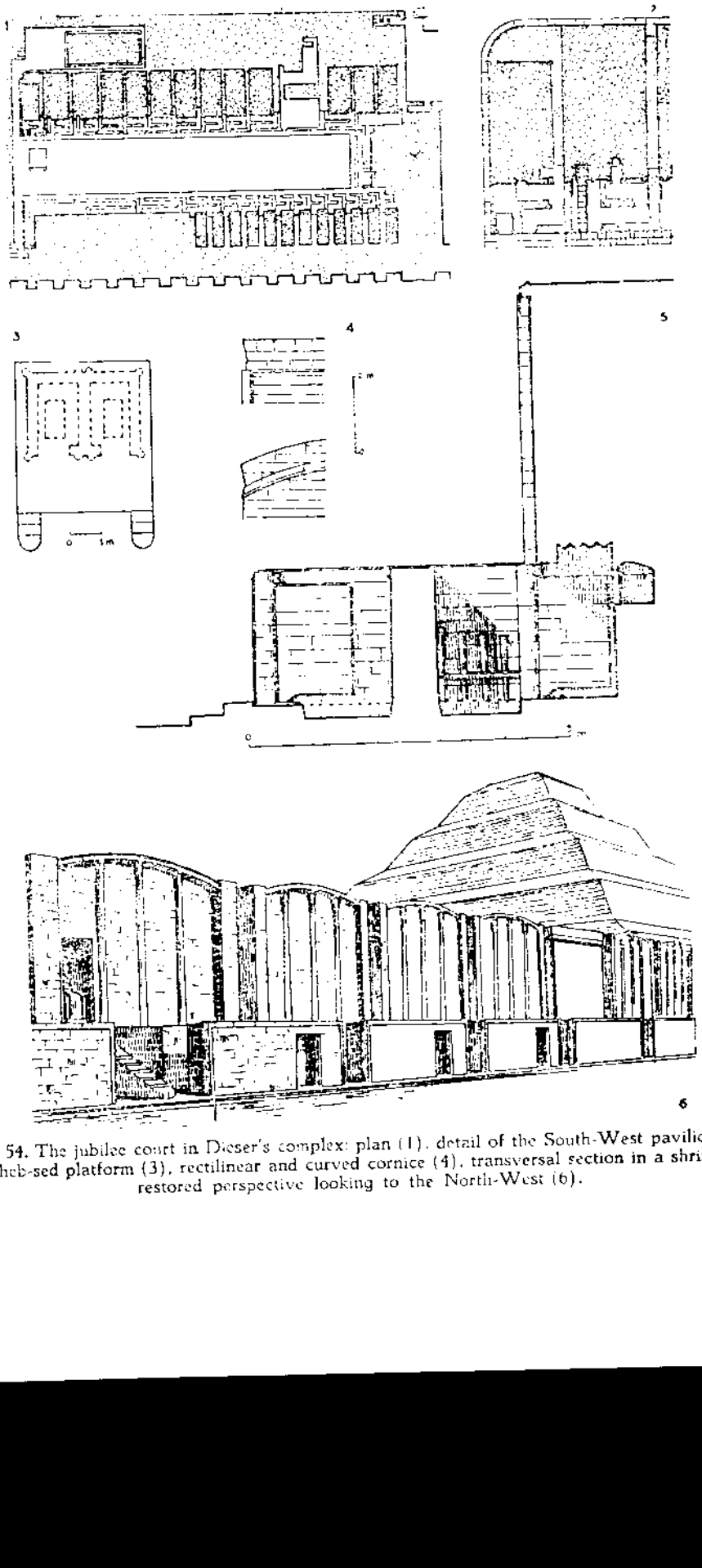

Fig. 54. The jubilee court in Dieser's complex: plan (1), detail of the South-West pavilions (2), the heb-sed platform (3), rectilinear and curved cornice (4), transversal section in a shrine (5), restored perspective looking to the North-West (6).

drawings. The two southernmost curved-topped shrines of the western row have a stairway each leading to a statue set in a niche. Quite at the North end of this side a small cell contains the remains of four pair of legs: these were perhaps standing statues of king Djeser, his wife and his two daughters.

The shrines on the eastern side are similar to the others, although smaller and deprived of torus and columns. At the southern end of the court a square platform with two stairways facing East carried the two heb-sed pavilions, sheltering the throne o fthe South and that of the North. Such a pavilion is engraved on the handle of an alabater vessel found in the underground chambers of the complex, and shows the two awnings back to back, although the basis shows traces of two structures, set side by side.

Connected with the heb-sed court by a passage at the S.W. angle is a small court where stands the King's Pavilion (*fig.* 39). It is to be noticed that the angle of the passage has been rounded, a feature borrowed from mud or wattle architecture. Compared with the small brick house found in the N.W. terrace and with an 'Amarna villa of the New Kingdom, this building shows such marked similarity that Ricke has proved that it must be a copy of a small palace. It is the sole building in the whole complex, which is to be used as such, and not a dummy structure with façades retaining a core of filling. The columns, engaged, could be restored as independant reed-bundles in the original structure. The main façade resembles that of a shrine-hut, with a rectilinear cornice straight in profile.

The South and North Palaces. Two independant courts, accessible from the great court, contain at their northern end a building called respectively "South Palace" (*fig.* 55) and "North Palace" (*fig.* 56), which represent the South and North national shrines[126]. Both buildings are similar, although not the same. The façade is reproducing that of a partly open flat-arched primitive structure, with a screen-wall of wattle topped with a kheker frieze and running in between the four fluted columns, and ending against two fluted corner-pilasters, adjacent to two semi-circular fluted shafts. The columns are slender semi-circular engaged shafts, with sharp taper and are topped with a curiously shaped sheath capital, unique in its shape, above two rounded projections and an intermidiary hole. Borchardt has supposed that the hole served for fixing horizontally a so-called horn-element, such as appears in the drawings of primitive shrines, and a Hathor-face between the two leaves of the sheath, on the evidence of a similar façade represented on the walls of Deir el Bahri temple. Lauer would, however, fix a wooden deity-stand in the hole and between the two projecting stones (*fig.* 61). The columns have shafts with concave fluting, about 12m in height, along the axis. A door opens to

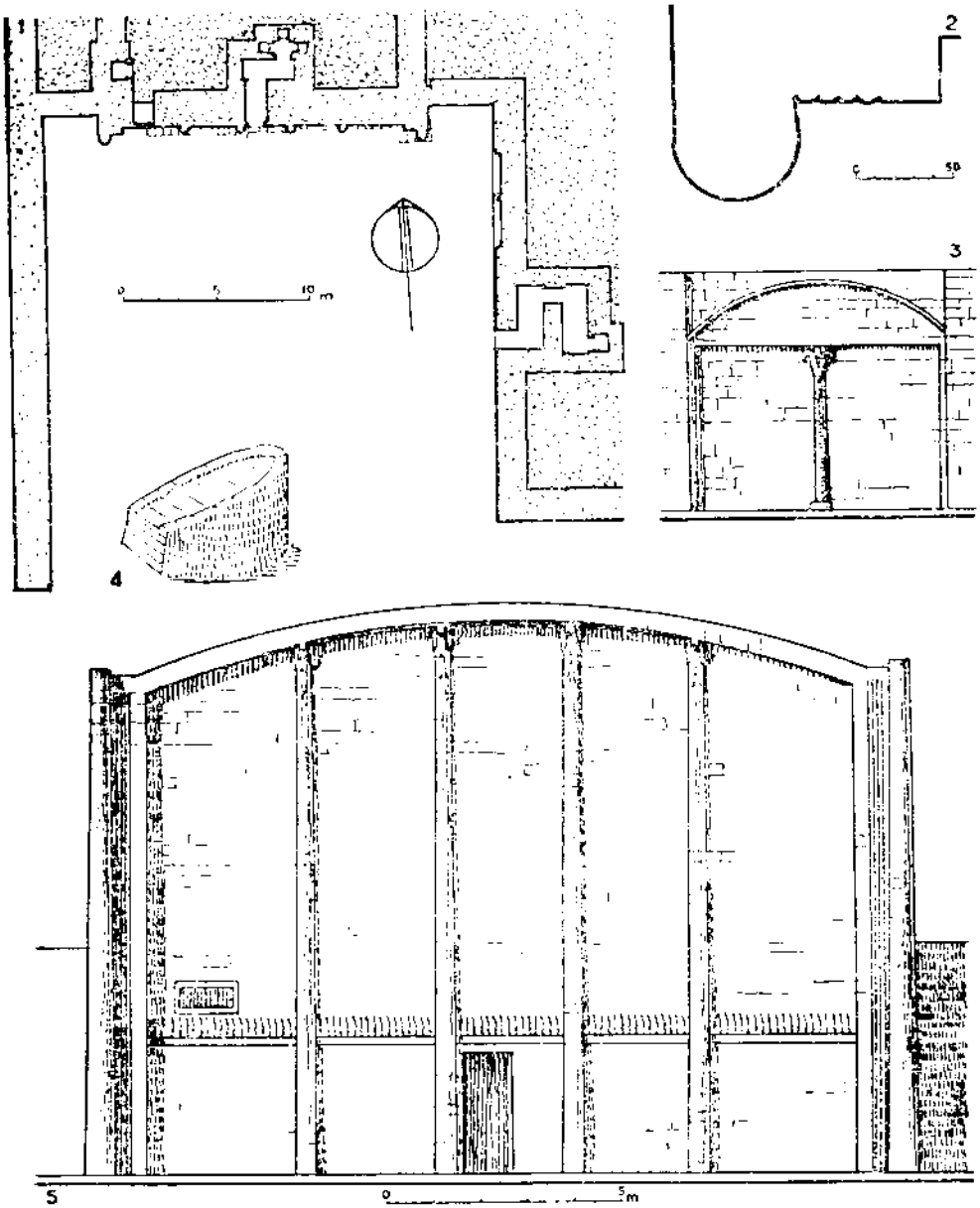

Fig. 55. The "South Palace" in Djeser's complex: plan (1), detailed section of corner-pilaster (2), restored elevation of the dummy façade symbolizing the South (3), perspective of milestone platform in court (4) and restored elevation of the "South Palace" (5).

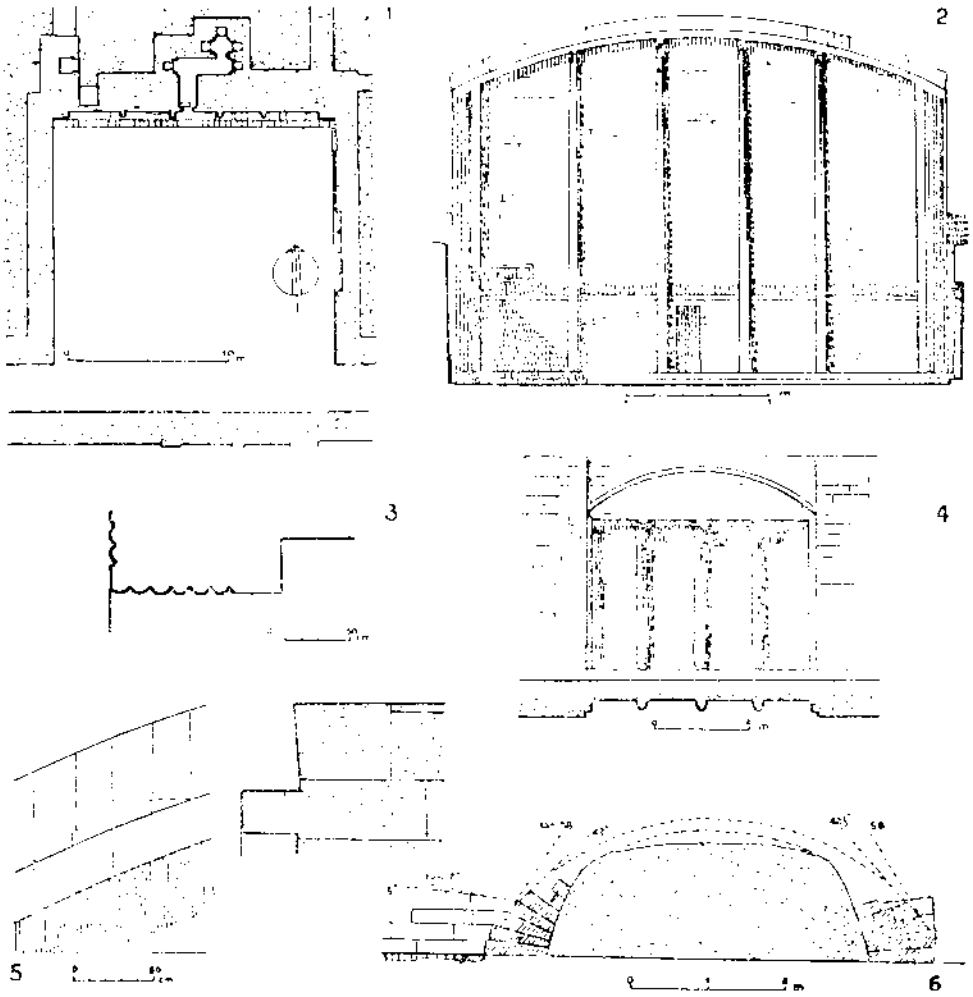

Fig. 56. The "North Palace" in Djeser's complex: plan (1), restored elevation of "North Palace" (2), detailed section of corner-pilaster (3), restored elevation of dummy façade symbolizing the North (4), details of curved cornice (5) and transversal section of dummy vault (6)

the West of the middle axis and leads by means of a short corridor, to a cruciform chapel, with three niches in the form of the primitive shrine-hut. It is surmised that these niches were designed to contain the Upper Egyptian crown. In the eastern wall of the court there was a small façade, arched and with one column in the middle, with cylindrical shaft and supposed to be topped with a capital stylized from the Upper Egyptian heraldic plant.

The Northern Palace façade (*fig.* 56) is of the same type, although without semi-circular shafts at the ends. The corridor is longer and contains

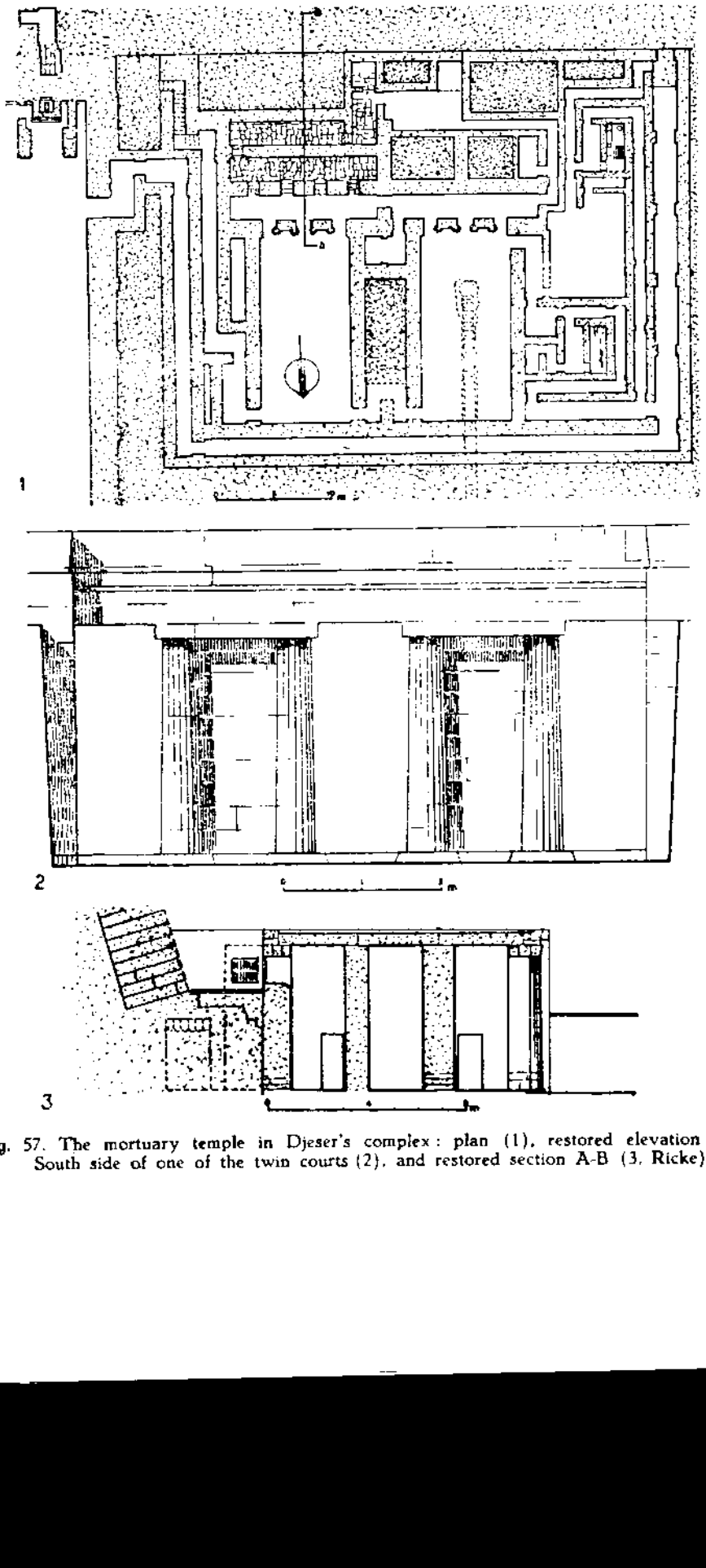

Fig. 57. The mortuary temple in Djeser's complex : plan (1), restored elevation of the South side of one of the twin courts (2), and restored section A-B (3, Ricke).

two niches similar to the three ones in the walls of the cruciform chapel. At the western corner is a cachette enclosed in the masonry and supposed to have contained a statue of the king. In the court, on the eastern wall, is worked the façade of a small building with a flat arch above an architrave resting upon three papyriform columns. The column is a direct copy of a papyrus plant, the shaft having a strong entasis, showing a triangular section with convex sides, topped with the styhzed reproduction of the umbella of papyrus, the heraldic plant for the North. Here again the structural forms such as the flat vault, the fluted columns, the papyrus-stem column and the screen-wall in the open columnated façade are direct copies from an architecture using light pliable materials. Nothing points to an intermediate stage in brick or wood.

The court of the "serdab". To the North of the pyramid is an extensive area connected with the Palace-courts and marked by the small cachette containing the funeral statue of Djeser (*fig.* 57). This is a closed room, whose front facing North has the same batter as the face of the pyramid (63°) on which it abuts, and preceded by two dummy door-leaves cut on both sides of a small enclosure.

The mortuary temple (*fig.* 57).- The buildings of the mortuary temple are on a square plan and abut in the middle of the North face of the pyramid. An angular sloping passage leads near the serdab, through a long corridor, into the twin courts, forming the centre of the plan. In each court, on the southern side is the façade of the temple itself, consisting of four engaged fluted columns, with three doorways in between. Behind these twin façades runs a wide gallery connected to a maze of corridors. It is surmised that this temple is a condensed representation of the king s palace at Memphis. The duality of the Egyptian kingship is here apparent in the twin-courts and façades of this temple.

New tectonic elements in Djeser's complex.— For the first time a whole seriesof tectonic elements such as the cornice, the torus, the corner posts, the columns appear in stone masonry. When compared to later examples these elements feature an earlier stage of development, whether in their form or their construction. This is conspicuous in the cornice which has a straight profile, the corner-posts which are either protruding as a shaft of circular section or fasciculated, and in the columns which are direct imitations of bundles or plants.

The cornice. - The cornice which characterizes Egyptian architecture and which is known as the "Egyptian gorge" is already used at the top of

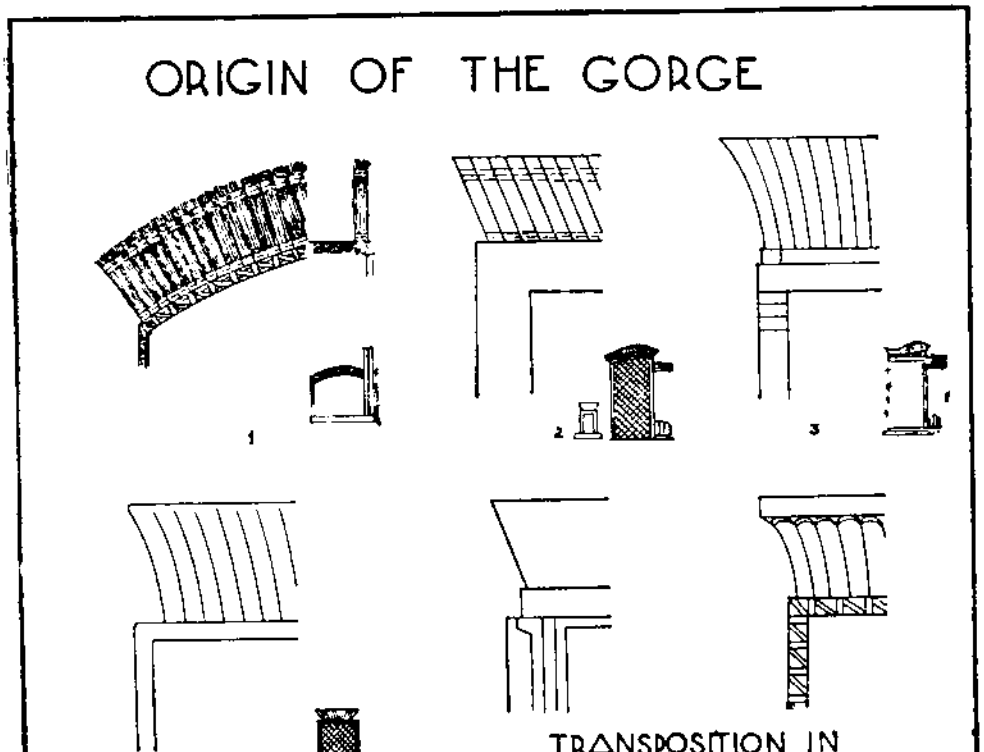

Fig. 58. Hypothetical evolution of the cornice from stiff stems topping a vaulted structure (1) to a horizontal rectilinear topping (4), with transposition in stone (Djeser's buildings).

some of the buildings, such as the shrines in the heb-sed court, the royal pavilion, the palaces of the South and the North, the mortuary temple[127]. In all cases however the end profile of the cornice shows no trace of curvature but is rectilinear, while the cornice itself may be either straight and horizontal, or slightly curved to follow the top line of the vault. Both this curvature and the straight profile at the end of this cornice will prove of value, as clues for the study of the origin of the element itself.

There is no doubt that this cornice is a transposition in stone of the top-element in the façade of the early shrine, known from archaïc drawings and hieroglyphs, and featuring in the side-elevation an irregularly shaped vault (*fig.* 58). This is topped with a frieze or parapet of straight upright stems following the curve of the vault so that its end-elements are inclined

towards the exterior. If we compare this element with the cornice at the top of curved façades in Djeser's complex we clearly see the relation between both. On the other hand the straight cornice running horizontally at the top of the other façades is nothing but the transposition in stone of the cornice apparent at the top of the rectangular façade represented in drawings. It has been proved elsewhere that both early representations show the side-elevation and the front-elevation of one single building, a wattlework hut owing its characteristic irregular vault to the fact that it represented at the origin an animal, probably Anubis[128]. The archaïc cornice of Djeser would therefore be a copy of a topping of upright rigid stems at the ridge of a curved vault. The inclined ends due to the curvature of the vault, would have been retained when the cornice was to run horizontally.

Later the end-profile of the cornice will slightly bend, this curvature gradually increasing till it assumes its usual type in the Vth dynasty, reminding one of the cavetto cornice in classical architecture. Early archaïc drawings have also cornices with straight profiles, while later examples show the curved type known from monuments. It is this curvature and the decoration of the cornice that has led to consider it as originating from a palm-leaf prototype[129]. The monuments of Djeser feature an earlier stage and prove however that the origin must be sought in rigid stems, probably reeds. A cornice of pliable materials such as palm-fronds would have bent irregularly outside as well as inside[130].

The origin of the cornice is directly connected with the evolution of the shrine-hut of Anubis, as it can be proposed from archaïc graphical evidence (*fig.* 59).

The torus moulding. - In the complex at Saqqara a torus moulding of semi-circular section usually runs under the cornice and is also found at the top and along the edges of façades and doorways. In the archaïc pictographic documents already studied the torus is regularly shown framing the rectangular façade, horizontally under the cornice and turning vertically at both ends. These consist clearly of a bundle of reeds or palm-fronds lashed together and to the wattle-partition forming the wall of the hut[131]. Later the binding carried diagonally along the torus will be represented in stone, carved or painted. Such a feature at Djeser's is certainly a direct copy from these elements, so important in the framework of a wattle hut.

The corner-posts. - At the corner of the front-façade of shrines posts, rectangular in section are set vertically with an imitation of semi-circular stems (Palaces of the South and the North), a protruding semi-circular shaft (Palace of the South), or without any carving (shrines in the Heb-Sed Court).

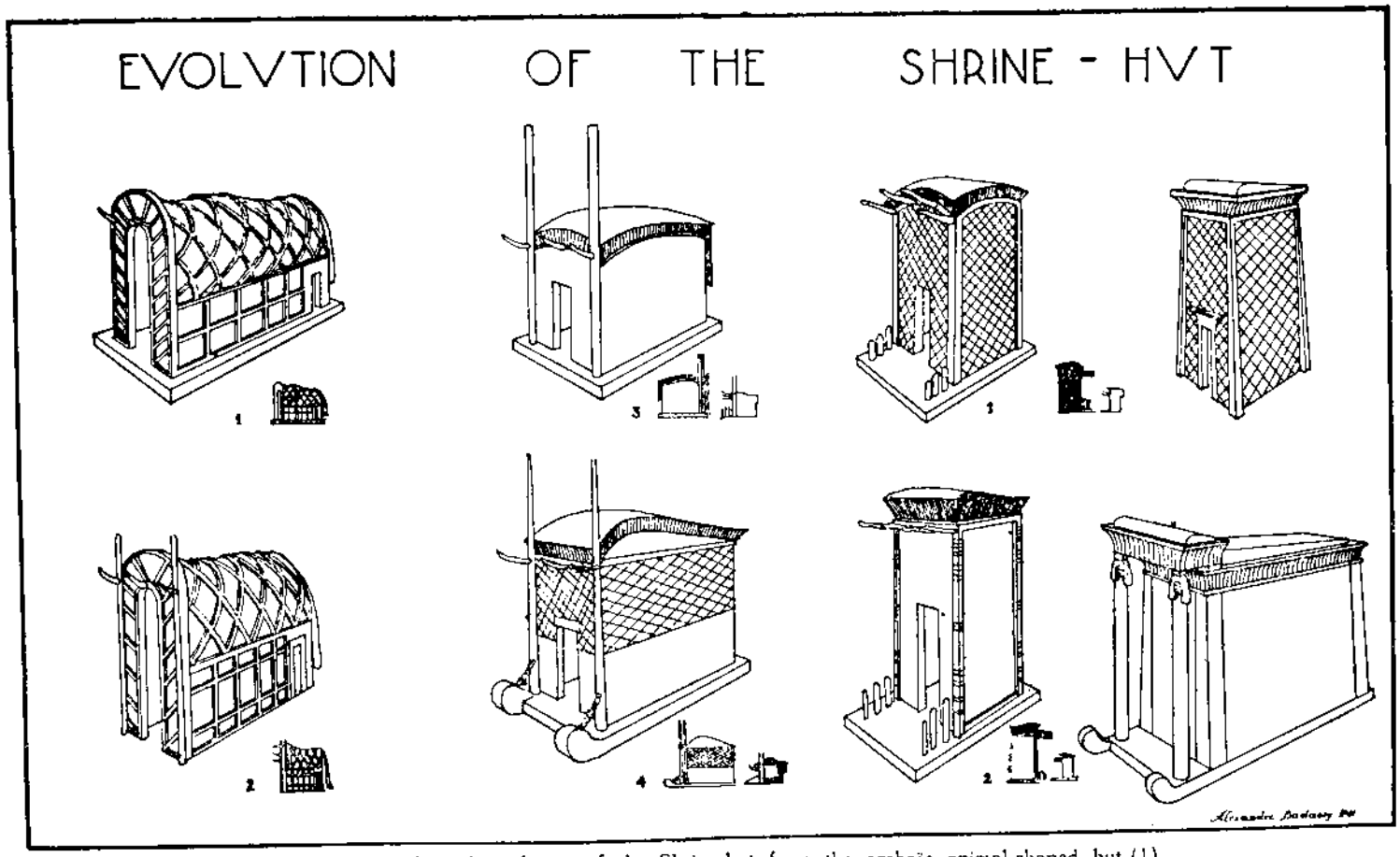

Fig. 59. Hypothetical evolution of the Shrine-hut from the archaïc animal-shaped hut (1) to the National Sanctuary of the South (2), (right corner).

Such elements form the essential features of a light structure where the four corner-posts, as represented in archaïc drawings (the so-called Osiris shrine), are the main vertical members about which are hung walls and roof. The rectangular section of the post would have been in favour of a wooden prototype[132], but for the convex semi-circular flutes which point to a bundle of stems. This is found in the hieroglyph of the open hut with post[133], as well as in the representation of the Hathor archaïc temple in the XVIIIth dynasty at Deir el Bahri[134].

The columns.- Although no single column in Djeser's complex is free-standing, yet it cannot be considered as pilaster since it shows the characteristic features of an engaged column. Four types with variations in the shaft or capital appear: the bundle-shaft, the fluted shaft, the papyrus column and the Upper Egyptian column.

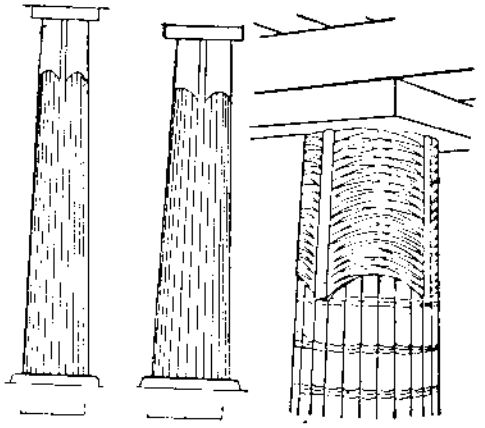

Fig. 60. The bundle shaft column in Djeser's complex and its assumed palm-leaves capital (Ricke).

The *bundle-shaft* (*fig.* 60) has a strongly tapering shaft (1.04m—2 cubits diam. at base), high (5.92m) and slender (0.7m at abacus), with 19 or 17 projecting roundings in the section, built in courses (23) and abutting at the end of transversal partition walls in the processional hall. At the top a kind of sheath covers the ends of the stems. Ricke does not consider these elements as columns but as protecting coverings for the but-ends of brick transversal partitions[135]. These transversal partitions have no original use in the plan and were introduced for structural reasons to strengthen the columns. Moreover the shaft would not have assumed such strong taper, had they been intended solely to cover the but-ends of internal partition-walls, doubtless with vertical faces in the mud brick original. Traces of red paint have been interpreted as pointing to a wooden prototype[136]. Colour is however no serious criterium, as red can also indicate conventionally dry reeds. Moreover ribbed vaults and arches in brickwork, painted red surely can only be stylised from structures in pliable materials[137].

The sheath at the top has been considered as a transposition from the leaves of the sedge-plant or the palm-leaves, if the shaft were of palm-fronds[138], spread around the top ends of the stems (*fig.* 60). A simple abacus

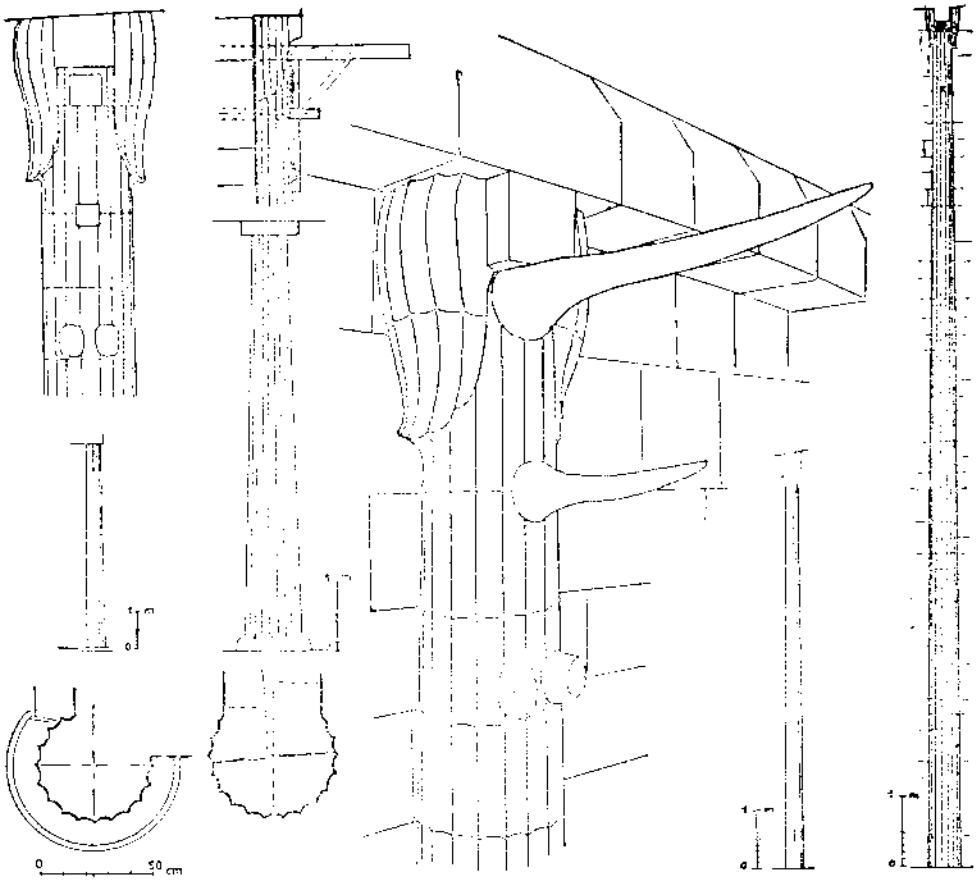

Fig. 61. Various fluted columns in Djoser's complex: (from right) Heb-Sed shrines, restored top of column in the "South Palace" (Ricke), restoration with bracket for emblem (Lauer), King's pavilion and mortuary temple.

served as seat to the architrave. The shafts are set on a thin base with tapering side.

The *fluted column* (*fig.* 61) is found in the royal pavilion, in the façades of the shrines of the Heb-Sed, in those of the Palaces of the South and the North and in the mortuary temple. Some of these columns are three-quarters corner-columns (Mortuary temple), the others however being semi-circular engaged columns. The flutes are concave and curved and would number, had the column been free-standing 20 (Mortuary temple), 14, 16 or 15 (façades of Heb-Sed shrines), 18 (Palaces of the South and of the North), 22 (King's pavilion[1530]). Dimensions and proportions vary: some are quite small (diam.

13-24 cm. façade of the Heb-Sed shrines), others are beautifully proportioned, somewhat sturdy (Mortuary temple, King's pavilion, diam. 0.77-0.48m), when compared to the slender engaged stems of the Palaces (12m ht. for the central column, diam. 0.5-0.28m). Some were crowned with an abacus (Mortuary temple, King's pavilion), others had a saddle-capital featuring a bracket in the front and two pendant leaves on the sides. A hole just under the bracket, sometimes with a second lower, may have hold one or two horns[139], copying the façades of archaïc shrines. It has also been proposed to set a Hathor-mask held in the top hole[141], the two side-pendants representing the wig shown in the later Hathor-capitals[141]. A third hypothesis inserts a wooden bracket for holding some sacred emblem with two tenons in both holes[142]. The columns of the Palace of the South have, still lower, two small projecting roundings, which were described as breasts (hypothesis of the Hathor capital) or two side-pegs (hypothesis of the bracket).

In all shafts a thin band runs at the bottom, slightly protruding above the flutes and reminding of a binding. The lower part of the shaft is painted black, while the upper part is red, and it has been suggested that it represented a leather sheath protecting the wood from mechanical wear and humidity and was secured at its top ridge with a copper ring[143]. While the shafts of the columns in the Mortuary temple and the King's pavilion have bases, those of the heb-sed shrines and the Palaces have not.

What is the origin of the fluted column ? Could it be found in a wooden post regularly cut in shape with an adze, whose traces would have suggested fluting ?[144] Or in a bundle of stems plastered with mud and along which the plasterer would have traced vertical flutes ?[145] Or from the polygonal pillar where chamfered edges would have been slightly curved for aesthetic reasons ?[146] The question remains open. Flutes could have been suggested by a section of dried mud plaster pealing off a reed wall.

The *papyrus column*[147] is used engaged in the small façade to the East of the Court of the North Palace. Three columns represent three stylised papyrus plants. The shaft is triangular in section, with slightly convex sides and a marked enthasis and carries a beautiful capital, sometimes called campeniform, having already the shape of the open papyriform capital used till the Roman times.

The Upper Egyptian column[148] appears as engaged column, with cylindrical shaft, showing a binding under the capital. The latter is lost but presumably would have represented a flower emblematic of Upper Egypt, perhaps the iris.

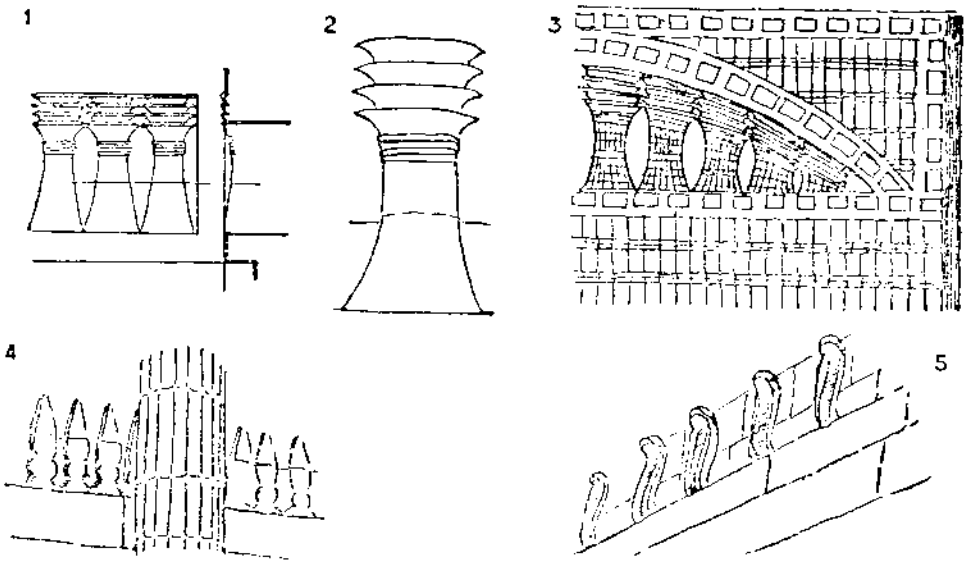

Fig. 62. Sculptured ornament in Djoser's complex: frieze of Djed (sculptured, 1; in faience, 2-3), of Uraei (5) and of Kheker (4).

The *kheker ornament* (*fig.* 62, 4). – Both the South and the North Palaces have a frieze of kheker ornament carved on the façade and representing the ornamental tufts at the upper end of a papyrus-stalks wall, tied together in bundles[(158)]. This decoration is known from drawings of predynastic cabins of boats and from the hieroglyphs of the palace-tower and the palace-enclosure. The kheker-hieroglyph means "adorn, ornament" and the frieze will be commonly used at the top of a wall decoratein or a piece of furniture.

The *djed-ornament* (*fig.* 62, 1-3). – This ornament, which features a series of pillars imitating a bundle of reeds, graded at the top, is used as a window-screen represented at the top of the throne-chamber in the King's pavilion, sculptured in stone, or in blue-glazed tiles in the arched panels of the underground chambers of the pyramid and the mastaba. The hieroglyph of the djed-column sumbolizes stability and the ornament will often be used later in window-screens or partitions.

The uraeus frieze. – Along the top of the recessed wall surrounding the South court runs a frieze of uraei or cobras, cut in high-relief, every serpent corresponding to the axis of a panel or a pilaster. This animal was sacred to Wadjit-Buto the goddes protecting the North kingdom and the frieze

may have pointed symbolically to the Buto burial performed in the mastaba[150] (*fig.* 62, 5).

The stairways. Small stairways of stone lead to two niches in front of two of the Heb-sed shrines and at both ends of the Heb-sed pavilion basis. They are independant, without parapet, each step being cut in one block fitting in the one below it with the tread sloping steeply and the lower riser at right angles to it. A constant feature is the rounded front riser of the lowest step.

The construction (*fig.* 63). — The complex of Djeser marks the earliest use on a large scale, of stone masonry. Stone had been in use since the Irst dynasty, in small parts of tombs, such as ceilings, pavements or porteullisses. King Kha'sekhemwy lined his funerary chamber with dressed stone and used granite for his temple at Hierakonpolis and a building at El Kab. The district of Memphis seems however to have had, at an early date, experienced craftsmen in stonework, a fact due probably to the rich limestone quarries at Ma'sara-Tura. The necropolis at Helwan, depending from the ancient Heliopolis, shows a general use of stone masonry, ever since the Irst dynasty. It is not, therefore, extraordinary that Imhotep decided to build the whole complex in stone and case its buildings with fine limestone from Tura.

It must be pointed out that the complex does not consist of true architectural projects, except in the King's Pavilion, since they are dummy buildings mostly filled in and where the apartments occupy only a small area. A direct consequence is that the majority of the façades consist of retaining walls of rough masonry lined externally with fine limestone. When independant thick walls with two faces had to be built they followed the same type of construction, and two retaining faces enclose a filling. Such will be the power of tradition that thick enclosing walls will be regularly built in this way. Thinner walls (0.5m) have already courses of headers alternating with courses of stretchers, or (0.6-0.85m) courses of headers on one face and stretchers on the other[151]. Such characteristics could have been borrowed from brickwork bond.

The blocks are relatively small, a feature suggested by the early use of brick, and joints fit exactly on the external face, but open inside. A common practice is patching holes by cutting these square and inserting pieces fitting in them. This would have been a copy of the method of patching carpentry.

Courses are inclined towards the exterior, another feature perhaps copied from brickwork and which was not followed later. In the façades courses follow a curved line, due to the fact that they had to meet the corner courses, caused to slant to afford a bondage. The upper part of the blocks was dress-

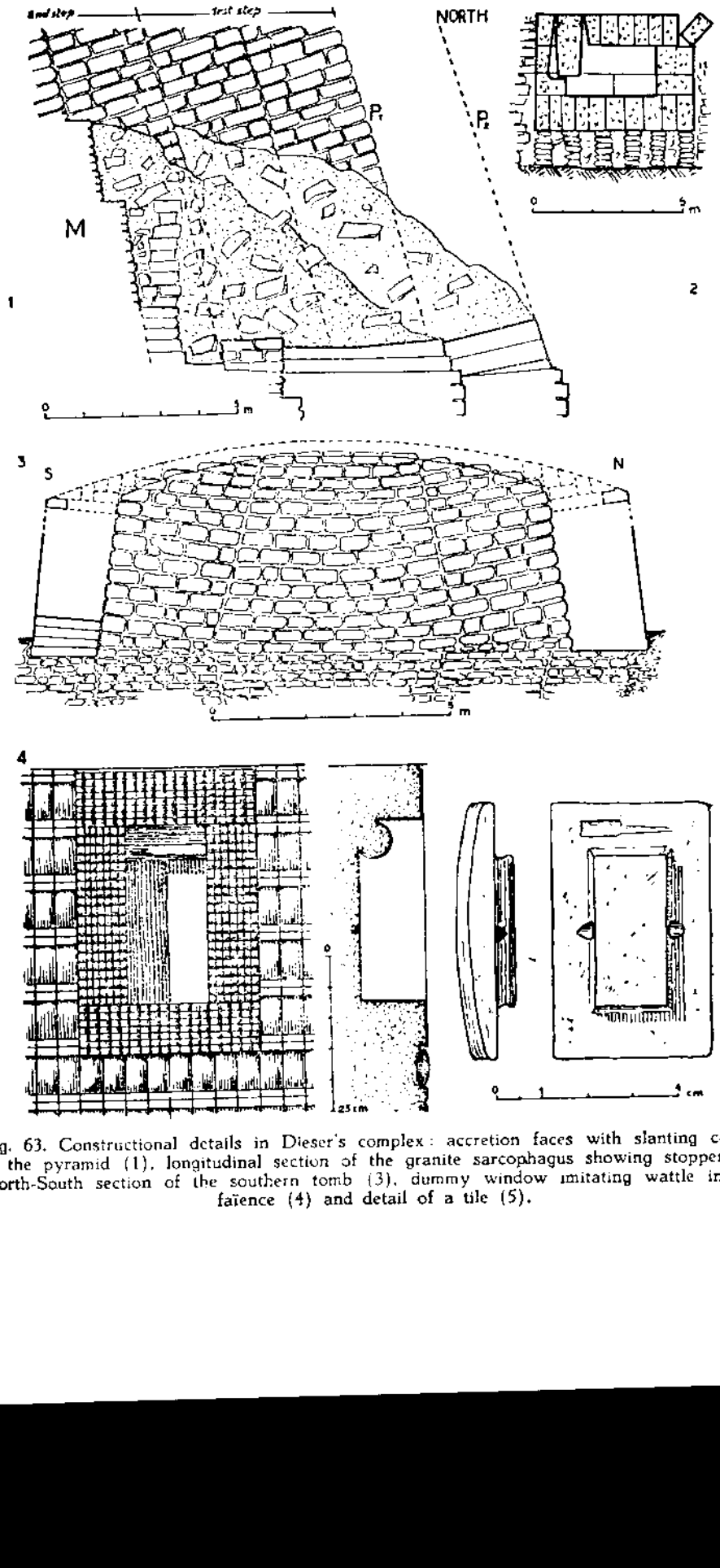

Fig. 63. Constructional details in Dieser's complex: accretion faces with slanting courses in the pyramid (1), longitudinal section of the granite sarcophagus showing stopper (2), North-South section of the southern tomb (3), dummy window imitating wattle in blue faïence (4) and detail of a tile (5).

ed when set in the course and liquid mortar was poured in the joints to fill vacuums, both features apparent in later masonry.

Stones were not yet bound together, except at the top of walls or parapets, or between the last course of a column and its abacus, where blocks have sockets on their lower face. Columns, all engaged whether in the façades or at butt-ends of walls, followed the courses of the surrounding masonry and were in more than one block to the course.

Mortars used are of a type special to this complex and not used elsewhere, being a mixture of powdered limestone (85:100) sand and mud (14:100), poured when in a liquid state.

Traces of colours have been found on many parts of the structures, mainly on columns, ceilings, dummy doors, suggesting plant stems or wood originals. Unlike later use of colour the pigment was applied directly on the stone, without any intermediate plaster.

Although some only of these features were retained in later periods, yet masonry is quite different from that of the IVth dynasty. The latter has been called megalithic on account of the large size of the blocks used, but it shows many characteristic noticed in the complex[152], especially in the later stages of the construction: irregularity in the courses, inclined joints, patching, lining of rough masonry or rock, use of colour. Masonry as a whole was of inferior quality and its follower in the IVth dynasty, marking a further stage in the development, improved both in materials and in method.

THE DEVELOPMENT OF THE MORTUARY TEMPLE

All the kings following Djeser built for themselves pyramids as their places of burial. To the pyramid was attached a complex of buildings, necessary for the performance of the funerary rites at the time of burial and the daily offering service. Both rituals formed, ever since the IIIrd dynasty, a mixture of various concepts originating from different religious centres.

The complex consists of an *offering-chapel* abutting on the pyramid, a *funerary cult-temple*, sometimes paired with a foretemple and connected by means of a ramp or portal, erected on the boundary of the desert and to which arrived a canal or waterway for the funerary processions. In every one of those buildings certain rites were performed, reminiscent of their original religious centres.

The offering-chapel.— The offering-chapel abutting in the axis of the North or East face of the pyramid and whose essential elements were one or

two abydian stelae and an offering-table, resulted from the development of the offering-place in front of the Abydos royal tombs. The plan had developed, from the simple court enclosed within a wall, into a court containing the stela and offering-table, preceded by a covered antechamber and a forecourt[155]. At Djeser's pyramid the offering-chapel should have stood on the North face, while it is already on the East face in both Snefru's pyramids at Dahshur, and recognisable at Mykerinos' pyramid. The two stelae have however been replaced by a stela and probably a statue, and they will later disappear altogether, replaced by statues (Neuserre', Vth dynasty)[154].

At the end of the IVth dynasty the open offering-court and the stela will be replaced by a roofed chamber containing a false-door (Shepseskaf's mastaba)[156].

The funerary cult-temple. A wide passage stood in the IVrth dynasty complex between the offering-chapel and the funerary cult-temple, planned symmetrically on the same axis (except at Userkaf's). A corridor led from the North corner at the back of the funerary cult-temple to this passage, thus establishing a connection with the offering-chapel. This corridor will later evolve towards an antechamber and a chamber whose walls will be decorated with the jubilee scenes of the kings and the gods[156].

The funerary cult-temple has as its most essential elements five adjacent chapels in its back wall. The origin of such a plan is to be sought in the first dynasty temple of the "First of the Westerners" (*Khentiamentyw*), the god of the dead at Abydos. Here are three adjacent chambers, opening on a wide hall preceded by two forecourts. The function of this temple was to provide the dead in the neighbouring necropolis with offerings from its sacrifices-court and with protection. The deceased king was endued with divinity through his statue, after the performance of ceremonies in the middle chapel of this temple.

This first copy of this temple in a royal complex is to be found at Djeser's, in front of the S.E. corner of his pyramid. Part of the interment procession went to the South tomb for the "Buto burial" ceremonies, and the rest to the pyramid for the "Abydos burial", passing in front of the temple of the "First of the Westerners"[157].

To these three chambers were added two others, somewhat different in size, representing the South and North national shrines, all five chapels containing statues. These two chambers seem to be represented at Djeser's in the initial stage of their evolution by the South and North Palaces[158].

The sacrifices-court of the Irst dynasty temple at Abydos is transposed in the Great court at Djeser's and in the wide court in front of the chapels of the IVth dynasty complexes[159]. The peculiar indented part connecting the wide court to the statue- chapels seems to represent symbolically the element known from the Pyramid texts as the "Portal of Nut", which will be named in the Vth dynasty "Portal of Nun"[160].

In Cheops' temple the walls were decorated with low-reliefs, a feature which led to their sheltering behind a pillared portico running in front of the walls[161]. The Portal of Nut will later, preceded by the wide hall, secede from the court (Userkaf-Sahure') and evoluate into a small antechamber and a corridor, respectively (Pepi II)[162]. The separation between the offering-chapel and the court, itself a transposition from the sacrificial court of the archaïc Abydos temple, seems to point to an appropriation of this court by Re', who rose in the Vth dynasty in the first place in the royal funerary cult[163]. An altar is erected in this court, upon which sacrifices are burnt.

In Sahure's temple the court will be turned 90° in plan so that its longer dimension will be along the longitudinal axis, a disposition which will be later regularly adopted (Neuserre', Pepi II)[164]. This court was surrounded by a portico with palmiform columns, a reminiscence from the early palm-forest at Buto[165].

The valley-temple. — The idea of a building on the boundary of the desert and in which the interment ritual was to be performed was already known in the Irst dynasty temple of the "First of the Westerners" at Abydos. Osiris was the successor of this early god of the dead and the temple was transposed into a building in which the ritual repetition of the purification and mummification processes could be performed on the mummy and the statues endued with life through the "opening of the mouth" ceremony[166].

The valley-temple, of which the earliest excavated example is the one of Chephren, consists according to Ricke-Schott in seven parts, corresponding to their ritual functions. In the light of the Pyramid texts they could recognize structural elements such as would be used for landing, ritual purification, protection, mummification and opening of the mouth[167]. All these are symmetrically set about a longitudinal axis.

For landing, two arms, symbolical for the reception of both processions from Buto and from Abydos, lead by means of a pair of corridors in which was performed the ritual purification of the mummy, to the mummification quarters. The real purification of the dead body actually had taken place in a wattlework hut, shown in scenes of the VIth dynasty private tombs at Giza

and Meir. The plan of this light structure is a T-shaped hut with two landing-ways at both ends. The middle element is to be understood as a wattle quay hanging over the canal[165] (symbolical for the "sedge-fields" of the pyramid texts). The equipment for purification was kept in this hut: baskets, a wooden hand, life-signs, sandals, courses of a meal, caskets with papyrus-rolls[166].

The mummification quarters stood in a wide hall adjacent to a deep hall, both with pillars (6 at Chephren's) or columns (8 in the wide hall at Sahure's and Neuserre's). Private tombs of the VIth dynasty show representations of a mummification hut in plan and elevation: this is a one-room structure, preceded by a forecourt with screen-wall and a shed on two palmiform columns. The top of the building can be ornamented with a kheker row. A wall with an indirect entrance in one corner seems to have surrounded the building[167]. In the Vth dynasty and probably due to the influence of the sun-cult the purification quarters even displaced mummification quarters which were no more hidden behind a wall, but with a façade completely open. This resulted in an open-axis plan (Sahure', Neuserre'). Towards the end of the Old Kingdom, as the Osirian religion regained some of its power, the ritual mummification quarters were again hidden (Pepi II)[171].

The rites of the "opening of the mouth", connected according to the Pyramid texts with those of mummification, were observed in the deep hall, itself adjacent to the wide hall of mummification (Chephren). The ceremony was probably performed on the mummy set in the middle of the hall and the royal statues against the walls. These statues represented the king as embodying so many deities. Under the influence of Re' the opening of the mouth quarters were crippled into a niche (Sahure'), while the whole building became more a portal than a temple. This does not last and the temple is later provided with hidden mummification quarters and a western chamber for the opening of the mouth (Pepi II).

Beginning from Snefru a building reproducing in plan the valley-temple appears and was later (Chephren) erected before the funerary-cult temple: this is the *foretemple* with wide and deep halls and a series of six deep niches. One group of four niches, two of which are shorter, was to harbour the inner organs of the deceased in a Buto burial. The second group of two niches was for the Upper and Lower Egyptian crowns, in a ceremony related to Sais[172]. Later these niches (Shepseskaf, Khentkawes, Mykerinos) will be set in the substructure or the inner rooms of the tomb itself.

The causeway. – With the valley-temple appeared the causeway which connected it to the funerary temple. At the origin it was an open-air ramp,

bordered by two side-walls (Meydum, Dahshur), but was later roofed to hide processions from lay eyes and protect the low-reliefs which decorated its walls (Sahure', Neuserre', Pepi II)[173]. These scenes represented the king as lion or griffin triumphing over his enemies, a subject which recalls the carving of the Great Sphinx to the North of the causeway of Chephren[174].

DESCRIPTION OF THE MORTUARY TEMPLES

Nothing has survived from the suprestructures of the two early pyramids at Zawyet el 'Arian. The remains of the complex at the North pyramid of Snefru at Dahsur have not been excavated. As this pyramid is later than both the South pyramid at Dahsur (the Rhomboidal pyramid) and the pyramid a Meydum, it is to be surmised that it shows a later stage in the development of the complex.

The Rhomboidal pyramid at Dahshur (*fig.* 64), ascribed to Snefru, has an offering-chapel in the middle of the eastern face, a foretemple at some distance down the plateau and probably a valley-temple not yet excavated. The offering-chapel is a brick wall enclosing a court with two stelae and an altar. The wall was not directly abutting on the face of the pyramid, so that there were two side-passages beside the main entrance set at an angle in the eastern façade of the enclosure.

The foretemple, built entirely of stone, had a South entrance façade along a court connected with the causeway (*fig.* 64). Two stelae with Horus-names were erected at both ends of the outer façade of the court-wall, with both Horus-birds directed towards the upper end of the causeway. The building, on a rectangular plan, (47.2 x 27.2 m), has two main parts: an antechamber whose walls were decorated with the fine offerings-bearers in relief, flanked by two similar rooms on both sides, presumably for dual ceremonies of the North and the South, a large court at whose back stands a portico with two rows of rectangular pillars, before a series of six shrines at a higher level than the court. These have been identified as the four rooms to contain the inner organs, or "Buto burial", and the two repositories for the two crowns or "Sais burial". A brick wall surrounds this building and unexcavated brick rests to the North.

The causeway turned at an angle, after the court, and was bordered by two thick walls about six cubits high.

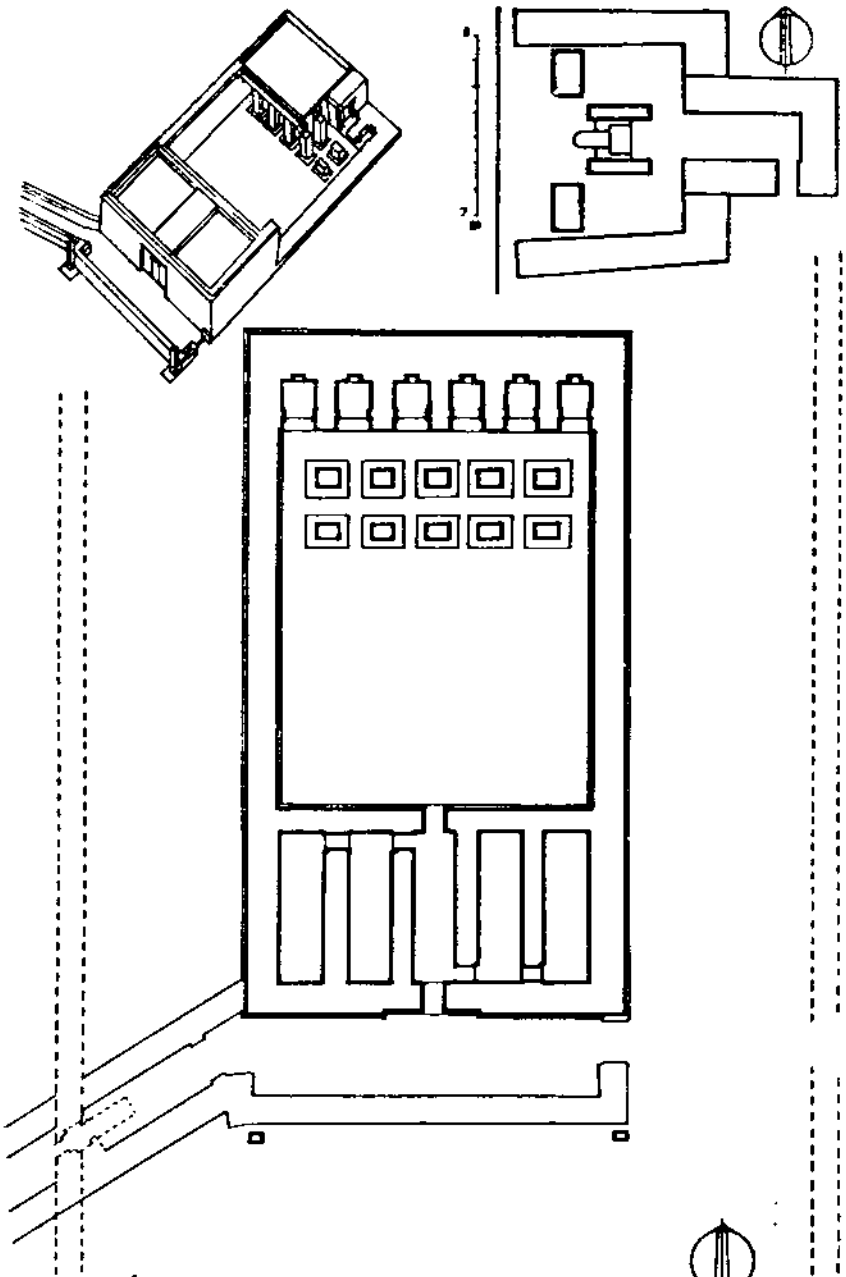

Fig. 64. The mortuary temple of the rhomboidal pyramid at Dahshur: the offering-chapel adjoining the east face, of the pyramid (top right) and the funerary cult-temple restored in plan and perspective (Ricke).

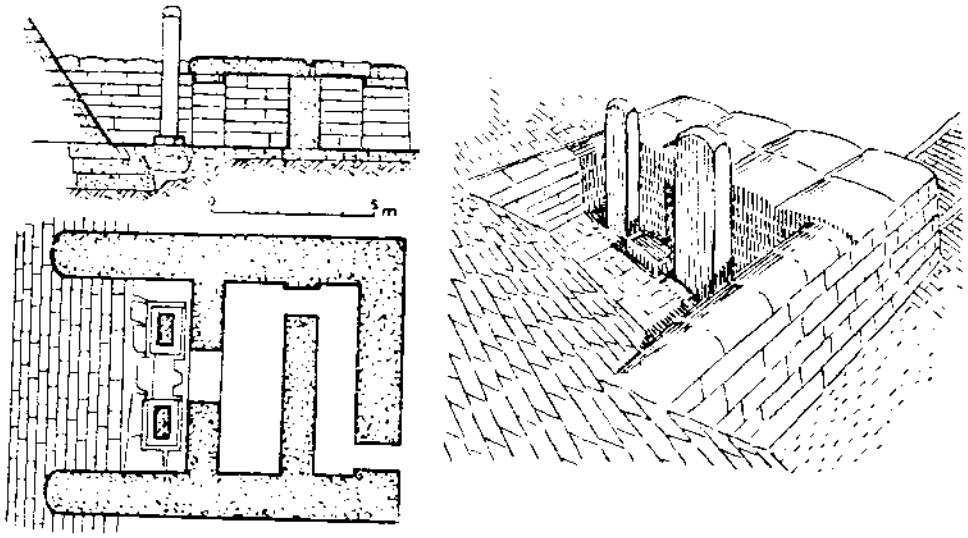

Fig. 65. The offering-chapel of the pyramid at Meydum, in plan, section and perspective.

THE MEYDUM COMPLEX (*fig.* 65). – This pyramid was surrounded by a stone wall enclosing a mud-plastered area in which stood a small pyramid, a mastaba and an offering-chapel abutting on the East face of the pyramid. The plan of the chapel is square and the limestone structure consists of an open court with a pair of monolithic limestone stelae, rounded at the top, without inscriptions, and an altar preceded by two roofed anterooms. The entrance is at one end of the façade and the doorway to the second anteroom at the other end of the opposite wall, thus providing a screen-wall disposition. No inscription seems to have been planned for the walls or stelae.

About eighty feet eastwards a narrow doorway gave access to two side-rooms and the causeway. This was bounded by a round-topped wall, about four cubits high (2.1 m), with two doors on either side of its upper end. A door with two leaves set in two sockets closed the lower end of the causeway, before it reached the valley-temple. This is now under water.

THE CHEOPS COMPLEX (Giza) (*fig.* 66)[1176]. – Traces remaining on the basalt pavement of Cheops' complex have enabled the restoration of the plan. Nothing is now apparent of the offering-chapel. The funerary cult-temple stands in the axis of the eastern face, on a rectangular plan (100 x 82 cubits), adjacent to the enclosure of the pyramid and consisting of a court surrounded by a row of square granite pillars, with a double indentation on the back wall and two further rows of pillars. This is Nut's portal[1177], communicating

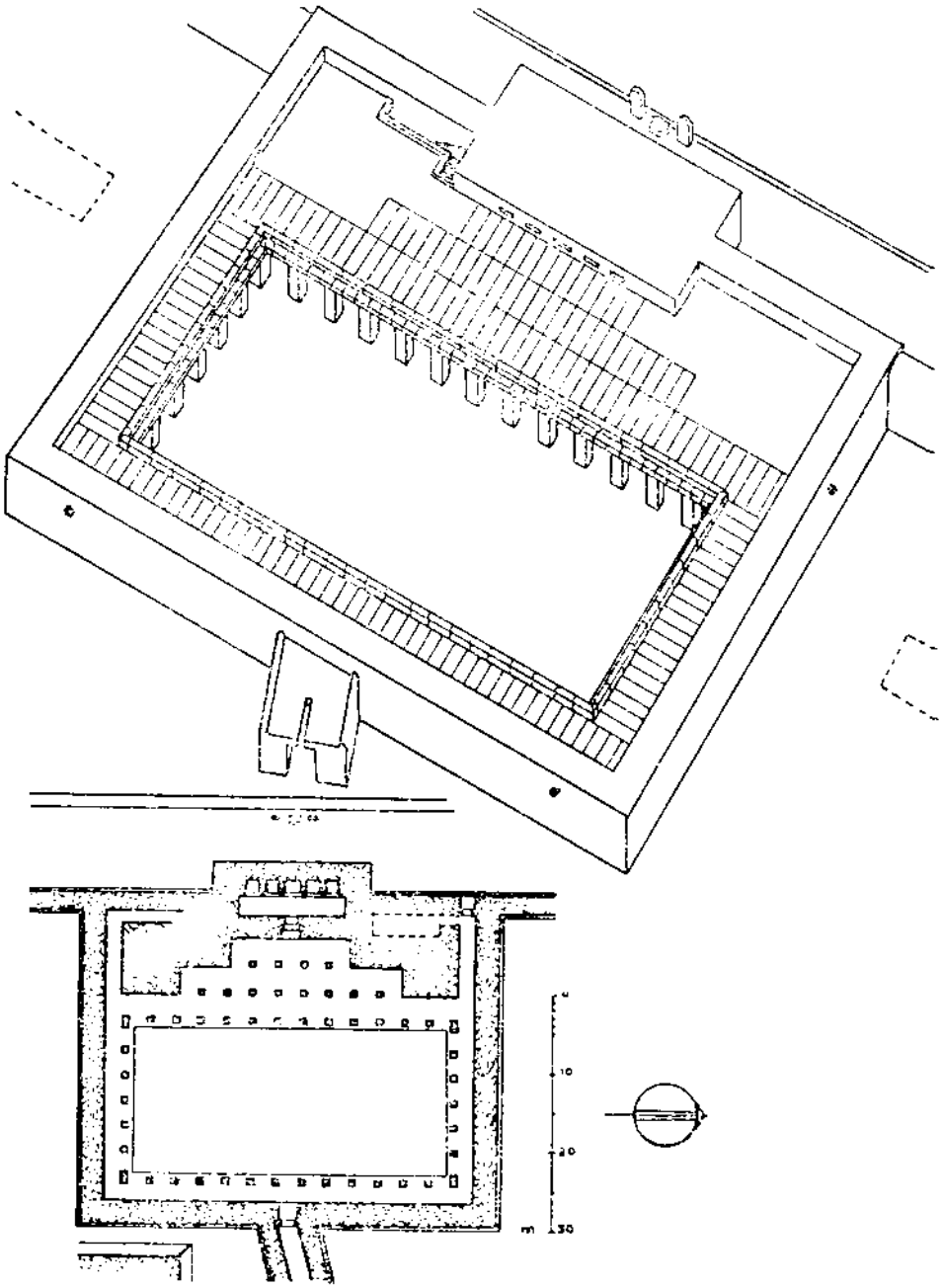

Fig. 66. The funerary cult-temple of Cheops' pyramid. in plan (Lauer) and axonometric view (Ricke).

through a small doorway with a transversal chamber, where one could restore five statue-niches[179]. A passage at the N.W. corner of the court leads to the enclosure of the pyramid, paved with fine limestone. The façade and walls were also of limestone, six cubits thick. If compared with the complex of Mykerinos and Userkaf, this temple of Cheops is found to be the prototype of that of Userkaf, with that of Mykerinos as intermediate stage. A causeway leaves the middle of East face, at an angle and is built on the rock or on an embankment of masonry, passing over a bridge. Its lower end and the valley-temple lie hidden under the modern village of Nazlet el Samman. Near the middle of its course a way crossing the causeway was bridged over by this one. According to a late tradition recorded by Herodotus (II. § 124) : "The period during which the people were submitted to extenuating labours would have amounted to ten years for the preparation of the ramp along which the stones were dragged, a work which according to my appreciation, is no less than the pyramid (its length is indeed five stades, its width ten orgyes, its height at the place where the ramp is the highest eight orgyes), worked in polished stone engraved with figures". Recently fragments of fine reliefs have been found, which could be ascribed to the walls of the causeway[179]. Rests of water canalisations found around the temple were probably to dispose of the huge quantities of rain-water from the faces and areas of the pyramid and temple. Two excavations on the North and South sides of the temple and a third along the North upper end of the causeway were intended to contain wooden barks to be used by the deceased king in his afterlife to accompany the sun in its daily course, or according to the Osirian religion, to travel to Abydos and Busiris.

THE CHEPHREN COMPLEX (Giza, *fig.* 67). - The complex of Chephren (Khafre') is by far, with that of Userkaf, the best preserved example. From the offering-chapel nothing has survived. The funerary cult-temple, doubled with a foretemple, occupies a long rectangular plan in the axis of the eastern face, outside the enclosure wall. The masonry is of local nummulithic huge limestone blocks, faced internally and externally with granite. The plan shows the first influences of the solar cult: the court is rectangular, dedicated to the sun, surrounded by a row of rectangular piers, while the two-stepped vestibule or "wide hall" (Nut's portal), has been separated and set in the foretemple. The drain in the alabaster pavement of the court was to dispose of rainwater. Against the piers, in shallow niches, seated statues of the king were set[180]. Opposite every one of the five doorways between the piers, at the back of the court, opened a deep shrine containing a royal statue and perhaps barks,

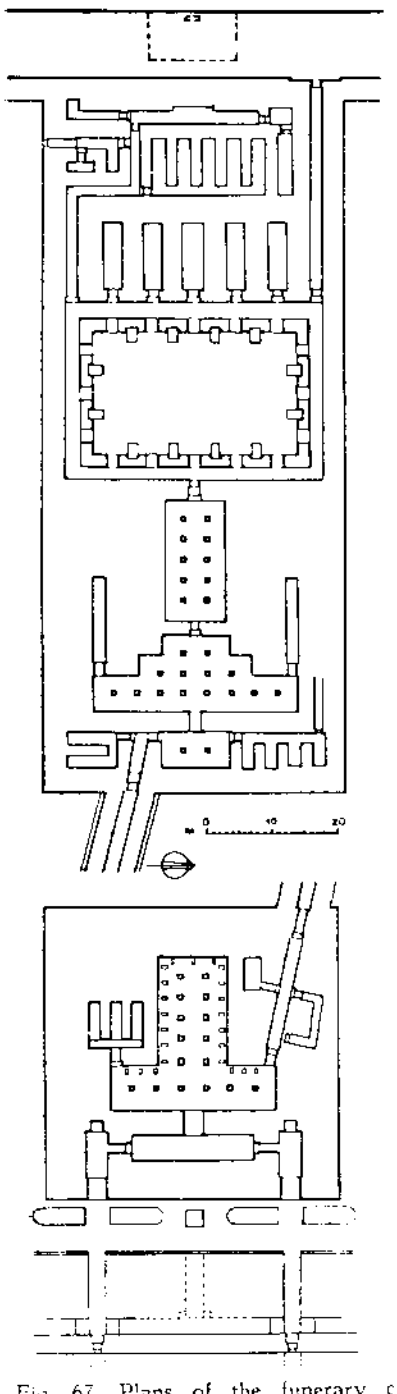

Fig. 67. Plans of the funerary cult-temple (top) and the valley-temple of Chephren.

specially in the northern and southern ones. To these five barks presumably corresponded the five barks excavated around the temple[181]. A deep hall lay between the wide hall and the court, and red granite pillars supported the roof of both halls. A long corridor connected the N.E. corner of the court with the pyramid enclosure.

In the foretemple two groups of niches, two of granite at the S.E. end and four of alabaster at the N.E. end of the transversal corridor, corresponding to the six niches in the valley-temple, also of the same materials, would have been used to contain the four alabaster sarcophagi of the inner organs (Buto burial) and the two crowns (Sais burial)[182].

A causeway, following a ridge of the rock, passes to the South of the Great Sphinx and reaches the well-preserved valley-temple[183]. The disposition of the plan served as model to that of the foretemple: a wide hall for the ritual mummification, adjacent to a deep hall for the opening of the mouth, with granite pillars and at one end, six niches in two storeys for the Buto and Sais burials. The transversal vestibule with two corridor-mouthes served for protection ceremonies. The outer walls of the structure are battered and faced with granite. The façade is sober, with two doors at both ends, flanked by sphinxes. A band of hieroglyphs giving the names of the king is the only ornament used on the otherwise polished façade. This massive simplicity, joined to the beauty in proportions and the adequate use of choice materials, are the characteristic features of IVth dynasty architecture, in sharp constrast with the IIIrd or even the Vth dynasty[184].

THE MYKERINOS COMPLEX (Giza, *fig.* 68).— Mykerinos (Menkaure') never finished the construction of his pyramid complex, the greater part of which was completed in brick by his successor Shepseskaf, on a widely modified plan.

Remains of the square granite pavement of an offering-chapel have been found, adjacent to the eastern face of the pyramid. From sunken traces in the pavement the structure could be restored:[185] a small court containing a stela and preceded by a roofed anteroom with side-entrance. This, however, was not carried higher than the basis and it was modified by Shepseskaf and reconstructed in the VIth dynasty. It can be surmised that, instead of the second stela, a statue was erected in the small shrine, to be seen in the Shepseskaf project.

The construction of the funerary cult-temple was only begun by Mykerinos. The masonry is of the megalithic type, in huge local nummulithic limestone blocks to be partly faced with black granite. The plan is a square, with a court, a wide hall, a two-stepped "Portal of Nut" and one single deep statue shrine. In the original project a row of pillars would have carried the roof of a portico running round the court. This was replaced by a recessed brickwork facing. This unusual feature has been explained as

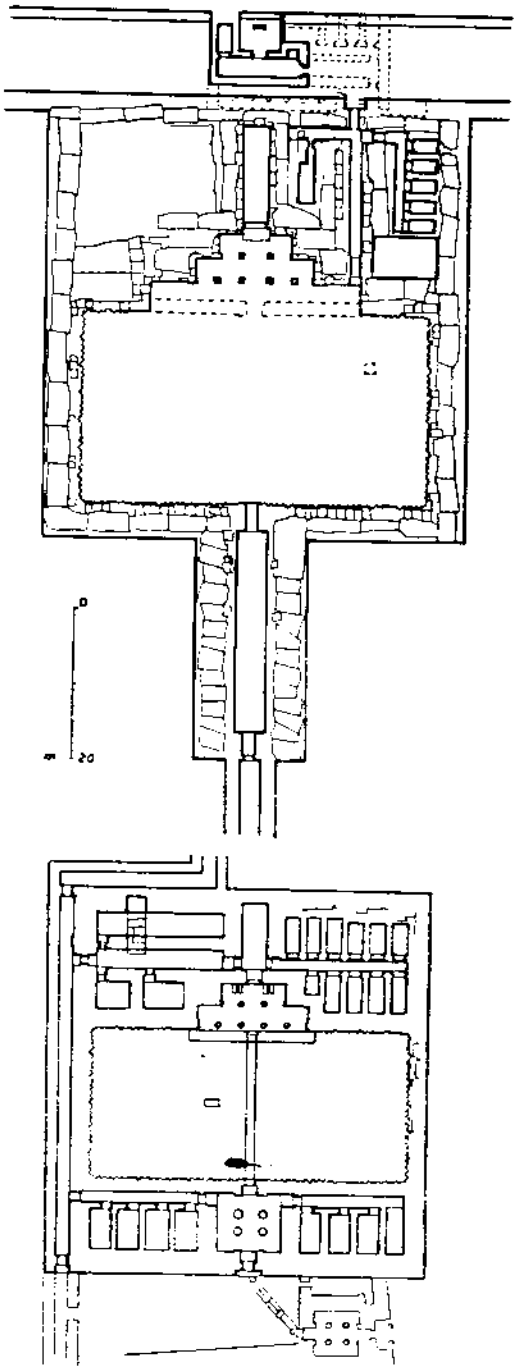

Fig. 68. Restored plans of the funerary cult-temple (top) and the valley-temple of Mykerinos.

symbolical of Buto, instead of the more expensive characteristic low-reliefs or reproductions of palm-forest in granite columns (Sahure', Unas)[186], used elsewhere as an environment for the Buto ritual. The single shrine in the axis, replacing the five statue-shrines known elsewhere, may have been dedicated to Osiris. The other deities would have been represented by statues erected in the Portal of Nut, where actual remnants of such statues were found in situ[187]. The empty space to the South of this shrine, accessible through a doorway in the wide hall would have been occupied by five magazines, with limestone walls.

In the N.W. angle of the wide hall a corridor leads to the pyramid enclosure and would have presumably been flanked, according to the original project, to the South, by the chambers for the two crowns (Sais) and to the North by the four chambers for the inner organs (Buto). This was replaced by Shepseskaf by five magazines[188]. The foretemple is represented only by the deep hall, between the court and the causeway. The sacred places for Buto and Sais were however shifted for the first time in the tomb itself: near the sarcophagus chamber in the pyramid are four shrines for the sarcophagi of the inner organs and two others for the crowns[189].

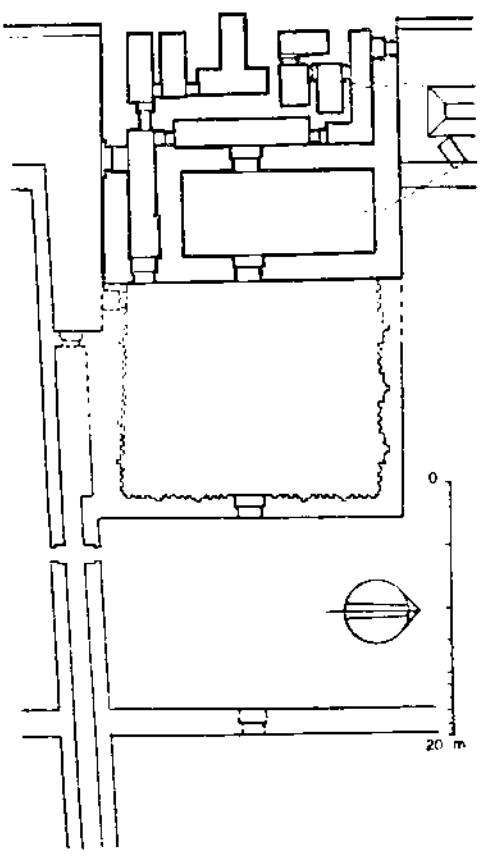

Fig. 69. The mortuary temple of Shepseskaf (restored plan).

That the court was treated in the characteristically Buto-recessed walls and adjacent to the wide hall, seems to point out that the Osirian religion had again come to an agreement with the sun-cult of Re'[190].

The valley-temple is on a square plan, built in brick instead of local limestone, on the model of the funerary-cult temple. The causeway turned round the South side of the temple and was connected to it by two doorways. That the project has nothing of the usual valley-temple programme suggests that it was built after Mykerinos' death. A vestibule with four columns and

connected by a corridor to four rooms on both sides, leads into the court with recessed wall facing. A two-stepped wide hall at the back of the court is connected with one axial shrine, itself communicating on both sides with series of chambers.

THE SHEPSESKAF COMPLEX (Saqqara, *fig.* 69).— Shepseskaf built a monumental tomb in the form of a house, the so-called Mastabat Far'un. That the superstructure of the tomb itself has adopted the form of a house shows clearly Lower Egyptian influence. The mortuary temple shows a peculiar plan. The offering-chapel is the first example to show a roofed room containing a false-door set in the vertical back wall, a concrete substitution for the former abstract stela element[192].

The plan of the funerary cult-temple is a rectangular enclosure, with the offering-chapel at its back. A side entrance leads from the tomb enclosure to the deep hall, having here the shape of a corridor set along the South side and opening to the East into a court with recessed brick walls, and to the West into another corridor and the wide hall at the back of a second court. This one, representing the initial sacrificial court of the primitive "Temple of the First of the Westerners" at Abydos, seems here to be dedicated to the sun-god Re'. The causeway runs along the South side of the unsymmetrical temple. The structure is in limestone, except the Irst court and the causeway, which are in brick. It is to be surmised that the long causeway ended at a Portal.

As in the pyramid of Mykerinos the four shrines for the inner organs and a room for the crowns have been added to the sarcophagus-chamber[193].

THE USERKAF COMPLEX (Saqqara, *fig.* 70).— The complex of Userkaf's pyramid at Saqqara was destroyed by Saite builders. The monument was situated on uneven ground so that only the offering-chapel could be planned on the East face of the pyramid, the funerary cult-temple being set on the southern face (Firth, Lauer). However Ricke would find in this abnormal plan provision of an ideal place for the Re'-cult to be introduced in the royal funerary cult[194].

The offering-chapel in the middle of the East face of the pyramid could have been a roofed chamber containing a stela flanked by two side-chambers[195].

The funerary cult-temple, symmetrical in the axis of the South face of the pyramid, is similar in plan to that of Mykerinos : a court surrounded on three sides by a portico upon pillars, communicating on its South face by two doorways with the wide hall and the Nut-portal. At the back of the latter a doorway leads into a transversal chamber with three shrines (five according

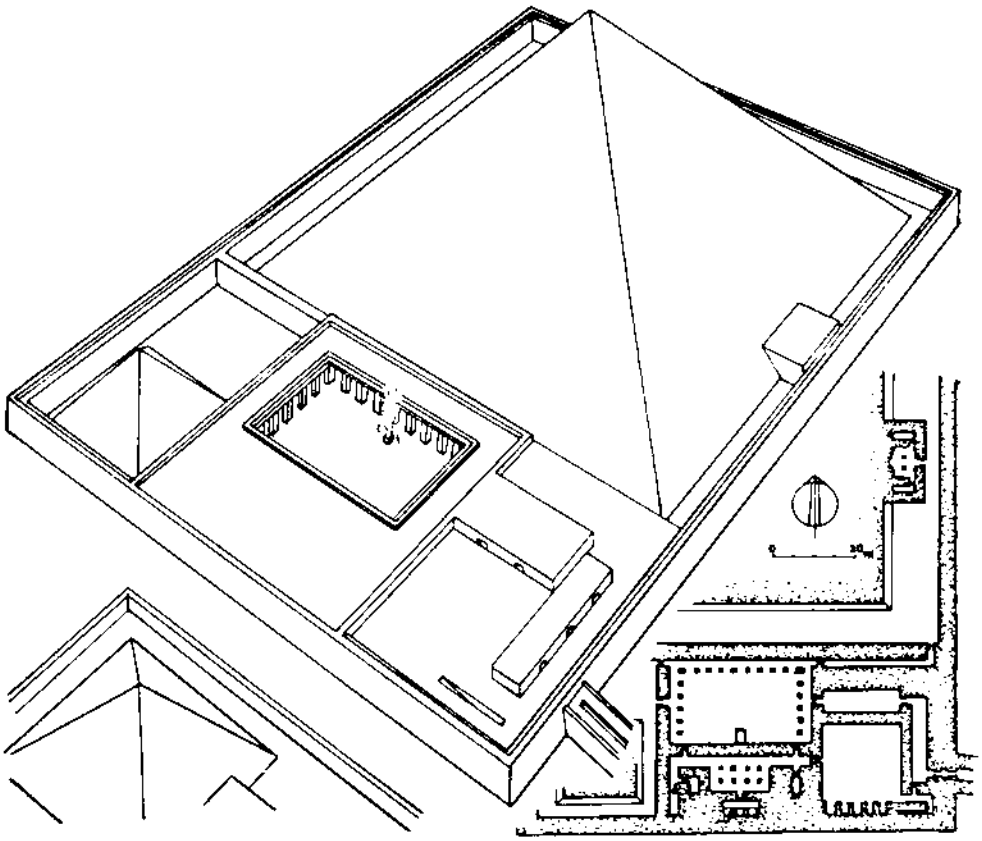

Fig. 70. Restored plan of the funerary cult-temple of Userkaf (Lauer) and perspective view (Ricke).

to Lauer), a direct replica to the sanctuaries in the temple "the First of the Westerners". At both ends of the wide hall, in front of the doorways to the court the two shrines for the South and the North open. The disposition of the court, with its longer axis in an E-W direction enabled a proper illumination of the altar by the sun. The separation of this court from the core of the temple by a wall resulted in the absence of a porticoed aisle along this wall, a failure from the aesthetic point of view[196].

The colossal red granite statue head of the king could have been part of a seated figure erected in the middle of the South wall of the court. The axiality of the main elements of the temple : statue-shrines, Nut portal, wide hall, colossal statue, altar and pyramid, with the tomb-chamber corroborates

their mutual relation. The foretemple is represented by a deep hall between the East wall of the court and the causeway. Nothing is known about the valley-temple.

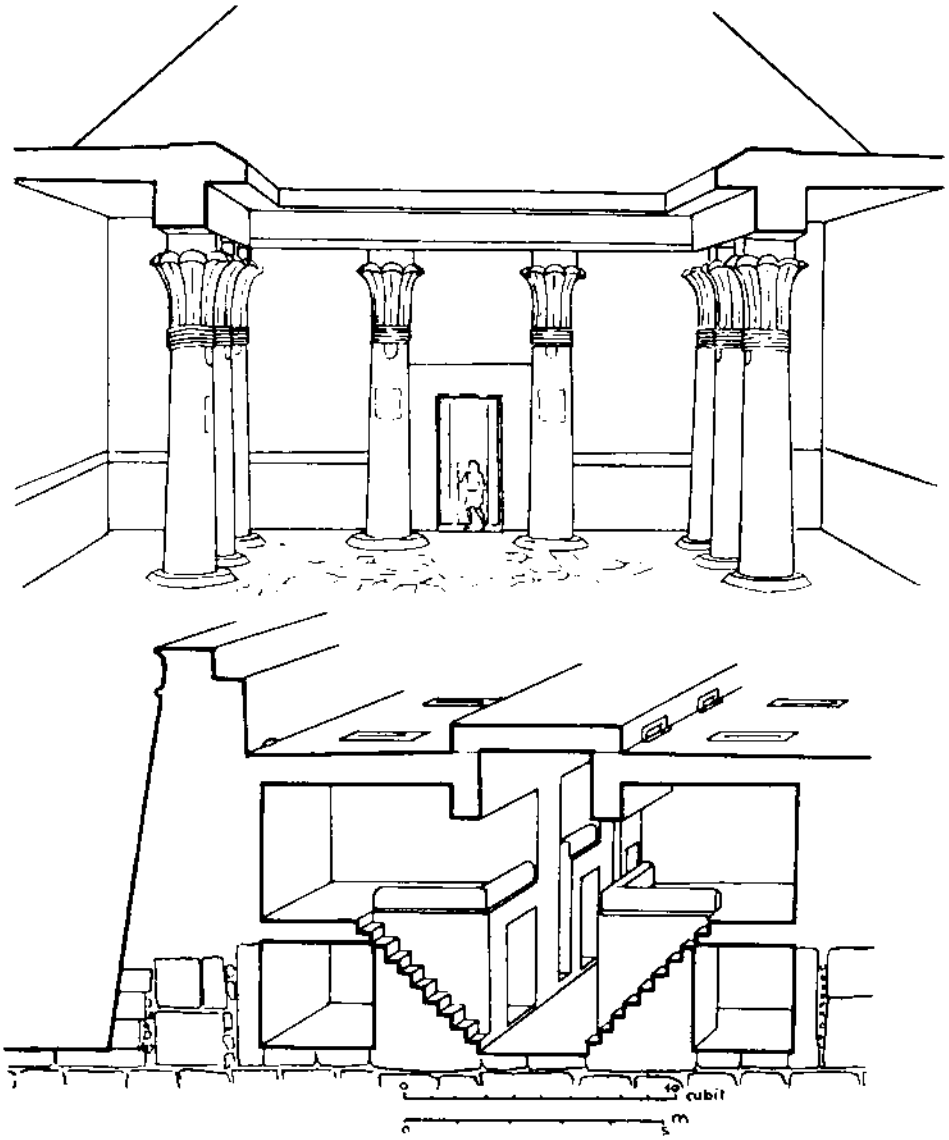

Fig. 72. Restored views of the central court and section in the granaries (funerary cult-temple of Sahure').

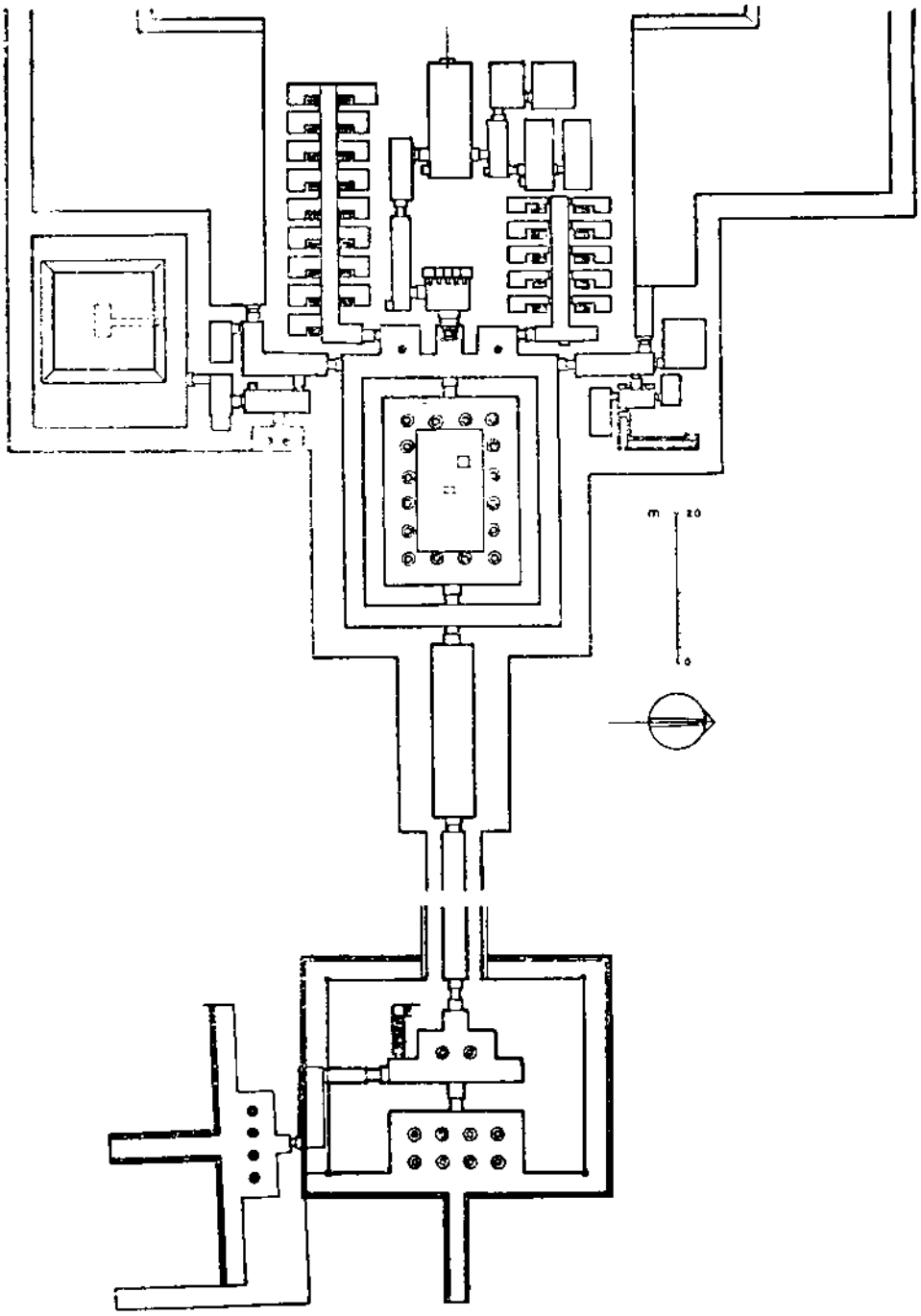

Fig. 71. Restored plans of the funerary cult-temple and the valley-temple of Sahure'.

THE SAHURE' COMPLEX (Abusir, *fig.* 71).— In the complex of Sahure' the offering-chapel is again embodied along the axis of the funerary cult-temple, to the East of the pyramid.

The offering-chapel was a deep roofed chamber, larger than before, paved with alabaster, with limestone walls painted and decorated with deities bringing offerings, above a granite plinth. In the western wall a granite false-door was set and in front of it an altar was used for the offering ceremony. This increase in importance of the offering-chapel is paralleled by the addition of a long offering-list to the small one already in use and the decoration of the walls in the chapel with scenes and texts recording and illustrating the offerings-ritual[197].

A side-corridor and an anteroom connect the offering-chapel with the five shrines hall at the back of the funerary cult-temple. The direct passage from the offering-chapel into the pyramid enclosure was henceforth abolished and the procession went from the court into the North side of this enclosure, to the entrance of the pyramid[198].

The symmetrical plan of the funerary cult-temple is extremely interesting, because it combines successfully all the elements of the early programme with new elements borrowed from the sun-temple. The court, paved in polished basalt, with its longest side on the main axis so that it may have an East-West orientation, is surrounded by a wall, replacing the original row of pillars, and a portico with palmiform columns representing the palm-forest symbolizing Buto (*fig.* 72). The alabaster altar served for the sun-cult. The walls were covered with fine reliefs representing the king slaying or capturing Libyans and Asiatics, or recording the various animals of the booty. A wide corridor paved with alabaster surrounded the walled court and was decorated with scenes representing the king or his successor in their daily pursuits, hunting or fishing, and the departure and return of a sea-fleet.

The wide hall is replaced by two rooms with one column, flanking a central antechamber symbolizing the Portal of Nut and leading into the chamber with the statue-shrines (*fig.* 73)[199]. The foretemple is represented by a deep hall to be used for both sun-cult and funerary cult ceremonies.

The valley-temple is simplified into a portal with a columnated porch at the end of the symmetrical axial causeway. The monolithic columns of granite had cylindrical shafts and palm capitals, and were erected on a wide low base. A second less important portal with a small porch, was set at an angle of nearly 90° on the western side, as a secondary landing-stage, connected internally by means of a corridor. The simplicity of the valley-temple implies a simplification of the ceremonies at the landing of the funeral pro-

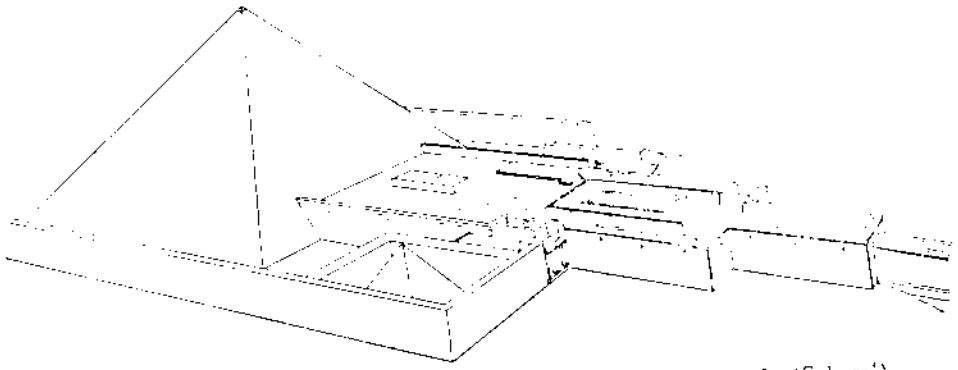

Fig. 73. Bird's eye-view of the pyramid and its funerary cult-temple (Sahure').

cession[203]. The opening of the mouth chamber is reduced to a niche in the western wall.

The Neferirkare' complex (Abusir).— Neferirkare' died when the work on his complex was still incomplete. It was carried out by Neuserre' who used brick and modified the initial project, appropriating to his own the causeway and the valley-temple.

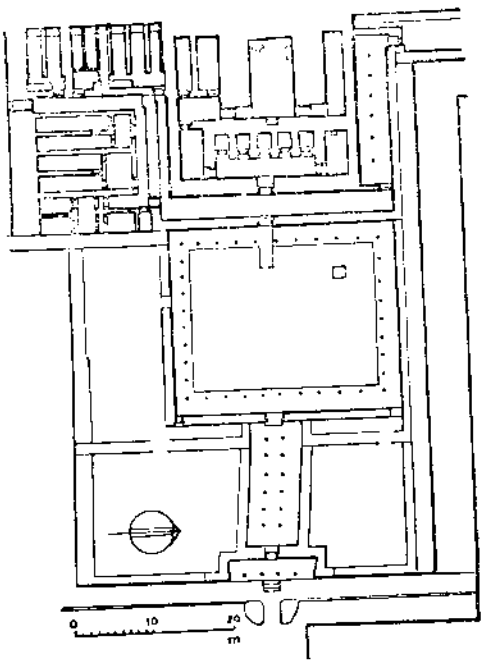

Fig. 74. Restored plan of the funerary cult-temple of Neferirkare' as completed by Neuserre'.

The plan (*fig.* 74) of the mortuary temple is unsymmetrical. The offering-chapel is a large chamber, nearly in the longitudinal axis of the temple. A false-door is set in its northern wall and could have been coupled to a statue. An altar is placed before it[204].

The funerary cult-temple, which is amalgamated to the offering-chapel, consists of the chamber with the five shrines, connected to the wide hall, itself adjacent to a large open court surrounded by a portico with lotus-bundle columns and having a sun-altar in its N.W. corner. The causeway, if executed, was to follow the outer southern side of the court, so that the burial procession

would not cross it but proceed directly to the wide hall. Another peculiar feature is the monumental columnated hall replacing the usual passage (as at Shepseskaf, Sahure', Neuserre') between the wide hall and the pyramid enclosure. The row of six columns is not in the middle of the hall, so that it is to be surmised that they formed a portico covering the widest aisle only(202).

The entrance on the eastern façade of the court was in the shape of a monumental porch with two columns. This porch, which could have been used as Portal of Nut, was transformed by Neuserre' into a deep hall by adding a room with two rows of ten columns, along an axis deviated to the South. A new porch with four columns was added in front of the structure. This was to provide for the ceremonies, instead of the valley-temple he usurped. He built a rammed earth terrace on a round plan in front of the entrance to prevent the accumulation of drifting sand(203).

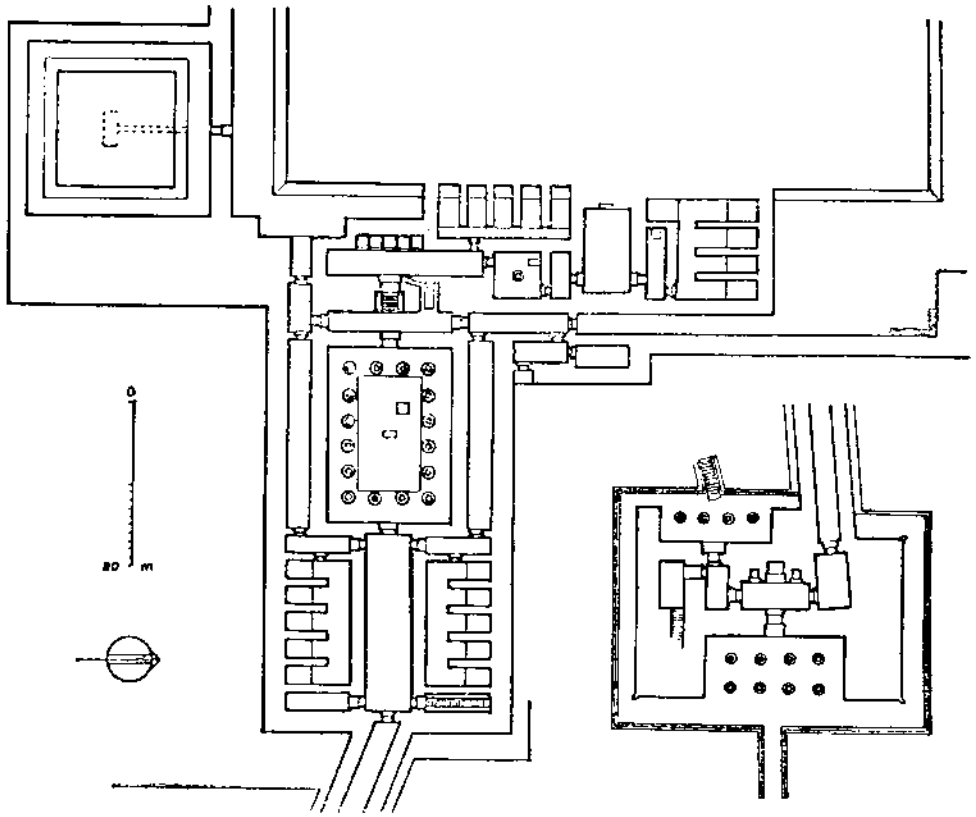

Fig. 75. Restored plans of the funerary cult-temple and the valley-temple of Neuserre'.

THE NEUSERRE' COMPLEX (Abusir).— The plan (*fig.* 75) is quite irregular since the offering-chapel and the funerary cult-temple are no longer in the same longitudinal axis of the pyramid, but one beside the other, marking a decrease in the formal relation between the offering-chapel and the statue-niches[204]. This was probably due to the topography of the site[205]. The

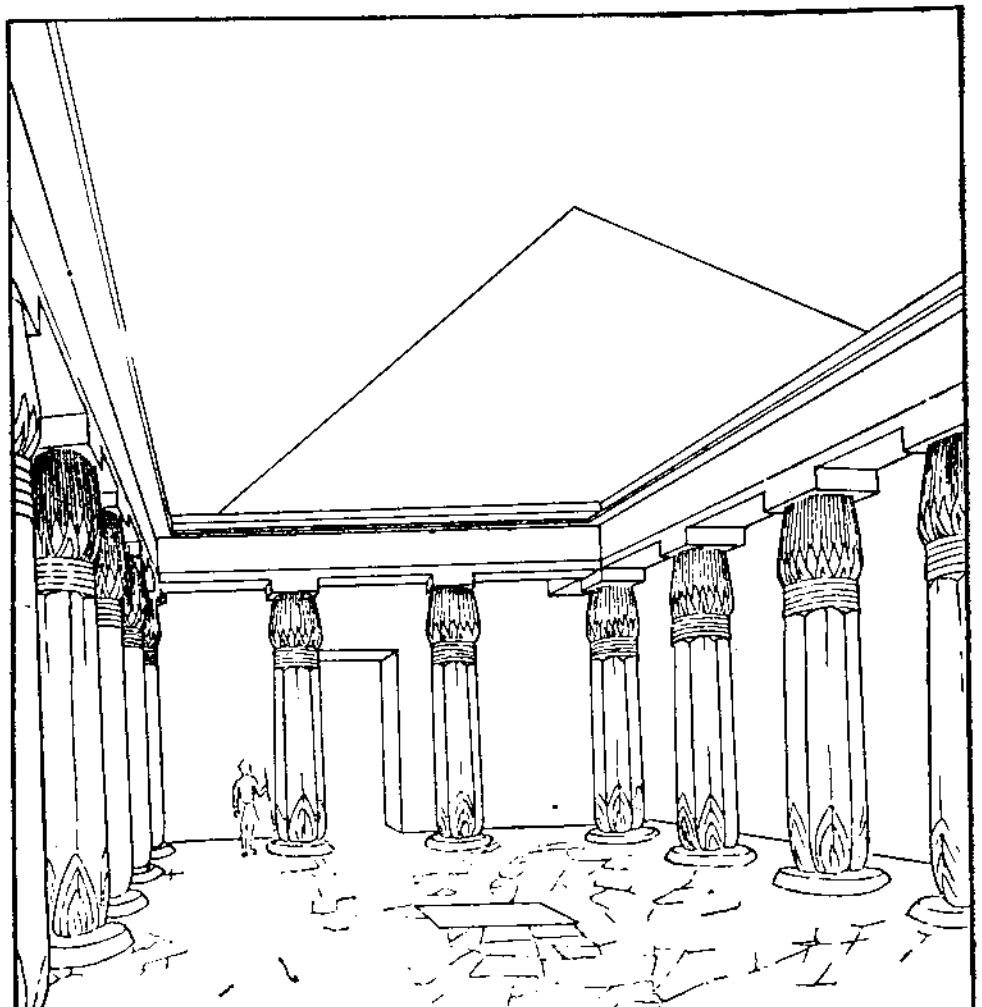

Fig. 76. Restored perspective of the hypostyle court in the funerary cult-temple of Neuserre' (according to Borchardt).

offering-chapel is set nearly in the middle of the East face of the pyramid. A false-door is engaged in the western wall, while in both the ante-chamber and the side-chamber a statue was erected.

The funeral cult-temple is connected with the offering-chapel by a square antechamber with one column, opening in the North wall of the five shrines-chamber. The whole temple is otherwise strictly symmetrical along the axis, beginning with the five shrines. In front of these open a transversal hall communicating axially with the court, and on both sides, with the pyramid enclosure. The court, similar to that of Sahure', is surrounded by a portico with papyrus-cluster columns whose symbolical value is not yet established (*fig.* 76). The walls of the court have been supposed to be in granite (Borchardt). The only element of the foretemple is a deep hall set directly on the East of the court and bordered on both sides with magazines[206].

The causeway, deviating towards the South to reach the original one of Neferirkare', and a basalt dado and walls of Tura limestone decorated with low-reliefs showing, as at Sahure's and Pepi II, the king as a lion in triumph scenes[207].

The valley-temple, like the portal of Sahure', had two entrances. The elements of the plan have however a thematic function. The main entrance faces East, with a transversal chamber, with three statue-shrines representing the opening of the mouth quarters and a porch with two papyrus-cluster columns, for the ritual mummification ceremonies (*fig.* 77)[208]. The causeway ends again at the North side of the valley-temple, showing that the statue-shrines room was actually the seat of the ceremonies and not an element of communication as at Sahure's.

THE UNAS COMPLEX (Saqqara).— With Unas the plan of the mortuary temple, deriving from that of Neuserre', becomes again symmetrical and stereotyped so that it serves as model for subsequent temples (*fig.* 78). The corridor surrounding the court disappears while an ever greater importance is attributed to the magazines[209].

Floors are here of alabaster instead of basalt. A new element appears above the entrance to the tomb-chambers: a small chapel with stela. The offering-chapel is in the middle axis of the eastern face, with a false-door set in the western wall and connected by an antechamber and a corridor to the five statues-shrines chamber, itself in the same axis. A transversal hall affords the essential communication at both ends with the magazines and the pyramid enclosure, and in the axis with the court. This is surrounded by columns and serves for the Re'-cult. A deep hall connects to the causeway, whose walls are decorated with fine reliefs. The causeway,

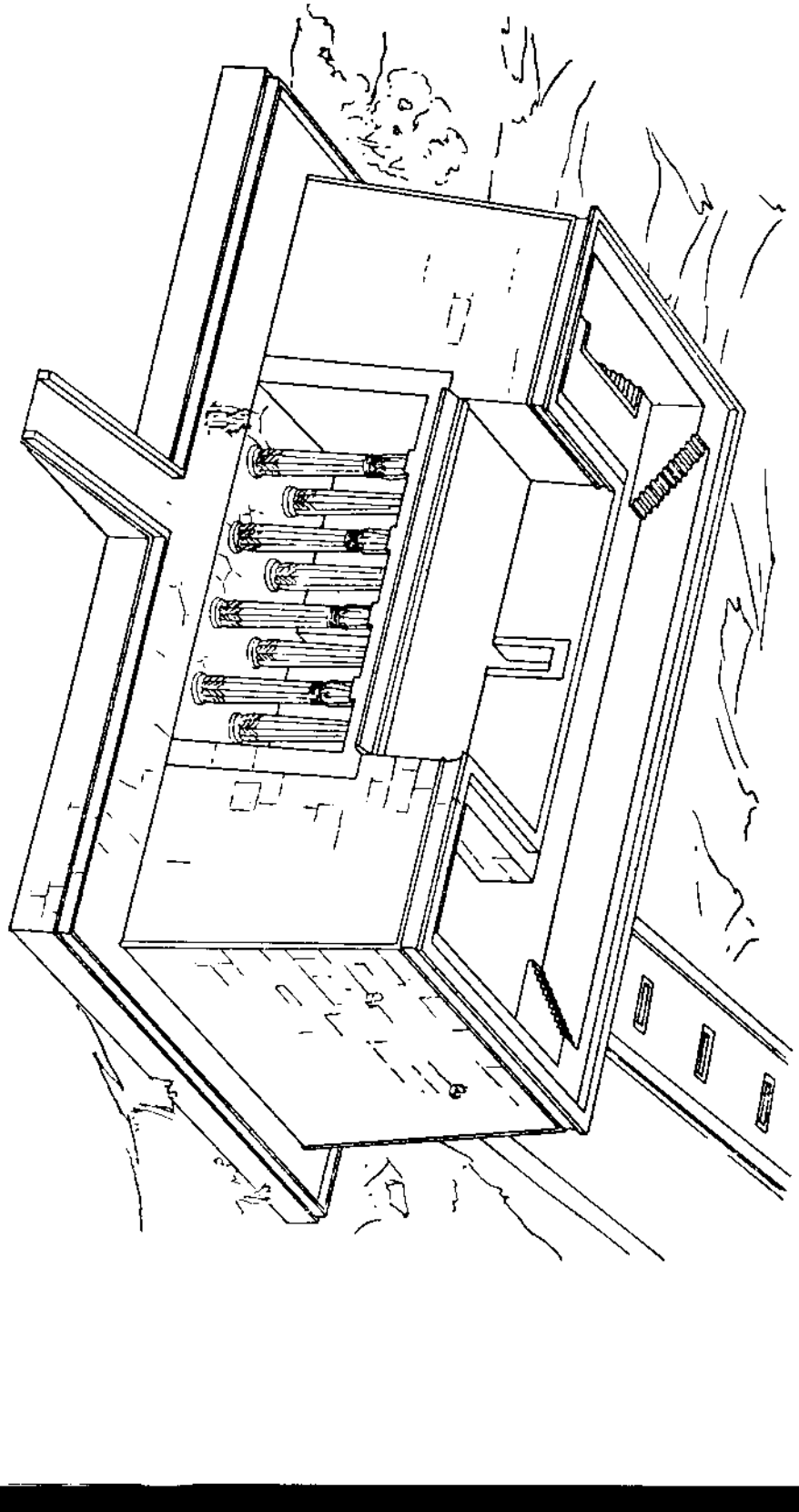

Fig. 77. Bird's eye-view of the valley-temple of Neuserre' (Borchardt).

about one kilometre long, is twice bent to follow natural features of the site and partly built on an embankment with steep batter, using blocks from the Djeser's complex. The walls (about 4m ht., 2.4m thick) of the corridor, in Tura limestone, carried two series of cantilever slabs forming a flat roof with an axial gap (0.2m) for lighting. The scenes represent various types of activities. Apart from the usual offerings-bearers are shown the plucking of figs, harvest of corn, collecting honey, various crafts, the transport of granite columns on barges from Aswan, desert animals and a realistic group of people dying from famine[210].

The valley-temple has only been partly excavated.

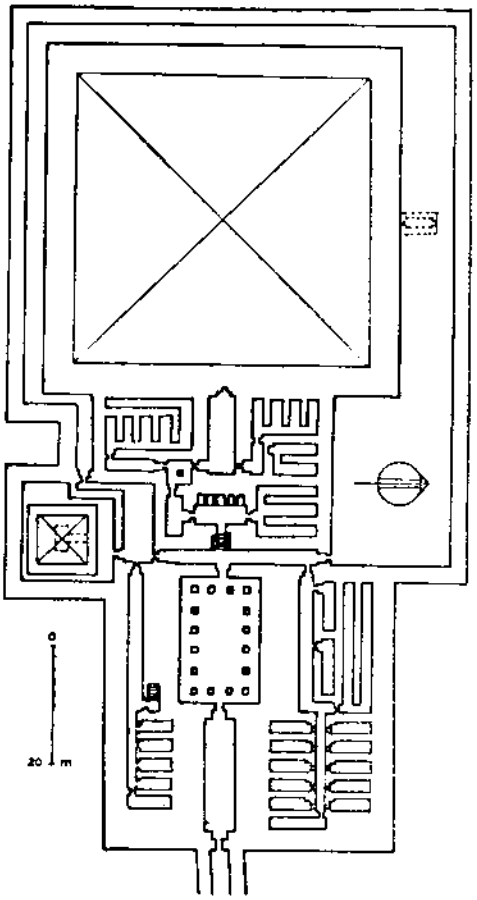

Fig. 78. Restored plan of the upper temple of Unas.

THE COMPLEXES OF TETI, PEPI I AND MERENRE' at Saqqara have unadequately been excavated, but seem to follow those of Unas and Pepi II. The temple of Teti has even the same main dimensions as that of Pepi II, but would have, in the court, wooden columns instead of the quartzite pillars erected by Pepi II[211]. This uniformity in architectural features expresses the uniformity in cult ritual, corroborated by the texts inscribed on the inner walls of the pyramids, beginning with that of Unas[212].

THE COMPLEX OF PEPI II NEFERKARE' (Saqqara)[213].— The last king of the VIth dynasty, who died a centenarian, left a pyramid complex to the South of those of his two predecessors. The main elements of the plan are set symmetrically along the middle axis of the East face of the pyramid (*fig.* 79) and show the same disposition as those of Unas: the offering-chapel, the five statue-shrines room, the transversal corridor the court, the deep hall preceded by a wide hall.

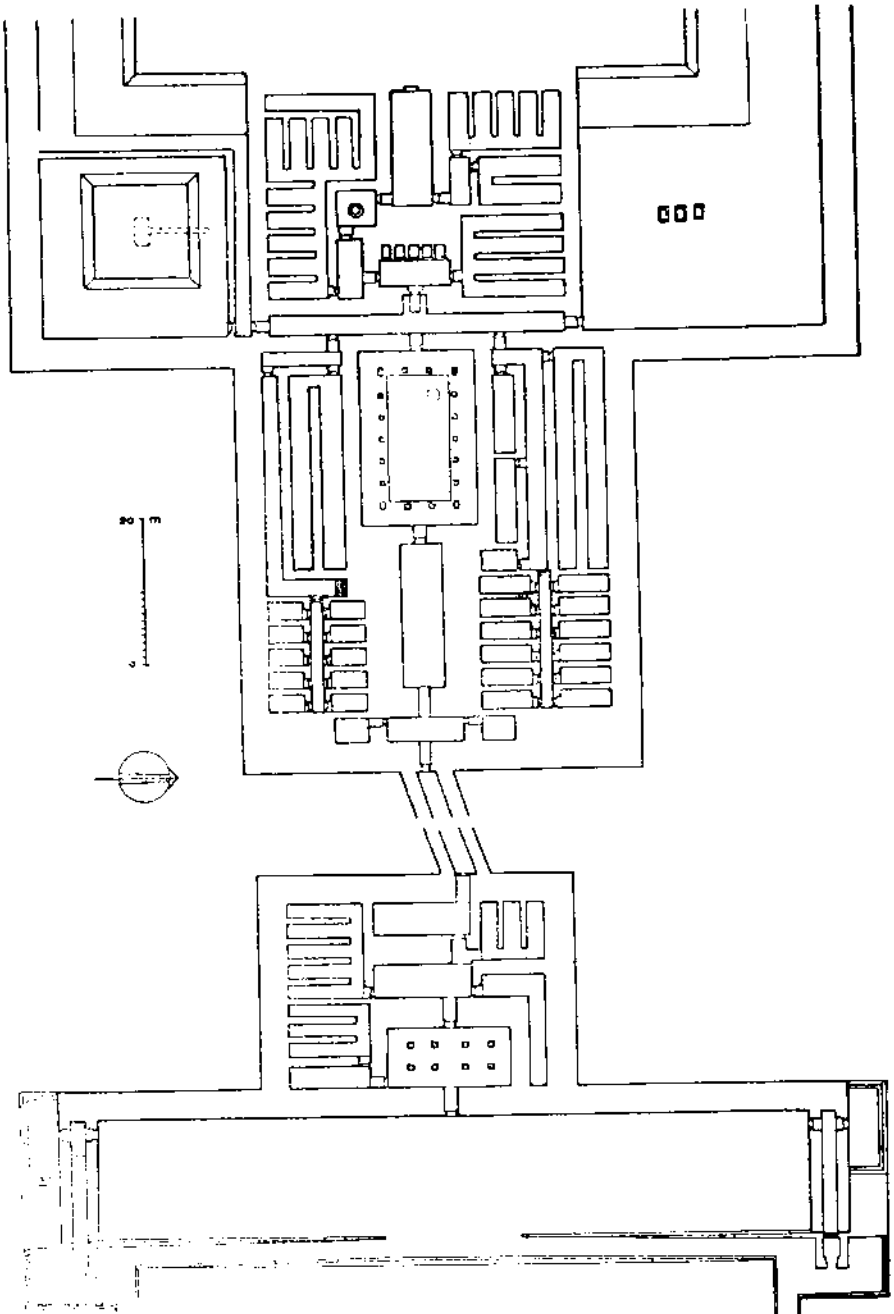

Fig. 79. The funerary complex of Neferkare' Pepi II.

The offering-chapel had a false-door and an altar at the western end, and the three other walls covered with coloured reliefs. On each of the North and South walls the king was represented seated in front of a table of offerings, his ka-soul standing behind him and about 125 personages before him, bearing offerings of various kinds. On the East wall other provisions were shown in a frieze above the scene of slaughtering the cattle[215].

In the anteroom connecting the offering-chapel to the funerary cult-temple a single pillar carried the roof, while the walls were decorated with scenes showing the king in the presence of about a hundred deities and receiving obedience from about forty-five officials. The walls of the narrow vestibule, adjacent to the statue-room show the king triumphing over his enemies. The five statues of limestone were placed in shrines shut with double wooden doors. A transverse shut-in space behind the walls of the shrines has been interpreted as a cachette for statues (ar. *serdab*).

Magazines flanked both sides of the statue-room. The walls of the transversal corridor were also covered with reliefs: the scene of the king smiting a Libyan and his wife and children begging for mercy is copied from Sahure', two centuries older. Scenes show episodes from the Heb-Sed ceremonies, where the king runs between milestones or attends the climbing of stays supporting a ritual pole[215].

The court, paved with limestone was surrounded by a portico on eighteen quartzite pillars, decorated on the external side with figures of the king and a deity. The limestone walls were left bare, a feature which would suggest that statues were erected along them[216].

The deep hall was decorated with scenes, one of which shows the king hunting hippopotami. The wide hall has evoluated into a transversal passage with two side-chambers[217], containing the stairways to the roof.

The causeway, as that of Unas, bends twice and is decorated with the stereotyped scenes: at the lower end the king as sphinx and as griffin, trampling down his enemies; at the upper end offering-bearers and deities advancing towards the king. A door on the North and South faces of the causeway enabled the priests to enter directly from the pyramid-city. On the North entrance to the pyramid stands a small chapel with stela similar to that of Unas.

The valley-temple had no open porch on the façade, but a transverse hall with eight pillars and was intended for ritual mummification ceremonies. Two other chambers adjoined it: the western for the opening of the mouth, connected to magazines[218]. The three chambers to the South of the wide hall served probably for the ritual attached to the inner organs (Buto) and that of the crowns (Sais).

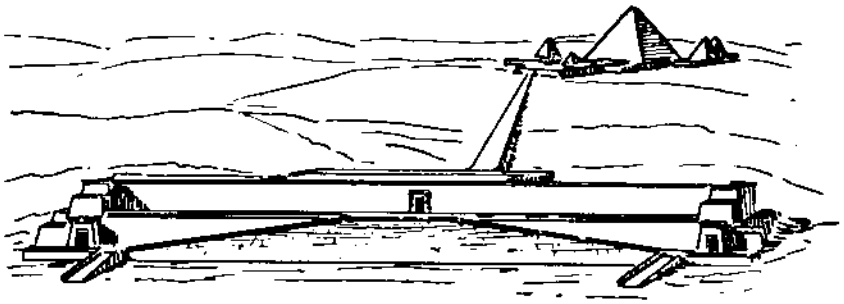

Fig. 80. Restored view of the valley-temple (Pepi II, according to Lauer).

A broad terrace, bordered on three sides by limestone enclosure walls, preceded the façade of the valley-temple and was accessible through ramps (*fig.* 80)[219].

THE MORTUARY CHAPEL OF PRIVATE TOMBS

In the mastaba type of tomb the funerary chapel formed part of the superstructure. It is to be noticed that certain tombs of the late Old Kingdom copied the essential elements of the royal funerary cult-temple. But only the three shrines originating from the three shrines of the primitive temple of "the First of the Westerners" at Abydos, are maintained. The two other shrines representing the national sanctuaries of the South and the North never occur in private sperstructures, even in the tombs of queens (queen Iput, VIth dynasty)[220].

THE CULT-TEMPLES

Although numerous names of temples are known from contemporaneous texts, yet very few remains have been discovered. Some as the square brick enclosure with rounded corners found at Heliopolis[221] cannot be dated with certainty and may go back, like that of Hierakonpolis, to the archaïc period. Nothing else from the temple itself remains. Some fragments of a foundation-scene from the temple of Hathor at Gebelein could be assigned to Kha'se-khemuy or Djeser[222]. Of the small sanctuary built by Djeser at Heliopolis only fragments of relief of good style have been found[223].

Most of the renowned sacred places boasted of having had sanctuaries going back into the remotest periods of history. It is true that such allegations

could have been put forward just to enhance the sacredness of the shrine. The plan of the Ptolemaic temple at Dendera is in no way related to that of an Old Kingdom shrine, although the inscriptions state that it was inspired from such old date. On the other hand many of the temples must have occupied the site of Old Kingdom sanctuaries, either built upon their foundations or embodying their materials and enlarging their original plans.

Architectural remains of three temples can be dated with certainty to the Old Kingdom: the temple at Medamud, the temple of the Sphinx at Giza and the sun-temple of king Neuserre' at Abu-Gurab.

THE TEMPLE AT MEDAMUD[224].— This extraordinary monument consists of a brick enclosure on a hill, surrounding a sacred forest. The enclosure is on an irregular plan (*fig.* 81) and has both inner and outer walls plastered and should have reached about 1.75m in height, rounded in section at the top. A rectangular recess in the North side of the enclosure forms the court, in which opens at the back the doorway to the main shrine and on the West that to the secondary one. The court was closed on the North by a gateway reminding of the later pylon and was subsequently enlarged northwards by the addition of another court and a second gateway, not in the same axis as the first. This first gateway had accordingly to be changed.

Each of the two shrines consists of a sinuous passage (1.5m ht.), plastered on the inside, vaulted and leading to a cell. An artificial mound covered each shrine. There was no door and the floor of each shrine was covered with fine sand. The purpose of the sinuous plan of the passage is clearly to hide the interior of the cell. In front of the main South shrine doorway were two cylindrical mud stands, while only one stand was set before the subsidiary shrine.

Nothing definite can be proposed regarding either the date or the function of the monument, but it is surmised that it may be an Osireion of the Old Kingdom. The distribution of the two shrines about the main axis, with respect to the shape of the enclosure, points to no primitive knowledge of architecture.

THE TEMPLE OF THE SPHINX (Giza)[225].— In front of the Sphinx, but not axial with it are the remains of a large rectangular temple. Its East façade is on the same line as that of the valley-temple of Chephren and the plan has the same depth. Two doorways open to the North and the South of the eastern façade and lead through an L-shaped entrance passage to the interior. The plan is symmetrical and consists mainly of a court (46 x 23m), set transversely to the E-W axis, surrounded by rectangular pillars, probably forming

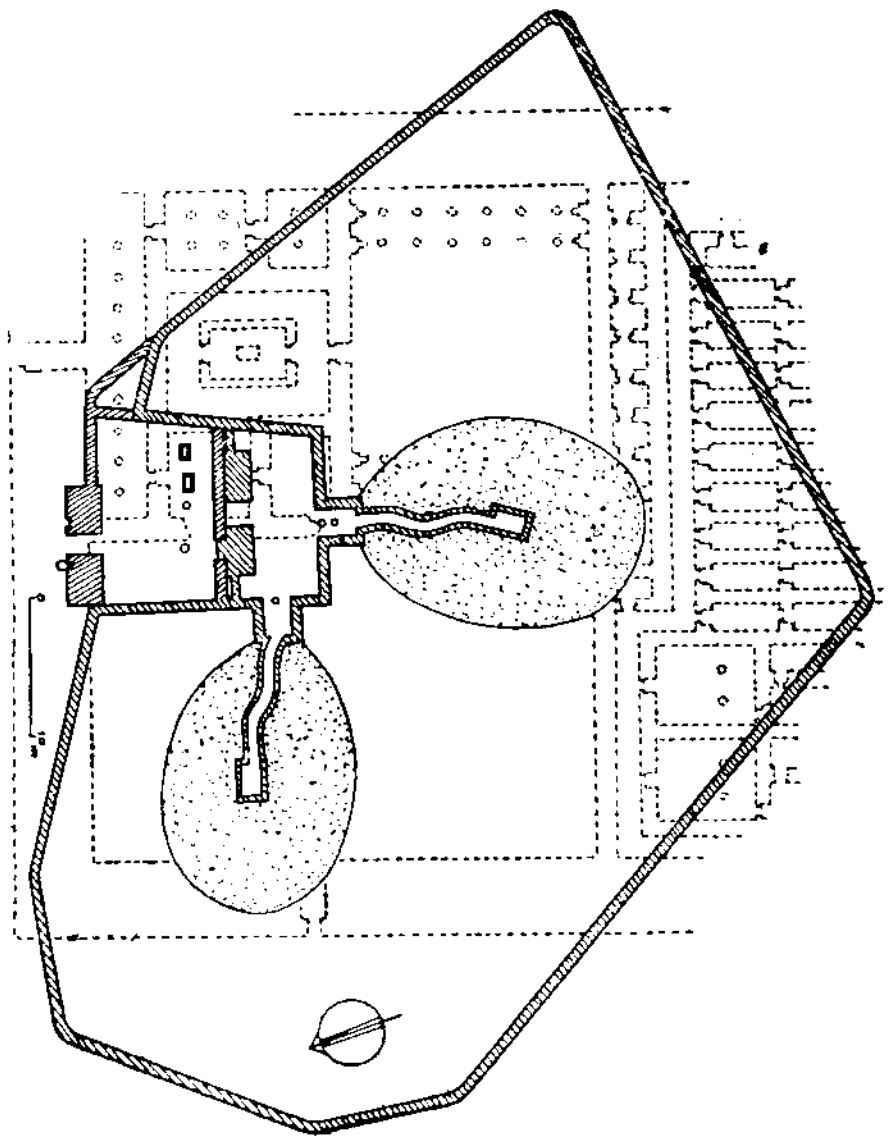

Fig. 81. The primitive temple of Medamud, rebuilt in the Middle Kingdom.

a portico (about 3m deep) (*fig.* 82). In front of each pillar is a rectangular trench sloping towards it and which could have served for its erection. In the middle of the eastern and western walls is a deep compound recess, in the E-W axis. On both sides of the western recess is a set of two N-S chambers (11.5 x 3; 5.5 x 3m), opening in one corner of the court.

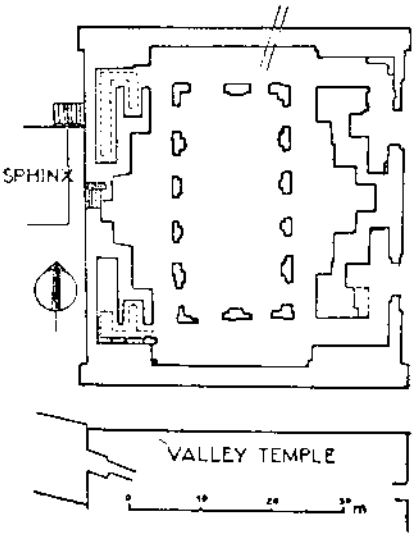

Fig. 82. The Sphinx temple.

The masonry is similar to that of the neighbouring valley-temple, of huge limestone blocks forming a core which was originally lined with granite slabs. The size of the core blocks exceed thrice that of a block from the great pyramid. The West wall is partly cut in the rock (2.5m ht.), and topped with limestone masonry. Remains of drains exist under the North and South walls, in the form of channels paved with granite and roofed over below the floor of the court. No communication actually exists between the temple and the precinct of the Sphinx.

No inscription was found in the tombs of the necropolis to shed some light on the nature of this temple. However the similarity of masonry in both the Sphinx temple and the valley-temple of Chephren as well as the relative position of the neighbouring tombs allow one to surmise that this temple dates back to the IVth dynasty.

THE SUN-TEMPLE OF NEUSERRE' (Abu-Gurab)[226]. — The cult of the sun-god Re' reached its apex under the first kings of the Vth dynasty, who were, according to an Egyptian legend, begotten of Re' and born of the wife of a priest of Re'. Although inscriptions mention the names of six sun-temples built by the Vth dynasty kings yet only two of these have been found. The temple of Userkaf, built in brick, has left but sundry remains. That of Neuserre', built in stone, could be studied and restored.

It is built on a mound North of the pyramid of the king at Abusir, on the boundaries of cultivated land. A causeway connected the temple to its valley-portal, passing through the pyramid-city, whose rectangular limestone enclosure wall (300m long) runs 36° West of North (*fig.* 83).

The valley-portal is a massive work on rectangular plan, with three

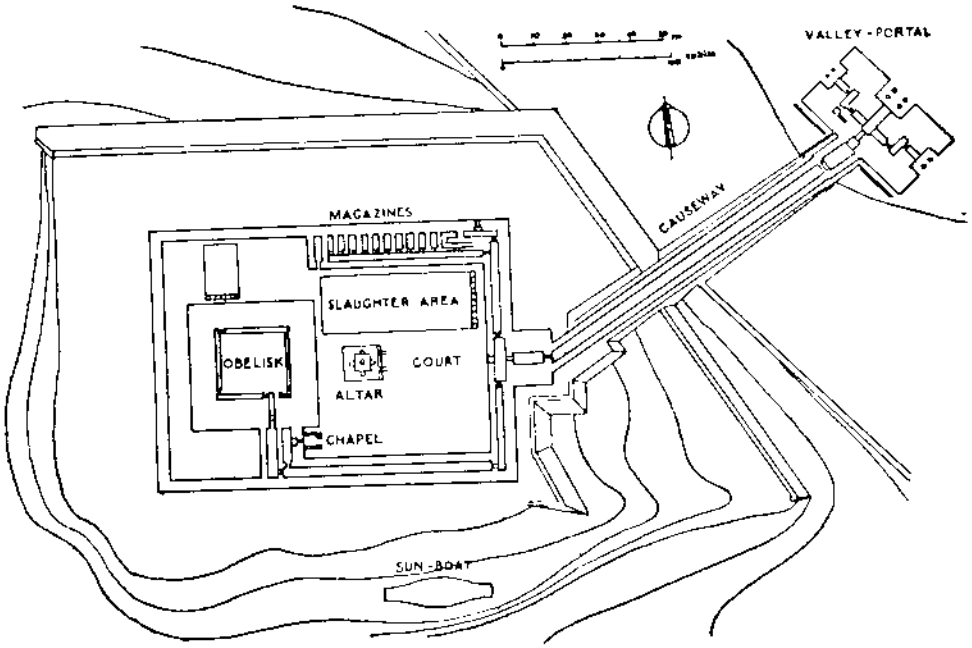

Fig. 83. Plan of the sun-temple (Neuserre' at Abu-Gurab).

entrance-porches, one on each of the main façade (N.E.) and the two side façades (N-W, S.E). Only the main façade was battered, the three others being vertical, a rare characteristic occuring again at Medinet-Habu. The main porch is supposed to have had four granite columns in two rows, while the side porches had only two each. A hall lined with granite led axially to the dooway opening in the causeway. Two side-passages, bent at right angles, connected the two side-porches with the hall. A staircase led to the terrace. A quay, surrounded by a low massive wall, ran round the three frontages of the portal.

The causeway, more than 100m long, had a covered passage ascending 16m higher to the plateau, levelled as two terraces and bound on the North and East by retaining walls. The upper end of the causeway was connected at a sharp angle with an upper portal consisting of a passage and a transversal hall, opening at both ends on two corridors running along the East façade of the temple. This temple consists of a rectangular enclosure, with the longer axis directed E-W, around a court at the back of which rose a massive obelisk.

The sun-cult, unlike the cult of other deities, was held in the open-air and through the obelisk. This programme is clearly featured in the open-air court, the main cult instrument which is the obelisk and its altar and dependances, such as two slaughtering courts and magazines.

The obelisk was squat and broad and rose 36m above its basis (20m ht.), with battered sides (76°) (*fig.* 84). It was built of a yellow limestone core cased in white limestone walls. Seen from the court it rose in its axis, although it was set somewhat to the South. A row of magazines along the North enclosure wall corrected the shift in the plan. A sloping corridor, with four right-angles branches, led up inside the mass of the base, turning twice round the central axis, to the terrace. It was lined with large blocks and roofed over with deep beams (2m deep x 1m thick x 3m wide) and rose to a slope of 1/14(1/2 palm to 1 cubit length), or 1·7 (1 palm to 1 cubit). The inner core of the base was reinforced with two diagonally set walls, a feature met with later in Senusert II's pyramid at Illahun. The foundations rose from the sand plateau and the inner masonry had no mortar, the rows of blocks being set perpendicularly to the sides in plan. The casing had a plinth layer of granite (1.05m ht., batter 1 4), continued above with limestone walls, a feature parallel to the casing of pyramids (Chephren, Mykerinos). As in the contemporaneous pyramids the corner-blocks had a protruding inner area fitting into a socket to afford a grip against sliding, in the course under it.

The restoration of the obelisk was mainly facilitated through comparison with the hieroglyph representing the monument, found in contemporaneous inscriptions (fig. 46).

To the East of the obelisk lay axially a huge alabaster quadrangular altar. In plan four blocks in the shape of the hieroglyph for "offering", were set round a circular block. For the sun-cult an altar set towards the four points was essential. It was perhaps surrounded by a low enclosure wall. Nearby is the large slaughtering-court with flat drains in its pavement, in which blood could run to the ten basins at the East end. It was called "offering-place of the royal temple". Another smaller slaughtering-court was set to the North of the obelisk.

Near the entrance to the base of the obelisk is a small chapel, with two basins on both sides of its door and two granite stelae. The walls of this chamber were decorated with reliefs showing foundation-ceremonial and feasts in the temple.

A row of magazines abutted on the North side of the enclosure wall. Low-reliefs of offering-scenes decorated the ten chambers, dimly lit through roof-slits. They opened on a common passage, communicating with the entrance corridor.

Fig. 84. Longitudinal section restored and axonometric section in the basis (upper temple, Neuserre' sun-temple).

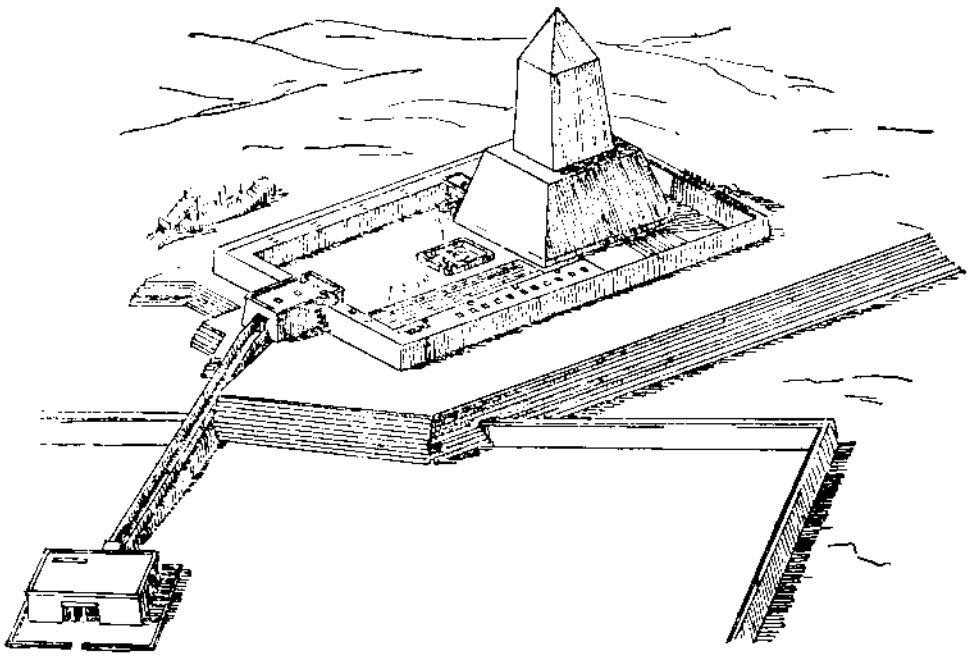

Fig. 85. Restored bird's eye-view of the sun-temple (Borchardt).

On the South side of the court a corridor led from the entrance passage to the vestibule of the obelisk. Above a plinth painted black were fine reliefs dimly lit.

Outside the temple, South of its lower terrace was the sun-boat (*fig.* 85), a structure in brick (30m long), featured by brick courses sloping at a sharp gradient at both ends and concave in the middle. Transversely the walls are curved outwards on both sides to imitate the convexity of the hull of a boat. It seems to have had a wooden deck and emblem-posts set in the brick bases along the main axis.

FUNERARY ARCHITECTURE

Monuments with funerary purpose such as tombs, temples or chapels for the funerary cult, provide the most complete set of documents, having been built with choice materials to last eternally. Part of the tomb, the superstructure was indeed exposed to factors of denudation, but the substructure, which was set deeper and deeper into the ground, was only attacked by tomb-robbers who usually succeeded in spite of all the devices contrived to prevent them.

The capital being at Memphis it was natural that the royal tombs in the form of pyramids and the necropoli would be in the neighbourhood, at Saqqara (IIIrd dynasty), at Dahshur (Snefru), at Giza (IVth dynasty). The king himself encouraged such settlements along the members of the royal family and also among the grandees, with gifts of land, materials and elements or craftsmen from his royal workshop. At the close of the Vth dynasty and during the VIth dynasty royal prerogatives gradually became the property of the people and the nobles, particularly the governors of the provinces, gained in independance and no longer sought the neighbourhood of the royal tomb. Large mastabas and rock-tombs are to be found along the valley, as far South as Aswan.

Graphical evidence is, comparatively speaking, very scarce. Hieroglyphs[227] represent only the pyramid in profile as a triangle, with two sides rising sharply (75°) from a low rectangle at the base. Some consider this rectangle as the base of the pyramid, the lower course being sometimes dressed and having vertical faces (Udjebten). Others would see in the representation the wall surrounding the pyramid precincts. In some hieroglyphs the triangle at the top and the band at the bottom are coloured to imitate granite. Every pyramid had indeed a hard stone pyramidion (basalt or granite) and some had a few lower courses in granite (Mykerinos, Shepseskaf, sun-temple of Neuserre').

In a scene a mastaba is shown in front-elevation. From the false-door at one end it may be inferred that it is the eastern one, with vertical sides. A ramp in side-view rises at the same end and offering-bearers ascend upon it to the statue in its naos set on the top of the superstructure. Such ramps have actually been found at Giza, rising along the side or against it to the

mastaba terrace. They were in brick, paved and plastered. Some had small abydian stelae at the lower ends of both parapets (*fig.* 105)[228].

Texts inscribed on some of the tombs relate their history, how the king ordered that the entire tomb or part of it, usually the false-door or the tomb-façade, should be built by his own craftsmen (Debehen in the reigh of Mykerinos. Washptah under Neferirkare')[229]. The width of the tomb mentioned by Debehen as 50 cubits in his inscription does not correspond to the actual dimension of the tomb at Giza, which is much less (16m). Washptah, chief architect, was stricken while visiting his works with the king Neferirkare' and his tomb was built by his son. Others record the building of the tomb or its endowment through the son of the deceased[230], or provision being made by the son to be buried in the same tomb as his father (Djau). This is conspicuous in the rock-tombs of Mekhu and Sabni at Aswan, which have individual plans but were caused to communicate through the destruction of the partition between them. The same familial sentiment is responsible for the setting of the many-shafts mastabas.

Besides the material protection against robbery afforded by various architectural devices such as the great depth of the underground apartments, portcullisses, filling up the burial shafts, the returning-back plan of the corridors, certain tombs have inscription on the external walls, intended to warn visitors against entering in a state of impurity.

THE ORIGIN AND DEVELOPMENT OF THE PYRAMID

The royal tombs were, till the IIIrd dynasty, of the mastaba type. The earliest royal tomb, whose superstructure differs from that of a mastaba is the layer pyramid at Zawiyet el 'Arian, built of stone on a square basis, in slanting layers (68°) and ascribed to a king of the IInd dynasty. Another tomb in the same district was never completed, but its substructure is of the IIrd dynasty type. The next pyramid in stone is the so-called Step-pyramid of king Neterirkhet-Djeser of the IIIrd dynasty at Saqqara. The outline is still stepped and the plan rectangular[231].

At Meydum a true pyramid was obtained by filling up the steps of a layer pyramid and casing it to four true plane faces. The builder si unknown. At Dahshur Snefru erected on a square base two true pyramids, one called the Rhomboidal, having two angles of incline. It has been, however, observed that the upper part of this pyramid is poorly built, where the angle diminishes, being presumably finished in a hurry. Nothing accordingly is in favour of considering the Rhomboidal pyramid, also called Blunt or Bent, as

representing an intermediate stage in the evolution of the pyramidal tomb. The true pyramidal shape was thereafter adopted by all the kings of the IVth-VIth dynasties, except Shepseskaf.

Through this sequence of forms it is apparent that the true pyramid on a square basis derived from the stepped pyramid, built in layers, itself a transition from the stepped layer-mastaba. It has been surmised by Reisner that this prototype was the superstructure of the tomb of King Djer, where additional layers of brick, or accretion-faces, would have been added around the initial mastaba to prevent lateral penetration[232]. Other superstructures of uncertain date are also in the layer-mastaba form: Zawiyet el Mayyitin, Nubt, Kula, Sila. A layer brick mastaba of the first dynasty (Nebetka at Saqqara) shows steps on three of its sides[233].

This incentive towards providing the most adequate protection to the burial is recognizable in the next stage of evolution, where the plan is definitely changed from the rectangle to the square. It is to be noticed that the early stone masonry has its beds inclined towards the interior of the structure (Zawiyet El 'Arian, Meydum casing), which is a guarantee of solidity.

The final step of filling in the steps and casing the whole into a plane faced pyramid was perhaps also due to the same incentive, since the entrance would be more difficult to find, as if left in steps.

From the religious point of view no definite clue as to the incentive at the origin of such an evolution can be found. The Heliopolitan texts entreat the various deities of the Ennead at Heliopolis to protect the pyramid[234]. However the pyramid is called in Egyptian texts, as was the dead king himself, "Osiris" or also "Atum", "Eye of Horus", "Fortress of the king". It seems that the pyramid was not introduced into the sun-religion realm except in the IVth dynasty. The triangular outline would symbolize the sun rays, represented otherwise as a bunch of lines, sometimes provided with hands at their ends (time of Akhenaten). Although different the obelisk, a true sun-monument, was always topped with a pyramidion, perhaps a copy from the pointed *benben* stone which formed the central cult element in the early temple at Heliopolis. In the Middle Kingdom pyramidal superstructures of tombs are topped with a pyramidion engraved with two *udjat*-eyes and a text wishing that the dead appears that he may see the Lord of the Horizon (the sun) as he travels across the sky.

A solar influence is to be detected in the introduction of various elements as quarters where the solar ritual could be performed in the mortuary temple of the pyramid and in its boats excavated nearby[235]. However the vast difference between the various sparse cult-buildings in Djeser's complex and

the compact plan of the mortuary temple of Chephren would point to a long period of development, whose stages are not conspicuously shown by the superstructure of Snefru at Dahshur and that at Meydum[236].

DESCRIPTION OF THE PYRAMIDS

THE LAYER PYRAMID (Zawiyet el 'Arian).— Only scanty remains of the superstructure show that it was of the stepped type, built in fourteen stone layers, or accretion faces, round a nucleus, on a square plan (*fig.* 86). The masonry is poor and traces of brick would suggest that it was cased with this material. The substructure is of the early stairway type. An open-air stairway, continued by a sloping corridor excavated in the rock leads to a shaft cut in the axis, in front of the North face. This shaft descends vertically to meet a horizontal corridor connected to the North with an E-W passage, longer than the pyramid and turning at 90° at both ends, and having 32 compartments, and to the South with a stairway and a corridor opening in the sepulchral chamber (3.63 x 2.65 x 3m. ht.). It is on account of this early type of substructure that Reisner dated the Pyramid to the IInd dynasty[237]. Others would however date it from the IIIrd dynasty or even later[238].

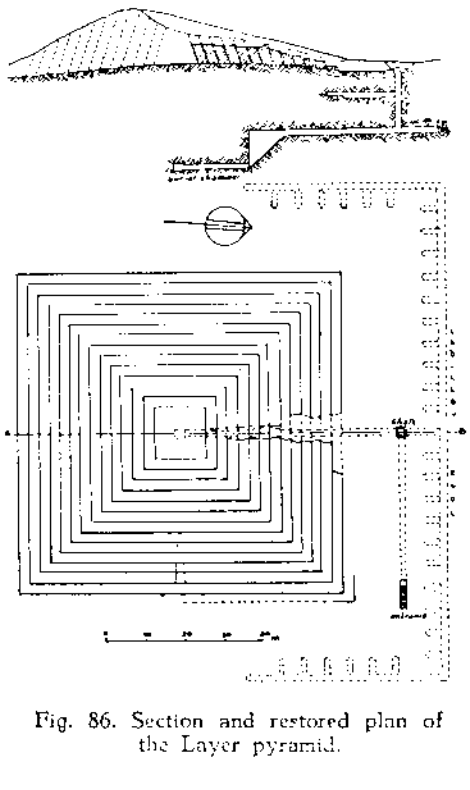

Fig. 86. Section and restored plan of the Layer pyramid.

THE UNFINISHED PYRAMID (Zawiyet el 'Arian). Only part of the substructure has been preserved. It is of the old open-pit type, with an open ramp cut in the rock and a stairway (6.35m). The stairway has two parallel flights of steps bordered on both sides and in between by a constructional runway. The bottom of the pit is paved with blocks of granite, surrounded by limestone (4.5m. ht.). The granite sarcophagus of oval shape was sunk into the pavement[239].

The step-pyramid of Djeser (Saqqara). - The superstructure of this famous pyramid, to which the name of the architect Imhotep is attached, is a nucleus of rough rubble cased in dressed stone. The project was changed six times, from an initial mastaba twice enlarged to a step-pyramid, by laying accretion-faces on the four sides over the mastabas, then by enlarging this pyramid on the North and West (*fig.* 87). The outline has now five steps and a height of 58.6m (originally about 60m).

The substructure, finished before the superstructure was begun, consists of a deep open pit to which a passage, continued by a tunnel under the mastaba, descends from the North. The pit was subsequently lowered, as well as the tunnel, into a steep ramp. The ramp opened above the ceiling of the sepulchral chamber, at the bottom of the pit. This is a chamber or pink granite, roofed over with nine beams. A large granite conical stopper closed an aperture in the North beams.

Two doors in the East and West walls of the ramp opened on stairways leading to a maze of corridors, set roughly towards N-S and E-W. Some of the walls (East gallery and two rooms) were covered with blue faïence tiles imitating a pattern of reeds partition walls. In the West wall of the East gallery three niches imitating doors and flanked by dummy windows, had three panels with reliefs representing the king performing heb-sed ceremonies. It is in these galleries that thousands of marvellous alabaster vessels were found. Eleven shafts cut on the eastern limit of the second phase in the construction of the mastaba, led to E-W galleries and sepulchral chambers for the queen and royal children. Some of the walls were covered with wood panelling. It seems that the second enlargement of the initial mastaba was to cover this series of shafts. They were connected together under ground and a long stairway led to the northermost shaft.

The original ramp was blocked and replaced by a new tunnel beginning with a stairway to the North of the pyramid.

The South tomb[241] is a large mastaba set E-W, enclosed in the southern wall of the court. The superstructure, of rubble core encased in dressed masonry, had battered sides and a vaulted roof. An open trench descends from the West and ends into an open pit, of the same dimensions as that of the pyramid. The sepulchral chamber is built in four courses of granite blocks and granite ceiling, with an opening blocked up by five granite stones. To the East lie the funerary apartments, some rooms of which are stone-lined with blue tiles panels. Three niches contained limestone slabs with reliefs showing the king celebrating heb-sed ceremonies. It has been pointed out that the long chamber opening in the middle of the course of the stairway and which served as magazine for wine vessels and funerary equipment, was in the same

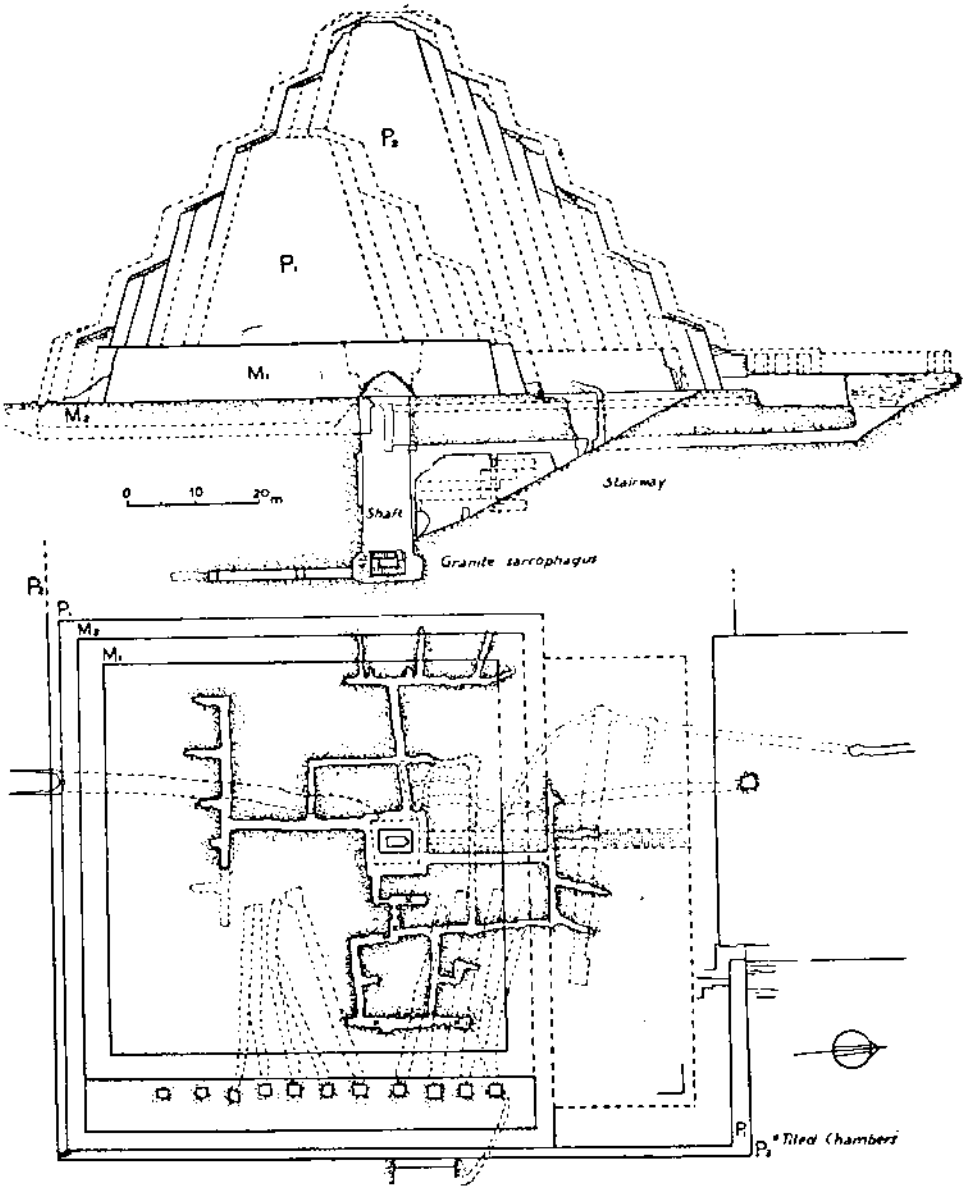

Fig. 87. Section (N-S) showing the various projects in the Stepped pyramid at Saqqara, and plan with the underground apartments.

axis as the back chapel of the building set in the court, in front of the South tomb, and which is the shrine for the crowns[242].

CHARACTERISTIC ARCHITECTURAL FEATURES OF THE STEP PYRAMID

It is to be noticed that the substructure is again of the open pit type, cut however in the rock and built in limestone and granite. The secondary galleries and chambers were hewn in the rock, a feature characteristic, according to Reisner, of the second dynasty underground chambers in the Memphite district[243].

The superstructure is on a rectangular plan, although that of the Layer pyramid (Zawiyet el 'Arian) has already a true square.

Stone handicraft was mastered by the IIIrd dynasty builders so that they could cut underground apartments or build stone structures, in imitation of brick architecture. The technique of the masonry using small limestone bricks well adjusted on the outer face, but with wide joints inside and casing a core of rubble, shows the beginning of stone masonry. The masonry is of yellow limestone cased in thick mud, sand and powdered limestone mortar, set in horizontal beds for the original projects and curved courses for the later pyramid projects[244]. The accretion-faces are independant from one another and have courses inclined towards the interior, a feature which insures stability in the structure. Such accretion-faces would have facilitated the process of construction by affording suitable scaffolding. Sliding, consequent to the inclination of the faces, is not to be feared of on the dry rock of the plateau[245].

In the substructures whole walls were lined with dressed limestone frames encasing blue tiled panels, imitating wattlework or matting. Doors and windows, with all their original wattlework details as well as arched panels are rendered with painstaking exactness.

Stone architecture as represented in the Djeser complex features an intermediate stage, both in style and construction, proceding from a primitive architecture in light materials towards a functional stone style.

THE PYRAMID AT MEYDUM[246]. The actual outline of the pyramid shows a three stepped structure with battered sides. This is due to the method of construction in three stages, with accretion-faces or inclined layers (74°) being added to a central core (*fig.* 88). The structure was originally cased so as to have a true pyramidal shape (51°), as is shown by the lower part buried in the sand. It is on a square plan (144.5m). The layers are independant and consist of a core of local stone cased with Tura limestone, left in the rough.

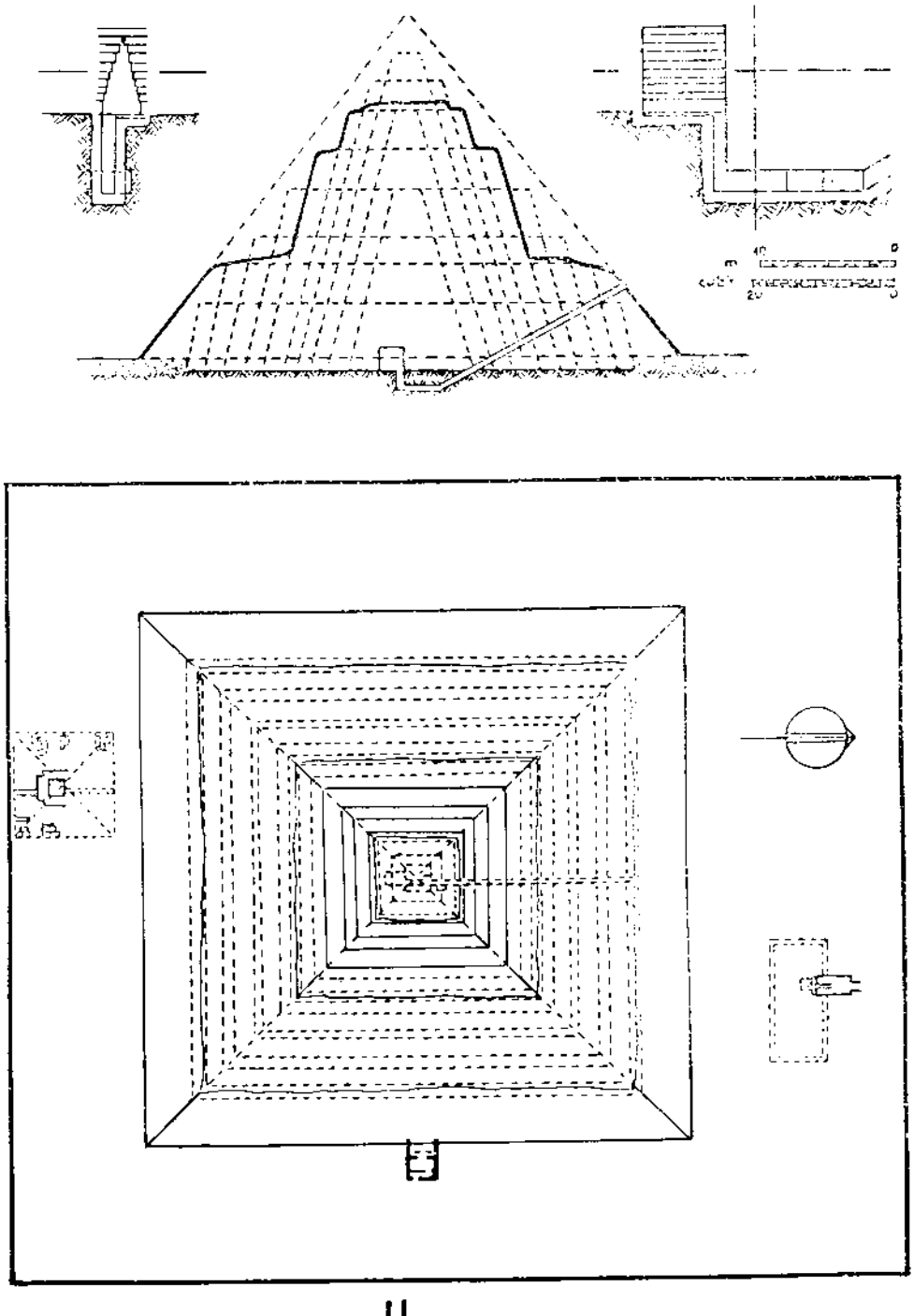

Fig. 88. Plan and section of the pyramid at Meydum with detailed sections of the burial chamber.

The substructure is a chamber built at ground level, with a corbel roof and reached by a sloping (28°) and a horizontal corridor opening on the North face. The horizontal corridor and two small chambers East and West of it, perhaps for stone plugs, are built in an open trench in the rock. At the end of this corridor a vertical shaft leads upwards to the burial chamber (5.9 x 2.6m.; 5,05m ht. at top), opening in the N.E. corner of its floor. Wooden baulks were found in the shaft and chambers.

The complex consists of a well preserved offering-chapel, a causeway and an enclosure.

The vertical shaft opening in the floor of the burial chamber was provided with two slots in the North wall, probably for the two cordages used to let a portcullis slide in place[247]. Some blocks were marked with sketches of two or three stepped pyramids, but no inscription gives a clue to the name of the builder.

THE NORTH PYRAMID OF SNEFRU (Dahshur)[248]. — Egyptian texts mention two names of pyramids for Snefru, one of which is called the "Southern pyramid". These two pyramids are now identified as being those at Dahshur and it is supposed that the North one was actually used for the burial (Borchardt), on the ground that it is surrounded by the tombs of funerary priests.

The outline of the pyramid is characterized by its flat angle of incline (43°36'). It is on a square plan (218.5m N-S and 221.5m E-W) and reaches a height of 104.4m.

The substructure is approached by a sloping corridor (27°36') opening on the North (76.2m long), changing to a short horizontal passage before reaching the first room, and the neighbouring second room. Both rooms have the same dimensions (8.3 x 3.6m and 12.3m ht. at the top), are directed N-S, at rock level, and have a corbelled roof. In the second chamber, at a height of 7.7m above floor level an opening leads by a horizontal passage to the burial chamber, built in the masonry of the pyramid and directed E-W (4.15 x 8.3m; 15m ht. at the top). The chapel, enclosure, causeway and temple are not excavated.

THE SOUTH PYRAMID OR RHOMBOIDAL PYRAMID (Snefru at Dahshur)[249]. — Recent excavations have proved that this was also built by Snefru. The outline is unique, having two angles of incline : in the lower part (44.9m ht.) the angle is 54°14'46" while in the upper part (apex at 52.5m ht.) the angles flattens to 42°59'26" (*fig.* 89). It has been noticed that the masonry consists of a core of local stone, cased with fine limestone, but that the upper part is definitely poorer, as if built in a hurry. The plan is square (188.5m), set towards the cardinal points with greater errors than in the orientation of the

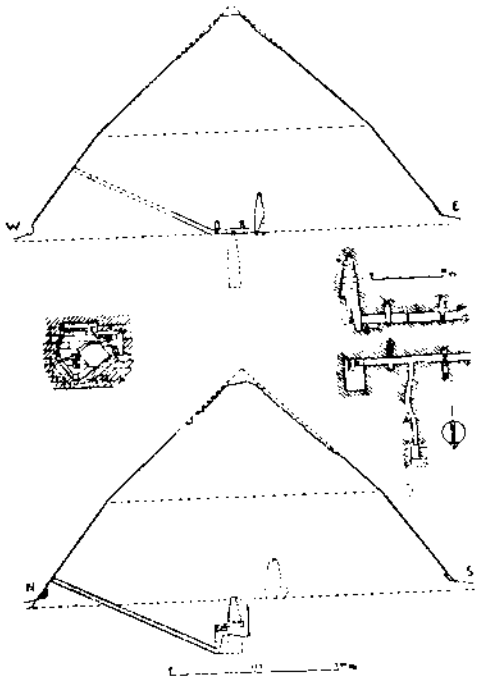

Fig. 89. Sections (E-W and N-S) of the rhomboidal pyramid of Snefru at Dahshur, and detail of the western upper apartment and one of its sliding portcullisses.

pyramids of Cheops or Chephren at Giza[250]. As to the technique of the masonry the courses of the casing are inclined inwards, perpendicularly to the face, which ensures greater solidity and economy in trimming.

The substructure is also unique in having two burial apartments, independant from one another, except through an irregular shaft, and having their entrances on the North and West faces.

The lower chamber, reached by a corridor from the North (originally 26°10'), is built in an open pit cut the rock (25m under ground level), in limestone with a corbel roof on all four sides (4.92 x 6.25 x 24.4m ht. at the top). It is preceded by a short gallery and its floor is eight metres higher than that of the latter. A door in the burial chamber, opposite the entrance, leads by a short passage to a blind shaft running upwards (12.5m). At the top of the corbelled roof an opening leads by an irregular tunnel to the entrance corridor of the other chamber.

The other chamber is reached through a sloping passage 26°36'), opening higher on the western face, with an entrance carefully concealed and continuing with a short horizontal corridor, to be blocked by two portcullisses sliding sideways on an incline, the first one alone having been put into position to block the corridor. Between the two portcullisses is the opening of the irregular tunnel, coming from the lower chamber. The chamber at the end of the North passage is at ground level, built in the masonry with a corbel roof (6.55 x 4.1m; 16m ht. at top). No trace of burial was found and Perring reports the discovery of ropes and baskets. The portcullis in position was carefully plastered on both sides, which proves that it was slid before blocking the entrance passage from the West. Furthermore the upper apartment is worked in better masonry than the lower and particular care had been taken to conceal its entrance on the outer face of the pyramid and

to block its passage by two sliding portcullisses. On the other hand no device for the protection of the lower apartment has been used. The irregular tunnel (relatively short 61ft8'), was certainly cut by the builders, as was the shaft at the bottom of the Great Gallery in Cheops' pyramid. It is only slightly inclined and seems to be about one metre wide. According to Perring: "The right hand corner of the upper end had been rounded, and a small recess had been cut out on the opposite side of the horizontal passage, apparently for the conveyance of a long solid body into the lower aprtment"[253]. All these facts seem to suggest that the burial would have taken place in the upper chamber, whose entrance corridor had already been blocked up and its entrance opening concealed under the casing. Had a burial taken place in the upper chamber the second partcullis could have been slid down and the papyrus cordages, which were found still hanging by Perring, would have been withdrawn.

The offering-chapel and the cult-temple were excavated recently.

TECHNICAL ACHIEVEMENTS AT MEYDUM AND DAHSHUR

The three pyramids of the end of the IIIrd dynasty show technical advance in the handling of stone and building in larger blocks (mortuary temples of Meydum and Dahshur South). The method of construction of core and casing is related to that in Djeser complex.

The corbel roof is used in stone for the internal chambers of the pyramid. Corbels in brick were already known in the IInd dynasty. According to Reisner stone corbelling was subsequently (Snefru-Cheops) used in private tombs of the same district[251].

Devices against tomb-robbers show refinement in the choice of an entrance to the burial chamber through a vertical shaft leading up to an aperture in the pavement (Meydum), or through a passage opening under the ceiling of a high room (Dahshur North). This shaft was surely blocked by means of a plug. A more complicated device is to induce the robbers in error by letting them enter one apartment, but hiding the real burial in another one, inaccessible (Dahshur South). This false architectural device was currently used in later tombs as false blocking, false chambers, blind corridors, false shafts.

Although the substructure of every pyramid has an individual plan, yet this one is an evolution of the type shown by the unfinished pyramid at Zawiyet el 'Arian: sloping passage entering an open trench in which are built a horizontal passage and a vertical shaft leading upwards to the burial chamber.

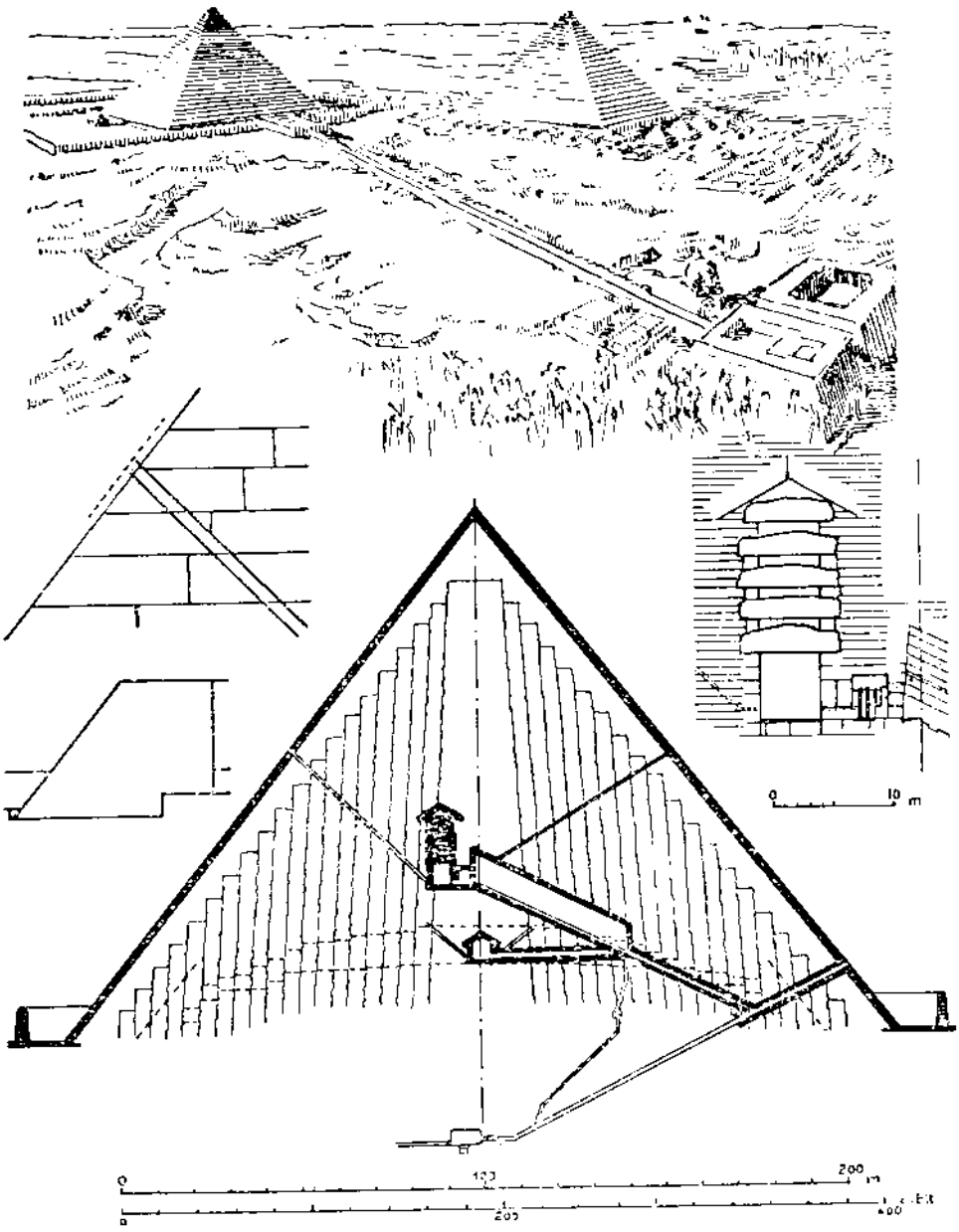

Fig. 90. Section (N-S) through Cheops' pyramid (Borchardt), bird's eye-view of Cheops' and Chephren's pyramids and temples and details of the relieving chambers, the South channel and mode of fixing bottom casing-blocks.

Reisner[252] illustrates the growth of the mastery gained by handicraft over stone through the comparison between the areas of the four pyramids dating from the IIIrd dynasty :

Neterirkhet-Djeser	14,857 sq. m.
Pyramid at Meydum	20, 880 sq. m.
Pyramid of Snefru (Dahshur S.)	35,400 sq. m.
" " " (Dahshur N.)	48,400 sq. m.

THE PYRAMID OF CHEOPS (Giza).— Cheops (Eg. Khoufou), son and successor of Snefru, built the largest and the most perfect pyramid. The accuracy in its orientation and the quality of its masonry have induced many theorists to consider it as a monumental custody of Egyptian science and symbolism and to read in its dimensions and internal apartments the most essential dates and facts of world history. It has been proved that the great pyramid is the tomb of king Cheops and that all the theories related to this monument are imaginative[253].

The plan is a square of 440 cubits (N. 230.253 - E.230.391 - S.230.454 - W.230.357m), whose sides are exactly set towards the cardinal points (the largest deviation being for the East side : 0°5'30" West of the true North). The present height is 137.18m, but it has been calculated that it was originally 280 cubits (146.60m), since about a dozen courses and the pyramidion have disappeared. The inclination of the faces is 51°52' to the ground (*fig.* 90).

The casing in Tura limestone has almost completely disappeared, except a few blocks at the base. The masonry consists, according to the usual method of construction, of a core of rough blocks irregularly set and bound with mortar and casing faces of finely dressed limestone. Borchardt noticed that these "girdle-stones" appeared every ten cubits (5.25m) in the ascending diate space was of blocks laid parallel to the slope of the corridor. At the bottom of the corridor blocks are irregular but with vertical joints, a fact which led him to suppose that this part was cut in the masonry, while the upper part had been built. This point would mark the level at which the pyramid builders changed their plans and decided to transfer the burial place from the underground room to the upper sarcophagus-chamber. Borchardt has supposed, on the ground that the second chamber was never finished, a third stage in the construction[254]. The present entrance is a hole hewn in the masonry by El Ma'mun men, below the original entrance in the North face. This entrance is still closed, having a double triangular arch of two pairs of sloping large stone beams, leaning against each other.

The first project was to have an underground chamber, the one left un-

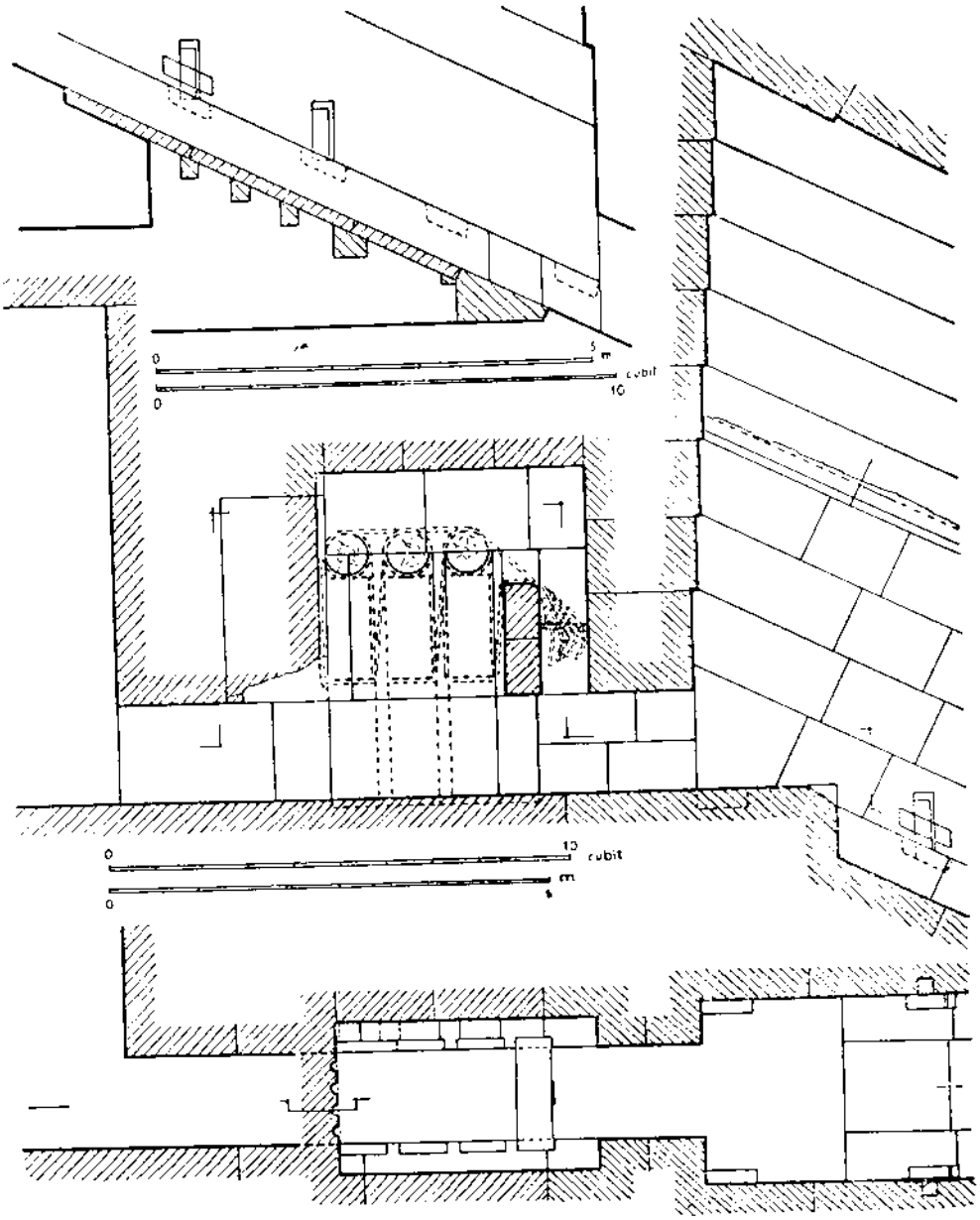

Fig. 91. Restored section through the chamber of the portcullisses showing the assumed method of lowering the blocks (Borchardt).

finished, South of the axis of the pyramid and which is reached by a sloping corridor (26°31'23"). The major part of the corridor, the small lower horizontal section and the chamber are cut in the rock. A blind passage had been begun in the South wall of the chamber.

The second project contemplated the building of a burial chamber in the axis of the pyramid at no great height. This was actually let unfinished and was accessible through an ascending corridor, beginning from an aperture cut in the roof of the original descending corridor and continuing horizontally before reaching the chamber. The aperture in this corridor was closed by a slab to hide it completely, but it seems to have fallen while El Ma'mun people were tunnelling. This is probably the entrance device described by Strabo[255] : "A stone that may be taken out, which being raised up, there is a sloping passage". Petrie, however, thought it could mean that the entrance doorway had a stone flap-door, similar to the one he restored at the rhomboidal pyramid of Dahshur[256]. The dimensions of the ascending corridor (26°2'30") are similar to those of the descending corridor. It seems that it was intended to block it with plug-stones, three large granite ones being still in store at its lower end. At the point where the great gallery meets the horizontal passage an irregular shaft was tunnelled through the masonry, downwards to meet the lower end of the descending corridor, thus affording a way of escape to the last workman who was to leave the monument after the burial, when the ascending corridor had been blocked. In the chamber at the end of the horizontal corridor a niche with corbelled sides was built in the East wall, presumably to shelter a statue. In each of the North and South walls there is a small rectangular aperture from which two shafts run horizontally and ascend at a slope of 30° towards the North and South faces, but stop, having been left unfinished when the project was altered for a second time. Similar shafts exist in the upper chamber. The chamber has a pent-roof and its floor has been left rough. The masonry is exceedingly fine, while the work above is rougher.

In the third project the ascending corridor was continued as a grand gallery (16m ht:4 cubits width), with corbelled sides and flat roof (2.2 cubits width), leading upwards to the final burial chamber, South of the axis of the pyramid. This axis, dropped vertically from the apex, is marked by the face of the threshold to the funerary apartment at the upper end of the great gallery. The slabs of the ceiling engage individually in notches at both ends in the side-walls, so that no slab transfers the stresses to the one below it[257]. On both sides of the gallery a runway follows its whole length and its flat top is marked by long slots (1 cubit) cut at regular intervals (2 cubits) near the walls. To these correspond vertical slots in the walls themselves. Study-

ing these slots Borchardt has deduced that they were to fix the lower ends of a wooden scaffolding upon which plugstones were to be stored till they could be used for blocking the ascending corridor[258]. This device would explain the unusually huge dimensions of the gallery. Its seems however that only three of such plugs were actually used, and these were too large to be stored in the horizontal passage. In front of the chamber is an antechamber with walls of granite and four slots in each of the East and West sides. Three of these slots reach to the floor and were to hold granite portcullisses, the fourth and northernmost is shorter and has still a double screen to block the gap between the storing-space above the portcullisses[259]. It is surmised that the portcullisses were dropped gradually by means of ropes sliding about round wooden beams, as a primitive windlass. The semi-circular notches where such beams were fixed are still to be seen on both walls, above every slot (*fig.* 91).

The funerary chamber, called King's chamber, is directed E-W, entirely lined with polished pink granite and roofed with horizontal slabs. Above this ceiling there is a unique device of four superimposed horizontal ceilings, enclosing vacant spaces between them and topped with a gable roof of two series of blocks leaning upon one another. These "relieving chambers" were intended as provision against stresses in the ceiling blocks of the chamber[260]. It is in the two upper chambers that ochre markings of the king's name were found. At the western end of the burial chamber is the plain granite sarcophagus. In the North and South walls are the apertures, similar to those of the middle chamber, of channels square in section, cut out of one stone and roofed with a slab. They are sloping upwards to reach the North and South faces of the pyramid, at the same level and have accordingly different gradients: 31° for the northern and 45° for the southern. They are usually thought to be ventilation-channels, but would better be considered as open ways for the king's soul to reach the circumpolar stars to the North and the Orion constellation, to the South.

The court of the pyramid enclosure was paved with limestone. Outside rows of mastabas run N-S according to a town-planning project, those to the East being for the relatives and those to the West for officials. Later in the Vth and VIth dynasties intrusive small mastabas filled in the spaces between the earlier ones.

On the South side lie three small pyramids, the central one belonging perhaps to queen Henutsen, half sister of Cheops. Every pyramid has a funerary chapel on the eastern side and a solar bark.

THE PYRAMID OF CHEPHREN (Giza).— The pyramid of king Chephren (Eg. Khafre') is slightly smaller than that of his father, but its faces are less

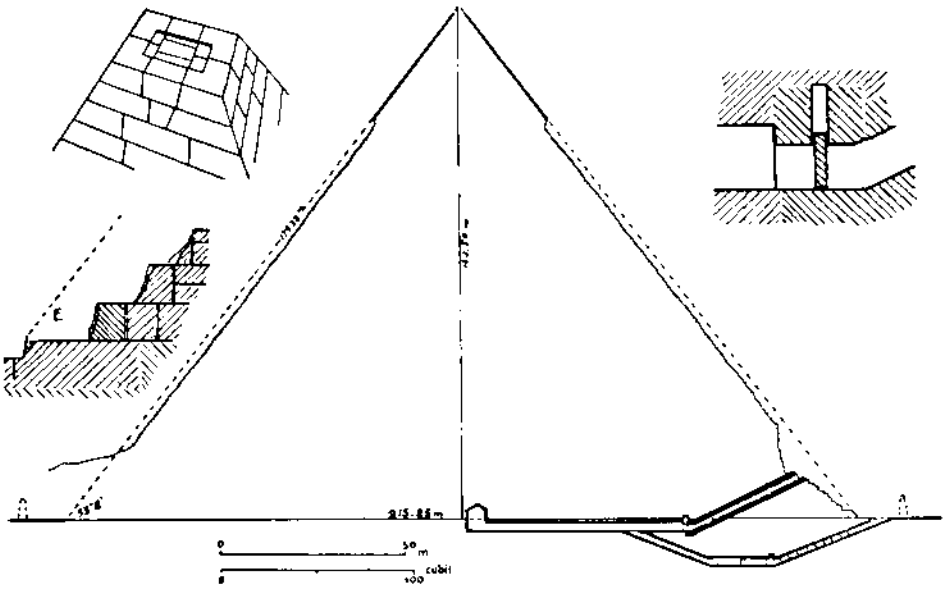

Fig. 92. Section through the pyramid of Chephren (N-S), with details of the top, the portcullis, and courses on the East face.

inclined (52° 20'). It is inferior in quality, both as masonry and workmanship (*fig.* 92). It retains part of its limestone casing at the top and its lower granite course. The site was not level and considerable cutting had to be done, especially on the North and West, while to the East an artificial plateau had to be built with blocks of rock. To the North a large levelled area still retains traces of the separating trenches between the blocks which were quarried[261]. This difficulty may account for altering the original project and removing the site of the plan farther South. Actually the pyramid contains one apartment, with two entrances, the early one being hewn in the pavement and concealed under it. This lower entrance opens into a corridor cut in the rock, sloping for some length (21°40'), but running horizontally and reaching a lower chamber by a sloping passage, entered from the East wall. This was the burial chamber of the initial project. The corridor rises again steeply and meets the corridor of the second project. This had an entrance to the East of its axis, on the North face, and led into a descending corridor of small section (25°55'), completely lined with granite, stretching horizontally at the level of the rock and reaching the burial chamber situated to the N.E. of the vertical axis from the apex. This room, hewn in the rock, is roofed with painted limestone slabs, inclined as pent-roof at the same angle as the faces of the

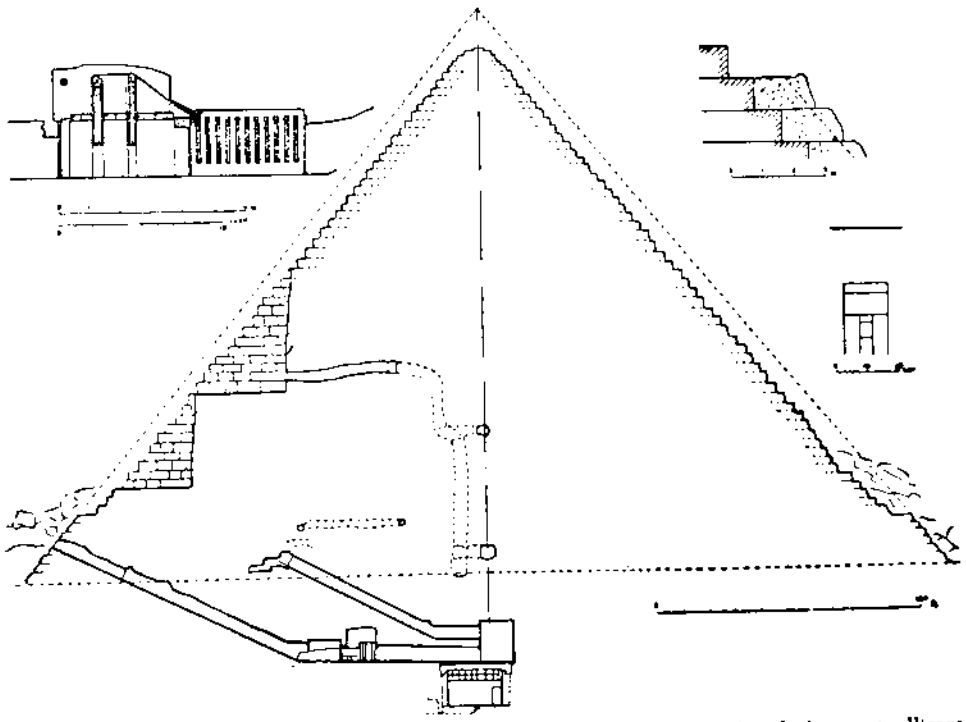

Fig. 93. Section through the pyramid of Mykerinos (N-S) and details of the portcullisses-chamber with recessed panelled wall and detail of the casing-stones.

pyramid. A sarcophagus was found sunk in the floor with a broken lid nearby. Vertical slots at the end of the granite lining of the corridor were to direct a granite portcullis.

The problem set by the ascending passage connecting the corridors of the two projects seem to find an answer if it is surmised that it served during the transport of the sarcophagus and the granite portcullis from the lower to the upper chamber[262].

THE PYRAMID OF MYKERINOS (Giza).— Mykerinos (Eg. Menkaure') built the third royal pyramid, by far the smallest, at Giza. It retains most of its casing and sixteen lower courses in undressed granite. The faces are inclined at an angle of 51° (*fig.* 93).

The initial project had been altered once to enlarge the size of the structure. In the initial project the sloping corridor was cut through the rock and reached a burial chamber directed E-W. The mouth of the corridor is

now lost in the masonry of the superstructure. The second project let the burial chamber be hewn deeper and a horizontal corridor run horizontally from it, under the initial one, being furnished at its end with three portcullisses, before reaching an antechamber whose walls have recessed panelling[263]. Between the antechamber and the portcullisses there was a doorway of granite with drum and lintel. The portcullisses are set wide apart from one another, which lets surmise that there was a granite ceiling between them, at the level of the ceiling in the corridor. From this chamber the actual sloping corridor rises to open on the North face (26°2').

As a third project a second burial-chamber was hewn under the original one, connected to it by a shaft lined with granite at its upper end and a trap-door at its lower end. The burial chamber is lined with granite and has a pent-roof cut underside into a pointed vault. Just before the lower burial-chamber some steps lead down to a chamber with four deep recesses for receiving the inner organs sarcophagi (Buto burial) and two recesses in the back wall for the crowns (Sais burial)[264]. These elements of the foretemple had been transfered into the substructure of the pyramid itself, probably by Shepseskaf.

The basalt sarcophagus found in the lower chamber, with recessed panelled sides and cornice-moulded lid, was lost in a shipwreck.

The construction was interrupted by the king's death and carried on by Shepseskaf, as is apparent also in the mortuary complex. Three small, partly unfinished pyramids lie to the South.

THE PYRAMID OF DEDEFRE' (Abu Rawash)[265].— To the North of Giza, on the outskirts of the valley, are the remains of an Old Kingdom necropolis and of the pyramid of king Dedefre' The superstructure has completely disappeared, but the lower apartments consist of a vertical pit (E-W 70ft x N-S 30ft x 30ft ht.) to which descends from the North a sloping open trench. A long causeway (1 mile) leaves the mortuary temple from the North and bends to the N.E., following a natural ridge of the rock. Nothing but brick traces have remained of the mortuary temple on the East face of the pyramid. The valley-temple is unrecognizable. It seems that brick was used to finish in haste the mortuary temple. Heaps of granite fragments lie nearby. South of the temple is the excavation for a sun-boat.

Two other small pyramids rose in the same district, but have now disappeared. It is to be noticed that the substructure has reverted to the open excavation type, after the tunnelling method had been in use since Cheops, a fact which can be due to the nature of the rock.

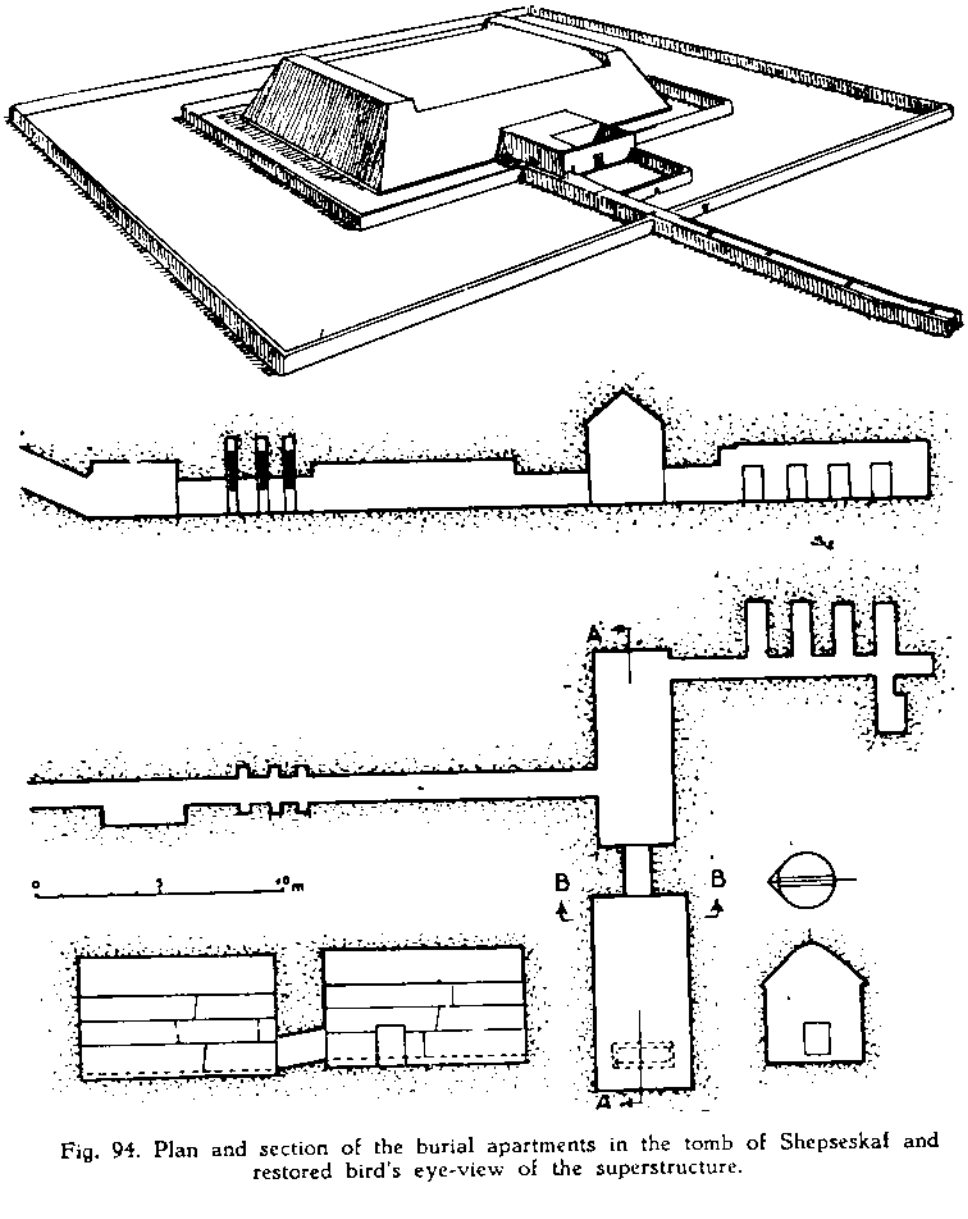

Fig. 94. Plan and section of the burial apartments in the tomb of Shepseskaf and restored bird's eye-view of the superstructure.

THE TOMB OF SHEPESEKAF (Saqqara)[266].— Shepseskaf is the only king of the IVth dynasty who did not build a pyramid. His tomb, the "Mastaba Fara'un", has a superstructure in the form of a house, a step which may be ascribed to Lower Egyptian influences, particularly that of Re'. This is to

be found clearly in the disposition of the funerary cult-temple of Shepseskaf : it has the earliest roofed offering-chapel, a lateral connecting-passage to the court, a second court with recessed panelled walls, no statue-shrine, which suggests that all other deities had been discarded except Re' and that the funerary cult was dedicated entirely to Re'[267].

The superstructure, of which only the core remains, has been restored as a rectangular mass with battered sides (65°), the two smaller rising as two but-end walls, about the flat vaulted roof (*fig.* 94)[268]. It was cased in limestone above a granite step and surrounded by a wall. The mortuary temple of small dimensions abutted on the East side and a long causeway reached it from the South side.

The substructure shows an intermediate stage between that of Mykerinos and those of the Vth dynasty pyramids. The internal apartments are completely lined with granite, in courses of one cubit in height. The entrance passage on the North descends (23°) to a small antechamber, followed by three granite portcullisses, a horizontal passage reaching a transversal vestibule. The sarcophagus-chamber is to the right, directed E-W, and pent-roofed, its blocks being cut to a curve to imitate a pointed vault, as that of Mykerinos. A long corridor in the back wall of the vestibule has four deep niches on the East side for the inner organs sarcophagi and one on the West side for the crowns[269]. The main characteristic feature is the transfer of the burial shrines, ascribed to Buto and Sais, from the foretemple to the substructure, a transfer which the same Shepseskaf had also caused to occur in Mykerinos' pyramid. It is the amalgamation of the Abydos tomb and the Buto tomb into a single tomb dedicated to the king as Osiris.

THE PYRAMIDS IN THE Vth DYNASTY

The kings of the Vth dynasty bring the cult of Re' to its apex and their architectural activity is accordingly directed to the building of sun-temples, perhaps on the model of the earlier sun-temple at Heliopolis. Their pyramids are built on a comparatively smaller scale and embody many new features, especially in their complexes, where the cult of Re' accaparates certain elements. With the apparition of the Pyramid texts on the internal walls of the pyramids a new reduction in bulk is allowed. As to construction masonry is strinkingly poorer than the megalithic IVth dynasty structures.

THE PYRAMID OF USERKAF (Saqqara).— Some have suggested that Userkaf built his pyramid at the N.E. corner of Djeser's enclosure, on account of the sanctity which this site had acquired[270].

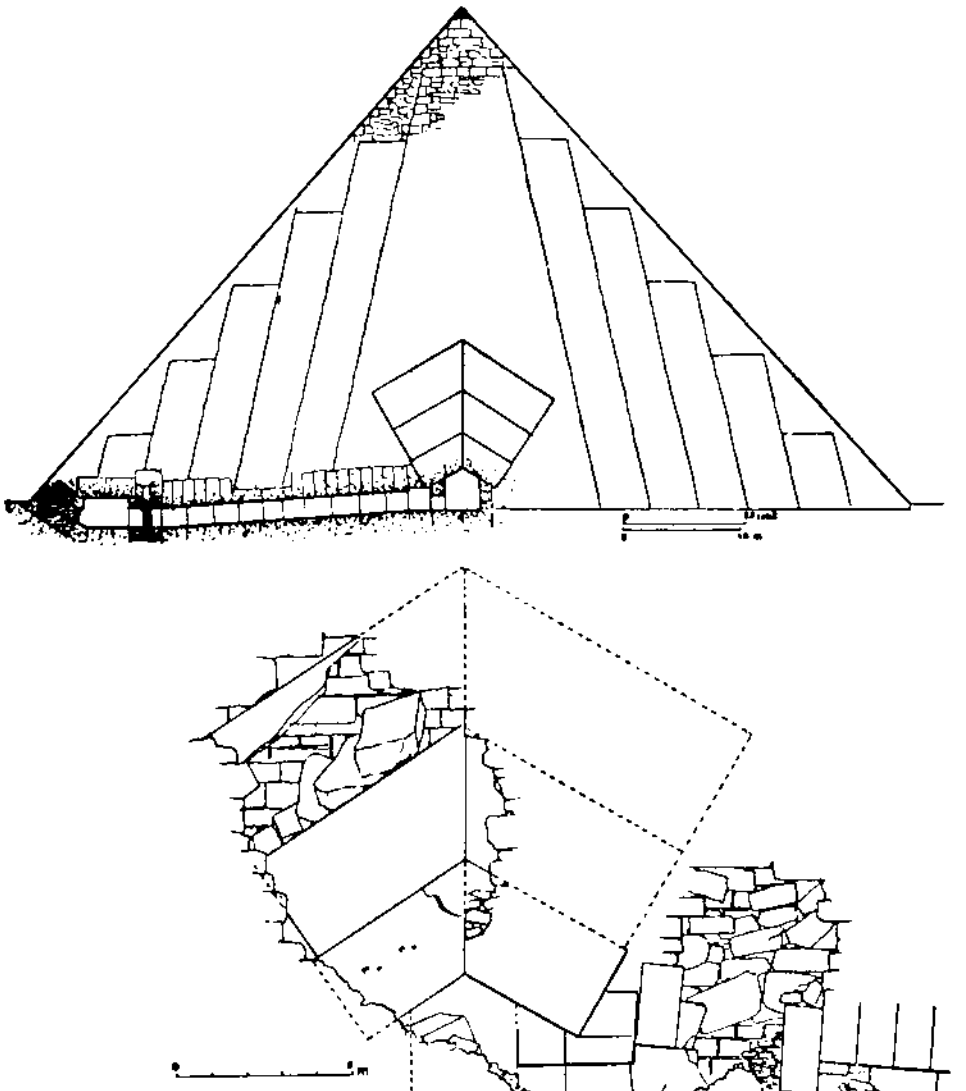

Fig. 95. Section through the pyramid of Sahure' and detail of the burial chamber.

The ground rises to the East so that only a small offering-chapel could be set on the eastern face while the larger funerary cult-temple had to be dissociated and built on the South (fig. 70)[271]. The superstructure[272] is of large undressed blocks, with no trace of casing (210ft square; 108ft ht.).

The substructure is hewn in the rock and consists of a northern sloping passage (26°35'), entirely lined and stopped up with blocks of granite and continuing horizontally. In the middle of the latter part a granite portcullis, larger than the passage section, blocked the way. Beyond, to the East, a side corridor leads to a vestibule and a large room N-S, lined with limestone. The passage reaches a vestibule out of which opens to the West the sarcophagus chamber directed E-W, lined and containing a small plain sarcophagus of basalt. These two main chambers are pent-roofed.

THE PYRAMID OF SAHURE' (Abusir).— Sahure' was the first king to build his pyramid on the plateau of Abusir, to the North of Saqqara. He was followed by Neferirkare' and Neuserre', with magnificent complexes.

Of the casing in the pyramid of Sahure'[273] only some limestone blocks have remained in situ in three places and give a slope of 50° 1/6. The square basis was 150 cubits long and the height has accordingly been calculated to 90 cubits, meaning a batter of 5+1/2+1/3 palm for every cubit in height.

Inside (*fig.* 95) the beginning of the North descending corridor (27°), which was in black granite, has disappeared. This very short sloping part must have been blocked with a granite plug. The corridor continued horizontally for a short distance and was blocked by a granite portcullis, set in a granite frame. It was lined with great blocks and roofed with sloping slabs. The corridor, lined with great limestone blocks, continued with a slight slope upwards to the funeral chamber. All these inner apartments are at ground level. Just before the chamber the corridor is again built in granite, probably to take the loading coming from the roof-slabs of the chamber. This roof is technically a sound piece of construction : it consists of three layers, each of two series of huge blocks set at a slope, gablewise. The upper layer has the longest blocks, so that the stresses are directly transfered to the neighbouring masonry of the core. Such an effective solution to transfer sideways the pressure exerted on the roof will never again be so accurately carried out in the later pyramids, although the greater slope of the blocks is certainly more adequate.

The inner masonry consists of a core of rubble, faced with undressed limestone blocks and surrounded by five layers decreasing in height as they are set farther away from the centre.

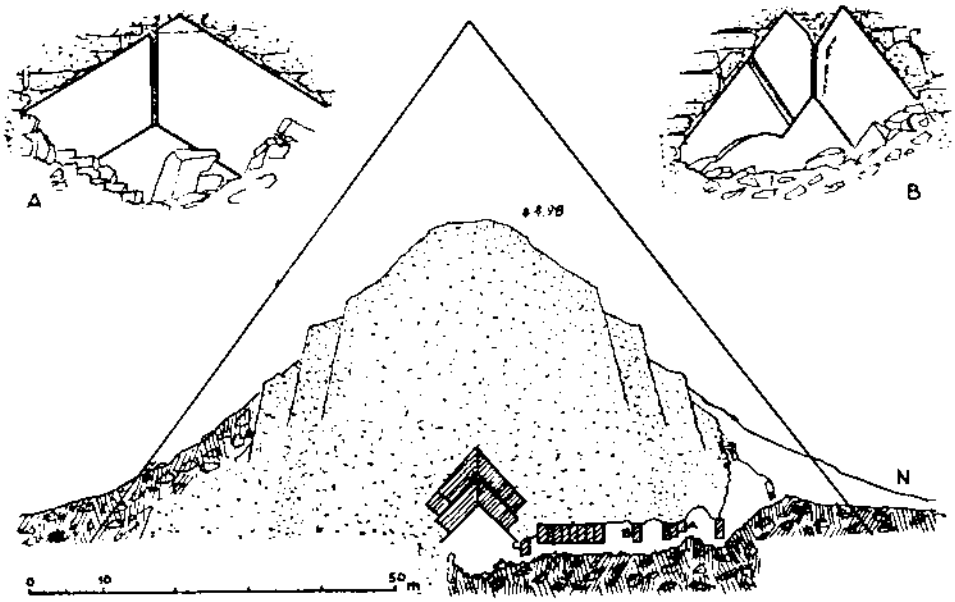

Fig. 96. Section through the pyramid of Neferirkare' and details of the pent-roof in the passage.

THE PYRAMID OF NEFERIRKARE' (Abusir)[273].— At the death of Neferirkare' the pyramid, although unfinished, was more complete than the buildings of the complex. Construction was continued in brick by Neferefre' and Neuserre'. The pyramid is slightly larger than that of Mykerinos and had red granite casing in the lower courses. The only block still in situ gives 53°,5 as gradient (5 palms par cubit ht.) The side of the pyramid is 200 cubits (106.8m). As that of Sahure' it is built in layers (4.1m = 8 cubits thick and inclined 77° = 1 1/2 palm per cubit ht.)[275], of yellow rubble, without mortar.

Of the inner apartments neither entrance nor granite plugs or portcullis remains. One must presume that the first part of the corridor was sloping (*fig.* 96). The horizontal part was covered with a pent-roof (30°), where the joint between the two inclined blocks, of different thickness and too short, sometimes does not coincide with both but-ends. Neighbouring pairs of inclined beams have different gradients, all features which show a deterioration in constructional conscience. The horizontal ceiling has disappeared. As in Neuserre's pyramid the corridor bends eastwards in plan, before reaching the burial chamber. A stem of acacia nilotica[276] is still engaged in the upper part of the corridor and may have served as mast to set beams into position.

The construction of the burial chamber[277] is similar to that in Neuserre's pyramid, with shorter beams in the middle layer of the pent-roof. Series of holes in the beams point to some process for manipulating them. An ante-chamber is connected to the West with the sarcophagus-chamber, directed E-W, and whose walls were lined with limestone (2m thick)[278]. On the beams some red ochre levels are marked with horizontal lines and texts, giving levels at various points of the corridors and chamber, above the pavement of the shrine. Such basic methods, which are still in use, were already the same as in the New Kingdom and Ptolemaic architecture[279].

THE PYRAMID OF NEUSERRE' (Abusir) [280].— Neuserre', with a view of appropriating to himself the causeway and valley-temple of Neferirkare', chose the site for his pyramid complex quite close to the East of that of Neferirkare'.

The pyramid on a square plan (75 cubits) has an angle of incline of 52°, or a batter of 5 palms 2 fingers per cubit height (*fig.* 97). The height would have reached 50.12m. The inner masonry consists of series of layers 5m thick, inclined at 76° and set in form of steps about a central core which embodies the chambers. The outer face of the layer is better in workmanship than the inner masonry and uses rare mortar. To enclose this stepped structure into a true pyramidal casing, a filling of blocks and limestone mortar was used in front of the layers. Casing blocks were just placed on an even course, except for the corner blocks which were set deeper in a socket in the block under them, to afford a grip preventing sliding. Casing blocks in one course are not always of the same height. The entrance doorway could have been blocked up with one inclined slab sliding horizontally.

The North sloping corridor begins in the casing and was 2 cubits high (1.05m). It was blocked with a huge granite wedge-shaped plug. Some way farther another limestone plug was set. Some of the slabs lining the corridor are still preserved (1.25m thick, 4.4m long). The end of the corridor is in granite to receive the stresses from roof-pressure. The pent-roof is in three layers of two series of blocks, inclined at 45° (1:1), towards the longitudinal axis of the chambers. One obvious error has been made in the execution of the work: the upper layer is of short blocks reaching the middle of the blocks under it, so that the loading is applied at the most unfavourable point on this second series of inclined blocks. Besides, just the lower end of the block is applied on the second layer block under it, the vacuum between both being stuffed with small stone filling. The same filling is used between the middle and the lowest series so that this latter has nothing but its own weight to carry. The corridor opens in an antechamber, connected to the West with the burial chamber, directed E-W, both built in yellow limestone.

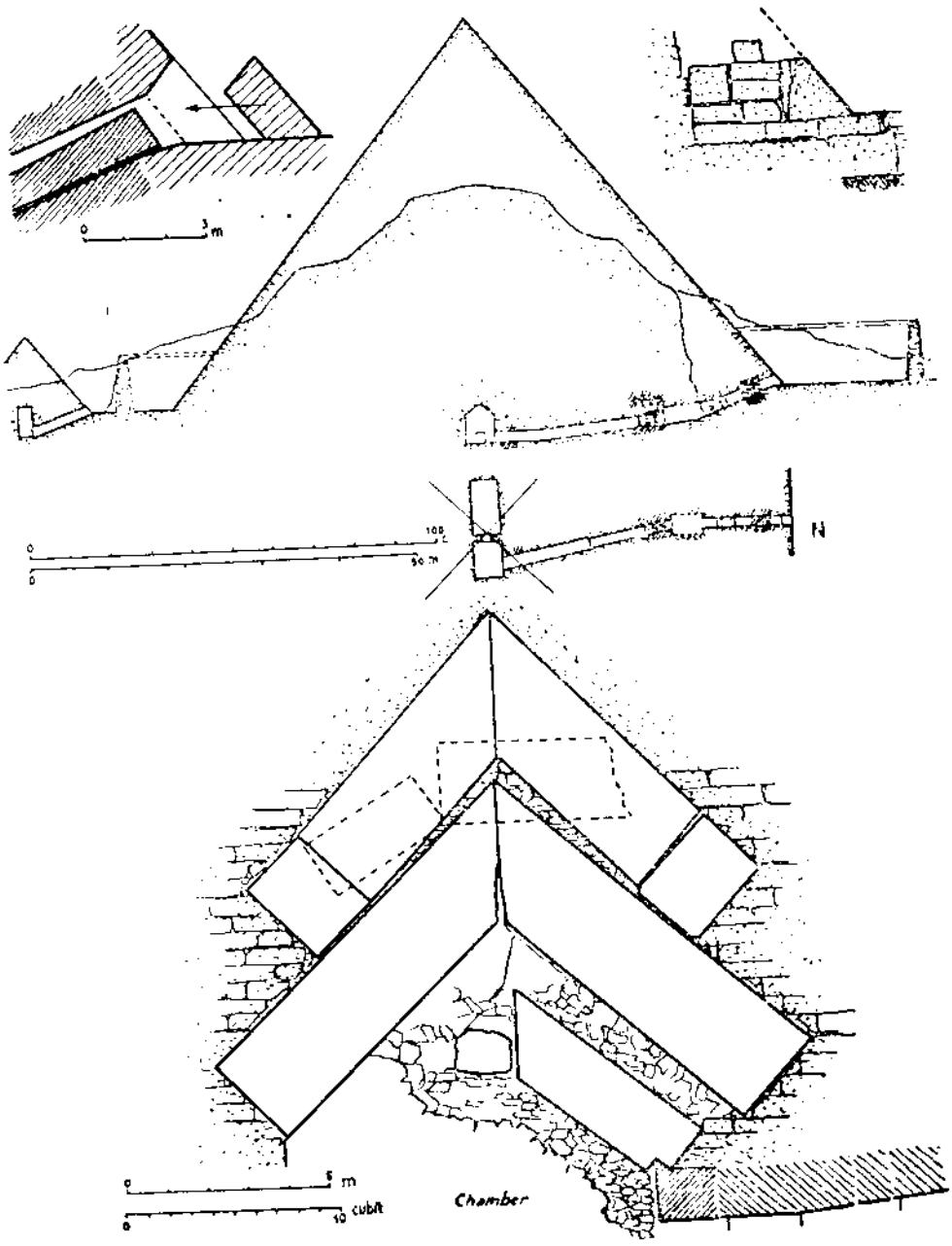

Fig. 97. Section through the pyramid of Neuserre' and details of the pent-roof above the burial chamber, method of blocking the entrance and casing-stone.

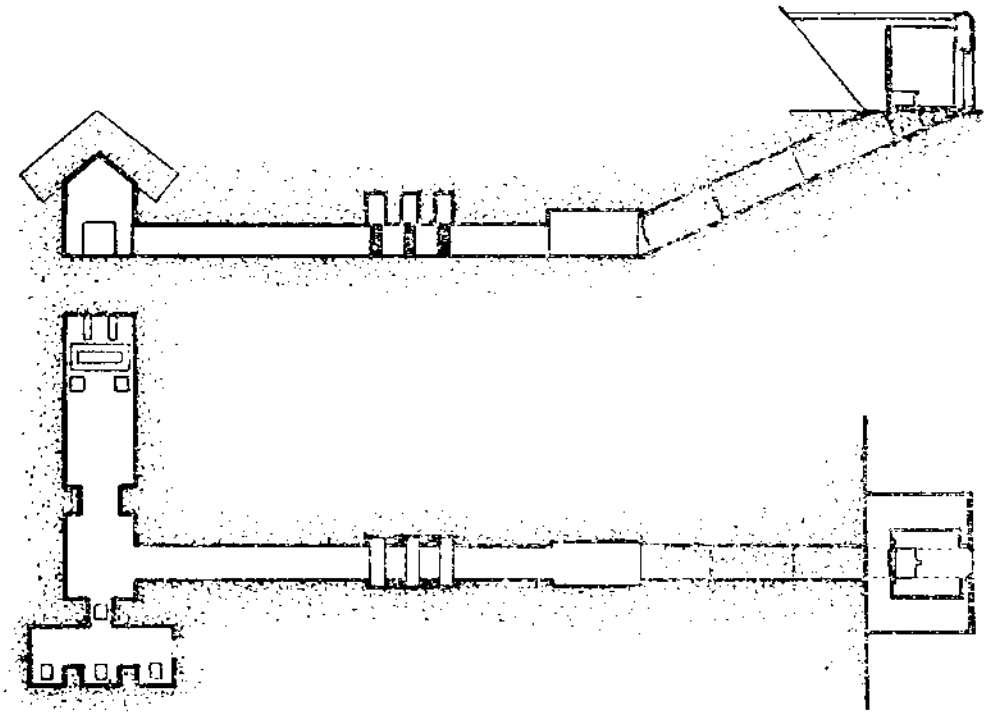

Fig. 98. Section and plan of the funeral apartment in Unas' pyramid.

THE PYRAMID OF DJEDKARE'-ISESI (Saqqara)[281].— Djedkare' built his pyramid at Saqqara (ar. Haram el Shawwaf), of undressed blocks with a casing of limestone (side 270ft, ht. 80 ft.). The causeway starting from the East side is cut in the rock and farther, built in large blocks.

THE PYRAMIDS OF UNAS, TETI, PEPI I, MERENRE', PEPI II (Saqqara)[282].— Although the smallest among the royal pyramids (57.6m side, 40m ht.), the pyramid of Unas (*fig.* 98) is architecturally important because its inner apartments plan was used as a model, with variations in dimensions, by the kings in the VIth dynasty: Teti, Pepi I, Merenre' and Pepi II (Side 150 cubits = 78.6m; height 100 cubits = 52.4m).

The entrance to the inner apartments was no more in the North face, but lower and covered by the pavement. The first part of the corridor is sloping and blocked with granite plugs. In Pepi I's pyramid this sloping corridor is partly inscribed. At the bottom of the sloping corridor a widening in the form of a room serves as connection with the horizontal corridor (1.3m ht.,

1.1m width; higher at Pepi's: 1.5m), with limestone walls, except in the middle part and before the burial chamber, where walls are in granite. In the middle part the granite portcullisses block the way, varying in thickness in different pyramids (0.62m at Unas; 0.78m at Teti and Pepi I; 0.96m at Merenre'; 1-1.6m at Pepi II). Thieves used various methods to proceed farther: either they cut a hole in the upper part of the setting and tunnelled through the two partitions between the portcullisses (Unas), or burnt the portcullisses and hammered a passage in them (Teti), or lifted them slightly, propping stones under them (Pepi I). All these pyramids were entered in the Middle Ages.

Just before the end of the corridor granite was again used for lining, to meet very adequately the stresses coming from the pent-roof blocks of the chamber. The doorway to the antechamber was again in limestone. The antechamber is square in plan and opens to the East and West by two square doorways (1.34 x 1.36m at Unas). The limestone walls were inscribed with vertical columns of hieroglyphs coloured with blue pigment. These famous pyramid texts are collections of spells originating from various theological systems (Re', Osiris), written in the Vth and VIth dynasties, but surely embodying archaïc elements which sound as anachronisms. The purpose of these texts was to provide the king with supplies of food and to enable him to accompany the sun in his daily course. Later, in the Middle Kingdom, texts derived from the pyramids will be inscribed or painted on the inside of coffins.

To the West of the antechamber is the long sarcophagus-chamber (E-W), with walls lined in limestone, inscribed and supporting a pent-roof. The basalt sarcophagus is at some distance from the back wall and in between are two brick ledges upon which the lid was stored till it was caused to slide in position (Pepi II). The back wall of Unas sarcophagus-chamber is lined with alabaster, engraved and painted with a recessed motive and a false-door.

To the East of the antechamber is a transversal room with three deep niches in its back wall, called the "serdab", or cachette for statues.

THE PYRAMIDS OF THE QUEENS OF PEPI II (Saqqara)[283]. – Near the royal pyramid of Pepi II lay the three pyramids and complexes of the queens of Pepi II, Neit, Udjebten and Ipuit. These were similar but on a smaller scale, to the royal pyramid (24m side and 21.5m ht. at Neit). The method of construction is similar, consisting of layers of dressed stone masonry encasing rubble. The whole had a limestone casing (61° at Neit; 55° at Ipuit; 65° at Udjebten) at an angle of incline higher than for royal pyramids (*fig.* 99).

The inner apartments were hollowed in the soil, so that the level of the ceiling in the funerary chamber corresponded to ground level. They con-

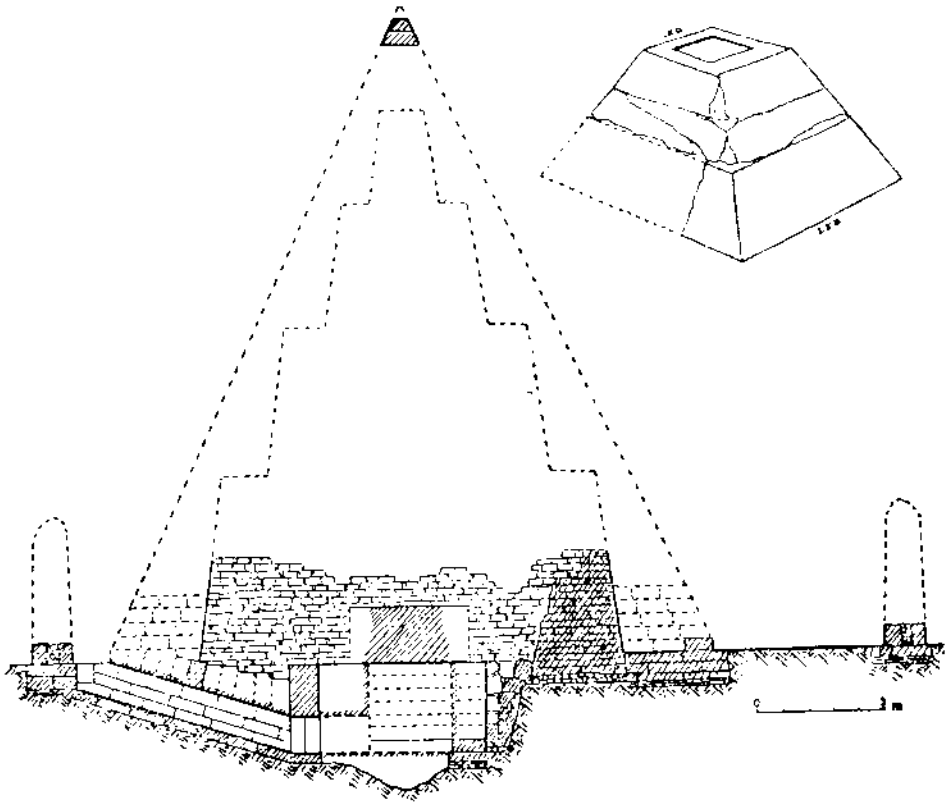

Fig. 99. Section through the pyramid of queen Udjebten and detail of its top courses.

sisted of a sloping corridor (26° at Neit; 23° at Ipuit; 18°30' at Udjebten), whose mouth was hidden behind the false-door of the North entrance chapel. The corridor had a square section (1.4m), lined with limestone, sometimes continuing horizontally for a short length. A granite portcullis and setting stopped the way to the funeral chamber. This one was directed E-W, lined in limestone and inscribed and was covered with a ceiling of huge beams. The sarcophagus of granite and canopic chest were set in front of the back wall, sometimes with five false-doors in this wall, or two brick ledges to carry the lid. To the East of the funeral chamber a small door led to the serdab, a tiny room for equipment.

THE BUILDING OF THE PYRAMIDS

The pyramids of Egypt are the most striking architectural achievements, both on account of their huge masses and the accuracy of their construction. Texts and scenes provide no evidence for the study of their methods of erection.

The sites of the Old Kingdom pyramids lay all in the district of the capital of Memphis, on a plateau accessible from the river or the inundation waters. This would facilitate conveying the blocks on Nile barges. The suitable rock area having been chosen it was levelled as for any other construction to be prepared for building by cutting away the high masses, perhaps using as datum line that of water enclosed in an artificial drain with mud embankments surrounding the area. This method is similar to the one used for dressing the faces of a stone block, where the previously prepared levelled ridge around every face served as datum-line for cutting the interior of that face. Sometimes a rock core was left to be embedded in the superstructure.

Surveying the site was carried out according to the usual method, shown in the ceremonial scenes of the foundation of a temple. Statues represent surveyors kneeling and holding with both hands circular bundles of cord used in their work. Long rods were driven into the ground to mark points of intersection of lines in the plan. The main problem was the orientation of the monument towards the cardinal points. It has been surmised, on the evidence of later texts describing the orientation of temples, that the North was determined through sighting one of the circumpolar stars at its rise and at its setting and bisecting this angle[285]. A simple device has been proposed: it consists of a circular brick enclosure, the top of which is set horizontally at man's height. The observer would stand in the centre of the enclosure and mark vertical lines on the wall above the points where he would sight the chosen star rising or setting at the top of the wall. The line joining the middle point between both and the centre would give the N-S direction[286].

One of the main dependances was probably the causeway built on a suitable ridge of rock, a choice which sometimes lengthened it (Abu Rawash). According to Herodotus (II, 124) the causeway to the great pyramid at Giza and the subterranean apartment took ten years to be prepared.

All the pyramids, possibly also those at Giza, were built in stepped layers inclined about 75°, abutting on a core of rough masonry (*fig.* 100). Each layer was faced with roughly or finely dressed masonry: this is the accretion face. When the structure presented the aspect of a stepped pyramid these steps were packed with blocks till the pyramid had four faces ready to be

cased in limestone. It has not been possible to determine if such accretion faces existed in the pyramids of Cheops and Chephren. That the accretion faces were sometimes left undressed[287] seems to prove that work was carried out over the whole of the area, course by course[288]. Dressing the prismatic casing-blocks proceeded from the apex towards the base of each face.

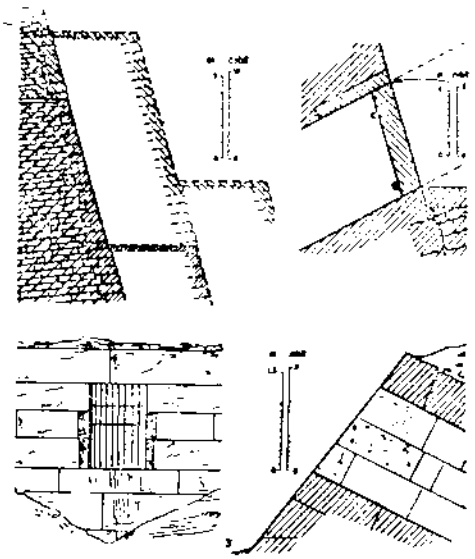

Fig. 100. Constructional details in the pyramid at Meydum : section through accretion faces, closing of entrance of second project, elevation and section of entrance to third project (Borchardt).

It has been surmised that embankments of earth or sand were used along the four sides of the structure, although this would have complicated the building process. However two ramps have actually been found at Meydum (*fig.* 101), and others at the pyramid of Chephren at Giza and that of Amenemhat at Lisht. Sledges carrying blocks could be slid up along these ramps to the terrace of the structure. Such a method would have allowed the handling of blocks from the front and the use of fixed reference points and datum lines from the base of the pyramid. Such references would eliminate the various problems relating to twist in the pyramid due to dressing the casing-blocks. It has been calculated that such a ramp running at right angle to the middle of a face and wide enough, would have been sufficient[289].

The truth of the account of Herodotus relating to the construction of Cheops' pyramid and in which he mentions the use of wooden machines does not seem to be founded upon fact. Herodotus states : "This was built thus, in the form of tiers, battlementwise as it is called, or according to others, stepwise. When they had first built it in this manner, they raised the remaining stones by machines made of short pieces of wood : having lifted them from the ground to the first range of steps, when the stone arrived there, it was put on another machine that stood ready on the first range and from this it was drawn to the second range on another machine; for the machines are equal in number to the ranges of steps (or, they removed the machine, which was only one, and portable, to each range in succession, whenever they wished

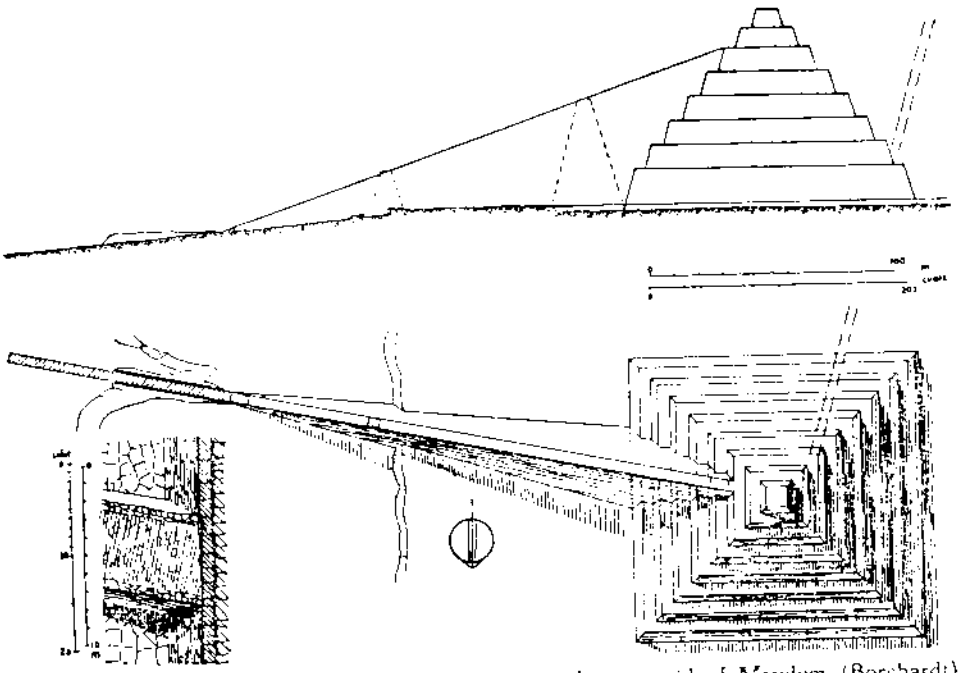

Fig. 101. Restored plan and elevation of the ramp at the pyramid of Meydum (Borchardt).

to raise the stone higher, or I should relate it in both ways, as it is related). The highest parts of it, therefore were first finished; and afterwards they completed the parts next following; but last of all they finished the parts on the ground and that were lowest". That those machines were the rockers known through models has been shown to be practically impossible[290].

If it be assumed that building proceeded in tiers the inner core blocks were first laid, with bottom faces smoothed. In casing the inner accretion faces it would be checked that the sides of the concentric squares and their faces would be accurately equal and at the chosen slope (75°-77°). Packing blocks were then laid in the steps and casing blocks of limestone, perhaps fitted together on the ground, would be set with as close joints as possible. It is to be noticed that the corner block in each course had a protruding square on its bottom, to fit in a corresponding shallow socket in the block under it, and in the rock at ground level. Mortar was used more as a lubricant than as a binding material.

The construction of the interior apartments of a pyramid presented as many problems as its superstructure. If the chambers were to be hewn in

the rock as in the pyramids before the Vth dynasty they would have been completed first. This is proved by the study of the different stages in the pyramids of Giza, especially that of Mykerinos and by the existence of a whole set of so-called trial-corridors and chambers similar to, although shorter than, those under the pyramid of Cheops, hewn in the rock to the East. This would represent an earlier attempt at building this pyramid, abandonned when the subterranean chambers had been prepared[291].

Levelling of the corridors was done by means of marks on the roofing, taken with respect to a fixed repère chosen at the entrance. Such marks on the beams over the corridor and chambers in the pyramid of Neferirkare' gave levels above the pavement of the chapel[292], a method which could compare favourably with those of modern levelling.

Gradients of slopes were probably calculated by simple means, being a ratio of vertical heights to horizontal distances. The ascending corridor had generally a gradient of about 26,5°, which represents a ratio of h:l = 1:2.

Meydum	Dahshur N.	Dahshur S.	Cheops	Chephren	Mykerines	Userkaf	Sahure'	Neferirkare'
28°	27°36'	26°10' (W) 26°36' (N)	26°31'23"	21°40' (lower) 25°55' (upper)	26°2'	26°35'	27°	26°3'

For the apartments in the superstructure blocks would have been dressed to fit and be set together along the corridor, before the surrounding core was brought in place. The exactness of the joints, especially in the pyramid of Cheops, proves that great accuracy was expected for the interior. This is corroborated by the setting of the burial chamber in the vertical axis passing through the apex (Zawiyet el 'Arian, Mastaba of Djeser, the middle chamber in the pyramid of Cheops, the first project of Mykerinos, pyramids of the Vth and VIth dynasties). Provision against failure due to the huge loading on the interior apartments was made through the choice of pent-roofs, succeeding to the earlier corbel-roofs, for corridors and chambers, relieved in the latter by means of supercumbant compound beams and void spaces. Over the upper burial chamber in Cheops' pyramid, itself roofed with a flat ceiling of granite beams, five such relieving chambers, the one above the other, were built, with four limestone ceilings and topped by a pent-roof[293]. In the pyramid of Sahure' at Abusir the burial chamber was covered by a pent-roof of three layers of beams abutting along one straight inclined plane on the masonry outside the walls of the chamber[294]. In the later pyramids the slope of the inclined beams was increased (45°), a factor which would lessen internal stresses

in the masonry, were the beams themselves not erronuously designed (Neferirkare', Neuserre'). Although in three layers yet only the middle one was acting, since it was separated from the one under it by rubble and beams above it were half its length, so that it afforded the worst case of loading[295] Thus structural science, or more likely conscientiousness of the builders, seems to have deteriorated after Sahure'. To meet the internal stresses resulting from these pent-roofs on the corridor, the parts of the latter, which were exposed to these stresses were built in granite. Such was the science of the builder that the part of the corridor immediately abutting on the burial chamber and those farther from the range of the said stresses, were never built in granite, but in limestone, as for the whole length of the corridor (Sahure', Neuserre', Neferirkare', Unas, Teti, Pepi I, Merenre', Pepi II). In the great gallery of Cheops' pyramid the blocks of the sloping ceiling are set, each in a ratchet at the top of the side walls, so that every block was secured independantly from the one above it[296].

Dimensions represent always round figures of cubits, the cubit being divided into 7 palms or 28 digits. Thus the pyramid of Cheops had 440 cubits for the side, that of Sahure' 150 cubits for the side and 90 cubits for the height, that of Neferirkare' 200 cubits for the side.

The slope of the sides varies around 52° and could be obtained on the field through a simple ratio of height to horizontal length. Thus a 52° incline would have been reached with a horizontal length of 5 palms 2 digits per cubit of height (Neuserre'); that of 53,5°, by means of 5 palms per cubit (Neferirkare'). The accretion faces of the core were set at an angle of 75°-77°, in layers of about 8 cubits (Neferirkare') to 10 cubits (Neuserre') in thickness. A slope of 77° is expressed by the diagonal of a right angle triangle, having 1,5 palm as basis for 1 cubit height (Neferirkare'). That such a simple method using plumb-bob and measurement was used is corroborated by the records of triangles of measure left by ancient builders[297].

Nothing beyond mere theoretical surmises can yet be considered regarding the amount of work and the duration of the construction of a pyramid[298]. Herodotus (II, 124), writing about Cheops' pyramid, informs us that 100,000 men were engaged for periods of three months yearly and that the construction of the pyramid itself required twenty years. In may prove interesting to survey a comparative list of the masses of masonry in various pyramids:[299]

Meydum	650,000 cu.m.
Dahshur North	1,670,000 cu.m.
Cheops (Giza)	2,590,000 cu.m.
Dedefre' (Abu Rawash)	230,000 cu.m.

Chephren (Giza)	2,100,000 cu.m.
Mykerinos (Giza)	260,000 cu.m.

That many pyramids were built with huge blocks weighing at least about one ton, with beams of nine tons, is not to facilitate the problem.

THE PRIVATE TOMBS

DYNASTY III(300)

The mastaba evolved towards the standard IVth dynasty type. However the superstructure, even for the large tombs, is still in brick, sometimes in a solid mass, but usually as walls enclosing a filling of rubbish. The faces could be panelled with the so-called palace-façade motive, as before on all four sides (Giza: mastaba T), or on the East face only. It is to be noticed that these façades were surrounded closely or leaving a passage corridor, by a wall, probably to protect them. This panelling could be simplified into one compound niche and three simple niches.

A further step in the simplification is the use of two niches near both ends of the East face (valley-side, sometimes western), the one on the South being larger. This niche could assume various forms more elaborate than in the preceding dynasties: great-door, compound niche or palace-façade niche(301). Near the cruciform chapel there is sometimes a small chamber, perhaps intended to contain a statue of the deceased. This would be the prototype of the "serdab" in the Vth-VIth dynasties.

To perform the funerary cult a chapel is built in front of the southern niche, usually as an open-air enclosure, or can extend along the eastern façade, forming an open-air or a roofed corridor, called the "chapel-corridor".

The last type in the evolution of the superstructure is marked by the introduction of the chapel into the rectangular mass of the mastaba. This interior or protected chapel could assume a cruciform plan, with walls featuring the great-door type, plain compound niche or with palace-façade motive on the back wall.

The wall faces are only slightly inclined to the vertical and are usually plastered and sometimes painted, with a dado running at the bottom.

The substructure is of the open stairway type, consisting of a stairway descending from the North end of the superstructure to reach one or more chambers excavated under it in the rock (Lower Egypt) or gravel (Upper Egypt). In Lower Egypt the stairway type is superseded by a derivative: the stairway and shaft type, where a shaft is sunk vertically at the bottom of the stairway and the approach through the latter is closed by a wall retaining

filling. Besides the rooms and stairs are excavated in limestone rock. In Upper Egypt stone slabs were sometimes used as lining in the chambers excavated in gravel. The use of the limestone portcullis slab sliding downwards in grooves is common in Lower and Upper Egypt.

The stairway developed from the short stairways descending from the valley side to the bottom of the archaïc pit tombs, is much deeper and begins from the North. The earlier closing of the entrance with a wall and wooden planks developped into the use of blocking the trench of the stairway with portcullis-slabs, let from above, sometimes through vertical shafts especially left in the masonry. According to Reisner all these shafts were closed and the constructional stairway filled, except the last shaft before the burial chamber, through which the body was lowered[302]. This would be the last stage, leading to the use of a plain vertical shaft embodied in the compound type: stairway + shaft type, used extensively in the IIIrd dynasty substructures at Memphis. The purpose of the shaft at the bottom of the stairway was to enforce protection against plunder by rapid excavation.

In Lower Egypt the plain shaft excavated without the help of a constructional stairway, appeared earlier than in Upper Egypt, presumably at the end of the IIIrd dynasty. The craft of stonework[303] was a local production of Memphis, perhaps due to the neighbouring limestone quarries of Ma'sara and Tura. It was encouraged when the court and its workshops settled in the district. The facility which craftsmen found in excavating underground apartments in the IInd dynasty is thus easily explained.

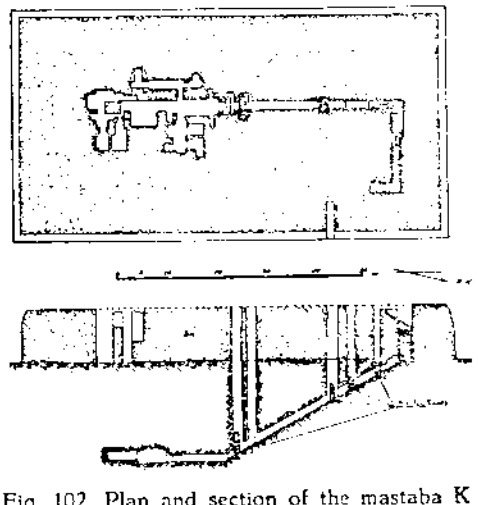

Fig. 102. Plan and section of the mastaba K I (stairway type, IIIrd dynasty).

DESCRIPTION OF TYPICAL TOMBS

I. Stairway tombs[304].— These are to be found in Upper and Lower Egypt, with brick superstructure and niche panelling or two niches. The large tombs of this type are all in Upper Egypt, while mostly small ones exist at Saqqara[305].

Mastaba K I (*fig.* 102)[306].— The superstructure of this large mastaba (85.5 x 46.2m) is in solid brick, with part of the stairway descending from the East face, turning at right angle northwards, then westwards to meet the smallest branch

from North to South. Here it is stopped up by a stone let from a vertical shaft. Beyond it is continued by a slope blocked further by four similar stones as portcullisses. The apartment is reached by a horizontal passage and consists of several rooms, the largest being lined with stone and intended for burial.

II. Stairway and shaft tombs[307] This was the characteristic type of the Memphite district in the IIIrd dynasty, and was prevailing after Snefru.

Mastaba T (Giza) (*fig.* 103)[308] The superstructure (61.7 x 34.5 m) is of massive brickwork, with recess-panelling on all four faces, surrounded closely by an outer plain wall.

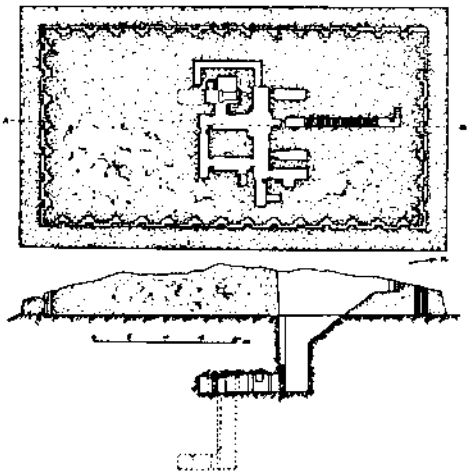

Fig. 103. Plan and section of mastaba T at Giza (stairway + shaft type, IIIrd dynasty).

A stairway beginning from the West and continuing southwards descends to meet a deeper shaft (7m). A portcullis blocked the entrance in the South wall of the shaft to an antechamber with a long hall opening off each of the other sides, connected with other rooms. From the floor of one of the rooms a shaft (10,5m deep) blocked at the bottom by a second portcullis, led to the sarcophagus chamber, having a coffin engaged in the West wall.

Mastaba of Hesire' (Saqqara, *fig.* 104)[309].— This mastaba, dating from the reign of Neterirkhet Djeser, is famous for its wall paintings and wooden panels. The superstructure is of brick (39 x 17.4m), with added parts. It has recessed panelling on the East face only, with a chapel corridor and eleven false-doors built and having at the back a wooden panel with the figure of Hesire' in low-relief, seated or standing accompanied by titles. This corridor is doubled to the East with a second plain corridor, built in the third stage and accessible through the same entrance. A serdab

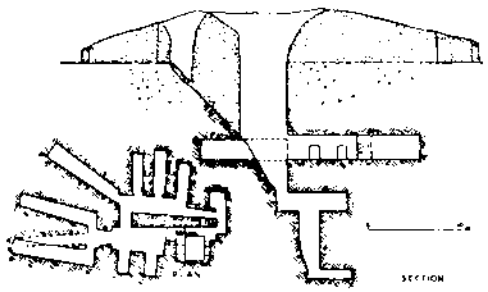

Fig. 104. Plan and section of the mastaba of Hesire' (Saqqara, IIIrd dynasty).

stands outside on the South of the entrance to the corridor. There was to the West, inside the masonry, the panelled façade of the earliest stage. On the East wall of the inner corridor painted friezes represented objects from the funerary equipment. Certain niches are painted with the representation of polychrom mats extended on a wooden frame, a custom recalling the predynastic lining of underground walls with mats[310]. The aesthetic value of both wooden panels and friezes is of the highest.

The substructure has rooms on three levels. A brick stairway, built in an open trench, led to the first level of the underground apartment. Later, part of the stairway was filled in with brickwork, leaving a rectangular vertical shaft (10.4 m deep). A square opening leads to the rooms of the second level, from which a third shaft descends to the third level rooms.

III. SHAFT TOMBS[311].— These appear only in the Memphite district, the earliest being the two princesses' tombs in Neterirkhet-Djeser's enclosure. These are mere vertical shafts (20m, 25m deep) leading to a chamber on the North.

Mastaba F S 3044 (Saqqara).— This mastaba of brick has a palace-façade (35 x 17.3 m) at the South end. The shaft leads down to a long corridor used for burial on the South side.

THE IVth DYNASTY AND LATER

The development of the mastaba-tomb shows in certain details a reversion to older traditions. The superstructure of the Giza mastaba[312] is featured by the absence of any recess or movement in the façades. It is a massive rectangular structure, reminding of the primitive tumulus. This simplicity is not to be ascribed to the universal use of stone, since well-articulated stone mastabas had been known before (Dahshur, Abu Rawash). The plan has retained its rectangular shape, due to the earlier stairway, although this has fallen in disuse. The structure consists of a retaining wall of stone, stepped, to receive the pressure of the rubbish filling or stone core. This stepped outer face has given rise to the battered façade of the stone mastaba from the IVth to the VIth dynasties. The small stepped core was succeeded by the massive stone core and the cased structure[313].

In front of the main façade, at the South end, is the brick chapel (*fig.* 105), entered from the North and consisting of an anteroom and an offering-room. The plan is L-shaped at Giza, a reminiscence of the chapels in Djeser's complex, but cruciform according to the old tradition at Saq-

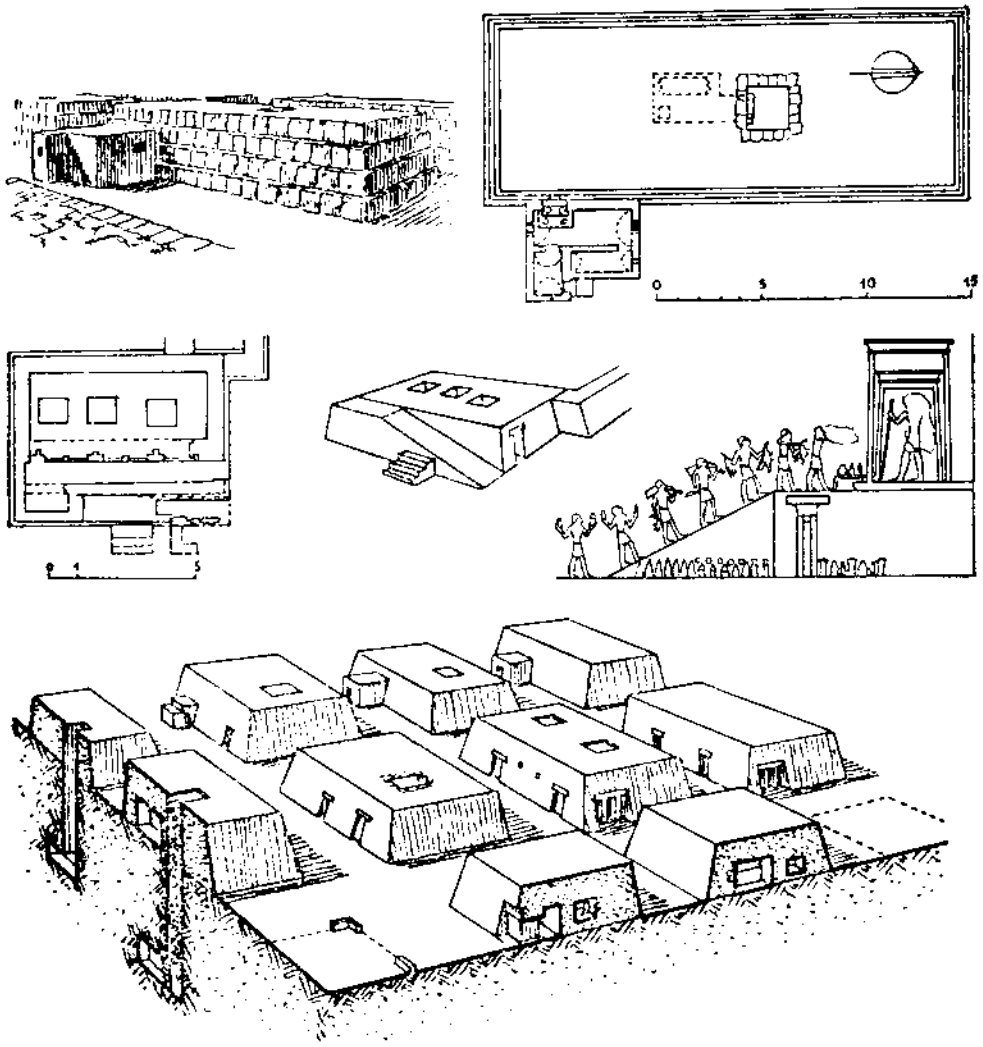

Fig. 105. Plan and perspective of a IVth dynasty mastaba at Giza, drawing of a mastaba with ramp, plan and restored perspective of the mastaba of Mery, and view of the IVth dynasty necropolis at Giza.

qara(314). The rooms were vaulted, but a flat roof covered the whole structure. This chapel complex, sometimes embodying magazines and statue-chamber, originates from the earlier offering-places, already noticed since the Irst dynasty (Tarkhan). The chapel can be external and cover one or two niches, or internal, when embodied in the superstructure. In the Vth dynasty the "corridor chapel" appears in the shape of a long covered passage along

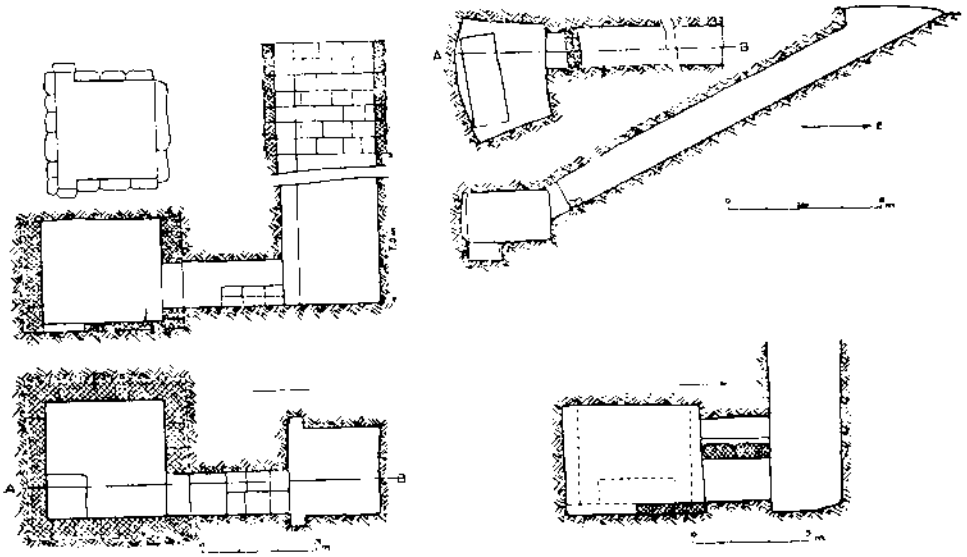

Fig. 106. Burial chambers, shown in plan and section, with shaft or sloping passage (Giza, 2130 A to the left, and 2381 A to the right).

the East façade and covering two or more niches. In the chapel the cult-ceremonies were performed in front of a simple slab-stela ("tableau"), originating from the earliest dynasties and which was already embodied above the lintel in the false-door, in other districts (Meydum).

Walls were plastered white and decorated with low-relief scenes, differing from those already known from the earlier niches. At Giza, on account of the unsymmetrical East and West walls four only of the six traditional scenes had been retained, the two chief ones being enlarged, while on the symmetrical walls of Meydum and Saqqara chapels the scenes are well developped and contain elements from the daily life of the owner of the tomb. Rock-cut tombs embody life-size reliefs of the dead and his relatives. In the Vth-VIth dynasties the chapels are fully decorated.

The substructure is of the shaft-type, with the mouth of the shaft opening towards the middle of the superstructure (*fig.* 106). The upper part of the shaft traversing the core of the mastaba is cased with fine masonry, while from the ground level it is hewn in the rock in well-dressed walls[315]. At the bottom, to the South, a short horizontal, sometimes sloping passage, leads to the rectangular burial-chamber containing the simple monolithic sarcophagus. The doorway to the passage was blocked after burial by means of a vertical

slab with three holes bored in its upper part, a remainder of the early portcullis. Sometimes it was sliding in vertical grooves in the S.E. and S.W. corner. The burial chamber itself was lined and the pavement covered with limestone blocks, but the roof was simply cut in the solid rock. The lining of the burial chamber has its origin in the early wood-lining of the open grave-pit in predynastic times, then in brick or stone in the stairway tombs. Walls are sometimes painted to imitate granite. A "canopic niche" in the pavement (Giza) or in the South wall (Meydum) served for the inner organs(316). The other features such as the shaft and portcullis slab, the connecting passage, the form of the burial-chamber are also found at Meydum and Dahshur.

This simplicity which characterizes the Giza-style as a whole is possibly due to an influence of pyramid-architecture. Such is not the case in other districts where funerary elements (serdab, false-door and cult-chamber) were since early times in common use. It is only in the Vth dynasty, when the Giza necropolis had ceased to be a royal dependance, that the superstructure of the mastaba attempts to embody other funerary elements (Kaninisut, end of IVth-Vth dynasty). The layout of the necropolis, which had strictly followed a chess-board pattern, is no more respected. In the Vth dynasty the serdab appears along the South end of the superstructure (Ra'wer I, II), connected by a slot to a deep niche, reminding of the earlier mastabas at Meydum (Ra'hotep, Neferma't, IIIrd dynasty), but intended to contain a statue. Such features as an entrance porch with two columns (Seshemnefer IV) may have been inspired from the valley portal of the royal pyramids of the Vth dynasty. Some of the substructures have a sloping gallery opening to the East, a feature which appears between the Vth dynasty and the end of the VIth dynasty, copying the inclined corridor of the pyramid and enabled the dead to come out and appear before the rising sun.

The old idea of providing the dead with a dwelling in his afterlife, similar to the one he had on earth, which governed the IInd dynasty plan of the mastaba at Saqqara, was revived in the Vth dynasty at Giza. The various elements: court, hypostyle hall, wide hall and deep hall, reproduce the basic elements of the large dwelling (Nisedjerkai)(317).

Some mastabas have ramps of brick ascending to the top, against a side or along it, with two stelae flanking the beginning. These ramps seem to have been used on the day of the burial and perhaps also afterwards on certain feasts(318). Such a ramp is shown in an Egyptian drawing (*fig.* 105).

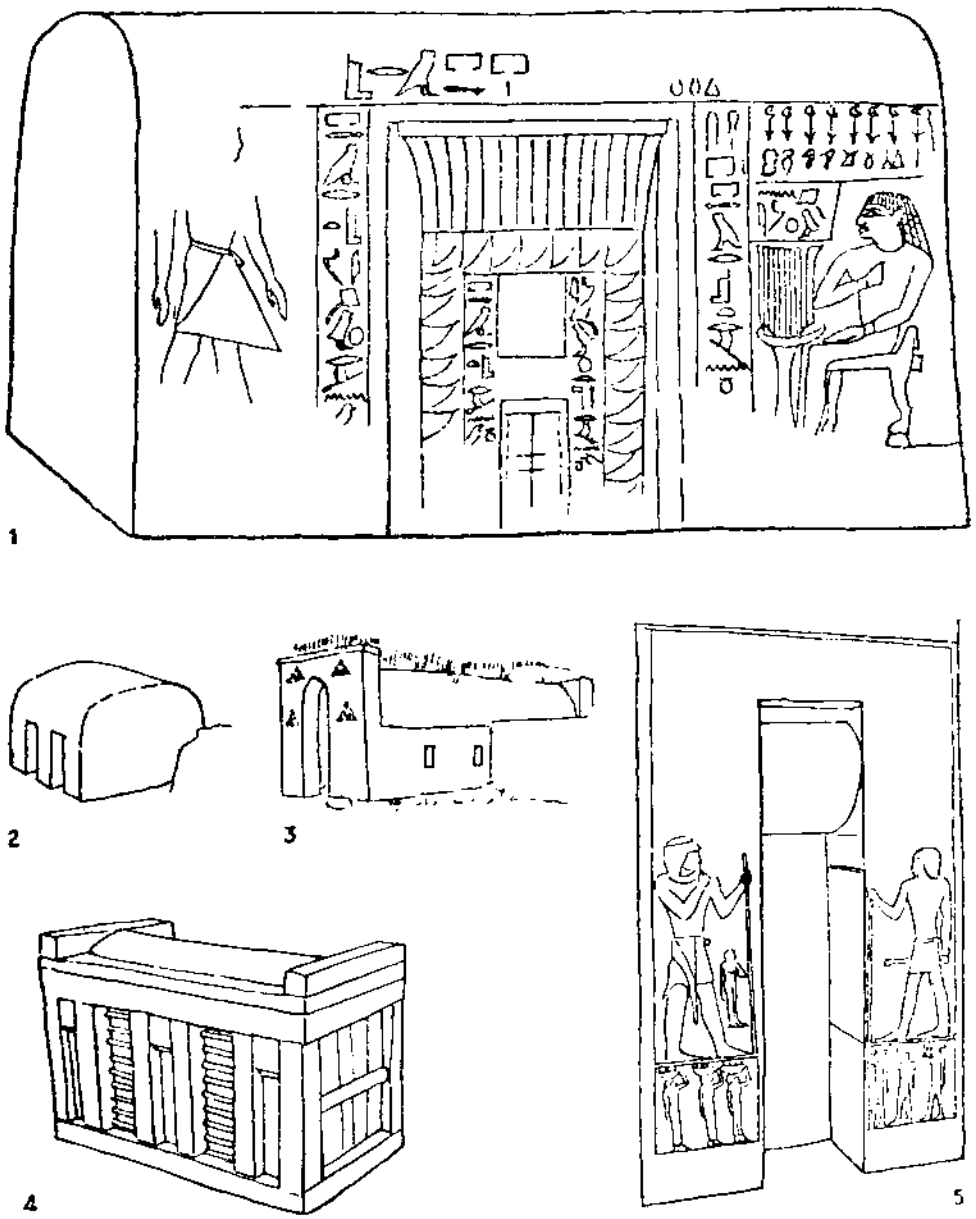

Fig. 107. Miniature tomb-superstructure representing a house, comparable to a similar superstructure on larger scale (2, Giza) and modern houses in Nubia(3), wooden sarcophagus (archaïc) representing(4) a house, false-door(5).

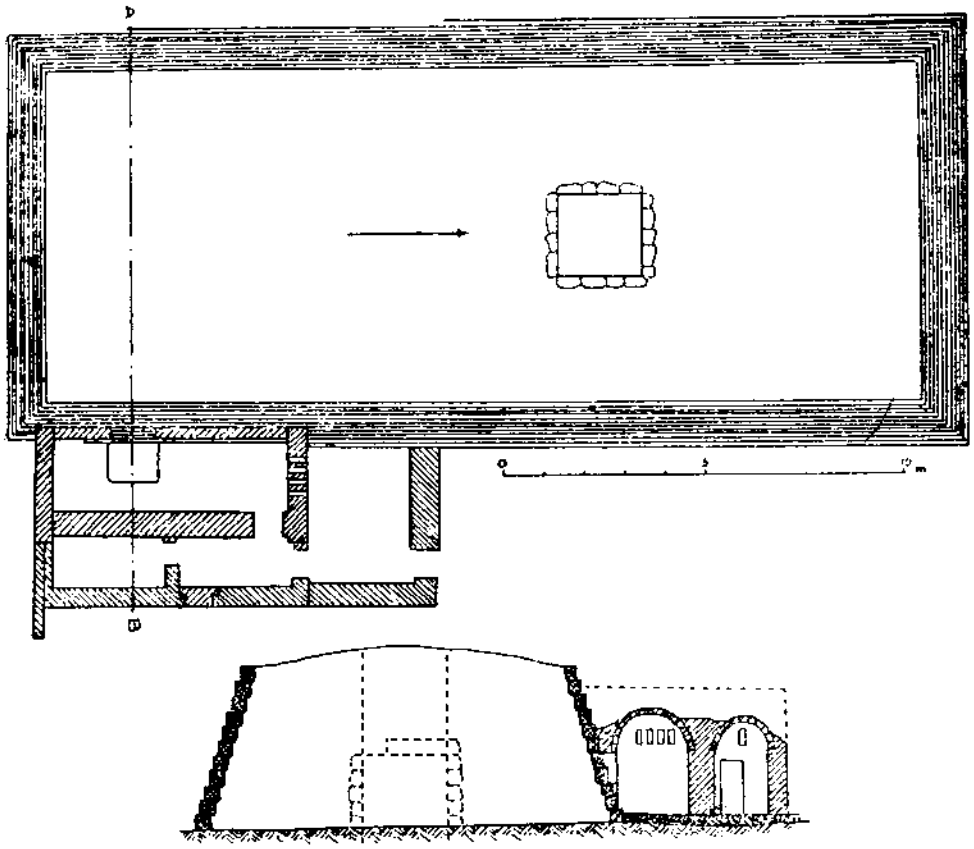

Fig. 108. Plan and transversal section in the mastaba of Kanofer (Giza 1203).

DESCRIPTION OF TYPICAL IVth-VIth DYNASTY TOMBS

THE GIZA NECROPOLIS.— With the rise of the IVth dynasty and the construction of huge pyramids on the Giza plateau the nobles and the grandees at the court had their tombs around those of the kings. In the western cemetery they were set in rows, leaving streets running from West to East, at right angle to the pyramid of Cheops, and from North to South, at right angle to that of Chephren. In the Vth dynasty the serdab will be placed to the South of the rectangular plan, sometimes protruding (Ra'wer I, II, Seshemnefer I, II). At the end of the Vth, and in the VIth dynasty, this order will be neglected and types with hypostyle halls and numerous chambers become in use.

Some of the features of the substructure seem to have been copied from Meydum early IVth dynasty examples, such as the lined burial-chamber cut

in the rock, the canopic niche in a pit in the S.E. corner of the floor, later reverting to the older niche in the South wall[319], the passage opening high in the wall of the burial-chamber or in the middle of its lower part. The pent-roof is used in Cheops' and Chephren's time.

G 1203 (Giza, *fig.* 108)[320].— This mastaba of Kanofer has a rectangular supestructure consisting of retaining walls of small limestone blocks, graded in low steps and enclosing a filling of sand and débris. The East façade has no niche, but only a slab-stela at its southern end. One single shaft, lined in its upper part built through the filling, descends to a large square, lined and paved chamber. A connecting passage near the eastern end of the North wall of this chamber opens low and a small step helps to descend to the floor of the chamber. The chapel in front of the slab-stela has three chambers and a court: a N-S offering-room, a magazine and a vestibule, roofed with leaning-course vault. Vertical slots let light into the offering-room.

G 7550 (Giza, *fig.* 109)[321].— The mastaba of prince Duwanhor has a rectangular superstructure of the internal chapel type, with subsidiary North

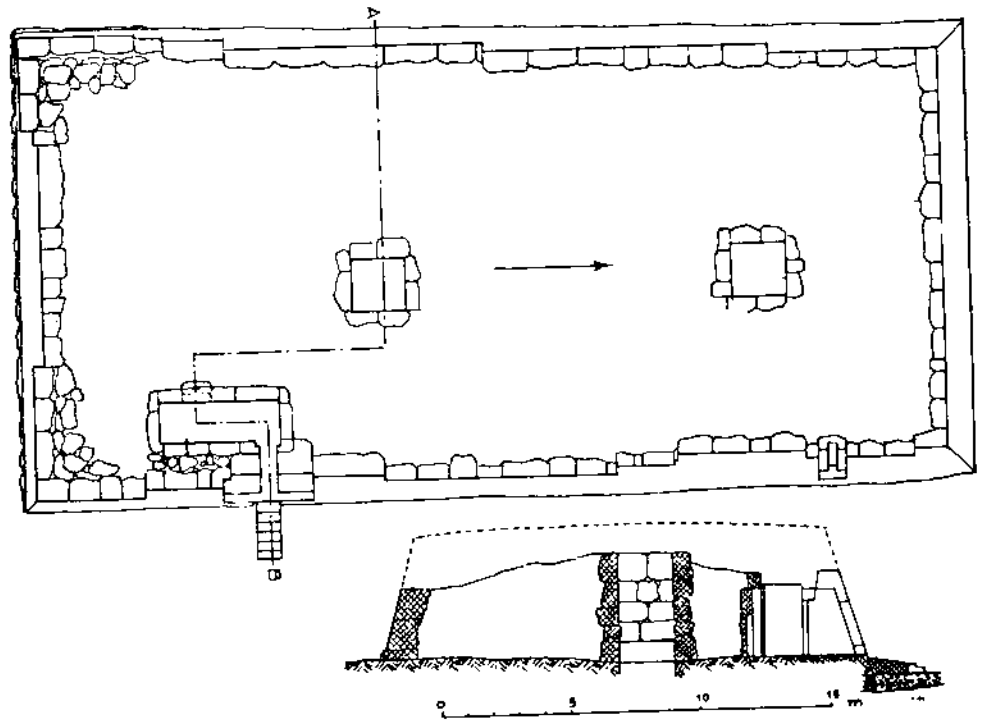

Fig. 109. Plan and transversal section of the mastaba of Duwanhor (Giza, 7550).

niche. It has retaining walls of large slabs set sloping and dressed to a battered face, enclosing rubbish or massive grey blocks. Two shafts (2m), with inclined connecting passage lead down through an opening near the middle of the chamber wall to large and high unlined chambers, cut to the South. The chapel has one niche of the deep compound type at one end of the West wall (4.7 x 1.6 m).

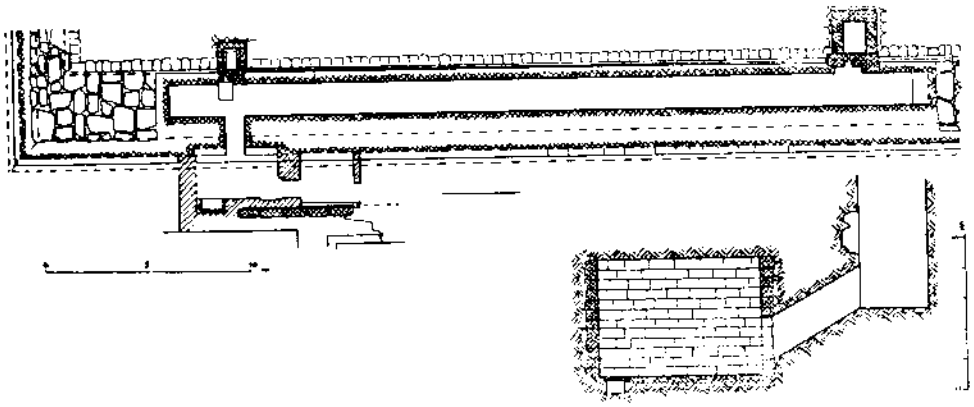

Fig. 110. Plan of the corridor-chapel and section of the burial-chamber in the mastaba of Hemiwnw (Giza, 4000).

G 4000 (Giza, *fig.* 110)[322].— Prince Hemiwnw, nephew to Cheops, had his large mastaba built as retaining walls of small grey blocks, in graded low courses, with a filling of stone blocks and embodying a recess for an interior South chapel. After it had been enlarged eastwards and at both ends the superstructure was used with fine white limestone. Two square shafts lead down to two chambers, the finished one being the largest in the necropolis (33.15 sq. m., capac. 135.92 cu. m.). A passage slopes down from the bottom of the shaft to the middle-level of the North wall of the chamber, leaving a high drop to its floor. The chapel is of the corridor type, in the form of a long passage running along the eastern face and enclosing two niches at both ends, a device reminding of that of the IIIrd dynasty. Behind each of the niches is a cachette for a statue (serdab), not in the axis of the niche. In front of the southern entrance are an offering-room and a vestibule in brick.

The mastaba of Seshemnefer and his family (Giza)[323].— The mastaba of Seshemnefer and his family affords a good example of the familial type

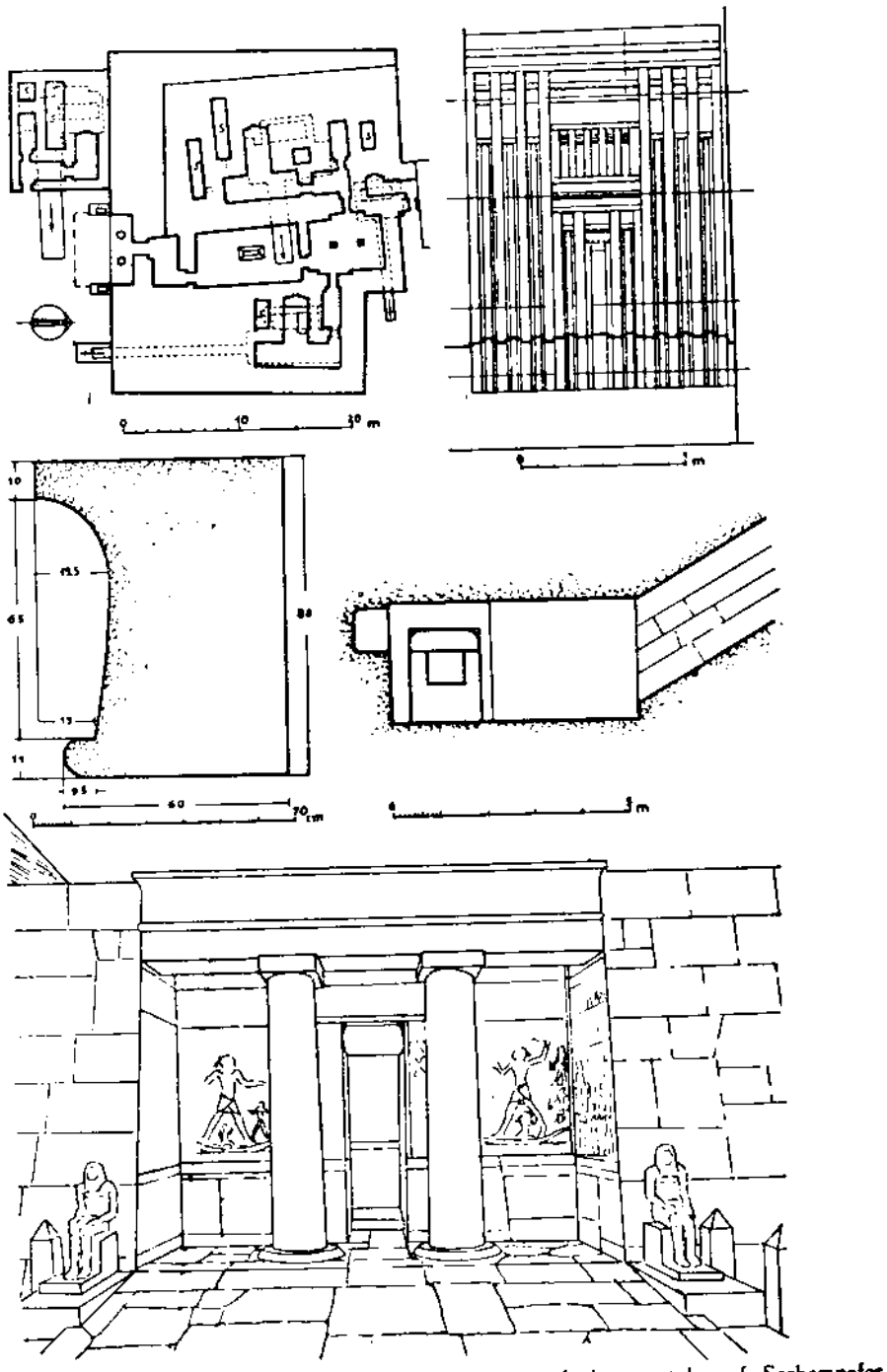

Fig. 111. Plan of the superstructure and front elevation of the mastaba of Seshemnefer (Giza, VIth dynasty), section of the burial-chamber, detailed elevation of a palace-façade stela and section of cornice.

with many shafts, of the middle of the VIth dynasty at Giza. The superstructure is irregular in shape (*fig.* 111), with a southern façade opening towards its middle through a porch with two columns, flanked with two seated statues of the deceased and dwarf obelisks, a feature currant at that time. The entrance doorway opens into an anteroom connected with an open court having a rectangular basin in its centre. Here, well hidden in the pavement, starts the sloping passage which led down from the East to the main burial, and in the wall above this passage a palace-façade stela is cut in relief. A door in the back wall of the court opens in a hypostyle hall with two pillars connected, on one side with the chapel of Seshemnefer, and on the other with that of Teti, each consisting of a deep cruciform chapel containing a false-door facing East and preceded by an anteroom. A serdab, or more, is built to the South of the false-door. Scenes on the walls and others of the deceased on the door-jambs depict the atmosphere which he used to live in. A tiny chapel is cut in the back façade for Hetepheres.

The superstructure is built in stone masonry of good workmanship. The porch with two columns is inspired from that in the valley portal of Sahure'. Under each apartment in the superstructure there is a burial chamber with a recess for the sarcophagus, in its western side.

Abutting on the southern façade of the mastaba is the small superstructure of the tomb of one of his sons, Ptahhetep, with an antechamber, a magazine, a plain chapel and two serdabs. Only the superstructure of Seshemnefer has a vertical shaft together with an inclined passage, the three others having only a passage.

THE NECROPOLIS OF MEYDUM.— The development of the IIIrd dynasty superstructure at Meydum is parallel to that at Saqqara. The substructure shows an intermediate type between the stairway type and the shaft type: it is a burial-chamber towards which descends a sloping corridor, built in limestone in an open pit and trench, a device probably invented on account of the bad rock at Meydum. It is succeeded by a special form of the shaft type, the shaft and the burial-chamber being constructed in an open pit, which evolves to a burial-chamber lined and roofed with stone and hewn in the rock. This seems to be the model of the Giza shaft tombs in the IVth dynasty, with a lined chamber[324].

Other points of resemblance between the Meydum and the early IVth dynasty Giza tombs are the opening of the passage into the burial-chamber through a doorway in the North wall, high up, or in the middle or at floor level, and the canopic niche in the South wall of the burial-chamber or high up under the corbelled ceiling, or as a pit in the floor in the S.E. corner.

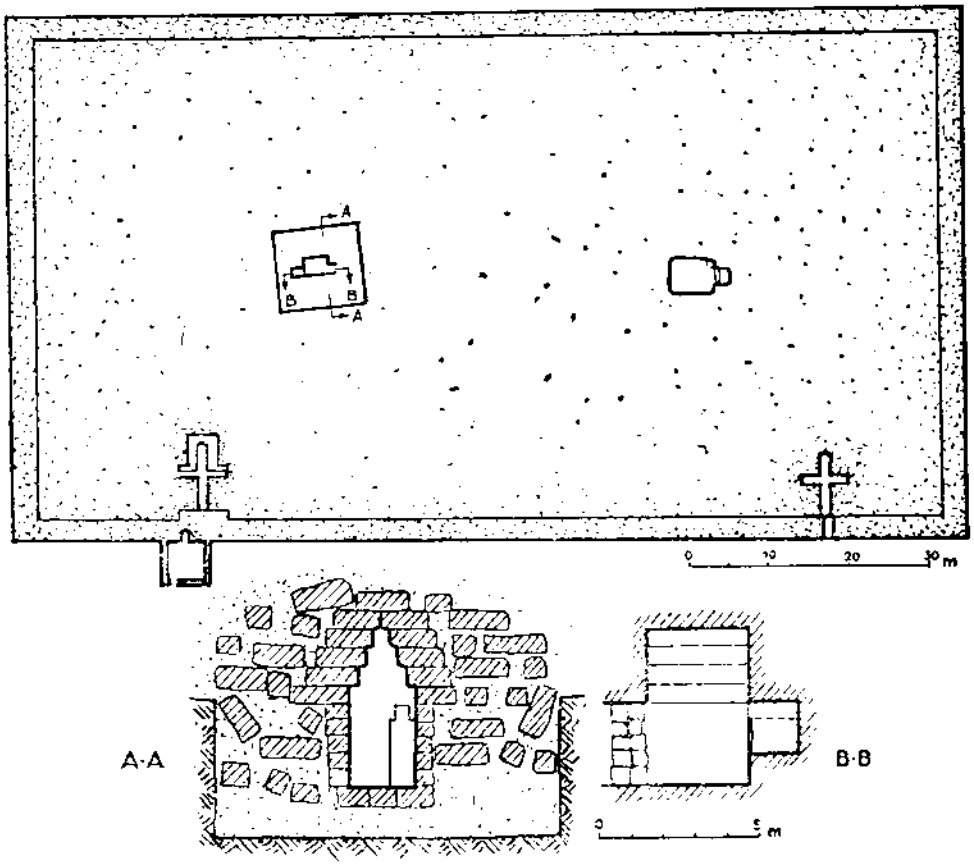

Fig. 112. Plan of the superstructure of the mastaba of Neferma't (Meydum, IVth dynasty) and sections through the burial-chamber.

Some of the mastabas have corbelled burial-chambers, a system of roofing used in the pyramid apartments.

Neferma't (fig. 112)[325].— The twin mastaba of prince Neferma't and his wife Atet (under Snefru or Cheops), has a brick superstructure, twice enlarged with additional layers (final 120 x 68 m). The first mastaba had two niches, the southern one being deep and lined with stone. The second mastaba had this niche transformed into a cruciform chapel and the final one had two niches and panelled faces with an external South chapel. The substructure features a corbelled stone chamber in an open pit, possibly with sloping passage, while the chamber of Atet was accessible through a shaft.

Mastaba No. 17 (fig. 113)[326].— This large mastaba (103 x 51.6m) has a stepped rubble core, cased with brick to a final batter. The burial seems to have been performed while the construction was still going on, since the superstructure was completed and the original sloping corridor blocked before being continued to the ground level. The South chapel seems to have been of the modified cruciform type. The substructure has a sloping corridor turning at right angle, with a long horizontal corridor. The chamber and the corridor are roofed with slabs. The chamber itself is high and has an eastern alcove for the sarcophagus. It is to be noticed that corners in the corridor walls have been rounded.

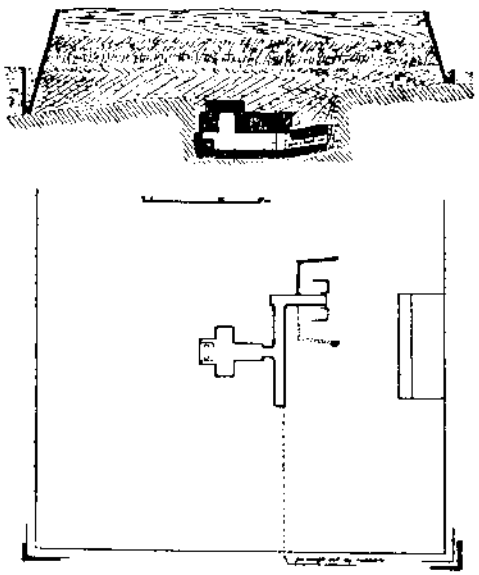

Fig. 113. Plan and section of the mastaba No. 17 (Meydum).

THE SAQQARA NECROPOLIS.— The Saqqara mastabas are featured by a cruciform or modified cruciform chapel with flattened West wall and symmetrical entrance on an E-W axis, passing through the main niche. The modified cruciform chapel is current till the end of the Vth dynasty or even later. This type, which is lacking at Giza, is supplemented by another, which could be considered as a connecting link with that of Giza. This consists in a short corridor chapel (Vth-VIth dynasty), with asymmetrical entrance. Later than the reign of Neuserre' the N-S offering-room of the cruciform one-niched chapel is replaced by an E-W room, also found at Giza and originating from the Vth dynasty pyramid chapels. This evolves towards an increase in both size and number of E-W offering-rooms, and the chapel becomes of the complex type. Some of these consist of groups of chambers for the different members of one family, having each one or two offering-rooms, directed E-W or N-S, resulting in a maze of rooms and an irregular plan. The walls are decorated with new scenes, perhaps influenced as to size by those in rock-cut tombs. In the substructure there is a direct transition from the stairway and shaft type to the shaft type. Some twin-mastabas have a shaft and stairway, or a shaft, as means of access to the funeral chambers.

The difference in the development of chapels at Giza and Saqqara, is due, according to Reisner, to two different sets of craftsmen working independantly(327).

In the IVth dynasty superstructures are mostly rectangular in plan, built of brick, with a cruciform chapel inside the core and a serdab adjoining it. A mud plaster with whitewash covers the walls. Later the structure is of local limestone masonry, with Tura limestone elements. Lighting was through small openings at the top of the walls (Ptahhetep).

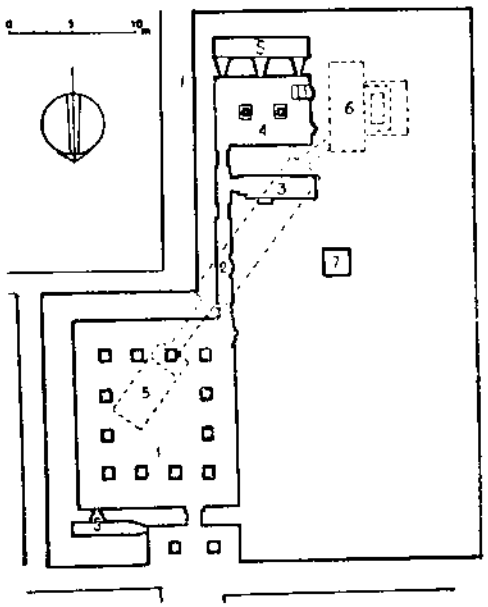

Fig. 114. Plan of the superstructure of the mastaba of Ti (Saqqara, Vth dynasty).

The mastaba of Ti (*fig.* 114).— Perhaps the most renowned of the tombs at Saqqara, the mastaba of Ti, a high official of the Vth dynasty, has a superstructure on an irregular plan, with a pillared portico, adjacent to a serdab, a court surrounded by twelve pillars, a corridor, a larder, a chapel connected by three slots with a second serdab. The walls are covered with low-reliefs representing scenes from the daily life, of the finest craftsmanship. In the floor of the court opens a flight of steps descending to an underground passage and a vestibule connected to an alcove in which the sarcophagus is set. In the corridor a false-door in the name of the wife corresponds to the vertical shaft descending behind it through the core of the mastaba.

The tomb of Ptahhetep (*fig.* 115).— The superstructure of the mastaba shared by Ptahhetep and his son Akhethetep is nearly square in plan, but quite irregular as to the internal arrangement. From a North porch a corridor leads into a large hall with four chamfered pillars, connected to the South with the chapel of Ptahhetep and to the West with that of Akhethetep. The chapel of Ptahhetep, directed N-S, is richly decorated with scenes in low-relief and has two false-doors in its western wall, the North one being of

the palace-façade type. The ceiling with its rounded elements imitates a primitive roof in bundles of reeds. The chapel of Akhethetep is cruciform in plan, has a large false-door occupying the whole of the western wall. The main shaft opens westwards of the chapel of Ptahhetep. A small shaft of uncertain date descends to the East of the corridor.

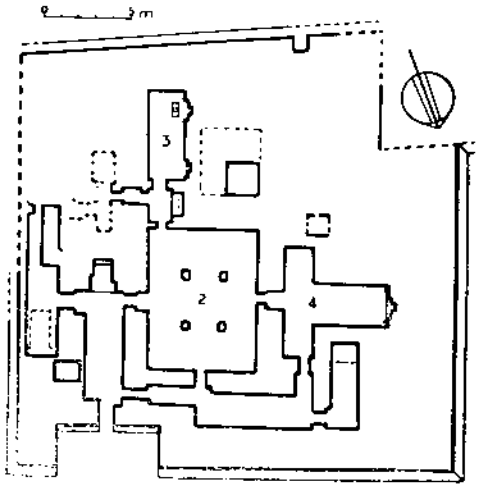

Fig. 115. Plan of the superstructure of the mastaba of Ptahhetep and Akhethetep (Saqqara).

The mastaba of Kha'bauseker(328). — This interesting mastaba from the time of Snefru has a brick superstructure (63 x 19 m), filled in, with two cruciform chapels of the palace-façade type. The entrance to the South chapel had a doorway with limestone lintel supported on two rows of three wooden posts adjoining the side walls, a constructional feature also used in the entrance to the wife's chapel (*fig.* 116). The southern chapel has at the back a limestone great-door, and at the South end, a second great door with a slot opening on the serdab. The eastern façade along the corridor chapel is elaborately panelled with compound niches and great-doors. Traces of painting remind of those of Hesire'.

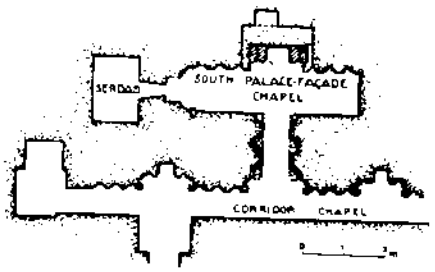

Fig. 116. Plan of the chapel in the mastaba of Kha'bauseker (Saqqara, IIIrd dynasty).

As to the substructure in contains two apartments of the type accessible through a stairway.

THE ROCK-CUT TOMBS(329)

It seems that the earliest rock-cut tombs in Egypt were set in the old quarry terraces at Giza, in the reign of Mykerinos and were still in use during the IVth dynasty. The two-niched chapel begun at the end of Mykerinos' reign and continued in the Vth dynasty.

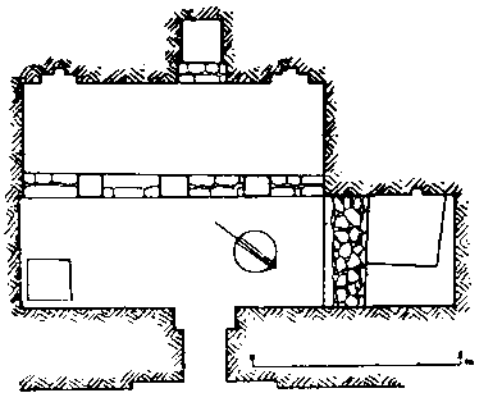

Fig. 117. Plan of the rock-cut tomb of prince Khunera (Giza).

The offering-chapel and the burial-place were not connected as in mastabas. A doorway in the quarry terrace, varying in orientation, opened on one or more rooms excavated in the cliff and forming the chapel. The plan is designed to suit the rock and sometimes part of the chapel is built, abutting on the mountain. The external façade is dressed to a steep slope or even lined, a traditional reminiscence of brickwork.

At Giza, in large tombs always provided with a pillared portico, two types can be differenciated:

a) a two-room arrangement with a N-S room and an E-W room beside it (*fig.* 117).

b) a cruciform plan and series of chambers E-W, connected by passages in the E-W axis of the chapel (*fig.* 118).

In the smaller tombs the corridor-chapel and the square chapel, together with an L-shaped chapel, occur.

A shaft opens in the floor of the main room or in the special shaft chamber and descends vertically, rarely at a slope, to the burial room.

In the VIth dynasty cemetery at Nag' el Deir the tomb had a vestibule or portico cut in the slope, leading to a large square chamber excavated in the rock and burial-shaft, vertical or sloping, in the main room. Most of the tombs were topped with a brick superstructure reminding of a mastaba. This type of rock-cut tomb was widely in use between the VIth and Xth dynasties and will form the normal Middle Kingdom type.

In Upper Egypt the plan of the larger tombs is nearly symmetrical about the entrance axis, consisting of a forecourt with pillars, an entrance

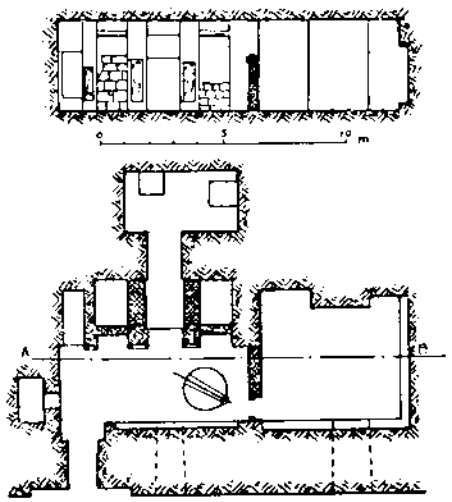

Fig. 118. Plan and section of the rock-cut tomb of Debehen (Giza, cruciform type).

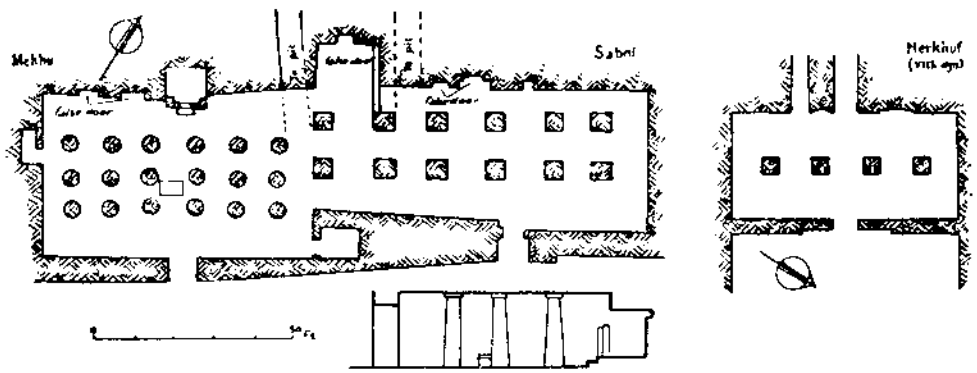

Fig. 119. Plan of the paired tombs of Mekhu and Sabni and the single tomb of Herkhuf at Aswan (VIth dynasty).

corridor leading to a main chamber with the stela and offering-table, in front of which opens the main shaft. Behind it (Pepi'ankhw Kheriib at Meir) or near it (Shedw at Deshasha) is a secondary chamber or recess for the statues. The shaft is sometimes replaced by a sloping passage (Inty at Deshasha, Serefkay at Sheikh Said, Aba at Deir el Gebrawi). The statues may be cut in the back wall of the secondary chamber (Serefkay at Sheikh Said). The chambers are usually at the same level, but may be cut at a higher level and rendered accessible through some steps (Shedu at Deshasha).

The tombs of Mekhu and his son Sabni at Aswan (VIth dynasty) have each a large hall with eighteen columns in three rows (Mekhu) or twelve pillars in two rows cut in the rock (Sabni). Inclined passages lead down to the underground burial chambers, that of Sabni having fourteen pillars (*fig.* 119).

It is to be noticed that the plan reproduces the various elements of a dwelling, similarly to the contemporaneous mastabas at Giza[330].

MILITARY ARCHITECTURE

Although archaeological evidence is almost completely lacking there is no doubt that military architecture, already flourishing in the archaïc period, developped higher types. Texts mention strongholds. Methen, a high official at the end of the IIIrd dynasty, was ruler of the stronghold of Sent and of that of Hesen in the Harpoon nome, besides being in charge of the "Cow stronghold" in one of the cases[331]. The latter office was also held by a certain Kamw (Vth dynasty)[332]. The famous Uni[333], who lived under Pepi I mentions *strongholds* (*sdr, wnt*). Under Pepi II the nomarch Ibi was

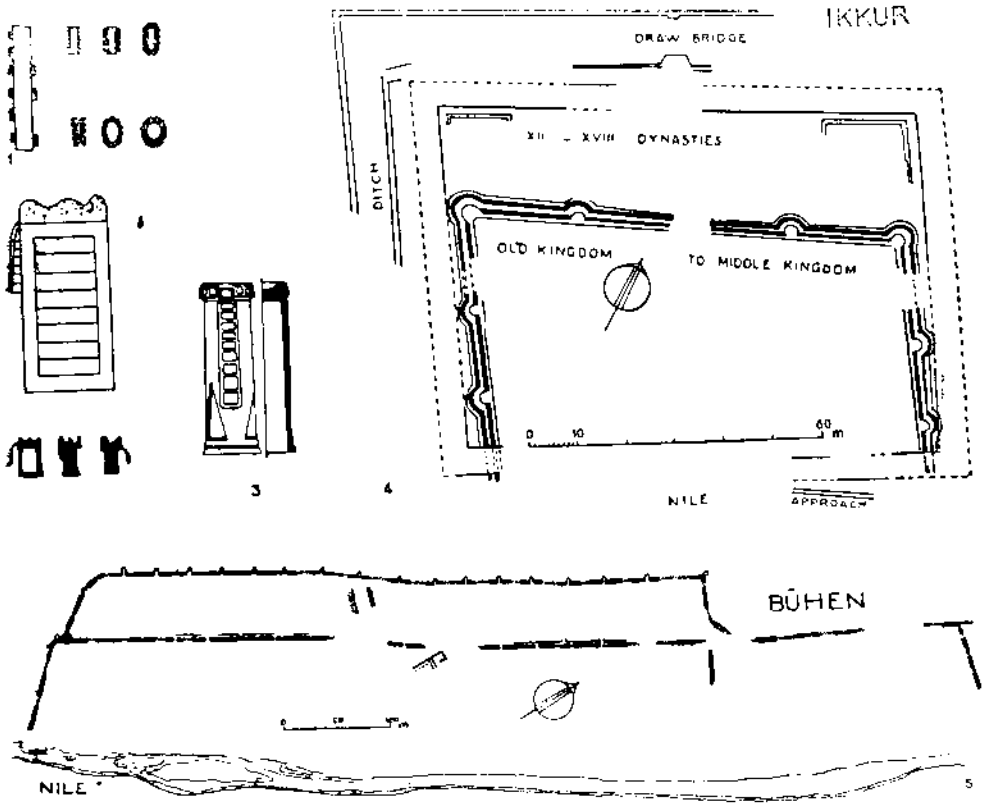

Fig. 120. Hieroglyphs representing : fortified walls in plan(1), the elevation of a tower(2), model of the same(3), and plans of the fortresses at Ikkur and Buhen in Nubia(4-5).

"commander of the stronghold of the granary"[334]. Egypt had constantly to wage war against the invading tribes from the East and the West, and although these were only defensive expeditions, yet it can be safely surmised that strongholds were established along the desert roads and frontiers to control them. The castles of the king and even the villages were surrounded with fortified walls on a rectangular or round plan.

This rather scarce evidence is supplemented by hieroglyphs. Certain sign known from the Pyramid texts, shows a wall on rectangular or oval plan, with square or rounded bestions on the external face (*fig.* 120, 1)[335]. Another sign with two variantes shows the elevation of the independant fortified tower, already in use in the archaïc period. The early type, with battered sides and projecting cantilever balcony at the top, appears with another rectangular shape, having horizontal or vertical stripes and battlements at the top (*fig.* 120, 2). In both variantes a ladder hangs loosely at the side. The new form would be that of a tower on a square plan, perhaps in wood or brick[336]. A model found in the Djeser's complex (IIIrd dynasty) represents a round tower with vertical walls, battlemented upper parapet and a small aperture out of which hangs a ladder of cord.

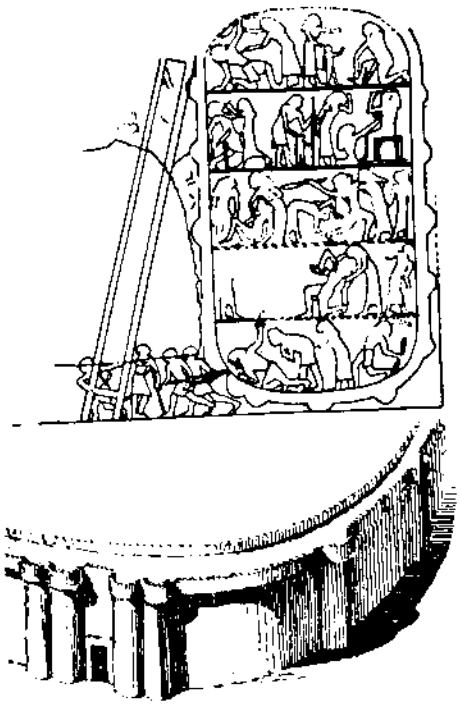

Fig. 121. Drawing of an Asiatic fortress in a tomb of the late Old Kingdom (Deshasha) and its restored entrance corner.

An interesting scene in a tomb of the late Old Kingdom at Deshasha (*fig.* 121)[337] represents the plan of an Asiatic fortress, rectangular in shape, with rounded corners. On the external face semi-circular bastions are set at regular intervals, a device shown in the corresponding hieroglyphic sign. It seems that, at one corner, two pairs of such towers are flanking a recess, actually undermined with crow-bars by the Egyptian soldiers. This could be the gate of the fortress, opening as in Egyptian ones at the end of one of the longer sides. This surmise is corroborated by the fact that Egyptian gateways in monumental architecture were always flanked with towering masses.

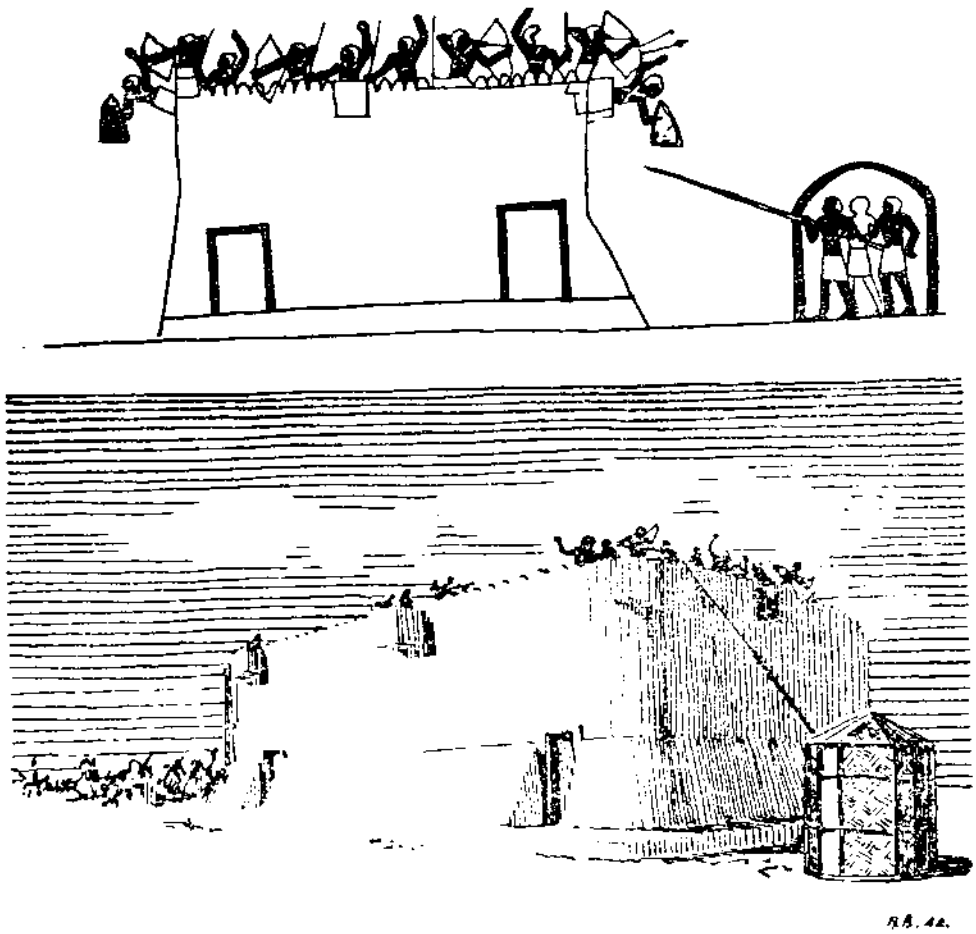

Fig. 122. Painting of a Middle Egypt fort and its restored view (Beni-Hassan, IXth-XIth dynasty).

During the uprises of local nomarchs, which gave birth to civil war in the X-XIth dynasties, between Middle and Upper Egypt, representations of Egyptian strongholds were introduced into the repertory of scenes to be shown on the walls of rock-tombs at Beni Hassan. These paintings show elevations of small structures with vertical sides rising above a battered counterscarpe (60°—55°). One or two doors with door-cases in granite open at one or both ends of the façade (*fig.* 122)[338]. A scalloped parapet runs along the top the wall, fortified at regular distances with protruding cantilever machicolations. From the scale of the soldiers it can be deduced that the

size of these strongholds could reach a minimum of 2.5-6.5m in length and 2.5-3.5m in height, although Egyptian drawings show such variations in scale as to render these deductions highly speculative. It may be infered from the counterscarpe and the machicolation that these were opened at the bottom, so that stones or arrows could be directed against the besiegers.

Of actual remains only scanty evidence can be derived. It has been propounded that the fortified camp at Elephantine dates back to the IIIrd dynasty, the name of king Huni having been found on a granite block[339]. At Ikkur, in Nubia, the Old Kingdom fortress is on a quadrangular plan with double brick walls (*fig.* 120). The inner wall is protected by semi-circular bastions at intervals of about twenty metres. These are marked by corresponding roundings in the outer wall. A trench follows the outline of the outer wall, both sides sloping and faced with brick[340]. Near Buhen, opposite Wadi Halfa, two long parallel walls (600m and 1000m long; 2.4m thick), with semi-circular bastions every thirty metres on their outer face and built in rubble in the lower courses, have been assigned to the Old Kingdom (*fig.* 120)[341].

Later this type of fortress will remain in use, but with square bastions and ditches running along the walls.

CONSTRUCTIONAL FEATURES IN THE MONUMENTAL ARCHITECTURE OF THE IVth-VIth DYNASTIES.

Construction in the IVth dynasty becomes more functional and the use of hard rocks and large-size blocks enables the achievement of boldier projects. The architectural style of the IVth dynasty does not develop the architectural elements copied from plants, however stylized they might be. Instead, structural elements whose form is developped from functional principles are brought to a high degree of perfection. The Vth dynasty reverts to the plant-repertory and decorates the walls with scenes in low-relief and painting.

The constructional features of stone architecture in the IVth-VIth dynasties will remain basically unchanged throughout the whole of Egyptian history.

PILLARS.— Monolithic pillars of granite or quartzite, perhaps originating from the evolution of a wall in which doorways increased so as to leave only short sections between them, were erected in halls such as those in the funerary temples of Cheops, Chephren, Mykerinos, Userkaf, Unas, Pepi II, or in rock-cut tombs and mastabas. A figure of the dead standing, in low-relief, or the representation of a wooden column with open lotus-capital, could adorn the face of a pillar in the tomb (VIth dynasty).

Rectangular holes with one shorter side sloping were cut in the pavement, in front of the place of erection of a pillar, to allow it to be shifted in position on its foundation (*fig.* 123)[342]. Proportions of pillars and interspacing vary slightly from the ratio: $\frac{\text{interspace}}{\text{height}} = \frac{1}{2}$, whether in granite or limestone[343]

COLUMNS (*fig.* 124). — One of the most beautiful achievement of architecture is the palm-column of the Vth dynasty funerary temples. Cut as a monolith in granite it has a conical taper without enthasis, the shaft being deprived of any ornament, and set on a low broad basis. At the top it is crowned with a capital of nine palm-branches, bound at their bottom by a cord in five rows (Sahure', Unas, Sun-temple of Neuserre'). A socket in the basis received a dowel inserted in the lower face of the shaft.

Lotus columns imitating a bundle of four lotus stems, were worked as sycomore shafts on limestone bases with rounded sides (Neferirkare')[344]. When the stems amounted to six their section was inscribed in an oval plan

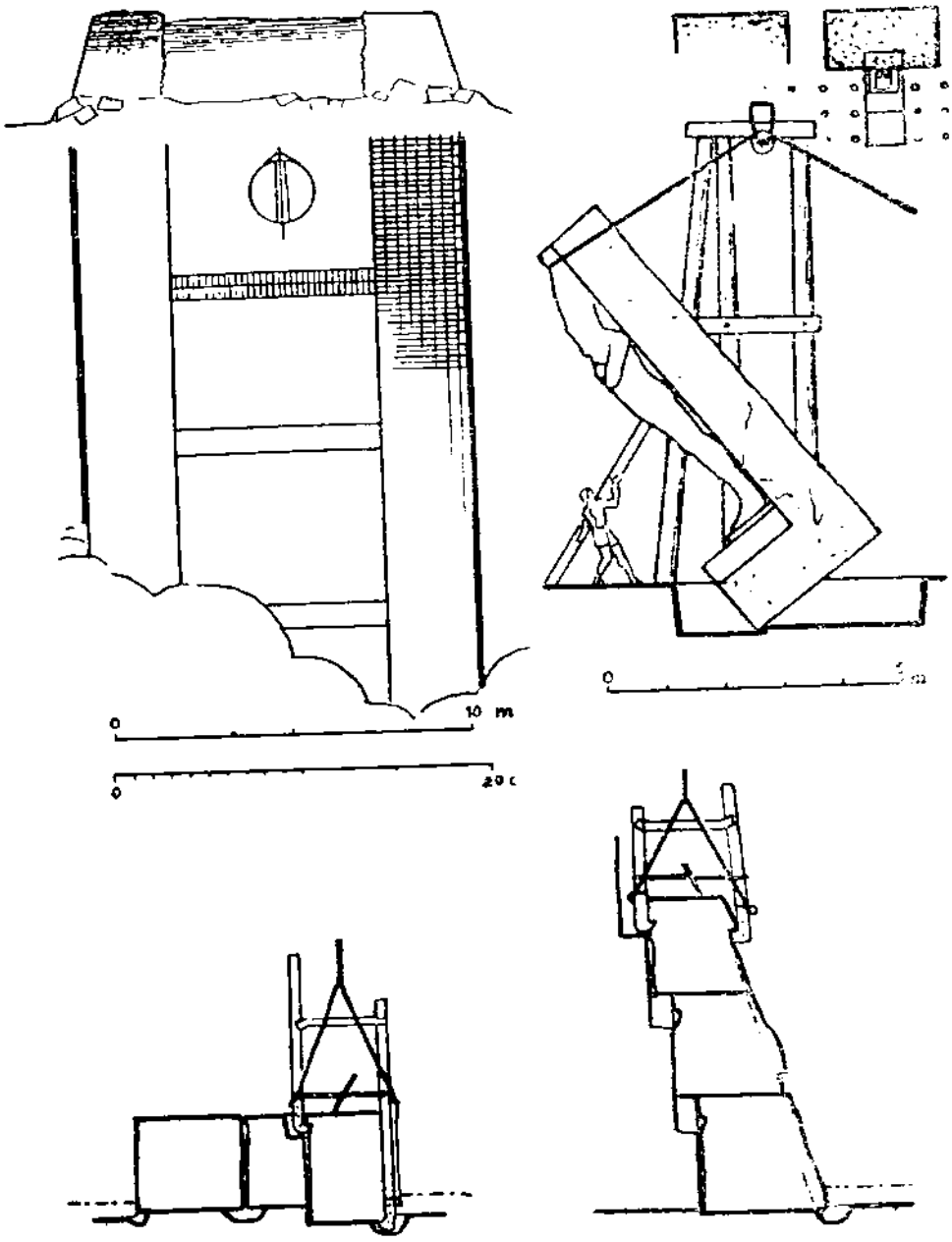

Fig. 123. Plan and section of ramp and presumed methods of setting upright blocks in place and usual blocks in courses (Hölscher).

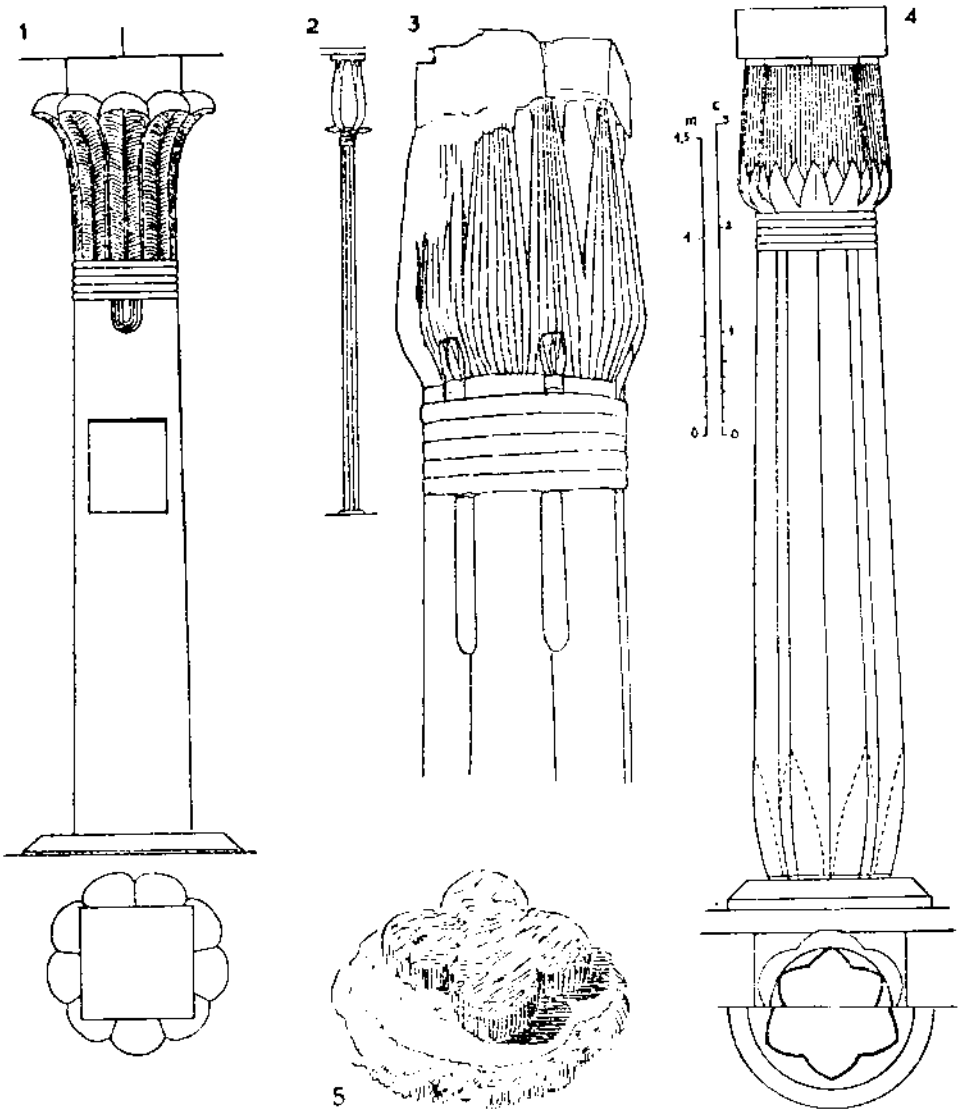

Fig. 124. Types of Vth dynasty columns: palmiform (1, Sahure'), from drawing(2), lotus-cluster capital (3, Ptahshepses), papyrus-cluster (4, Sahure') and wooden shaft on stone base (5, Neferirkare').

(Ptahshepses' tomb at Abusir). Cypsum plaster covered the wood and was painted green. Egyptian drawings represent lotus columns, probably of wood, with a capital in the shape of a widely open flower.

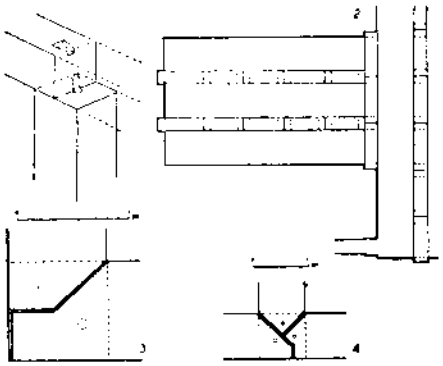

Fig. 125. Methods of setting architraves: on a pillar(1), in two aisles of a T-shaped hall(2, valley-temple of Chephren), at right angle on a pillar(3), three architraves meeting on a pillar(4).

Papyrus columns represent a bundle of six papyrus stems, recognisable from their enthasis and their triangular cross-section, bound with five rows of cord under the six closed flowers (Neuserre')(345). The column is built of granite in courses of one block each, with details of the clustered heads marked in relief and painted. In the middle of the shaft the name and titulary of the king are inserted upon three of the stems. An abacus serves as seat to the architraves. Columns with cylindrical shaft, chamfered basis and square abacus were used in the lateral portico of the valley-temple of Sahure'. In mastabas columns could be of wood (Djadjaem'ankh).

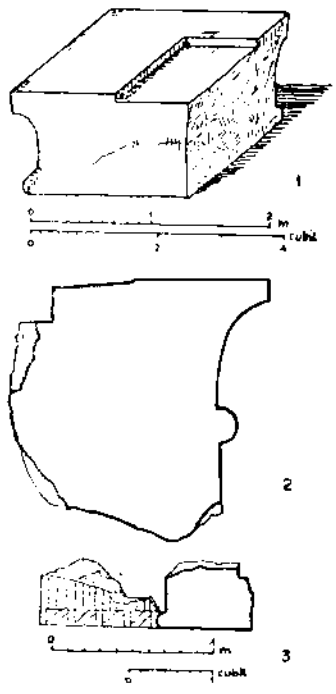

Fig. 126. Sections in cornice capstones(1, sun-temple; 2-3, mortuary temple of Neuserre').

ARCHITRAVES (*fig.* 125).— Architraves are set in the same direction as the row of supports, and are bound by means of clamps and peg dowels or dovetails in wood or stone (Chephren, Neuserre', Sahure')(346). When two halls meet at right angle in plan a secondary line of architraves was set along the meeting line (Chephren)(347). A line of hieroglyphs usually decorated the architraves.

CORNICES (*fig.* 126).— The cornice has definitively assumed the gorge-section, slightly curved at the upper part and bounded at its bottom by the torus, of semi-circular section. The details are sometimes painted to represent conventionally the prototype, yellow for the dried stems, and black for the binding. The cornice starts always tangentially from the wall it crowns, while the top band has the same taper as the wall(348).

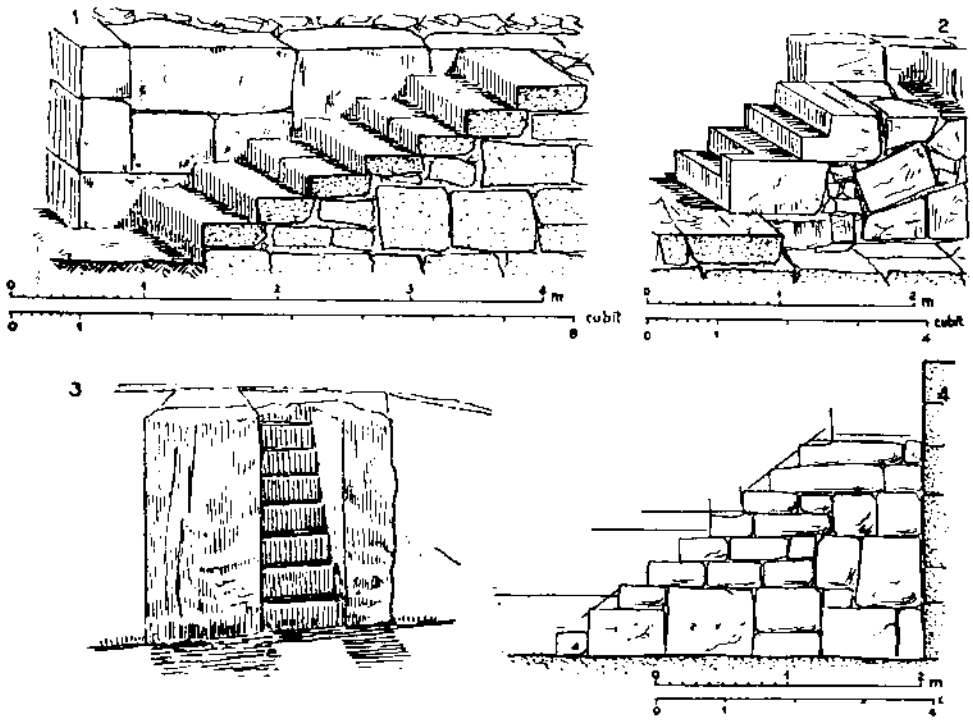

Fig. 127. Sections of staircases in stone (1-2, sun-temple; 4, mortuary temple of Neferirkare') and perspective of monolithic staircase (3, Sahure').

Staircases (*fig.* 127).— In temples staircases led from lateral chambers up to the terrace. They were narrow, with low gradient for monumental staircases, but very steep for magazines, the tread being equal to the riser. Steps were cut to the block (Sun-temple)(352), or in single blocks (Sun-temple)(353) and set upon solid masonry abutting against a wall for the lower flight and probably upon brick vaults for the higher ones. In one case the guide-lines indicating the slope are still marked on the wall (Neferirkare')(354). Stone stairways with two lateral runways were sometimes cut in one single monolith (Sahure')(355). Brick stairways led to the magazines and silos, and had wooden planks as treaders (Neferirkare')(356).

Doors.— In brickwork doorways were usually of monolithic jambs and threshold, sometimes in wood (Neferirkare'). In stone masonry sills of limestone were pierced at the corner (Sun temple of Neuserre')(349), to receive the

lower door-pivot, sometimes turning in a special stone or metal block (basalt in Chephren's). The door-leaves were hung by inserting first the top-pivot in the lintel-socket and letting the lower pivot fall in the bottom-socket of the threshold.

Leaves of doors were of wood decorated with scenes and painted, having top and bottom pivots protruding at both ends of one of the leaf-uprights (Kaemhesit, of one piece of wood). Doors had one or two leaves (Neferirkare'). A shallow recess could be cut in the wall against which the door-leaf opened, to the shape of this leaf.

Doors were secured with an elaborate system of bolt set in the door-jamb and that could be brought out against a one-leaf door (Sahure')(350), or by horizontal bolts and bars for two-leaf doors.

WINDOWS.— In the funerary temple of Chephren windows consist of a slot connected to a vertical shaft opening at the top of the external face of the wall, thus affording only dim light. The causeway had likely only slot openings in the ceiling (Neuserre', Sun-temple), bounded by a rim to prevent rainwater from dripping inside.

MASONRY (*fig.* 128).— Monumental architecture was generally constructed in stone, but when left unfinished on account of the death of the king, was sometimes completed in brickwork. Thus Mykerinos' mortuary temple was built by Shepseskaf in brick, over the original granite and limestone. Similarly the temple of Neferirare' was completed in brick by Neferefre'.

The bulk of a pyramid temple was constructed of local limestone but was generally lined with fine limestone or even with granite on both the interior and exterior walls (Chephren, temple of the Sphinx, Mykerinos). The kings of the Vth dynasty decorated the walls with scenes in low-relief on limestone, above a dado of granite (Sahure') or basalt (Neuserre'), which combined with pavements and ceilings in granite, basalt or alabaster.

Brickwork was used for magazines and priests' dwellings. Masonry shows a current use of large blocks set, according to the method noticed in the IIIrd dynasty review of construction, in horizontal courses with blocks of various heights and oblique joints, and patched areas (Neferirkare'). Walls had an inner core of second-rate masonry, lined with finely dressed ashlar (enclosure of Sahure'), usually topped with a rounded course. Cap-stones of such top-courses as well as pyramidions (Udjebten) and corner-blocks had a dowel on their lower face to be inserted in a socket (Sun-temple). Blocks were adjusted before being set in the course, except for the top bed which was dressed in situ.

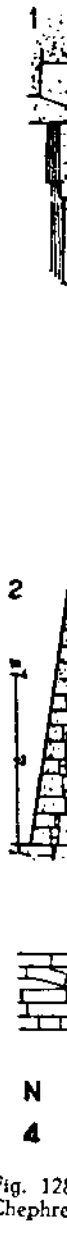

Fig. 12
Chephre

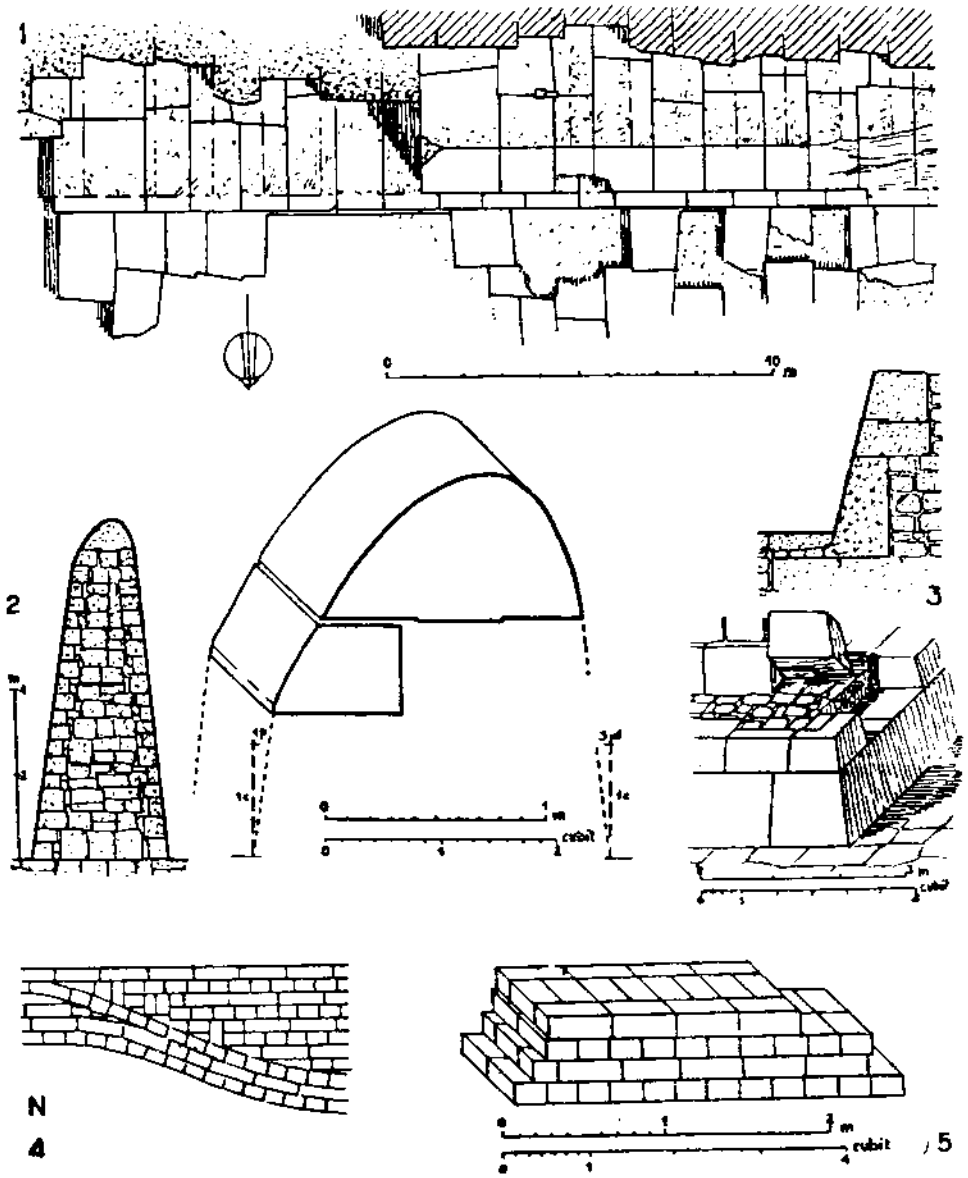

Fig. 128. Constructional details in IVth-VIth dynasties masonry: plan of casing-blocks at Chephren's pyramid(1), section in enclosure wall(2, Sahure'), fitting corner blocks (3, sun-temple), slanting courses in a sun-boat(4), bonding in brick(5, sun-temple).

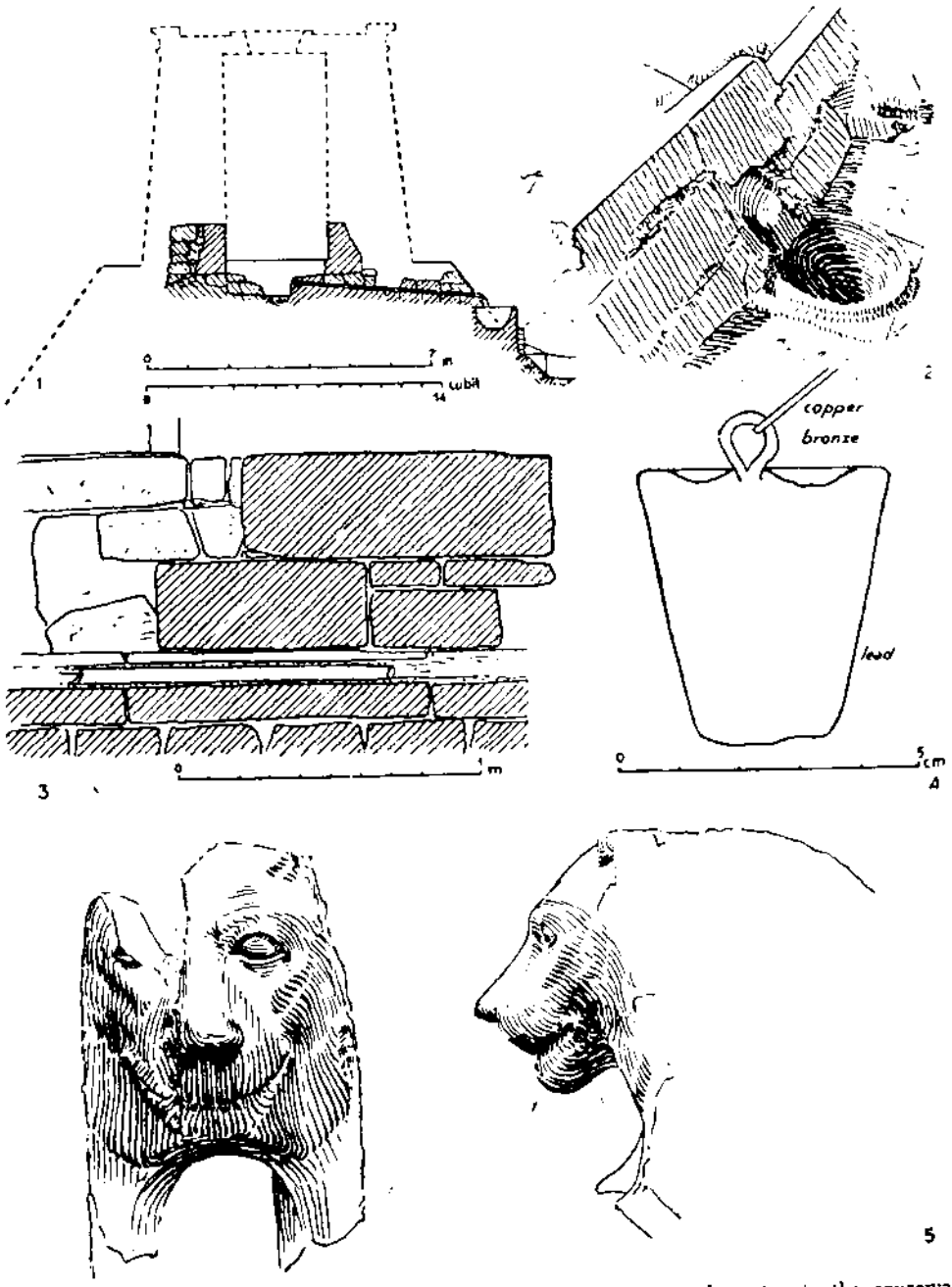

Fig. 129. Provision against rain in Vth dynasty temples: transversal section in the causeway showing the drainage channel(1-2, Neuserre'), copper piping(3, Sahure'), lead stopper(4, Sahure'), gargoyle passing between the legs of the forepart of a basalt lion(5, Sun-temple).

A theory, based upon the study of the numerous sockets cut regularly in blocks of stone and in the pavement along a course, propounds the use of wooden cranes to raise the blocks in the field (*fig.* 123).

ROOFS[357].— The ribbed type of roofing, imitating bundles of pliable stems, and known in Djeser's complex, was still in favour for brick arches and vaults in the Giza tombs. Stone monuments however had roofs of large slabs, narrow and deep. Around a court the roof-slabs projected from the wall in the form of a chamfered cornice (Sahure' Neuserre'). Terraces were bordered with parapets (Sahure', Neuserre'). The ceiling was decorated with yellow stars on a blue sky (Sahure').

Brick vaults and domes covered chapels and corridors of the tombs and probably the huge magazines attached to the temples.

In structures where excessive loading exerted, as the internal apartments of pyramids, pent-roofs covered the chambers as well as the corridors. Above the upper chamber in Cheops' pyramid a system of five relieving chambers had been devised, while in the other pyramids a pent-roof, usually in three layers of blocks transfered the loads to the neighbouring masonry. The section of the corridor which had to carry the stresses thus produced was built of granite. This type of pent-roof was exactly carried out in the pyramid of Sahure', but was carelessly constructed elsewhere, in later pyramids, with short beams in the upper layers, so that beams were exposed to the worst cases of loading.

PROVISION AGAINST RAIN (*fig.* 129.— An elaborate system for collecting rainwater was devised in the temples of the Vth-VIth dynasties. In the pavement sloping channels led water outside the enclosure walls. Usually the canalisations were under the pavement, cut in stone blocks or as copper pipes set in stone channels and running under the whole temple to copper-lined stone basins with small lead stoppers secured to bronze chains (Sahure')[358].

Rainwater falling on the terraces was poured to the pavement by water-spouts, sculptured in the shape of the forepart of a lion. The water-spout passed between the fore-paws of the reclining lion, usually a beautiful piece of sculptured basalt[359]. In contemporaneous mastabas canalizations in the form of stone channels or earthenware pipes were set beneath the pavement[360]

THE STYLE OF THE IIIrd DYNASTY[361].

Perhaps the most characteristic features of the IIIrd dynasty style as examplified in the Djeser complex are articulation and rhythm. Symmetry, which will so strongly characterise later plans of monumental buildings, is not yet applied. The main entrance is not axial, but at one end of the longer side, askew although intended to be transversal. It seems that the elements of the plan are juxtaposed but not composed: the main South court and the pyramid are flanked with elements set in a row. Even in the temples adjoining the court the connecting entrances between one court and the next are always on one side, perhaps a remembrance of the primitive lateral entrance in the plan of the court. The same characteristic is to be noted in the façades, where the door reminds of the prototype entrance opening near one of the posts of the hut. Structural influences copied from light materials architecture, are prominent throughout the style.

Columns are always engaged in the façades or at the but-ends of transversal partition walls, so that the plan of hypostyle halls is seceded into as many lateral compartments as there are columns. Open door-leaves are copied in stone, and no opening seems to have been stopped up with a real wooden door. The fact that the complex contains only dummy buildings is of importance when style is considered. Ceilings are ribbed, being copies of bundles or reeds roofs. Columns and corner-posts themselves are direct copies from bundles of reeds or other stems, and they show through their convex and concave flutes the same feature of articulation conspicuous in the elements of the plan, such as the Heb-Sed chapels or the recessed panelled walls inside and outside the complex. Rythm is also expressed by the same elements.

Contrast is to be found between the proportions of slender columns and the façades or the tiny openings and the areas of masonry, as well as in the plan, in the long courts or hypostyle halls. Movement is everywhere, in the vertical articulation of the walls and façades as well as in the horizontal steps of the pyramid, the curved lines of the roofs imitating flat vaults, crowned with a straight-sided cornice.

In funerary architecture brick is gradually replaced by stone. Façades of mastabas are still characterized by recessed panels as before.

Masonry using small blocks derives its characteristics from brickwork and carpentry. Ornament is known, stylizing plant motives in sculptured stone or copying reed structures in glazed tiles. Statues are occasionally set in niches, but are not embodied in the architectural project. Mural paintings and scenes inlayed with coloured pastes in stone are known.

The style, elegant and agreeable according to our modern aesthetics, is however not mature and expresses an intermediate stage in an evolution. It appears all of a sudden in an amazingly developed form.

THE IVth DYNASTY.

Contrasting strongly with the IIIrd dynasty and even with the Vth-VIth dynasties, architectural style in the IVth dynasty is quite a distinctive achievement, which can be ranked as the sincerest and most beautiful.

Successful use of stone, whether concerning structure or aspect of materials, is at the basis of the style. Order, simplicity, usually expressed as symmetry and sometimes allied to monumentality, are the main characteristics. The plan of the Giza necropolis shows an ideal example of neat order in the arrangement of its rectangular mastabas along straight streets intersecting at right angles.

The plan is influenced by the use of large blocks of stone. Axiality and symmetry are allied to massive walls and pillars. The column seems to be neglected. The pyramid is cased and polished to appear as one single geometrical mass with glittering faces. Façades are nude, without cornices or ornament, and with tiny doorways and scarce bands of hieroglyphs incorporated into architecture. Ceilings are flat, set upon architraves, a result of the use of huge slabs of stone. Walls are also nude, without recessed panelling.

Mastabas are as monumental as pyramids or temples, with huge simple masses as façades. The chapel is a cubical structure set at the southern end of the East face and replaces the inner apartments of the superstructure.

Masonry, using large blocks, has become truly structural, with no direct recollection of wood or light materials prototypes. Use of the proper materials with taste is the main achievement in ornamentation, together with the incorporation of statues in the architectural project.

Inner effect is also due to simplicity: walls are nude, lined with limestone, sometimes sprinkled with red dots to imitate granite. The false-door and the niche are replaced by a small tablet in front of the offering-places. The sarcophagus is simple in form, finely cut in limestone.

Architecture expresses the immense power of the divine pharaoh. Its aesthetic value is mainly due to the sound use of structural science as applied to stone construction. It reaches its effect through emphasis of simplicity in lines and impressiveness in masses, always relying upon adequate materials. It certainly reaches, with the pyramids and temples at Giza, its culminating point in the whole of Egyptian history.

THE Vth AND VIth DYNASTIES.

At the end of the IVth dynasty, in the reign of Mykerinos, a new trend in style dawns. The severe, essentially monumental and abstract style of the IVth dynasty is brought down to human scale and becomes accessible to human feelings. The plan of the mortuary temple expresses an invitation to enter into the monument. Its magazines show an important development. Façades are crowned with a cornice consisting of the gorge and the torus. Earthly recollections and liveliness are introduced with the use of plant-columns, variety of materials and decoration of walls in low-relief scenes. Colour is spread all over the structures, in bright tones. Columns are no more a direct copy from nature. The shaft has assumed a geometrical form: the single palm-trunk is a conical shaft, while the bundle-shaft shows stylised stems of lotus or papyrus, distributed axially and tied at the top with five ligatures. Texts cover the walls of the inner apartments. Monumentality subsides: pyramids become smaller and workmanship deteriorates. Religious texts inscribed on the walls offer sufficient protection and replace efficiently architectural scale and monumentality.

Mastabas have no more the massive superstructures of the IVth dynasty, but the chapel and its dependances, ever growing in importance, are introduced in the rectangular plan. Scenes in low-relief depicting everyday life decorate the walls. In the VIth dynasty such a repertory will also be introduced for the underground chambers. Two quite separate lines of development characterize the VIth dynasty mastaba: the very large type for rich people, with a maze of chambers in the superstructure, and the small degenerate brick tombs set irregularly, regardless of the necropolis plan.

Low-relief scenes endued with harmonious rhythm in the Vth dynasty, become unsymmetrical and feature new types in the VIth dynasty. Decorative sculpture is incorporated to architecture such as gargoyles and huge statues.

In the Vth dynasty architecture is no more godly. It becomes symbolical and the structural effect is thus often hidden, though still essentially sound. It seems highly possible that the Heliopolitan cult of the Sun is responsible for the movement. Deterioration of the new style at the end of the VIth dynasty is due to the desintigration of the country.

THE ACHIEVEMENT OF THE OLD KINGDOM ARCHITECTURE.

THE PROGRAMME.— In every kind of architecture various types of building programmes are undertaken and carried out to a high standard of perfection. In domestic architecture the private house for the commoner or the palace for the king, with its dependances such as the quarters for the harem-women, has already assumed the typical tripartite subdivision, which will characterize the elaborate plan of the Egyptian house, as exemplified in the XVIIIth dynasty villa at 'Amarna. The garden with its artificial pond, plays a prominent role in the programme of the mansion. The granaries appear as separate units, sometimes provided with porticoes. Townplanning is based on the most rational chessboard pattern, whether in necropoli or in towns. The county-council type of uniformly planned house is devised in governmental schemes.

In religious architecture the different needs are adequately met by the various programmes of the mortuary temple, with its offering-chapel, its funerary cult-temple and its valley-temple, to perform the ritual due to a king, or in the cult-temples, whether for the cult rendered to a deity in its naos or to the sun-god Re', through an obelisk erected in an open court. The elaborate programme is so well studied that the plan emerges as a complete success, applying the rules of symmetry and balance in design. It is in the temples of the pyramid complexes that monumental architecture finds its fullest measure of development.

Due to the incentive of ensuring the security to the mummy the royal tomb is erected as a monumental pyramid, displaying a refined taste as well as an amazing mastery in technique and in the organization of labour. The commoner's tomb definitely secedes into a superstructure and a substructure, with funeral apartments set deeply at the bottom of a vertical shaft. This shaft will be the essential element in most tombs during the whole history of funeral architecture from the Old Kingdom down to the late Roman times. The tomb becomes familial, sheltering several members of one family. The architectural importance of tombs lies more in the aesthetic effect attained than in the structural achievement.

Although very poorly represented by surviving remains military architecture seems nevertheless, on the basis of graphical evidence, to have achieved such efficient programmes as small fortresses, complete with battlemented walls, counterscarpe and cantilever machicolation.

THE AESTHETIC EFFECT.— The aesthetic effect in such a utilitarian architecture as that of the Old Kingdom could only be a secondary achieve-

ment. Yet it is always extant, whether as the effect of perfect masses and proportions, joined to an impressive scale, or as the result of structural science or adequate use of rich materials. This primary effect alone is responsible for the majesty of monumental architecture in the IVth dynasty, in pyramids and temples.

A secondary effect is achieved through the elaboration of stylistic façades in trabeated architecture, using columns and wall decorations. One of the most momentous achievements in such a field is the plant-column in its various forms and that of the various plant-elements such as the cornice, the torus, the kheker- and the djed-ornament. Such was the mastery of the architect in the Old Kingdom that he succeeded to stylize the different plant-elements already used tentatively in the IIIrd dynasty and bring them to standard forms in the Vth dynasty, never to be surpassed.

Architectural sculpture is using in the main fine low-reliefs and sometimes huge statues in front of the pillars of a portico. These were probably the prototypes of the New Kingdom osiriac pillars and the unique huge statues in the rock-cut temples at Abu Simbel. There is safe ground to surmise that the magic of colour, already known to the archaïc Egyptian, was used in monumental architecture. Various refined techniques such as that of inlay with coloured pastes and blue faïence were used in mural scenes or panels, since the IIIrd dynasty. Polychrom faïence inlaid in walls will be a prominent decorative feature in the New Kingdom.

THE CONSTRUCTION.— Structural achievements in the IVth-VIth dynasties feature a complete set of constructional elements used onwards till the latest times. The technique of stone-cutting attained such an excellence that it could easily devise courses with blocks of various heights and inclined rising joints. Stone walls with filling encased between two retaining faces, inclined courses and patched defects in stone, were known in the IIIrd dynasty. Lining of rubble masonry or rock faces with limestone and sometimes with granite, basalt or alabaster, was commonly used. The various systems of roofing are known: the corbel-roof, the pent-roof occasionally cut on its underside in the shape of a pointed vault, the ceiling with horizontal slabs (once topped with relieving chambers), the vault in brick, with smooth or ribbed underside.

In trabeated structures stone lintels were supported on pillars or columns, usually monolithic. In current buildings wooden baulks and columns were used instead of stone elements.

The temples and tomb superstructures of the IVth-VIth dynasties provide abundant evidence of a most efficient underground system of canalization and drainage of rainwater.

(1) Herodotus II, 15.
(2) Herodotus II, 17.
(3) Herodotus II, 10, 5.
(4) J. PIRENNE **Histoire des Institutions et du Droit Privé de l'Ancienne Egypte.**
(5) Palermo stone. Cf. J. H. BREASTED, **Ancient Records**, I, § 76 fl.
(6) H. JUNKER, **Merimde**, 1933, S. 85.
(7) CATON THOMPSON-GARDNER, **The Desert Fayum**, II, pl. III, CXII. Also: J. VANDIER, **Manuel d'Archéologie Egyptienne**, I, p. 68 fl.
(8) CATON THOMPSON-GARDNER, op. cit., II, pl. XXV, 34; XXVI, 7; XXVII, 3.
(9) **Ibid** II.
(10) H. JUNKER, **Vorbericht über die Grabungen auf der neolitischen Siedlung von Merimde-Benisalâme (Westdelta)**. Also: J. VANDIER, op. cit., p. 109 fl.
(11) H. JUNKER, **op. cit.**, 1932, Abb. 1.
(12) H. JUNKER, **op. cit.**, 1934, Abb. 3.
(13) H. JUNKER, **Merimde**, 1939, Abb. 2, 3, III, Taf. 3 b. Also: J. VANDIER, **Manuel d'Archéologie Egyptienne**, p. 113-117. This kind of wall is represented by the hieroglyph **dr** "boundary, limit".
(14) H. JUNKER, **op. cit.**, 1933, S. 70; 1929, S. 217.
(15) H. JUNKER, **op. cit.**, II, Taf. III, 6.
(16) H. JUNKER, **op. cit.**, I, S. 218-219.
(17) F. DEBONO, **Annales du Service des Antiquités Egyptiennes**, XLVIII, p. 561-569.
(18) CATON-THOMPSON, **Badarian Civilisation**, p. 82 fl., pl. LXVI-LXVII. J. VANDIER, **Manuel d'Archéologie Egyptienne**, I, p. 498-502.
(19) J. GARSTANG, **Mahasna and Bêt-Khallâf**, p. 6-7, pl. IV.
(20) J. VANDIER, **Manuel d'Archéologie Egyptienne**, I, p. 500.
(21) E. PEET, **Cemeteries of Abydos**, II, p. 7-10, pl. I; III, p. 1-7, pl. I. J. VANDIER, op. cit., I, p. 503-508.
(22) O. MENGHIN-M. AMER, **The Excavations of the Egyptian University in the Neolithic Site at Maadi**, I-II. O. MENGHIN, **Die Grabung der Universität Kairo bei Maadi (III Grabungsjahr)**, Mitt. Kairo V, (1934), p. 111-118. J. VANDIER, op. cit., p. 508-518.
(23) I have been informed by the discoverer Prof. M. AMER that he met with such huts in Tanganyka.
(24) C. BOREUX, **Etudes de nautique égyptienne**, M.I.F.A.O., L, p. 21.
(25) EDGERTON, **Journ. of Sem. Lang. and. Lit.**, 39; (1922-1923), p. 109-135. Alexandre BADAWY, **Le dessin architectural chez les Anciens Egyptiens**, 1948, p. 4.
(26) A. BADAWY, **op. cit., p. 4-8.**
(27) W. FL. PETRIE, **Royal Tombs**, II, pl. IV, 1. Reconstruction in: A. BADAWY, **Le dessin architectural chez les Anciens Egyptiens**, fig. 7 b.
(28) BRUNTON, **Studies presented to F. Ll. Griffith**.p. 272 fl. J. VANDIER, **Manuel d'Archéologie Egyptienne**, I, p. 528-529.
(29) R. MACIVER-MACE, **El 'Amrah**, p. 42, pl. X, 1-2.
(30) W. FL. PETRIE, **Egyptian Architecture**, p. 90, fig. 151.
(31) ALEXANDER BADAWY, **Vaults and domes in the Giza Necropolis**, in A. ABU BAKR, **Excavations at Giza**, 1953.
(32) J. E. QUIBELL, **Hierakonpolis**, II, p. 3 fl. pl. LXXII. J. VANDIER, **op. cit.**, p. 521-522. The name of Hierakonpolis is written with a hieroglyph representing the plan of the platform of the sanctuary. Cf. H. RICKE, **Der "Hohe Sand in Heliopolis"** A. Z. 71, 1935, S. 109-110.

(33) J. VANDIER, op. cit., p. 577-578. CROMPTON, Journal of Egyptian Archaeology, V, (1918), p. 57-60. pl. VII.
(34) F. LEGGE, The carved slates from Hierakonpolis and elsewhere, Proceedings of the Society for Biblical Archaeology, XXII, pl. V. W. FL. PETRIE, Note on a carved slate, P.S.B.A., XXII, p. 140-141. ALEXANDRE BADAWY, Le dessin architectural., p. 16-17. J. VANDIER, Manuel d'Archéologie Egyptienne, I, p. 590-591.
(35) G. REISNER, The Development of the Egyptian Tomb down to the accession of Cheops, 1936, p. 1-5. The contracted position may have been chosen to spare excavating without adequate tool.
(36) H. JUNKER, Merimde.
(37) J. VANDIER, op. cit., p. 156-161.
(38) BRUNTON, Mostagedda, p. 5 fl. J. VANDIER, op. cit., p. 168 fl.
(39) BRUNTON, op. cit., p. 43. J. VANDIER, op. cit., p. 192 fl.
(40) R. MACIVER-MACE, El 'Amrah, pl. IV, V. J. VANDIER, op. cit., p. 236-240.
(41) AYRTON-LOAT, Mahasna, pl. PIII, IX, X. J. VANDIER, op. cit., p. 240-244.
(42) W. FL. PETRIE, Naqada, pl. III. J. VANDIER, op. cit., p. 244.
(43) BRUNTON, Matmar, 1948, p 12 fl., pl. VIII-X. J. VANDIER, op. cit., p. 246-247.
(44) BRUNTON, Badarian Civilisation, p. 52-53. J. VANDIER, op. cit., p. 246-247.
(45) G. REISNER, Tomb Development, p. 5, fig. 10.
(46) ALEXANDRE BADAWY, Le dessin architectural, p. 41-65.
(47) H. RICKE, Der Grundriss des Amarna-Wohnhauses, 1932, S. 7.
(48) F. Ll. GRIFFITH, A Collection of Hieroglyphs, fig. 193.
(49) Mace-head of Na'rmer, cf. J.E. QUIBELL, Hierakonpolis, I, pl., XXVI, B.
(50) W. FL. PETRIE, Royal Tombs, I, pl. 16, 20. ALEXANDRE BADAWY, Le dessin architectural, p. 27, fig. 37.
(51) G. REISNER, Tomb Development, p. 243 fl. J. VANDIER, Manuel d'Archéologie Egyptienne, p. 898, fl. ALEXANDRE BADAWY, op. cit., p. 67 fl. fig. 9.
(52) H. FRANKFORT, American Journal of Semitic Languages and Literatures, XLVIII (1941), p. 329-158. Also : Birth of Civilization, p. 103-105. A. SCHARFF, Frükulturen Aegyptens und Mesopotamiens, Der Alte Orient, Bd. 41, 1941. Das Grab als Wohnhaus in der ägyptischen Frühzeit, 1947, S. 35-36.
(53) W. FL. PETRIE, Tarkhan, II, pl. XV.
(54) H. W. FAIRMAN, Townplanning in Pharaonic Egypt, The Town Planning Review, XX, No. 1, 1949, p. 49.
(55) W. EL. PETRIE, Abydos II, pl. LI.
(56) H. RICKE, Bemerkungen zur Aegyptischen Baukunst des Alten Reichs, I, 88, 275, 281.
(57) J. VANDIER, Manuel d'Archéologie Egyptienne, I, p. 524; 525.
(58) J. VANDIER, op. cit., p. 950.
(59) H. RICKE, Der "Hohe Sand in Heliopolis", A.Z. 71, 1935, S. 107-111.
(60) ALEXANDRE BADAWY, Le dessin architectural chez les Anciens Egyptiens, 1948, p. 10-16.
(61) S. SCHOTT, Hieroglyphen, S. 24. J. VANDIER, op. cit., p. 604-605.
(62) ALEXANDRE BADAWY, op. cit., p. 16-17.
(63) Ibid.
(64) H. RICKE, Bemerkungen zur Aegyptischen Baukunst des Alten Reichs, I, S. 29-31.
(65) ALEXANDRE BADAWY, Le dessin architectural chez les Anciens Egyptiens, p. 24-25, fig. 34-36.
(66) Ibid. p. 25-26, fig. 37.
(67) Ibid. p. 47-49.

(68) **Ibid.** p. 206.
(69) **Ibid.** p. 52-53, fig. 52.
(70) W. EMERY, **Great tombs of the First Dynasty**, 1949, p. 12.
(71) G. REISNER, **Tomb Development**, p. 5 fl.
(72) **Ibid.**, p. 7, 134 fl. J. VANDIER, op. cit., p. 618 fl.
(73) G. REISNER, **Tomb Development**, p. 237 fl. J. VANDIER, op. cit., p. 690 fl.
(74) A. SCHARFF, **Das Grab als Wohnhaus in der ägyptischen Frühzeits**, 1947.
(75) Theory propounded by Ricke, cf. A. SCHARFF, op. cit., S. 26, refuted by SCHARFF.
(76) H. RICKE, **Bemerkungen zur Aegyptischen Baukunst des Alten Reichs, I**, S. 58-59.
(77) G. REISNER, **Tomb Development**, p. 154-155.
(78) J. E. QUIBELL-GREEN, **Hierakonpolis, II**, pl. LXXIV, p. 19 fl. J. VANDIER, op. cit., 526-527.
(79) B. SMITH, **Egyptian Architecture as Cultural Expression**, 1938, p. 218.
(80) E. R. AYRTON-C.T. CURRELLY-A.E. WEIGALL, **Abydos III**, 1904, pl. VI. J. VANDIER, op. cit., p. 945-946.
(81) B. SMITH, op. cit., p. 40, 218. AYRTON-CURRELLY, op. cit., pl. VII.
(82) AYRTON-CURRELLY, op. cit., pl. VIII. B. SMITH, op. cit., p. 40, 217-218.
(83) ALEXANDRE BADAWY, op. cit., fig. 23, 25, 38.
(84) W. FL. PETRIE, **Royal Tombs, II**, pl. 5. ALEXANDRE BADAWY, op. cit., p. 62-63.
(85) L. BORCHARDT, **Altägyptische Festungen an der zweiten Nilschnelle**, 1923. Abb. 9.
(86) **Ibid.** S. 29.
(87) J.H. BREASTED, **Ancient Records, I**, § 147, 148.
(88) **Ibid.** I, § 173.
(89) **Ibid.** I, § 328.
(90) J. PIRENNE, **Histoire des Institutions et du Droit Privé dans l'Ancienne Egypte**, La Vème dynastie, p. 293.
(91) ALEXANDRE BADAWY, **Le dessin architectural chez les Anciens Egyptiens, p. 43**, fig. 44 a.
(92) **Ibid.**, p. 44-45, fig. 45.
(93) **Ibid.**, p. 65.
(94) **Ibid.**, p. 51-52, fig. 51.
(95) B. SMITH, **Egyptian Architecture as cultural Expression**, pl. III, 2.
(96) ALEXANDRE BADAWY, op. cit., p. 53-54, fig. 53.
(97) **Ibid.**, p. 56, fig. 56.
(98) H. JUNKER, **Giza VII**, S. 124, Abb. 46; **Giza XI**, S. 127.
(99) J. GARSTANG, **Excavations at Hierakonpolis, at Esna and in Nubia**, A.S.A., VIII, p. 132-148.
(100) H. RICKE, **Bemerkungen sur Aegyptischen Baukunst des Alten Reichs, I**, S. 93-94, Abb. 29.
(101) S. HASSAN, **Excavations at Giza**, IV, fig. 1, p. 35.
(102) ALEXANDRE BADAWY, **La maison mitoyenne de plan uniforme dans l'Egypte pharaonique**, Bulletin de la Faculté des Lettres, Fouad Univ., 1953.
(103) W. FL. PETRIE **The Pyramids and Temples of Giza**, 1883, p. 213.
(104) W. FL. PETRIE, **Gizeh and Rifeh**, 1907, p. 14-20, pl. I, XIV-XXII.
(105) ALEXANDRE BADAWY, **Le dessin architectural**, p. 116-121.
(106) **J. CAPART, Etudes et Histoire**, p. 74. B. SMITH, **Egyptian Architecture**, p. 41, H. Ricke accepts the possibility of lining the whole external wall surfaces in brick buildings with mats, cf. H. RICKE, **Bemerkungen zur Aegyptischen Baukunst des Alten Reichs, I**, S. 90-91, 26, 34.

(107) H. RICKE, op. cit., I, S. 94, Abb. 26.
(108) W. FL. PETRIE, Egyptian Architecture, 1938, p. 79.
(109) J. H. BREASTED, Ancient Records, I, § 97, 108-110, 119, 134, 143, 156, 167.
(110) J. H. BREASTED, op. cit., I, § 173.
(111) Ibid., I, § 180.
(112) ALEXANDRE BADAWY, op. cit., p. 46-47.
(113) Ibid., p. 47-49.
(114) W. FL. PETRIE, Ancient Egypt, 1926, p. 24.
(115) ALEXANDRE BADAWY, op. cit., p. 49-51.
(116) E. NAVILLE, The Festival Hall of Osorkon II, 1893, p. 13, pl. II, 8. ALEXANDRE BADAWY, op. cit., p. 52-53, 160-162.
(117) ALEXANDRE BADAWY, op. cit., p. 56-57, fig. 58.
(118) Ibid., p. 209-211, fig. 244-247. H. RICKE, Bemerkungen II, S. 89-98, Abb. 39-41.
(119) ALEXANDRE BADAWY, op. cit., p. 160-162, fig. 189-202.
(120) C. M. FIRTH-J. E. QUIBELL, The Step Pyramid (1936). J.P. LAUER, La pyramide à degrés, 1936. Etudes complémentaires sur les monuments du Roi Zoser à Saqqarah, 1948. B. SMITH, Egyptian Architecture, p. 60-80. I.E.S. EDWARDS, The pyramids of Egypt, 1947, p. 44-66. H. RICKE, Bemerkungen zur Aegyptischen Baukunst des Alten Reichs, I-II.
(121) H. RICKE, op. cit., I, S. 68.
(122) Ibid., S. 71-77.
(123) Ibid., II, S. 38, Abb. 10.
(124) Ibid., II, S. 106, Abb. 44.
(125) Ibid., I, S. 79, Abb. 20.
(126) Ibid., II, Abb. 10.
(127) ALEXANDRE BADAWY, Le dessin architectural, p. 31-35. Also; La stèle funéraire sous l'Ancien Empire: son origine et son fonctionnement, A.S.A., T. XLVIII.
(128) J. P. LAUER, La pyramide à degrés, p. 76, 141, 143, 151, 164, pl. LVIII, LXVI, LXX.
(129) G. JEQUIER, Manuel d'archéologie égyptienne, I, Les éléments de l'architecture, 1924, p. 8. S. CLARKE-R. ENGELBACH, Ancient Egyptian Masonry, p. 6 W. FL. PETRIE, Egyptian Architecture, 1938, p. 16.
(130) ALEXANDRE BADAWY, Le dessin architectural, p. 35. B. SMITH, Egyptian Architecture, p. 69.
(131) W. FL. PETRIE, op. cit., p. 53, fig. 71. G. JEQUIER, op. cit., p. 72. B. SMITH, op. cit., 69. S. CLARKE-R. ENGELBACH, op. cit., p. 5.
(132) ALEXANDRE BADAWY, op. cit., p. 49.
(133) Ibid., p. 51.
(134) Ibid., p. 21 E. NAVILLE, The Temple of Deir El Bahari, 1901, IV, pl. CIII. L. BORCHARDT, Tempel mit Umgang, 1938, Abb. 9.
(135) H. RICKE, op. cit., I, S. 71, 137.
(136) J. P. LAUER, La pyramide à degrés, III, p. 64.
(137) ALEXANDRE BADAWY, La première architecture en Egypte, A.S.A., T. LI, p. 1-28.
(138) H. RICKE, op. cit., I, S. 140, Tafel I. J. P. LAUER, Etudes complémentaires sur les monuments du Roi Zoser à Saqqarah, 1948, p. 38.
(139) J. P. LAUER, La pyramide à degrés, I, p. 74, 137, 148, 159.
(140) H. RICKE, op. cit., I, S. 82, Abb. 82, Taf. 2.
(141) L. BORCHARDT, Tempel mit Umgang, S. 27.
(142) J. P. LAUER, La pyramide à degrés, I, p. 138, 161, fig. 166.
(143) H. RICKE, op. cit., I, S. 78-79. J. P. LAUER, Etudes complémentaires, p. 42.

(144) H. RICKE, **op. cit.**, I. S. 78, Abb. 20. J. P. LAUER, **Etudes complémentaires**, p. 42.
(145) B. SMITH, **op. cit.**, p. 76.
(146) J. P. LAUER, **La pyramide à degrés**, I, p. 125 ; III, p. 46.
(147) **Ibid.**, I, p. 172; II, pl. LXXXIII.
(148) **Ibid.**, I, p. 169, fig. 188.
(149) W. FL. PETRIE, **Egyptian Architecture**, p. 16-17, fig. 25. ALEXANDRE BADAWY, **Le dessin architectural chez les Anciens Egyptiens**, p. 5, 43, 45.
(150) H. RICKE, **Bemerkungen zur Aegyptischen Baukunst des Alten Reichs**, II, S. 105, Abb. 44.
(151) J. P. LAUER, **La pyramide à degrés**, I, p. 221 fl.
(152) S. CLARKE-R. ENGELBACH, **Ancien Egyptian Masonry**, p. 8.
(153) H. RICKE, **op. cit.**, II, S. 26. Abb. 5, 6.
(154) **Ibid.**, S. 29, Abb. 34.
(155) **Ibid.**, S. 30.
(156) **Ibid.** S. 33-35, Abb. 8, 9.
(157) **Ibid.** S. 38, Abb. 10.
(158) **Ibid.** Abb. 10.
(159) **Ibid.** Abb. 10, S. 45.
(160) **Ibid.** II, S. 45-46, 60-62.
(161) **Ibid.** S. 47, Abb. 13.
(162) **Ibid.** Abb. 24, p. 61.
(163) **Ibid.** S. 65.
(164) **Ibid.** S. 71, Abb. 29.
(165) **Ibid.** S. 73.
(166) **Ibid.** S. 87.
(167) **Ibid.** Abb. 37.
(168) B. GRDSELOFF, **Das Aegyptische Reinigungszelt**, 1941. ALEXANDRE BADAWY, **op. cit.**, p. 209-210, fig. 244-245.
(169) H. RICKE, **op. cit.**, II, S. 94-96.
(170) B. GRDSELOFF, **op. cit.**, S. 12. ALEXANDRE BADAWY, **op. cit.**, p. 211, fig. 246-247. H. RICKE, **op. cit.**, II, Abb. 41.
(171) H. RICKE, **op. cit.**, S. 97-98, Abb. 37-38.
(172) **Ibid.** S. 105-108.
(173) **Ibid.** S. 114-117, Abb. 48.
(174) **Ibid.** S. 117.
(175) W. FL. PETRIE, **Medum**. WAINWRIGHT, **Medum and Memphis**. A. ROWE, **Excavations of the Eckley B. Coxe, Jr., Expedition at Meydum Egypt**, 1929-1930. Museum Journal, Pennsylvania, 1931. I.E.S. EDWARDS, **The Pyramids of Egypt**, 1947, p. 77, 79, fig. 13. H. RICKE, **op. cit.**, II, S. 28, 116, Abb. 5, 48, 13.
(176) J. P. LAUER, **Le temple funéraire de Khéops à la grande pyramide de Guizeh**, A.S.A., T. XLVI, 1947, p. 245-259.
(177) H. RICKE, **op. cit.**, II, S. 60, Abb. 23.
(178) H. RICKE, **op. cit.**, II, S. 44.
(179) I.E.S. EDWARDS, **The Pyramids of Egypt**, 1947, p. 102. W. STEVENSON SMITH, **Old Kingdom Sculpture**, American Journal of Archaeology, vol. XLV, p. 514-528, 1941. **A History of Egyptian Sculpture and Painting in the Old Kingdom**, 1946.
(180) See the new reconstruction, H. RICKE, **op. cit.**, II. S. 50-55, Abb. 20, Taf. 2. I.E.S. EDWARDS, **op. cit.**, p. 114-115.

(181) H. RICKE, **op. cit.**, II, S. 55. (224)
(182) **Ibid.** S. 108.
(183) **Ibid.** Abb. 37. (225)
(184) H. JUNKER, **Von der ägyptischen Baukunst des Alten Reiches,** A.Z., 63, S. 1-14.
(185) H. RICKE, **op. cit.**, II, S. 28-29, Abb. 6. (226)
(186) **Ibid.** S. 58, Abb. 22. (227)
(187) **Ibid.** S. 59.
(188) **Ibid.** S. 110. (228)
(189) **Ibid.** S. 108-109, Abb. 47. (229)
(190) **Ibid.** S. 59. (230)
(191) **Ibid.** S. 101, Abb. 42. (231)
(192) **Ibid.** S. 30, 62-65, 77, Abb. 31.
(193) **Ibid.** S. 110, Abb. 46. (232)
(194) **Ibid.** II, S. 68.
(195) I am indebted to J. P. LAUER for the permission to use his plan of the temple. (233)
(196) H. RICKE, **op. cit.**, Abb. 24, S. 70. (234)
(197) **Ibid.** S. 32. (235)
(198) **Ibid.** S. 34, Abb. 8. (236)
(199) **Ibid.** S. 71-74, Abb. 28-29. (237)
(200) **Ibid.** S. 92, Abb. 48, S. 115-116. (238)
(201) **Ibid.** S. 32, Abb. 32.
(202) **Ibid.** S. 78, Abb. 33. (239)
(203) **Ibid.** S. 80-81. (240)
(204) **Ibid.** S. 82, Abb. 34.
(205) I.E.S. EDWARDS, **The Pyramids of Egypt,** p. 146.
(206) H. RICKE, **op. cit.**, S. 82-83, Abb. 34. (241)
(207) I.E.S. EDWARDS, **op. cit.**, p. 147. H. RICKE, **op. cit.**, S. 117. (242)
(208) H. RICKE, **op. cit.**, Abb. 37, S. 99. (243)
(209) **Ibid.** S. 84. J.P. LAUER, **Le problème des Pyramides d'Egypte,** 1948, p. 101, fig. 31. (244)
(210) I.E.S. EDWARDS, **The Pyramids of Egypt, 1947, p. 147-149. pl. 11 a-b.** ET. DRIOTON, **Une représentation de la famine sur un bas-relief égyptien de la Vème dynastie,** Bull. de l'Institut d'Egypte, T. XXV, p. 45-54. (245) (246) (247)
(211) J. P. LAUER, **La pyramide à degrés,** p. 101, fig. 32.
(212) H. RICKE, **op. cit.**, S. 83. (248)
(213) G. JEQUIER, **Le monument funéraire de Pepi II,** 1936-1941 (249)
(214) I.E.S. EDWARDS, **op. cit.**, p. 161.
(215) **Ibid.** p. 158-159. (250)
(216) H. RICKE, **op. cit.**, S. 85. (251)
(217) **Ibid.** S. 113. (252)
(218) **Ibid.** S. 99, Abb. 38. (253)
(219) J. P. LAUER, **op. cit.**, fig. 19.
(220) H. RICKE, **op. cit.**, II, S. 41, Abb. 11. Cf. aussi V. LORET, **Fouilles dans la nécropole memphite,** Bulletin de l'Institut Egyptien, 3ème série, No. 10, année 1899 p. 85 ff. (254)
(221) H. RICKE, **Der "Hohe Sand in Heliopolis",** A. Z., 71, 1935. S. 107-111. (255)
(222) W. S. SMITH, **A History of Sculpture and Painting in the Old Kingdom,** pl. 30, d, e. J. VANDIER, **Manuel d'Archéologie Egyptienne,** p. 952-953. (256) (257)
(223) R. WEILL, **Sphinx,** XV, (1911-1912), p. 9-26. W. S. SMITH, **op. cit.**, p. 132 fig. 48-53. (258)

(224) ROBICHON-VARILLE, Description sommaire du temple primitif de Médamoud, 1940, p. 1-2, 4, 13, 19.
(225) S. HASSAN, The Sphinx, 1949, p. 28. The Great Sphinx and its secrets, 1953, p. 25-29, pl. XVI.
(226) W. von BISSING, Das Re-Heiligtum des Königs Ne-Woser-Re, 1905.
(227) ALEXANDRE BADAWY, Le dessin architectural chez les Anciens Egyptiens, 1948, p. 56, fig. 57.
(228) Ibid. p. 212, fig. 249-250. H. JUNKER, Giza IX, S. 4 fl., Abb. 2-3.
(229) J. H. BREASTED, Ancient Records, I, § 211-212, 239-249, 308.
(230) Ibid. § 181-187, 202, 232-235. For Djau: § 382-383.
(231) L. BORCHARDT, Die Entstehung der Pyramide, Beiträge zur Aegyptischen Bauforschung und Altertumskunde, 1928.
(232) G. REISNER, The Development of the Egyptian Tomb down to the Accession of Cheops, 1936, p. 338.
(233) W. EMERY, Great Tombs of the first dynasty.
(234) A. MORET, Le Nil et la civilisation égyptienne, 1926, p. 202-203.
(235) H. RICKE, Bemerkungen zur Aegyptischen Baukunst des Alten Reichs, II, S. 92, 112.
(236) Ibid. S. 42.
(237) G. REISNER, op. cit., p. 134-136.
(238) J. P. LAUER, La pyramide à degrés, p. 8-9. J. VANDIER, Manuel d'archéologie égyptienne, p. 640-643.
(239) G. REISNER, op. cit., p. 151-153. J. VANDIER, op. cit., p. 942-944.
(240) G. REISNER, op. cit., p. 147-151. J. P. LAUER, La pyramide à degrés, FIRTH-QUIBELL, The Step Pyramid, 2 vols., 1936. I.E.S. EDWARDS, The Pyramids of Egypt, Chap. II.
(241) G. REISNER, op. cit., p .151. J. P. LAUER, op. cit., p. 94-112, pl. III-IV, XXXI.
(242) H RICKE, op. cit., II, S. 106, Abb. 44.
(243) G. REISNER, op. cit., p. 153.
(244) J. P. LAUER, op. cit., p. 210 fl.
(245) A. CHOISY, L'art de bâtir chez les Egyptiens, p. 107.
(246) G. REISNER, op. cit., p. 195-197. I.E.S. EDWARDS, op. cit., p. 73-79.
(247) L. BORCHARDT, Einiges zur dritten Bauperiode der Grossen Pyramide bei Gise, 1932, S. 19-20, Taf. 11.
(248) G. REISNER, The Development of the Egyptian Tomb, p. 199-200.
(249) Ibid. p. 197-199. VYSE-PERRING, Appendix to Operations carried on at the Pyramids of Gizeh in 1837, vol. III, 1842, p. 68, pl. 3.
(250) I.E.S. EDWARDS, The Pyramids of Egypt, p. 68-73. G. REISNER, op. cit., p. 201.
(251) G. REISNER, The Development of the Egyptian Tomb, p. 362.
(252) L. BORCHARDT, Gegen die Zahlenmystik an der grossen Pyramide bei Gise, 1922.
(253) J. H. COLE, Determination of the Exact Size and Orientation of the Great Pyramid of Giza, Survey of Egypt Paper No. 39, 1925. L. BORCHARDT, Länge und Richtungen der Vier Grundkanten der Grosser Pyramide bei Gise, 1926.
(254) L. BORCHARDT, Einiges zur dritten Bauperiode der Grossen Pyramide bei Gise, 1932.
(255) STRABO, Ed. Bohn, III, 249.
(256) W. FL. PETRIE, The Pyramids and Temples of Gizeh.
(257) L. BORCHARDT, Einiges zur dritten Bauperiode der Grossen Pyramide bei Gise, 1932, Taf. 3, 8.
(258) Ibid. Taf. 2, 7.

(259) **Ibid.** Taf. 4, 10.
(260) S. CLARKE-R. ENGELBACH, **Ancient Egyptian Masonry**, 1936, p. 189, fig. 228.
(261) **Ibid.** p. 16, fig. 13.
(262) I.E.S. EDWARDS, **The Pyramids of Egypt**, p. 119-120.
(263) L. BORCHARDT, **Einiges zur dritten Bauperiode der Grossen Pyramide bei Gise**, Taf. 12, S. 18-19.
(264) H. RICKE, **Bemerkungen zur Baukunst des Alten Reichs**, II, S. 109. Abb. 47.
(265) VYSE-PERRING, **Appendix to Operations carried on at the Pyramids of Gizeh in 1837**, 1842, III, p. 8-9.
(266) H. RICKE, **op. cit.**, II, S. 64.
(267) G. JEQUIER, **Le mastaba Faraoun**, 1928.
(268) H. RICKE, **op. cit.**, II, Abb. 25.
(269) **Ibid.** Abb. 46.
(270) I.E.S. EDWARDS, **op. cit.**, p. 137.
(271) H. RICKE, **op. cit.**, II, Abb. 27.
(272) VYSE-PERRING, **op. cit.**, III, p. 39-41, pl. pyramid No. 2.
(273) L. BORCHARDT, **Das Grabdenkmal des Königs Sahu-Re'** I, 1910, S. 68. Blatt 7.
(274) L. BORCHARDT, **Das Grabdenkmal des Königs Nefer-ir-ke-Re'** 1909, S. 39 fl.
(275) **Ibid.** S. 40.
(276) **Ibid.** S. 43.
(277) **Ibid.** S. 43, Blatt 2.
(278) **Ibid.** S. 45, Abb. 54.
(279) **Ibid.** S. 48.
(280) L. BORCHARDT, **Das Grabdenkmal des Königs Ne-user-Re'**, 1907, S. 99 fl. Blatt, 17, 19.
(281) VYSE-PERRING, **op. cit.**, III, p. 51-52.
(282) G. MASPERO, **Les inscriptions des pyramides de Saqqarah**, 1894, p. 1-2, 87-148, 256-257, 329-331. G. JEQUIER, **Le monument funéraire de Pépi II**, 1936-1942.
(283) G. JEQUIER, **La pyramide d'Oudjebten**, 1928, p. 1-5. **Les pyramides des reines Neit et Apouit**, 1933, p. 11, 46.
(284) I.E.S. EDWARDS, **The pyramids of Egypt**, 1947, p. 206 fl. S. CLARKE-R. ENGELBACH, **Ancient Egyptian Masonry**, 1930, p. 117 fl.
(285) L. BORCHARDT, **Längen und Richtungen der vier Grundkanten der grossen Pyramide bei Gise**, 1937, S. 9-13.
(286) I.E.S. EDWARDS, The Pyramids of Egypt, 1947, p. 209-210, fig. 32.
(287) L. BORCHARDT, Das Grabdenkmal des Königs Sahure', I, S. 29.
(288) S. CLARKE-R. ENGELBACH, **op. cit.**, p. 123.
(289) J. P. LAUER **Le problème des pyramides d'Egypte**, 1948, p. 176-177, fig. 43.
(290) S. CLARKE-R. ENGELBACH, **op. cit.**, p. 94.
(291) W. FL. PETRIE. **The Pyramids and Temples of Gizeh**, p. 50-51, pl. III.
(292) L. BORCHARDT, **Das Grabdenkmal des Königs Nefer-ir-ke-Re'**, 1909, S. 39 fl.
(293) S. CLARKE-R. ENGELBACH, **op. cit.**, p. 189, fig. 228.
(294) L. BORCHARDT, Das Grabdenkmal des Königs Sa-hu-Re' I, 1910, S. 72.
(295) L. BORCHARDT, Das Grabdenkmal des Königs Ne-user-Re', 1907, S. 103.
(296) W. FL. PETRIE. **The Pyramids and Temples of Gizeh**, p. 72.
(297) S. CLARKE-R. ENGELBACH, **op. cit.**, p. 125. L. BORCHARDT, **Das Grabdenkmal des Königs Ne-user-Re'**, 1907, S. 154.
(298) J. P. LAUER, **La pyramide à degrés**, p. 175-185.
(299) L. BORCHARDT, **Die Entstehung der Pyramide**, 1928, S. 18.

(300) G. REISNER, The Development of the Egyptian Tomb down to the Accession of Cheops, 1930, p. 184-186.
(301) Ibid., p. 255, fig. 144-146.
(302) Ibid., p. 186.
(303) Ibid., p. 357.
(304) Ibid., p. 172 fl.
(305) Ibid., p. 162.
(306) J. GARSTANG, Mahâsna and Bêt-Khallâf, pl. VII, p. 8-11. G. REISNER, ibid., p. 172, fig. 79.
(307) G. REISNER, op. cit., p. 154 fl.
(308) COVINGTON, A.S.A., VI, p. 193 fl. W. FL. PETRIE, Gizeh and Rifeh, pl. VII, p. 7, fig. 73.
(309) J. E. QUIBELL, Excavations at Saqqara, (1911-1912), The Tomb of Hesy, pl. I. G. REISNER, op. cit., p. 158, fig. 75.
(310) J. E. QUIBELL, op. cit., Compare the representation of similar hangings in the Vth dynasty tomb of Djadjaem'ankh: L. BORCHARDT, Das Grabdenkmal des Königs Ne-user-Re', Blatt 24, S. 125. Paintings of hangings have been found on the recessed panelled walls of a brick tomb from the time of Qa', at Saqqara (1954, by Emery).
(311) G. REISNER, op. cit., p. 167, fig. 78.
(312) H. JUNKER, Von der ägyptischen Baukunst des Alten Reiches, A. Z., 63, S. 9-12.
(313) G. REISNER, A History of the Giza Necropolis, p. 6.
(314) Ibid., p. 183.
(315) Ibid., p. 85.
(316) Ibid., p. 220.
(317) A. SCHARFF, Das Grab als Wohnhaus in der ägyptischen Frühzeit, 1947, S. 46.
(318) H. JUNKER, Giza IX, S. 4, fl, Abb. 2-3.
(319) G. REISNER, A History of the Giza Necropolis, p. 220-221, 360-361.
(320) Ibid., p. 39, 187, fig. 1, 94.
(321) Ibid., p. 43, 208, fig. 11, 118.
(322) Ibid., p. 125, 211-212, fig. 36, 121, H. JUNKER, Giza I, S. 137, 138.
(323) H. JUNKER, Giza XI, S. 92 fl.
(324) G. REISNER, The Development of the Egyptian Tomb down to the Accession of Cheops, p. 360-361, 221.
(325) Ibid., p. 221-222, fig. 117, 106.
(326) Ibid., p. 221, fig. 105, 171.
(327) G. REISNER, A History of the Giza Necropolis, 1942, p. 302 fl. fig. 191-192.
(328) G. REISNER, The Development of the Egyptian Tomb, p. 203, fig. 158, p. 269.
(329) G. REISNER, A History of the Giza Necropolis, 1942, p. 210.
(330) A. SCHARFF, Das Grab als Wohnhaus in der ägyptischen Frühzeit, 1947, S. 47.
(331) J. H. BREASTED, Ancient Records, I. § 172, 174. K. SETHE, Urkunden des Alten Reichs, I. S. 1, 2.
(332) J. H. BREASTED, op. cit., § 187. K. SETHE, op. cit., S. 33. A. MARIETTE, Les mastabas de l'Ancien Empire, p. 160.
(333) J. H. BREASTED, op. cit., § 311, 313. K. SETHE, op. cit., S. 101-103.
(334) J. H. BREASTED, op. cit., § 379. K. SETHE, op. cit., S. 145.
(335) ALEXANDRE BADAWY, Le dessin architectural chez les Anciens Egyptiens, 1948, p. 54, fig. 54.
(336) Ibid., p. 61 fl., fig. 62-68.

(337) W. FL. PETRIE, Deshasheh, pl. IV. ALEXANDRE BADAWY, op. cit., p. 139-143. fig. 164 a-167.
(338) P. NEWBERRY, Beni-Hassan, I. pl. XIV; II. pl. V, XV. ALEXANDRE BADAWY, op.cit., 143-145.
(339) L. BORCHARDT, Altägyptische Festungen an der zweiten Nilschnelle, 1923, S. 39.
(340) S. CLARKE, Ancient Egyptian Frontier Fortresses, J.E.A. III, p. 160, pl. XXV.
(341) Ibid., p. 163, pl. XXVII.
(342) U. HOLSCHER, Das Graddenkmal des Königs Chephren, 1912, S. CLARKE-R. ENGELBACH, Ancient Egyptian Masonry, fig. 164.
(343) W. FL. PETRIE, Egyptian Architecture, p. 54.
(344) L. BORCHARDT, Das Grabdenkmal des Königs Nefer-ir-ke-Re', 1909, S. 20-21, Abb. 16-19.
(345) Ibid. Abb. 45, 5. S. 66-67.
(346) S. CLARKE-R. ENGELBACH, op. cit., p. 152, fig. 170. L. BORCHARDT, Das Grabdenkmal des Königs Sahu-Re' Abb. 47. Das Grabdenkmal des Königs Ne-user-Re', Abb. 36. U. HOLSCHER, Das Grabdenkmal des Königs Chephren, S. 43.
(347) G. JEQUIER, Manuel d'archéologie égyptienne, I. Les éléments de l'architecture, p. 280, fig. 187.
(348) U. HOLSCHER, op. cit., Taf. X, XII.
(349) W. von BISSING, Das Re-Heiligtum des Königs Ne-Woser-Re', 1905, Abb. 52. L. BORCHARDT, Das Grabdenkmal des Königs Ne-user-Re'. AAb. 33.
(350) L. BORCHARDT, Das Grabdenkmal des Königs Sahu-Re', Abb. 34, 72.
(351) W. FL. PETRIE, Egyptian Architecture, p. 76.
(352) W. von BISSING, op. cit., Abb. 32.
(353) Ibid. Abb. 8-9. L. L. BORCHARDT, Das Grabdenkmal des Königs Nefer-ir-ke-Re' Abb. 37-38.
(354) L. BORCHARDT, op. citt., S. 33-34.
(355) L. BORCHARDT, Das Grabdenkmal des Königs Sahu-Re', Abb. 76-78, S. 60-61.
(356) L. BORCHARDT, Das Grabdenkmal des Königs Nefer-ir-ke-Re', Abb. 39, S. 35.
(357) G. JEQUIER, Manuel d'archéologie égyptienne, I. Les éléments de l'architecture, p. 289, fl. L. BORCHARDT, Das Grabdenkmal des Königs Sahu-Re', Abb. 51.
(358) L. BORCHARDT, op. cit., S. 76, Abb. 102-113. Das Grabdenkmal des Königs Ne-user-Re', Abb. 28.
(359) L. BORCHARDT, Das Grabdenkmal des Königs Ne-user-Re', Abb. 44.
(360) L. BORCHARDT, Das Grabdenkmal des Königs Ne-user-Re', S. 120. W. von BISSING, op. cit., Abb. 49-50.
(361) H. JUNKER, Von der ägyptischen Baukunst des Alten Reiches, A. Z. 63, 1927, S. 1-7. A. SCHARFF, On the Statuary of the Old Kingdom, J.E.A., XXVI, 1941, p. 41-50. K. PFLUGER, The Art of the Third and Fifth Dynasties, J.E.A., XXIII, p. 7-9.

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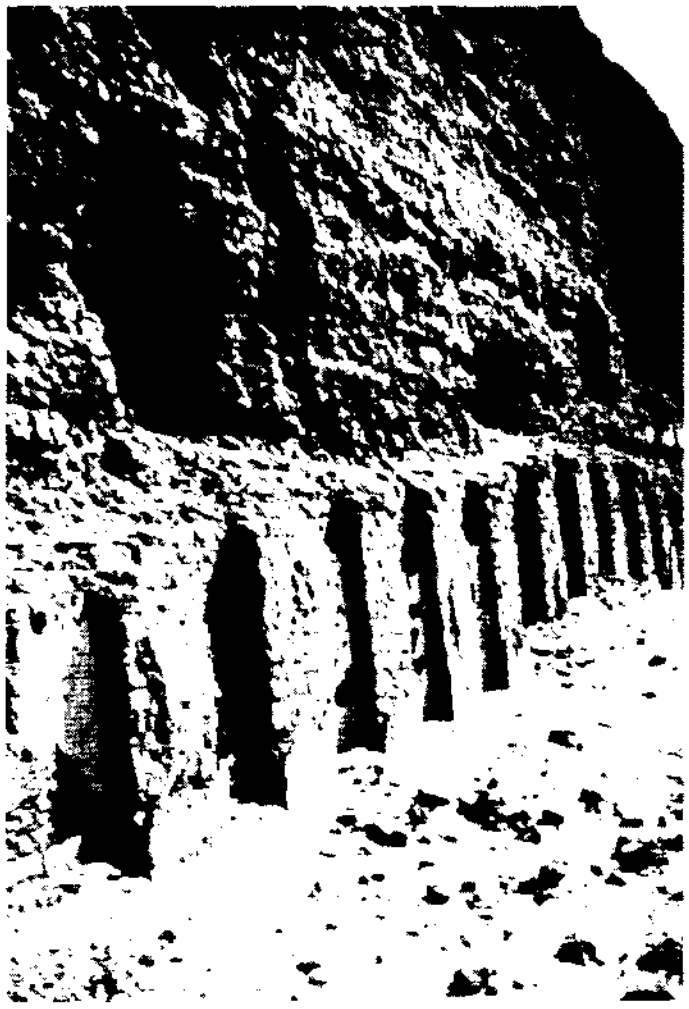
b)

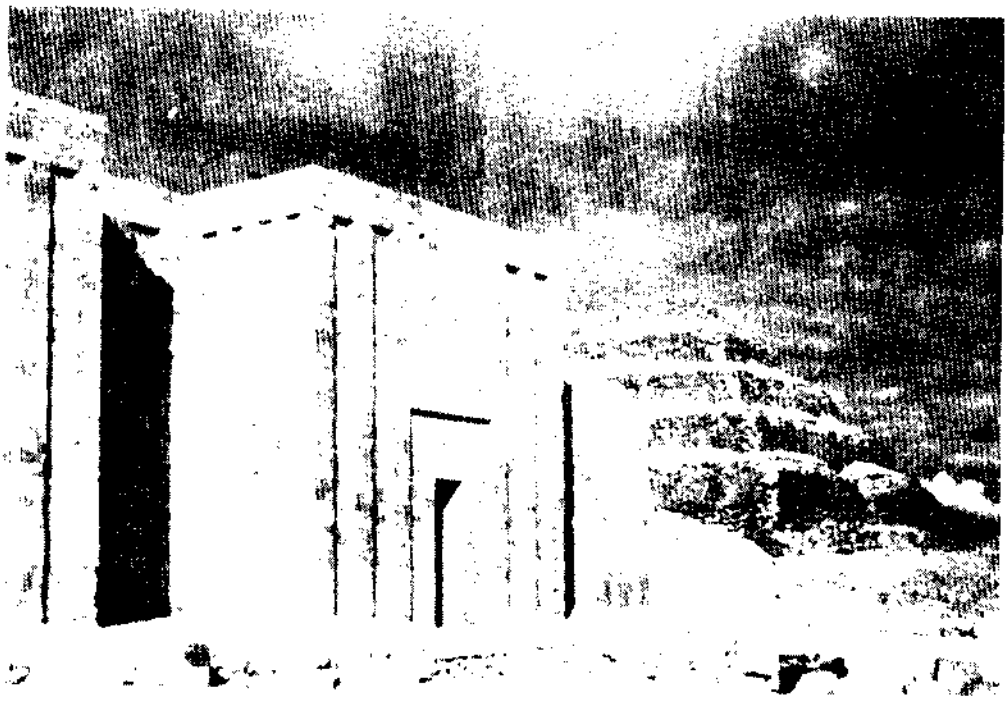
a) Brick lined substructure of archaïc tomb showing staircase and magazines (Helwan, IInd dyn.)

b) Substructure of archaïc tomb lined with slabs of limestone and showing a stairway with portcullisses (Helwan, IInd dyn.)

a) Brick lined substructure with two side-chambers and limestone portcullis (Helwan, IInd dyn.)

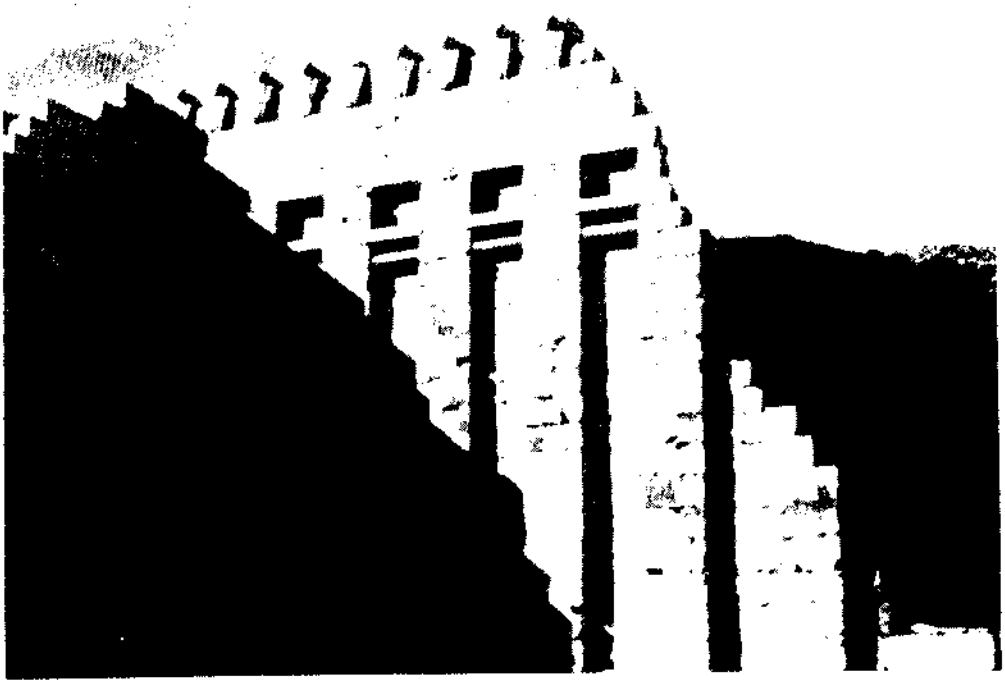


b) Outer face of the Shunet el Zebib showing the high brick wall with remains of the recessed panels in the lower part (Abydos, IInd dyn.)

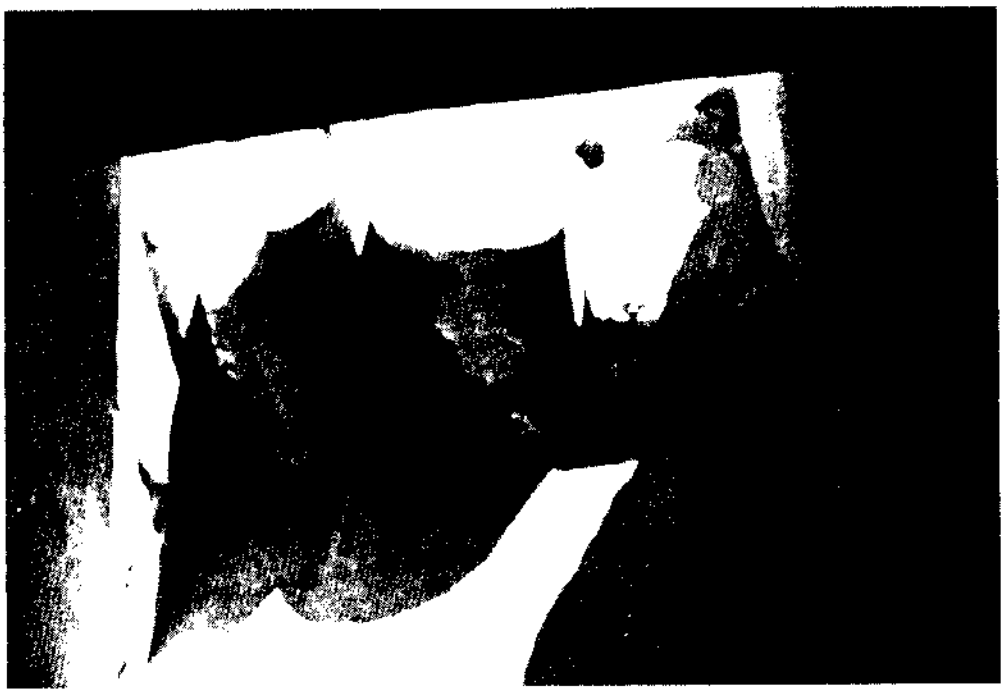


a) Entrance bastion at the southern end of the East façade of the enclosure wall in Djeser's complex (Saqqara, IIIrd dyn.; restored)

b) Detail of the bastions on the outer eastern face of the enclosure wall in Djeser's complex (Saqqara, IIIrd dyn.)



a) South-West corner of the Great Court, showing simplified panelling (Djeser's complex, Saqqara, IIIrd dyn.).



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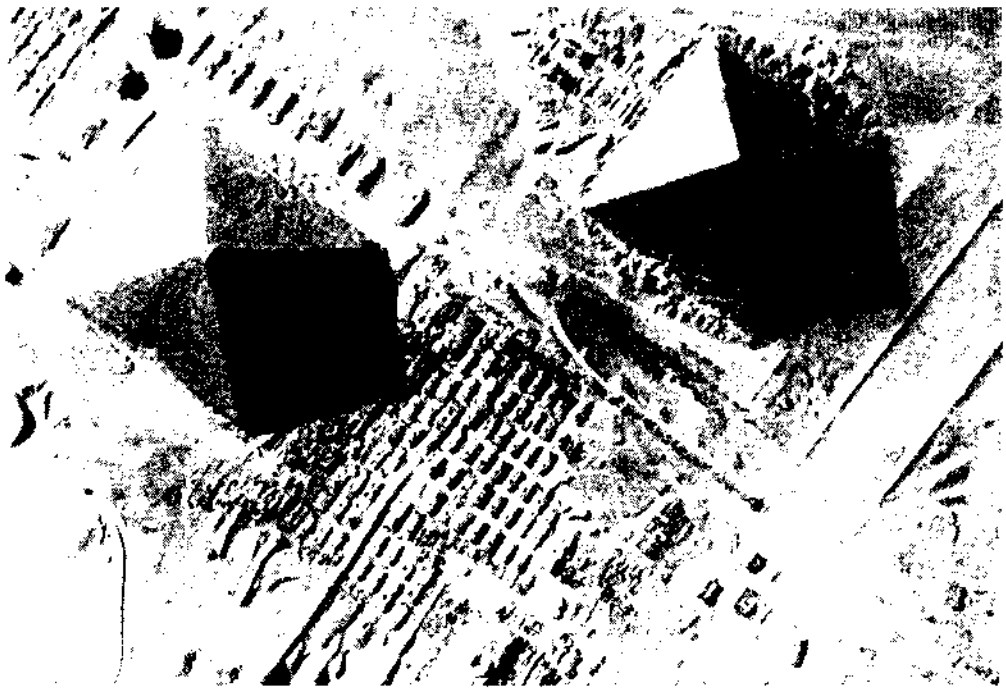

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