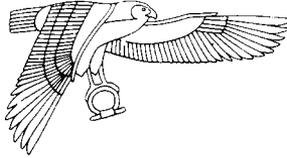


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PORTCULLIS STONES: TOMB SECURITY DURING THE EARLY DYNASTIC PERIOD

Michael Birrell,
Macquarie University

Macquarie University has been excavating at the Early Dynastic cemetery site of Helwan for the past three seasons (see the article by Köhler herein). During the recent season (November 1999-January 2000) a small mastaba tomb was excavated in Operation 4. The tomb, identified as Tomb 4/4, consists of a 5 m deep brick-filled staircase leading to a subterranean antechamber and burial chamber (Figure 1). A limestone portcullis stone that was lowered down a specially formed slot created in front of the entrance blocked the doorway to the tomb. Behind the stone, a mortared mudbrick wall had been built across the doorway. At some time after the burial, robbers dug a pit through the fill of the stairway and smashed their way through the portcullis stone, gaining access to the burial chamber and its deposit of grave goods (Plate 1). The thieves disturbed the body and took precious commodities, but they left a rich deposit of calcite vessels and three 'beer-jars', copper utensils and pins to be discovered by the Macquarie Project. The discovery of a tomb with portcullis stone in situ provides an opportunity to place this building practice in context.

The portcullis used in Tomb 4/4 was carved from a slab of porous limestone and measured 1.29 m high by 91 cm wide by 12.5 cm thick. Considering the fact that limestone weighs 1.8-2.5 tons/m³,¹ the stone weighed approximately 300 kg. The edges of the portcullis were not perfectly squared, being slightly rounded and roughly formed. There were no holes pierced through the stone to assist in lowering it. The slot created in front of the doorway was considerably larger than the stone, being 1.23 m wide and 30 cm thick. The tombs at Helwan are excavated into the compacted gravels of the Wadi Hof palaeofan rather than in solid limestone strata as at Saqqara. Stone for portcullises could not have been obtained from the immediate vicinity and it was undoubtedly cut from the nearby quarries of Ma'sara/Tura and then presumably dragged on a sled to the cemetery.² Helwan preserves a large number of tombs that were protected using portcullises, the availability of good quality stone obviously having a part to play in their regular employment (Plate 2).

Portcullis stones rank amongst the earliest use of monumental stone in Egypt, and the desire for such stones must have facilitated the development of stone masonry. In their day, they provided the most sophisticated method of

securing a tomb. However, as more elaborate methods were employed, thieves found ways to circumvent them. As a result, this method of tomb security was used for only a relatively short period of time, but was retained much longer in royal burials. In private tombs, portcullis stones appear in the First Dynasty and they are largely supplanted by the Third Dynasty when shaft tombs became more common.

One of the earliest examples of a portcullis was that in a large pit tomb at Hierakonpolis. The tomb, identified as T2, contains an early example of the use of stone as a blocking for a subterranean burial chamber. It is located at the southern end of the Locality 6 cemetery,³ and is dated to the Naqada III-Dynasty 1. A large rectangular pit forms the main part of the tomb. On the eastern side of the pit, a small roughly carved chamber was cut, the entrance blocked by two rough-hewn stones made from cherty limestone.

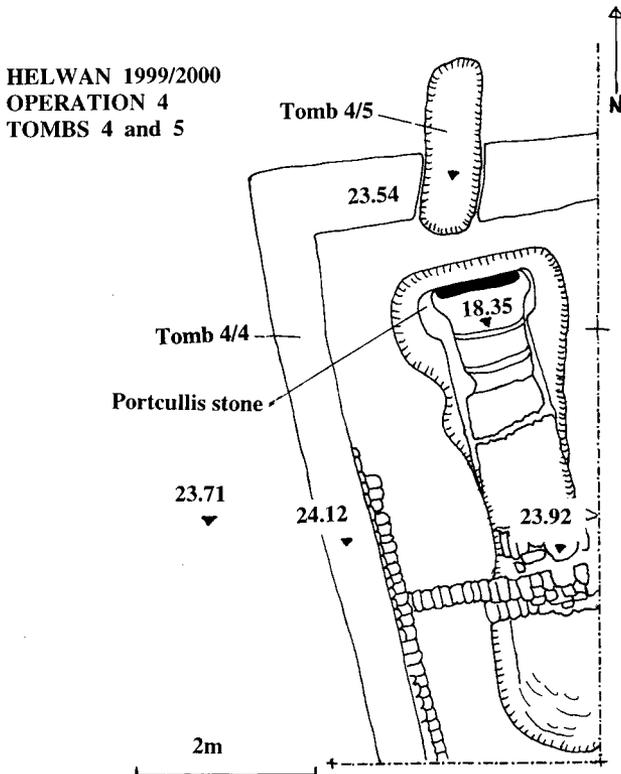


Figure 1. Plan of Tombs 4/4 and 4/5 at Helwan

The use of stone as a blocking in royal tombs begins in the First Dynasty but remains rather limited. Pit burials roofed with timber covered by a mudbrick mastaba superstructure provided very inadequate security against robbery. As the Egyptians became increasingly adept at the cutting of deeper and more enclosed pit tombs, an incentive developed to use stone blocks for protecting the entrance, since this was the weakest point in the tomb's defences. During the reign of the First Dynasty pharaoh Den, a significant development in tomb protection occurred; the use of a descending staircase and a blocking mechanism.

The tomb of Den consists of a large rectangular pit lined with brick.⁴ A brick-lined staircase gave access from the northeast. An emplacement for a blocking of some kind appears at the lower end of the staircase, immediately adjoining the granite threshold observed by Petrie. It measures approximately 2 m wide by 50 cm thick.⁵ Nothing survived of the blocking itself but it was probably made of stone. The tomb of King Anedjib, successor of Den, was also approached by a staircase that gave access to a simple brick-lined pit.⁶ At the base of the staircase was a blocking that fitted into a plaster-lined emplacement created in the mudbrick lining. It measured 2.5 m wide and 25 cm thick.⁷ Surprisingly, the tomb was not found sealed by a stone portcullis, but by wooden planks and loose bricks. The wooden planks were about 5 cm thick and were held in place by upright planks placed against them in the groove, the whole outside of the planking then covered by loosely stacked bricks.⁸ The tomb of king Qaa, last king of the First Dynasty, had a monumental brick lined chamber and staircase entrance.⁹ Nine steps gave access to a short horizontal passage. Here a massive limestone block was used for securing the tomb against robbery, the stone inserted into vertical slots. The presence of a blocking stone at this point indicates that the staircase was considered the weakest point in the tomb security, and suggests that the lower part of the staircase was roofed with substantial quantities of mudbrick.

There is clear evidence to suggest that First Dynasty private tombs were being robbed shortly after the burial had taken place.¹⁰ The architects of the tombs were forced to devise more elaborate ways of securing the burial. The private tombs at Saqqara demonstrate a steady development in security that parallels the royal tombs at Abydos. Early First Dynasty tombs have a pit as the burial chamber, the mastaba superstructure created after the inhumation. During the reign of King Den, stairway entrances appear in private tombs with the stair closed by a slab of limestone.

The tomb of Hemaka at Saqqara (no.3035), dated to the reign of King Den, has a very sophisticated portcullis system consisting of a number of limestone blocks and ranks as one of the earliest private tombs using stone.¹¹ The tomb consists of a monumental superstructure that measures 57.3 by 26 m. The substructure consists of a large open pit originally roofed with timber, and three rockcut chambers opening off it. Access to the pit was via a staircase that was sealed by three massive portcullis stones (Figure 2). They were located 3.2 m, 4.85 m and 7.55 m from the head of the staircase, the emplacements for the upper two being recognisable by grooves cut into the bedrock through which the stairs descend. The first two stones were removed at some time in antiquity but in the third groove part of the portcullis stone survives in situ. It is made of limestone and is 2.21 m wide and 35 cm thick, the sides of the stone being bevelled and well fashioned. Four semi-circular grooves were cut vertically down both broad sides of the stone, the channels meeting underneath; the grooves are 5 cm thick. These grooves were apparently designed to house the ropes that lowered the very heavy stones into position.

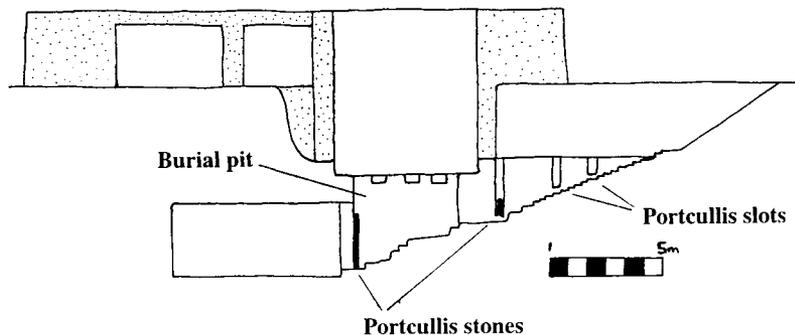


Figure 2. Section drawing of the mastaba of Hemaka at Saqqara
Adapted from Emery, *Hemaka*, fig.2

The burial chamber of the tomb of Hemaka, which opens off the main pit, was itself blocked by another large portcullis stone. This rested flush in front of the entrance rather than being lowered into a recess.¹² The stone was originally pierced near the upper edge by 3 holes but as the upper edge of the stone is badly damaged, only two holes were visible. The stone is 1.53 m wide and 25 cm thick, both broad surfaces containing vertical grooves in which ropes were apparently run. The stone offered no real resistance to the thieves who first plundered the burial chamber by breaking through the base of the

stone where a large hole is present. At a subsequent period, when the roof had collapsed, thieves again entered the chamber cutting through the top of the stone.

The tomb of Ankh-ka (no.3036) at Saqqara is also dated to the reign of king Den.¹³ A rockcut pit is reached via a staircase that terminates in a rockcut groove designed to take a portcullis. This groove is 2.7 m across and 63 cm wide, and this gives some indication of the size of the stone that once blocked the entrance. A second groove, similar to the first, is located midway down the staircase at the point where the staircase disappears beneath the thick external wall of the superstructure; it measures 2.27 m across and 40 cm wide. A horizontal roof at ground level covered the staircase between the two portcullis stones while the upper part of the staircase was filled with rubble upon which a brick paving was laid.

Portcullis stones protected the entrances of most late First Dynasty elite tombs at Saqqara. Tomb 3505, dating to the reign of King Qaa, had a stepped ramp leading to a pit roofed with timber.¹⁴ A stone that was lowered through a slot created in the mudbrick superstructure sealed the entrance into the pit. Thieves had smashed the stone, but the dimensions could be established from the slot: 3.00 m high by 1.4 m wide by 25 cm thick. A similar tomb at Saqqara (no.3500), also dated to the reign of King Qaa, has a staircase leading directly into the burial pit.¹⁵ Two massive portcullis stones were found in situ, the first one measuring 3.10 m by 1.35 m by 30 cm, the second measuring 2.60 m by 1.20 m by 25 cm. The stone closest to the chamber had two large circular holes about 13 cm in diameter carved in the upper section for the insertion of lowering ropes which were obviously of considerable size. After the burial, the lower part of the staircase was blocked up with brickwork, sealing the portcullis stones in place.

Tomb 1/1 at Helwan, originally excavated by Saad in 1944/5 and re-excavated by Macquarie University in 1997/8, is a large pit tomb of late First Dynasty date.¹⁶ It consists of a large open pit lined with massive stone slabs. The staircase that leads from the north was blocked at the lower end by two large portcullis stones, which were found in situ. Both of the stones had been broken in antiquity. The lower of the two portcullis stones, damaged in the upper section, had one hole surviving in the upper part but probably originally had a second hole, while the other portcullis had two holes. These were located in the lower part of the stone and presumably the ropes for lowering the stones were wrapped around the stone. Both stones measure 1.15 m at the base, 1.00 m at the top and are 30 cm thick.

In the Second Dynasty, requirements for increasing security meant that the burial chamber was cut entirely out of the bedrock, rather than being a pit roofed with timber and brick. A staircase was often cut to provide access to the subterranean chambers, the steep vertical face in front of the doorway shaped to house a portcullis block. A number of sophisticated Second Dynasty tombs with portcullis stones were excavated by Quibell,¹⁷ and they share a number of common elements: the staircase has an L-shape bend in its access; the slot for the descending stone is carved from the native rock in such a way that it secures it into position; subsidiary chambers are located both inside and outside the portcullis block (the ones outside presumably containing food commodities which were not thought worthy of being protected). Tomb 2103, had brick superstructure walls and a gravel filling. A staircase led from south to north, ending in a portcullis blocking.¹⁸ The stone was still in situ; the robbers had simply forced their way around it. Tomb 2302 at Saqqara, dated by sealings to the reign of King Ny-netjer, had a very elaborate system of defences, having three portcullis stones rather than the usual one.¹⁹ A passage leads to a short staircase that at its lower end was blocked by a portcullis. The passage leading towards the burial chamber has two additional slots in which stones could be lowered into place. Tomb 2452 dates to the Second Dynasty.²⁰ A staircase descends 8 m from the top of the mastaba. A large portcullis stone was found in situ and Quibell mentions that it was more than 2 m high.

A desire for increased tomb security saw the use of multiple stone blocks in some tombs in the Second Dynasty. Tomb 2171 at Saqqara is a large mudbrick mastaba, excavated by Quibell, which can be dated to the Second Dynasty by sealings of Ny-netjer.²¹ An irregular staircase gives access to a rectangular pit. The base of the staircase was sealed with five limestone blocks that had been roughly worked. Rather than being placed perpendicular to the axis of entry, the stones were placed side by side, creating a more secure blocking of the entrance with a sealing that measured at least 1.5 m thick. Another mastaba of similar date, Saqqara Tomb 2498, also had large limestone blocks laid side by side parallel to the axis of the entrance creating a more solid protection.²²

Tombs of the Third Dynasty tended to be deeper, and where possible, protected by greater quantities of stone blocking. Petrie published a tomb of the Third Dynasty at Giza known as 'Covington's Tomb'. The steep staircase was blocked with a large limestone portcullis block.²³ At the site of Beit Khallaf, located near Abydos, John Garstang excavated a series of five mastabas that are dated to the Third Dynasty. Tomb K1, dated to the reign of King Djoser by inscriptional evidence, was the largest of these monumental mastaba tombs, the superstructure measuring 85 m by 45 m and preserved to a

height of 8 m.²⁴ The staircase entrance leads from the roof of the superstructure through the solid body of the mastaba, and thence through the solid bedrock to a subterranean chamber. Six large slabs of limestone provided one of the most elaborate systems of private tomb security in this period (Figure 3). One slab was placed at the top of the long descent, held in place by a groove on the western side. It had subsequently fallen or been pushed out of place and was found resting on the north side of the staircase; it measured 3.3 m high, 1.5 m wide and 45 cm thick. The other five stones were each lowered into position through shafts that were created in the superstructure and through the solid rock. These slots were each wider than the staircase so that they barred the way and could not be turned around. The stones were of increasing size as the entrance was approached - the second stone was 3.3 m high, 1.5 m wide and 65 cm thick while the sixth and last stone measured an incredible 5 m in height by 3 m wide by 45-60 cm thick. These parameters would give the block an estimated weight of about 15-20 tons and the vertical slot down which the stone was lowered was 25 m deep! Despite these elaborate precautions, the tomb had been robbed. Rather than finding the staircase and breaking through each portcullis stone, the thieves simply cut shafts through the superstructure and the desert bedrock directly into the burial chamber.

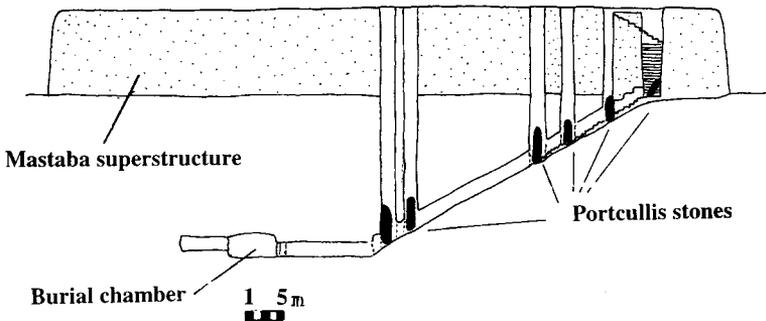


Figure 3. Tomb K1 at Beit Khallaf
Adapted from Garstang, *Mahasna and Bet Khallaf*, pl.7

Tomb K2 at Beit Khallaf is another large mastaba tomb of the Third Dynasty.²⁵ It is rather unusual in that it consists of two substructures below a shared mastaba superstructure (Figure 4). In each case, a staircase with L-shape turn from east to south led into a subterranean chamber. Two portcullis stones that had been lowered into position protected the southern structure.

The lower of the two stones was very large, measuring 5 m by 2.8 m by 60 cm. The northern structure is interesting because it retained a portcullis stone that had never been lowered; the tomb was apparently prepared but was never used. The stone in this case was found suspended in an open position in front of the entrance to the tomb, supported by mudbrick 'walls' which kept the stone 1.2 m above the floor of the passage. Three smaller mastabas (K3, K4 and K5) at Beit Khallaf provide further evidence of portcullis use in the Third Dynasty.²⁶

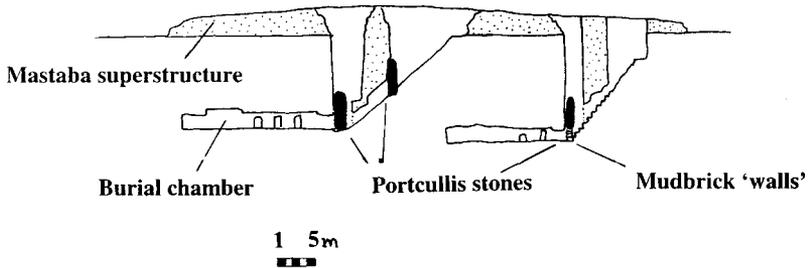


Figure 4. Tomb K2 at Beit Khallaf
Adapted from Garstang, *Mahasna and Bet Khallaf*, pl.18

Garstang excavated other tombs dated to the Third Dynasty at the site of Reqaqnah, north of Beit Khallaf. The superstructure of Tomb 1 at Reqaqnah consists of a thick mudbrick wall filled with rubble surrounding a stairway trench cut into the desert surface.²⁷ The stairs give access to a series of chambers that are entirely cut out of the native rock. A vertical face in the rock above the entrance to the door enabled a large stone block to be lowered to secure the entrance. This provides a close parallel with Tomb 4/4 at Helwan.

A number of Third Dynasty tombs were excavated by Reisner at the site of Naga ed-Der, on the left bank of the Nile near Abydos, and they show a number of similarities with Helwan Tomb 4/4. Naga ed-Der Tombs 573 and 599²⁸ both had the small burial chamber closed off by a limestone block, the entrance to the chamber further secured by a mudbrick wall that closed off the doorway. The reason for the second, more basic blocking is unclear - it is doubtful that it served as a further security considering the use of an outer stone blocking. It is possible that the tomb was blocked up with the mudbrick wall after the burial had occurred as a way of stopping unauthorised access before the blocking stone could be manoeuvred into place.

Portcullis stones disappear in private tombs during the late Third Dynasty-early Fourth Dynasty presumably because so many burials of this kind had

been disturbed. The portcullis block could always be undermined or worked around if the surrounding material was of less durable material. The stairway entrance was soon abandoned and a deep vertical shaft was utilised instead. A number of early Fourth Dynasty shaft tombs, mainly dated to the reign of Sneferu (Saqqara mastaba 3073,²⁹ Meidum mastabas 4 and 6³⁰ being examples) sometimes incorporated a portcullis block that was lowered down the shaft in order to block off the entrance to the lateral burial chamber. By the reign of Khufu, however, loose debris and stones were used to block a vertical shaft, and this was presumably found to be more effective in securing the tomb.

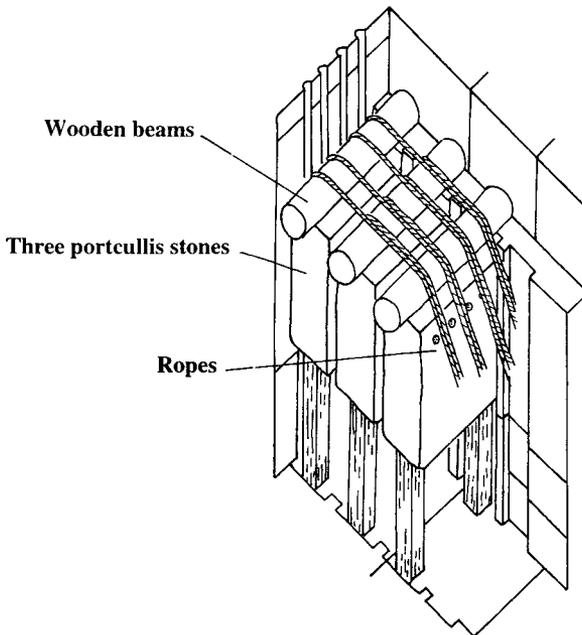


Figure 5. Portcullis stones in the Giza Pyramid of Khufu
Adapted from Arnold, *Building in Egypt*, fig. 5.15

The use of portcullis stones was retained in royal funerary architecture in the Fourth Dynasty. Heavy portcullises were lowered with ropes that wound around wooden beams, the ropes being manipulated in the corridor in front of the portcullises. Before the burial took place, the portcullis waited in small chambers above the corridor, the stones held in place by vertical wooden posts (figure 5). The system was not particularly successful because the robbers could work around the stones and make their way into the pyramid via the

storage chamber where the stones had been waiting. Pyramids of the Fifth and Sixth Dynasty invariably had three portcullis stones, the whole section of the passage being surrounded by granite. The presence of these portcullises was usually overcome by simply placing levels underneath then and then lifting them up far enough to pass underneath.

The Early Dynastic private tombs at Saqqara were apparently more secure than the royal tombs at Abydos. The large First Dynasty mastabas at Saqqara used far greater amounts of worked stone than the tombs at Umm el-Qaab. This has been explained as a result of the proximity of good quality stone to the necropoleis of the north, but it is difficult to believe that the kings of this period could not have brought stone to Abydos if they so wished. In the Second Dynasty, the royal tombs at Abydos are virtually unprotected, Khasekhemwy retaining an old fashioned pit tomb which had no provision for stone blocking. The availability of stone must not be the point at issue. It was presumably easier to police the royal necropolis, and thus the tombs there were not thought to warrant protection by the use of portcullises or other sophisticated methods of security.

The mechanism by which the heavy portcullis stones were lowered into place in mastabas remains uncertain. The holes that are preserved in portcullis stones clearly suggest that they were lowered using heavy ropes.³¹ The massive stones were brought to the site and put in place above the doorway before the construction of the mastaba superstructure. The ropes do not survive in place i.e. connected to the portcullis stones, so they must have been threaded through the stone in such a way that they could be removed once the stone was in place. Because mudbrick mastabas are usually poorly preserved, we have very little idea about the mechanism by which the portcullis stones were lowered. Some wooden framework must have been created which would permit the stones to be held in place and then lowered after the burial.³² In the case of the large mastabas, the portcullis stones must have been in their respective slots before the superstructure was built, since it is highly unlikely that the stones, some weighing up to 20 tons, were moved onto and across a less durable structure made of mudbrick. An elaborate wooden framework of some kind must have been built above the portcullis slots and presumably was incorporated into the superstructure, since this was built before the stones were put into place. The stones were held in place using mudbrick supports, as at Beit Khallaf, or they may have had wooden beams placed underneath them. Once the burial had taken place, the supports under the stone would be removed, the stone lowered into position, the ropes removed and the wooden

framework dismantled. The slot down which the stone moved was then filled in and the tomb secured.

Despite its portcullis stone, Tomb 4/4 at Helwan was robbed shortly after burial. The thieves knew exactly where the slot was located; they simply removed the staircase filling in front of the stone and smashed their way through the block in order to gain access to the burial. The robbing of Tomb 4/4 was probably not a large-scale activity involving numerous people during daylight hours, since more time would undoubtedly have been expended on removing all precious commodities. We may suppose that only a few people were involved and that they wasted no time in getting away. How long it took them remains uncertain, but one wonders whether the portcullis blocking in this case, being located in a large cemetery relatively close to habitation, was designed to stop thieves from gaining access in a single night. The partial disturbance of a burial was likely to be noticed the following day.

The portcullis system of defending a private tomb was undoubtedly the most sophisticated method of securing a tomb at the time. The large stone blocks that were used to seal the entrance formed the strongest barrier that was available in an era of mudbrick building. Certainly the general effectiveness of the stairway-portcullis system is suggested by Garstang who relates that in his excavation of a mastaba tomb of the Third Dynasty at Beit Khallaf, it took 60 men seven weeks to get into the burial chamber.³³ Tomb 4/4 at Helwan belonged to an official of the Memphite court who had enough connections with the administration to acquire a stone block that could be used to secure his tomb. The stone was not large in comparison with contemporary tombs, but it may have been considered security enough for a cemetery that was actively being used. The backfilling of the staircase and the presence of a portcullis stone was unfortunately not enough of a deterrent and his tomb was robbed, possibly in a single night, by thieves who did not linger to clear out the tomb completely. Despite all the measures taken to secure the burials of this period, no private tomb guarded by a portcullis has ever been found intact.

¹ D. Arnold, *Building in Egypt: Pharaonic Stone Masonry* (Oxford, 1991), p.28

² A. Lucas, *Ancient Egyptian Materials and Industries*, 4th ed (London, 1989), pp.52-3. For the handling of large stone blocks see S.Clarke and R.Engelbach, *Ancient Egyptian Construction and Architecture* (London, 1930), pp.84-95

³ B. Adams, "Elite Graves at Hierakonpolis" in J.Spencer, *Aspects of Early Egypt* (London, 1996), p.2, fig.2. My thanks to I.Casey for this reference.

⁴ W.M.F. Petrie, *The Royal Tombs of the First Dynasty*, vol II (London, 1902), pp.9-11, pl.LXII; A.J. Spencer, *Early Egypt* (London, 1993), fig.3

- 5 G.Reisner, *The Development of the Egyptian Tomb down to the Accession of Cheops*
 (Cambridge, 1936), p.58
- 6 Petrie, *Royal Tombs I*, p.12-13, pl.LXI
- 7 Reisner, *Development*, p.60
- 8 Petrie, *Royal Tombs I*, pls.LXV and LXVI. For a similar tomb at Helwan
 (no.1371H2), protected by two portcullis stones, see Z.Saad, *Royal Excavations at*
Saqqara and Helwan (1941-1945) (Cairo, 1947), pp.109-10; pls.XXXVIII, XLIX-L
- 9 Petrie, *Royal Tombs I*, pp.14-16, pl.LX; G.Dreyer, "Umm el-Qaab" in *Mitteilungen*
des Deutschen Archäologischen Instituts Kairo 52 (1996), pls.57-71
- 10 W. Emery, *Great Tombs of the First Dynasty*, vol. II (London, 1954), pp.7-12
 discusses the robbery of Tomb 3504, built during the reign of King Djer.
- 11 W. Emery, *Excavations at Saqqara; The Tomb of Hemaka* (London, 1938), p.6.
- 12 Emery, *Hemaka*, p.7, pls.5b, 6a and 6c
- 13 Emery, *Great Tombs I*, p.73, fig.35
- 14 Emery, *Great Tombs III*, p.9, pls.3 and 4
- 15 Emery, *Great Tombs III*, p.101, pls.119b, 1209b; Spencer, *Early Egypt*, fig.72. See
 similar tombs in Saad, *Saqqara and Helwan*, pp.107-8, pl.XXXVII-XXXVIII
- 16 Saad, *Saqqara and Helwan*, pl.LXIX and LXX; E.C. Köhler, "Excavations at Helwan
 – New Insight into Early Dynastic Stone Masonry" in *Bulletin of the Australian*
Centre for Egyptology 9 (1998), pp.65-72; E.C. Köhler, *Helwan I* (forthcoming)
- 17 J. Quibell, *Excavations at Saqqara: Archaic Mastabas* (London, 1923), pl.XXX
- 18 Quibell, *Archaic Mastabas*, p.18
- 19 Quibell, *Archaic Mastabas*, pl.XXX; Reisner, *Development*, p.138, fig.60
- 20 Quibell, *Archaic Mastabas*, p.41, pl.II.
- 21 Quibell, *Archaic Mastabas*, pp.7, 23-24, pl.XV
- 22 Quibell, *Archaic Mastabas*, pl.XXIV.2
- 23 Reisner, *Development*, fig.73
- 24 J. Garstang, *Mahasna and Bet Khallaf* (London, 1903), p.8-10
- 25 Garstang, *Mahasna and Bet Khallaf*, pp.11-12
- 26 Garstang, *Mahasna and Bet Khallaf*, pp.14-16. Helwan tomb 810H3 is similar in plan
 to our Tomb 4/4 and probably dates to the late Second or early Third Dynasty. See
 Saad, *Saqqara and Helwan*, pl.LXV. Likewise tomb 25H4 (now identified as Op2/1)
 must date to the late Second Dynasty. See Z. Saad, *Royal Excavations at Helwan*
(1945-1947) (Cairo, 1951), plan 4; Köhler, *Helwan I* (forthcoming).
- 27 J.Garstang, *Tombs of the Third Egyptian Dynasty at Reqaqnah and Bet Khallaf*,
 (Westminster, 1904), pl.IVA. Another close parallel is found with Helwan tomb
 25H5, for which see Saad, *Helwan*, pl.13
- 28 G. Reisner, *The Early Dynastic Cemeteries of Naga ed-Der III*, (Oxford, 1932), p.217
 and 224; Reisner, *Development*, p.181, fig.86 and p.183, fig.87
- 29 Reisner, *Development*, p.203
- 30 Reisner, *Development*, p.211 and 214, figs.107 and 113
- 31 Saad, *Saqqara and Helwan*, p.162 mentions that tomb 1H3 at Helwan had a
 portcullis stone with four holes in the lower part, for which see pl.LXVIII. The large
 stone used to block the entrance of tomb 809H3 has two large grooves carved into the
 sides of the block, suggesting that the lowering ropes were wound around the stone.
- 32 See Arnold, *Building in Egypt*, fig.3.21 for suggested method of lowering stones.
- 33 Garstang, *Mahasna and Bet Khallaf*, p.17