

THE DATE OF THE TEMPLE OF POSEIDON AT PAESTUM

CARLA GOTTLIEB

PLATES 53-54

THE temple of Poseidon at Paestum (I am referring to the later temple dedicated to this divinity and not to the "Basilica") survives in a comparatively good state of preservation for a Greek building. In consequence it has frequently attracted the interest of archaeologists. Outstanding among their investigations are those of Koldewey-Puchstein published in *Die griechischen Tempel in Unteritalien und Sicilien* (Berlin 1899);¹ of Krauss published in *Paestum. Die griechischen Tempel* (first edition Berlin 1941, second edition with small corrections in the text Berlin 1943);² and of Dinsmoor published in Anderson-Spiers-Dinsmoor *The Architecture of Ancient Greece* (third edition London-New York 1950).³

The salient features of this temple can be summed up as follows:

- (1) plan, hexastyle with fourteen columns on the flanks;
- (2) double angle contraction on the flanks, simple angle contraction on the fronts;
- (3) smaller column diameters on the flanks⁴ combined with wider column spacings;
- (4) peristyle columns with twenty-four flutes (as in the archaic examples from Corcyra, Tarentum, and the temple of Zeus at Cyrene), and heavy in proportions, height equalling 4.21 and 4.36 column diameters respectively;⁵

(5) mouldings belonging to the transitional period (first half of the fifth century), postdating those of the temple of Demeter from the same site;

(6) a double range of interior columns in two storeys, separated merely by an architrave with a continuous crowning moulding instead of the more usual regulae and guttae.

On the grounds provided by these features Koldewey and Puchstein in 1899 dated the temple after the erection of the Parthenon, grouping it together with the temple at Segesta, the temple of Concord at Agragas, and the temple of Athena (the cathedral) at Syracuse.⁶ According to Michaelis' chronology current at the turn of the century, the Parthenon had been erected between the years 454-438 B.C.;⁷ consequently the German scholars chose the year 440 B.C. as an approximate date for their group of western temples. But in the light of twentieth century archaeological discoveries the characteristics of the temple of Poseidon have been judged differently, viz. as indicating an earlier and pre-Parthenon date. As is now known, the construction of the Parthenon was commenced in 447 B.C.,⁸ and the date of the temple of Poseidon at Paestum was determined as c. 460-450 B.C. by Krauss⁹ and as c. 460 B.C. by Dinsmoor.¹⁰

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⁴ First pointed out by Dinsmoor AAG 111.

⁵ *Ibid.* 110. Dinsmoor's chronological list of Greek temples AAG facing 340 has 4.20 column diameters.

⁶ K-P 232-233.

⁷ Michaelis *Der Parthenon* (Leipzig 1870-71) 8-11.

⁸ Dinsmoor "Attic Building Accounts," *AJA* 17 (1913) 77-78.

⁹ Krauss 64.

¹⁰ AAG 110.

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been taken into consideration for placing the building chronologically. Koldewey's plate IV exhibits T-shaped cuttings for dowels at the corners of the temple's middle step (pl. 53) upon which he commented as follows:

"Grosse Sorgfalt ist auf die Befestigung der Plinthen gegen das Abrutschen im Sinne der Aussenkanten verwendet; namentlich die Eckplinthen sind in der Nähe ihrer Stossfuge mit der Oberstufe verdübelt und dieser Dübel durch eine in die Unterschicht versenkte T-Klammer der Längsrichtung nach festgelegt, verankert, die darauf folgenden Plinthen aber nur mit dem an der Fuge angeordneten, weil nur von hier vergiessbaren Dübel gesichert, ..."¹¹

Koldewey is the only scholar who has mentioned this peculiarity. I propose to show that his restoration was vitiated by his then more limited knowledge of archaeology and that the correct interpretation of these cuttings supplies an important clue for establishing the date of the temple.

What is the basis for Koldewey's restoration of the dowel form used at Paestum? He could have based it either upon a preserved example or upon his interpretation of the cuttings. His text states nowhere that he found such a bonding device on the site. But as "Klammern und Dübel, mechanische Bindemittel für die Werkstücke (vergl. Blümner III 95, Hittorff, *Rec.* 562. Durm² 79), sind bei den unteritalischen und sicilischen Tempeln selten, weil das Steinmaterial meist weich und grob ist, und noch seltener im Original erhalten (bei E, sonst Nägel vom Dachrand)," ¹² he would not have

omitted to mention it had he found the remains of this unusual variety of dowels. It must be concluded that this was not the case and that he based his restoration upon interpretation of the cuttings. The restoration itself is reminiscent of the restoration of dovetail clamps current in his time,¹³ which shows likewise the awkward two-piece combination of dowel with clamp for bonding the stones. The form at Paestum is obviously a derivation from it. Being forced to guesswork, Koldewey naturally fell back upon analogy, adapting it to fit the evidence with which he had to contend on that site.

However, this is the point at which he was led astray. Today archaeologists are aware of the fact that such a combination of dowel-and-clamp never existed.¹⁴ In consequence the form described by Koldewey for Paestum ought to be discarded as stemming from an erroneous restoration.

We turn to the next point of the argument: substitution of another interpretation of the cuttings from Paestum which allows the restoration of a dowel form in accordance with our present-day knowledge of archaeology.

This may be best achieved by recourse to the supplementary evidence regarding the dowels of the temple of Poseidon at Paestum supplied by Stevens.¹⁵ Pl. 54, fig. 1c reproduces his illustration of the form used in the temple. Contrary to normal dowels (pl. 54, fig. 1a), these are  shaped in section. Stevens supplied the explanation for this curious form. The building material of the temple of Poseidon at Paestum was not hard stone, such as the marble

¹¹ "Great care is taken of fortifying the stylobate slabs against slipping down the outer edges; particularly the corner slabs are dowelled to the middle step in the vicinity of their joint and this dowel is fixed, anchored, in the lengthwise direction by means of a T-clamp sunk into the lower course, while the following slabs are secured merely by the dowel disposed at the joint because it could be leaded only from here. . . ." K-P 25.

¹² "Clamps and dowels, mechanical bonding devices for the architectural members (compare Blümner III 95, Hittorff, *Rec.* 562. Durm² 79), are rare in the South Italian and Sicilian temples, because the building material is mostly soft and coarse, and even more rarely are

they preserved in original (at E, otherwise nails from the border of the roof)." K-P 226.

¹³ As shown for Nape by Koldewey in Koldewey *Die antiken Baureste der Insel Lesbos* (Berlin 1890) 46; Durm *Handbuch der Architektur: Die Baukunst der Griechen*³ (Leipzig 1910), abbreviated henceforth to Durm, fig. 118. For other examples see references quoted by Dinsmoor "Studies of the Delphian Treasuries," *BCH* 37 (1913), abbreviated henceforth to Dinsmoor "Studies," 9/n.

¹⁴ Dinsmoor "Studies" 9/n.

¹⁵ Fowler-Wheeler-Stevens *A Handbook of Greek Archaeology* (New York-Cincinnati 1909), abbreviated henceforth to *HGA*, 105-6.

used in Ionia and fifth century Athens; it was soft, friable limestone (compare *supra* page 96), and as a preventive measure against the eventuality of breaking out, the dowels had to be placed at some distance from the joint.¹⁶ Now, if such a  shaped dowel be substituted for Koldewey's restoration, it would correspond *in section* to his description and drawing of the cornerstone dowels from Paestum as well as his own restoration.¹⁷ It would differ from them *in plan*, Stevens illustrating dowels — shaped in plan (pl. 54, fig. 1c) while Koldewey drew and described a  form (pl. 53). However, this relationship in plan at Paestum between the outline of the dowel employed for securing intermediate stones on the one hand () and the outline of the cornerstone dowel on the other () brings to mind that an identical relationship existed in Periclean buildings between the form of normal dowels (securing the intermediate stones; pl. 54, fig. 1a) and the form of T-dowels (securing stones which had one end exposed; pl. 54, fig. 1b).¹⁸ In view of this it seems safe to conclude that the cornerstone dowel at Paestum was a variant on the dowel used regularly in this temple, a variant which had been in-

troduced to do special duty at the corners where movement in two directions had to be stayed. It may, therefore, be restored identical in section with the dowel illustrated by Stevens, but having in plan an added crossbar on the principle current in Periclean buildings as precautionary disposition against movement of stones with one end exposed.¹⁹ It is obvious from the German publication that there was a crossbar at the lower ends of the cornerstone dowels, the ends which were sunk into the course below. Whether or not their upper ends, fitting into the course above, were also T-shaped in plan cannot be deduced from either description or drawing. To me it seems more probable that both ends were T-shaped (pl. 54, fig. 2) but this is only conjecture. It is based firstly upon the analogy of similar dowels — though with much less pronounced crossbar — in the fourth century temple at Tegea (pl. 54, fig. 3) where they were used along with normal dowels for securing the antae, stones near the cella door, and perhaps also the interior corner pilasters;²⁰ and secondly upon the fact that dowels with both ends T-shaped would be more efficient to fulfill their function in the friable stone used at Paestum.

¹⁶ *Ibid.* 105.

¹⁷ The relevant difference in section between the two restorations — I assume that Stevens' drawing is based like Koldewey's upon interpretation of the cuttings and not upon a clamp actually found on the site — is that Koldewey's consists of two pieces and Stevens' of one. Otherwise the outlines are approximately identical.

¹⁸ The normal dowels in form of parallelepipeds, disposed parallel to the direction of the course and at one end of the stones only, could prevent merely lateral motion. To be sure, as far as intermediate stones were concerned which had neighbors to right and left, there existed no problem of movement in the direction of the course. But stones with one end exposed, *e.g.*, cornerstones, had to be taken care of in this respect. By placing two dowels at right angles to each other in form of a  a device was created which effectively tied the stone down in both directions. For the form and use of normal and T-dowels see Stevens "The East Wall of the Erechtheum," *AJA* 10 (1906) 51 where the latter variety was first correctly described, *seven years after* the publication of Koldewey and Puchstein on the temple of Poseidon at Paestum had appeared; *HGA* 104-105; Paton-Stevens *The Erechtheum* (Cambridge, Mass. 1927) 192-5; Dinsmoor "The Sculptured Parapet of Athena

Nike," *AJA* 30 (1926) 11; Gottlieb *The Restoration of the "Nereid" Monument at Xanthos* (microfilmed Ann Arbor 1952), abbreviated henceforth to "*Nereid*" *Monument*, 26, 31.

¹⁹ The possibility that these cuttings from the temple of Poseidon at Paestum were filled merely with lead may be ruled out on the basis of Koldewey's and Stevens' restorations; both assumed the presence of clamps, I infer, because the walls of the cuttings are definitely outlined. But even if the solution adopted here (*i.e.*, a bronze or iron clamp and not merely a lead filling secured the cornerstones at Paestum) is wrong, it would not affect the conclusion that the principle of T-dowels appears in the temple.

²⁰ Dugas-Berchmans-Clemmensen *Le Sanctuaire d'Aléa Athéna à Tégée au IV^e Siècle* (Paris 1924), quoted henceforth as Dugas *e.a.*, 56, pls. 27-28, 68, 69A. It would be interesting to know whether or not the sister temple at Nemea likewise utilized this dowel form. While there is no connection apparent between Paestum and Tegea which would explain the sporadic appearance of the same dowel form in their techniques, the temple at Nemea was built in limestone like the temple of Poseidon at Paestum.

This brings us to the third part of the discussion, *i.e.*, the conclusions which can be drawn from the use of the principle of T-dowels at Paestum.

It is usually surmised that this principle was restricted to Periclean buildings.²¹ This is, however, contradicted by the evidence from Paestum and Tegea. Moreover, there may be cited a third example of non-Periclean use of T-dowels, namely the "Nereid" Monument at Xanthus (pl. 54, fig. 4).²² And perhaps there can be added a fourth example to the list: the temple at Segesta; at least Koldewey mentioned that the bonding system of this temple was very similar to the one used at Paestum.²³ Since three of these sites, Segesta, Xanthus, and Tegea (Segesta is included for good order's sake) show definite connections with Periclean Athens,²⁴ one might amend the prevalent view regarding the distribution of T-shaped dowels as follows: T-shaped dowels were in use in Periclean Athens and sites within her sphere of influence. But the fifth instance of non-Periclean use of the T-dowel principle, the temple of Poseidon at Paestum presently dated pre-Periclean, makes even this enlarged formula not comprehensive enough. It poses the dilemma either to accept the orthodox dating of the monument and revise the current theory regarding the origin and distribution of T-dowels, or to accept the current theory regarding the origin and distribu-

tion of T-dowels and revise the dating of the monument.

It seems to me that the latter attitude ought to be adopted on the following counts. Graphically the alternatives of relationship between the isolated cases of the use of the T-dowel system can be expressed in forms of genealogical trees, which reduced to the essential are: (*See diagram on p. 99*)

Possibility (A): the principle of T-dowels was universally employed throughout Greece and her colonies, must be rejected; this could not have been the case without one or the other instance of its use having been noted in the excavations of the last forty years when scholars were already aware of the existence and purpose of this variety of dowel.²⁵ Possibility (B): the T-dowels from Paestum and those from Athens had a common ancestor, is again unlikely for the same reason; without traces of T-dowels none of the important archaic Greek sites qualifies as a central point for the dispersion of the system. The choice lies between solutions (C) and (D), in both of which the T-shaped dowels from Paestum are shown directly related to those at Athens, alternately as prototype and as descendant. Here the claim of priority must be settled in favor of Athens. Clamps and dowels were very rare in western Greek architecture (see p. 96). Moreover, when they were used, they often adopted special decorative

²¹ T-dowels have been noted in the following Periclean buildings: basis of Athena Parthenos, Dinsmoor "The Repair of the Athena Parthenos . . .," *AJA* 38 (1934) fig. 2; Propylaea, Dinsmoor "The Gables of the Propylaea . . .," *AJA* 14 (1910) 152; Erechtheum, Paton-Stevens *The Erechtheum* (Cambridge, Mass. 1927) 194-5, fig. 17; Nike Temple, Orlandos "Nouvelles observations sur la construction du temple d'Athéna Niké," *BCH* 71-2 (1947-8) fig. 15; Temple of the Athenians at Delos, Courby "Les Temples d'Apollon," *Exploration archéologique de Délos* 12 (1931) fig. 260. For justification regarding the inclusion of the temple of the Athenians among Periclean buildings, see Courby *ibid.* 204; *AAG* 183.

²² "Nereid" Monument 30-33.

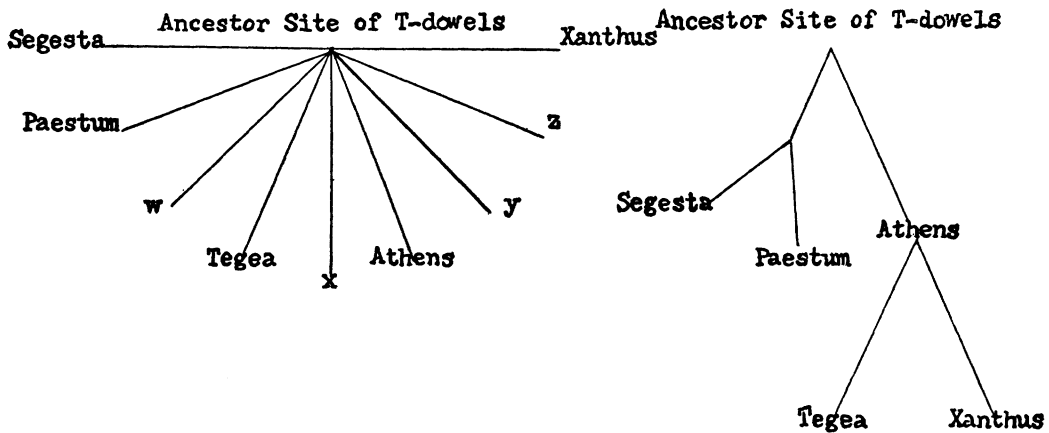
²³ K-P 25, 134, 226. Koldewey illustrated one example of an "anchored dowel" from a corner intercolumniation of the temple, misinterpreting it as at Paestum as a dowel-and-clamp form (K-P fig. 118; Durm fig. 103). According to his drawing the crossbar of the dowel seems less prominent than at Paestum, resembling the form

used at Tegea, which is reproduced here as pl. 54 fig. 3. One wonders what form the dowels securing the intermediate stones had at Segesta.

²⁴ Segesta's treaties with Athens in 453 B.C. and 426 B.C. are discussed in *CAH* 5 (1927) 159, 162, 224/n. The influence of Periclean architecture upon the "Nereid" Monument has been pointed out repeatedly; I quote at random: Luebke *Geschichte der Plastik*, . . . 3 1 (Leipzig 1880) 235/n; Niemann *Das Nereiden-Monument in Xanthos* . . . (Wien 1921) 7; Dinsmoor "The Gables of the Propylaea . . .," *AJA* 14 (1910) 181; *AAG* 257; Picard *Manuel d'Archéologie Grecque: La Sculpture* 2 (Paris 1939) 854. For Tegea see Dugas *e.a.* 60-61, 63; *AAG* 219.

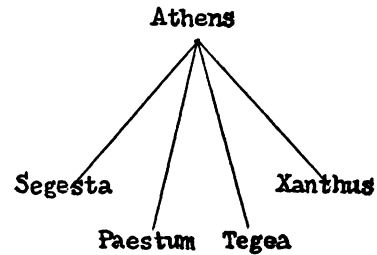
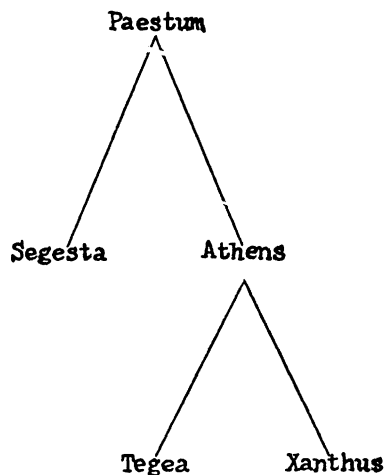
²⁵ The $\perp$ shaped lead dowels from the Cnidian Treasury at Delphi (Dinsmoor "Studies" 10, figs. 1 and 2) occur at the joint of *every* stone and seem, therefore, to be the local Cnidian variant of dowels, as the $\lrcorner$ form is the local Paestan variant.

²⁶ K-P fig. 11.



A. THE PRINCIPLE OF T-DOWELS WAS UNIVERSALLY EMPLOYED THROUGHOUT GREECE & HER COLONIES

B. THE T-DOWELS FROM PAESTUM & THOSE FROM ATHENS HAD A COMMON ANCESTOR



C. THE ATHENIAN T-DOWELS ARE DESCENDANTS OF THOSE FROM PAESTUM

D. THE T-DOWELS FROM PAESTUM ARE DESCENDANTS OF THOSE FROM ATHENS

GENEALOGICAL TABLES OF THE USE OF THE T-DOWEL SYSTEM

(See p. 98)

forms found nowhere else in the Greek lands (e.g. the clamps of the "Basilica"),²⁶ verging toward ornament rather than practicality. It seems irrational to credit this region with the invention of a purely functional form like T-dowels. Athens with its feverish building activity subsequent to the destruction of the sanctuaries by the Persians seems a much more suitable candidate for the place of origin of T-dowels. Likewise the historical and cultural position of Athens under Pericles, compared with that of the Achaean colonies around the middle of the fifth century, makes it more credible that the stream of influence was running from the east toward the west and not in the opposite direction. Hence it must be concluded that the current view regarding the place of origin of T-dowels is correct and ought to be retained: they were invented at Athens. The subsequent use of T-shaped dowels in the temple of Poseidon at Paestum proves that this temple, like the buildings at Tegea, Xanthus, and Segesta, was influenced by Periclean architecture.

Bearing this in mind, a surprising element in the design of the temple finds an explanation. I am referring to the double range of interior columns in two storeys, unique with one exception²⁷ among the temples of Magna Graecia. Most western Greek temples had narrow long cellas; if in rare cases they introduced interior supports, these were ranged in one row along the axis of the building and were equal in height to the outer columns or to the cella walls ("Megaron" at Selinus, "Chiesa" at Metapontum, "Basilica" at Paestum, temple at Crimisa). On the other hand, the non-axial interior colonnade in two storeys had become a standing feature in fifth century mainland Greece. It was so much *de rigueur* that in one

case, the Hephaesteum at Athens, it was even employed when wholly superfluous from the structural point of view. The use of this eastern design for the interior of the temple of Poseidon at Paestum may then be due to Athenian influence like the use of T-shaped dowels for securing the cornerstones.²⁸

Having thus established theoretically the connection between Periclean architecture and the temple of Poseidon at Paestum in technique, and perhaps also in design, we come to the practical part of this discussion, namely when this influence could have been exercised; the answer to this question will furnish, in turn, the *terminus post quem* for dating the temple. By great good luck this can be fixed within a narrow limit by means of the T-dowels.

The appearance of T-dowels is closely datable because one building survives at Athens which did not make use of them as yet in the early stages of its construction but availed itself of this method in the later. It thus gives us the precise moment of their introduction into Athenian architecture. This is the Parthenon. The temple walls were built without T-dowels while the basis for the cult statue of the Athena Parthenos regularly employed T-dowels at the corners for bonding.²⁹ Since the temple was begun in 447 B.C. and the statue of the Athena Parthenos dedicated in 438 B.C.,³⁰ T-dowels must have been invented at Athens around 445-440 B.C. This dating is confirmed by the fact that the older generation of Periclean architects, such as the architect of the Hephaesteum (whose activity falls between the years 449-432 B.C.),³¹ did not yet use this new technique, while the younger ones, such as Mnesicles (in the Propylaea and Erechtheum, 437-405 B.C.) and Callicrates (in the Nike temple and in the temple of the Athenians at Delos, 427-417

²⁷ Temple GT where the double range of columns was three-storeyed on account of the temple's great dimensions. Dinsmoor *AAG* list facing 340 dated it c. 520-450 B.C. According to his chronology, the execution of the interior would thus have been contemporaneous with that of the temple of Poseidon at Paestum. Perhaps temple GT's date ought also to be lowered slightly.

²⁸ A chemical analysis made recently (Müller-Skjold "Eine Reihenuntersuchung an antiken italischen Marmorsandstücken," *AA* (1950/51) cols. 132-140) proved that the stucco used in the temple of Poseidon at

Paestum differed in its constituent parts and phosphorus reaction from all other stuccoes subjected to examination, viz. those of the "Basilica" and five Roman buildings. The latter six stuccoes are similar in composition. — No analysis of Periclean stucco is at hand for comparison.

²⁹ See footnote 21 for reference.

³⁰ Dinsmoor "Attic Building Accounts," *AJA* 17 (1913) 77-79. Work continued on the sculptures until 432 B.C., *ibid.* 79-80.

³¹ The dating of monuments follows *AAG*.

B.C.)³² worked with them. If T-dowels were invented for the basis of the Parthenos, the *terminus post quem* for their importation into the western Achaean colonies, and subsequently for the erection of the temple of Poseidon at Paestum, is 445-440 B.C.

The archaic features of the temple of Poseidon at Paestum — to which in view of the foregoing may now be added the non-ambulatory interior colonnade, antedating the coming into fashion of the Parthenon ambulatory scheme — preclude a too extensive lowering of its date.³³ It must, therefore, be inferred that the *terminus ante quem* for dating the temple is identical with the *terminus post quem*.

This dating of the temple, in turn, presupposes that the T-dowel technique was passed on from Athens to Paestum immediately after its invention and appeared in that colonial provincial town at a time when mainland buildings in the metropolis itself did not as yet utilize the new method. Is this credible? It seems to me that this may have been the case under certain circumstances, such as a moment of direct contact between the two cities.

Considering the scarcity of historical data for the western colonies at the disposal of the scholar, it must be deemed fortunate, indeed, that relevant facts for proving such direct contact have survived. The same quinquennium to which the invention of T-dowels can be dated saw the founding of New Sybaris and Thurii,³⁴ which may be called the stepmother-cities of Paestum. Diodorus Siculus tells us that two-

fifths of the colonists settling Thurii hailed from Athens.³⁵ What is more, it is even known that one architect was among them: Hippodamus of Miletus. Though not an Athenian himself, he had worked at Athens and must have become acquainted there with the use of T-dowels. He seems unsuitable as author of the almost canonically Doric design of the temple of Poseidon³⁶ which contrasts sharply in that respect with the Ionicizing schemes of the other two temples on the site. But this does not preclude that he, or perhaps some architect from his suite, may have acted as mediating factor in transplanting to the Achaean colonies of the west³⁷ the Athenian method for securing the corners of buildings.

Having detected Periclean influences in the technique, and perhaps also in the design of the temple of Poseidon at Paestum, having been able to present an occasion and a carrier for the transmission of these influences to Paestum, it may be concluded that the temple in question postdates the Parthenon; it could not have been commenced earlier than 440 B.C. It would be of interest to examine the technique of other buildings of Magna Graecia from this period. Perhaps this would yield unexpected relationships, and consequently throw new light upon the history and development of the group of temples using simple, tentative double, or full double contractions.

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³² For references see footnote 21. Since the temple at Bassae shows no signs of T-dowels and, as far as the evidence is available, the Telesterion was likewise devoid of them, it may be conjectured that Callicrates was responsible for the use of T-dowels in the basis of the Parthenos. It is regrettable that the technique of the temple on the Ilissus, the early work of Callicrates datable 449 B.C., cannot be studied in this respect.

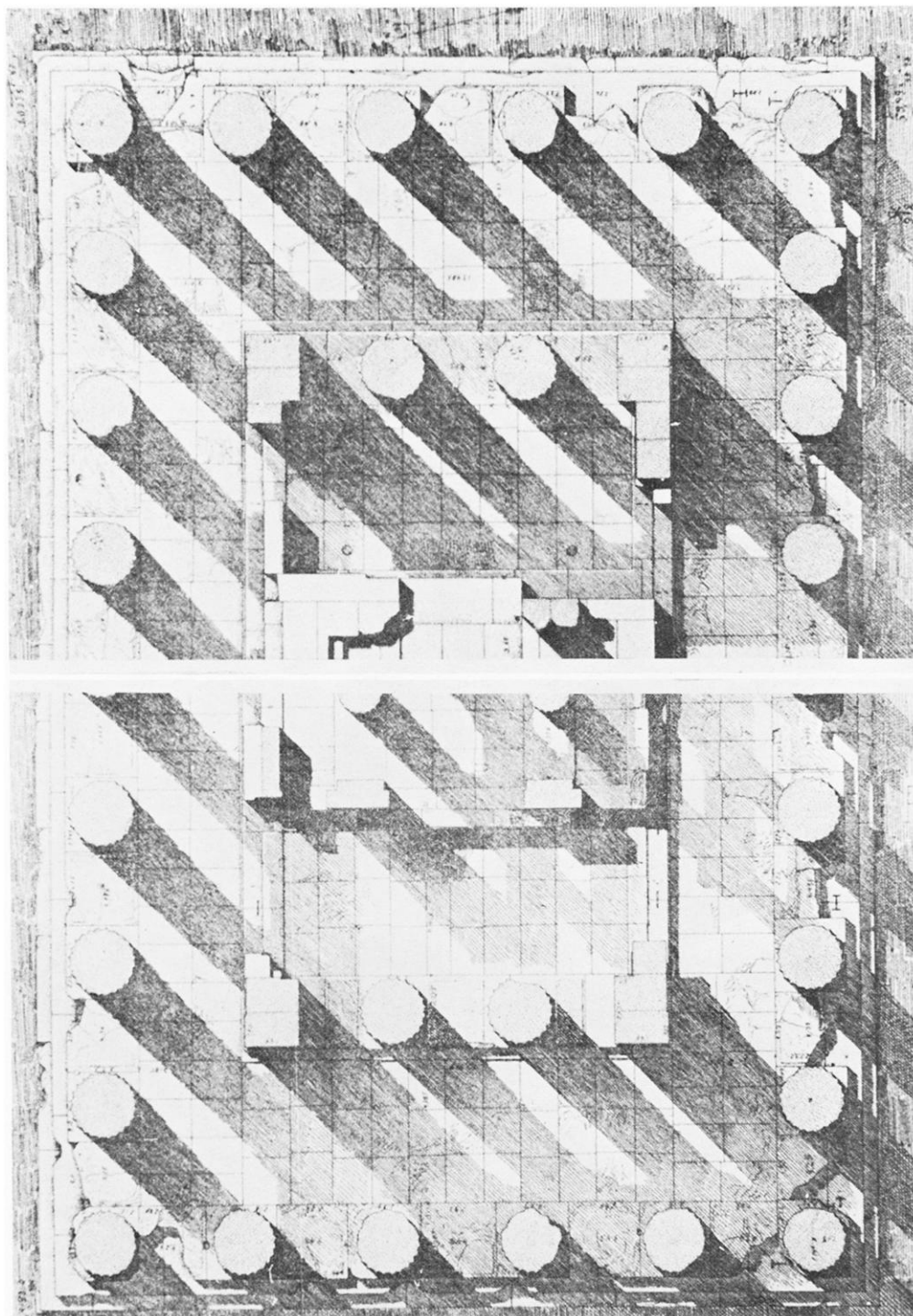
³³ Contrary to what is sometimes thought, the use of hook clamps in the temple (alongside of double-T clamps; pl. 53) does not constitute proof for a late date. For this problem see "*Nereid*" Monument 310-313.

³⁴ Adcock *CAH* 5 (1927) 168-169.

³⁵ 12, 11, 3.

³⁶ To my knowledge the only Ionic element in the temple of Poseidon at Paestum was the continuous crowning moulding of the interior architrave.

³⁷ The influence of Periclean master builders, and specifically that of Hippodamus, was felt even in Roman architecture. Sjöqvist "Pnyx and Comitium," *Studies presented to David Moore Robinson* (Saint Louis 1951) 400-411; Boëthius "Roman and Greek Town Architecture," *Göteborgs Högskolas årsskrift* 54 #3 (1948) 7.



GROUNDPLAN OF TEMPLE OF POSEIDON AT PAESTUM
(K-P PL. IV)

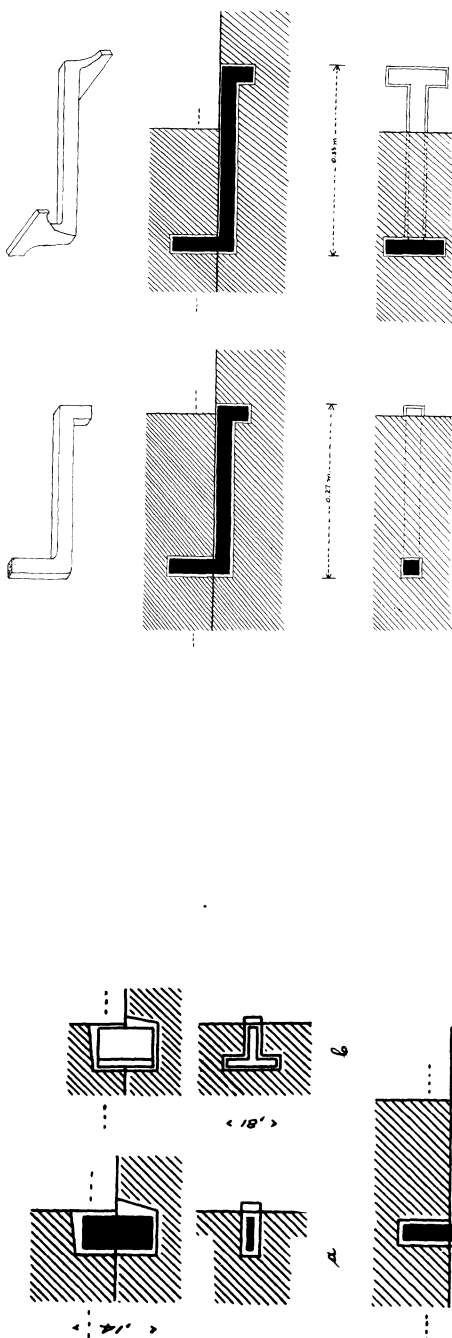


FIG. 2. RESTORATION OF CORNERSTONE DOWEL FROM PAESTUM
ON THE BASIS OF DOWEL fig. 1c

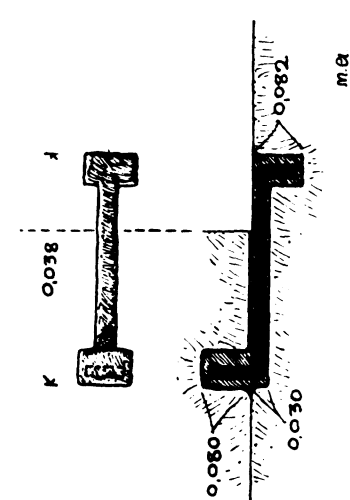


FIG. 3. DOWEL FROM TEGEA
(CLEMMENSEN IN DUCAS *e.a.* fig. 22)

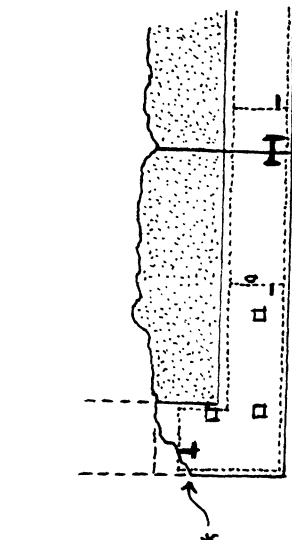


FIG. 4. T-DOWEL AT EAST CORNER OF
"NEREID" MONUMENT

FIG. 1. DOWEL FORMS

- a. NORMAL DOWEL
- b. T-DOWEL
- c. DOWEL FROM PAESTUM
(HGA FIGS. 60, 61, 64)