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SOMMARIO

<i>Editoriale</i>	9
SAGGI	
PASCAL ARNAUD, <i>Closed or open ports: Technical solutions for a difficult compromise between an efficient traffic flow and security requirements in ancient ports. The limen kleistos and the kleithra (part one)</i>	13
GLORIA OLCESE, ANDREA RAZZA, DOMENICO MICHELE SURACE, <i>Il sito di Aenaria/Cartaromana a Ischia: i reperti dei recuperi subacquei degli anni '70</i>	31
NICOLAI LOMBARDO, <i>Contributi alla topografia dell'antica Ripa Puteolana: ricognizioni subacquee nel vicus Lartidianus. Anni 2017-2022</i>	73
MASSIMO CAPULLI, <i>I nuovi relitti di Grado e l'isola lagunare di Gorgo: aggiornamenti sulla portualità aquileiese</i>	101
FRANCESCO GALLUCCIO, <i>Gli elmi di tipo Montefortino con decorazioni apicali dal mare di Sicilia</i>	123
DIEGO SERRA, <i>La navigazione antica e le fonti del diritto marittimo nel II millennio a.C. Dallo scavo archeologico alla realtà giuridica dei contratti e della prassi commerciale marittima</i>	139
MARCO BONINO, <i>Immagini, idee e scritti navali di Leonardo da Vinci (parte seconda)</i>	179
<i>Norme tipografiche e redazionali</i>	219

CLOSED OR OPEN PORTS: TECHNICAL
SOLUTIONS FOR A DIFFICULT COMPROMISE
BETWEEN AN EFFICIENT TRAFFIC FLOW
AND SECURITY REQUIREMENTS
IN ANCIENT PORTS. THE *LIMEN KLEISTOS*
AND THE *KLEITHRA* (PART ONE)

PASCAL ARNAUD

ABSTRACT · This article stands as the first section of a wider study about the technical solutions applied to balance the conflicting exigencies of an efficient traffic flow and access control in ancient ports. It will focus on the notion of *limen kleistos*, arguing that this concept is applicable to ports provided with closing devices called *kleithra*, which were common in the Greek world since the 5th century BC at the latest. It will discuss the available written evidence to determine the type of closing devices used before the advent of chains.

KEYWORDS · Greek-ports, Closed Ports, *kleithra* / -on.

PORTS were an important source of revenue for ancient cities thanks to *ellimenion*, or port taxes, and *telè*, or customs duties on incoming and outgoing goods,¹ as well as the economic activity induced by the port. These revenues would generate sufficiently high profits to lead Xenophon to consider the port of Athens as one of the main sources of the city's public revenue and of the private wealth not only of its citizens, but also of those who chose to establish their business there.²

For those reasons, ports, which were also the vector of strategic supplies, were expected to be both capable of generating large volumes of goods, which required a smooth and efficient traffic flow, and protecting from external aggression, which almost necessarily meant controlling movements of ships, therefore restricting the volume of traffic. The ideal port, in a way, would be both an open and a closed space, so that it could become a citadel in an extreme situation. A well-functioning port had to face a compromise between these conflicting requirements.

How ease of traffic and access restriction were combined in ancient ports will be the subject of our further studies. In this first one, the focus will be on the highly debated *limen kleistos* and on what seems to be its peculiar closing device, the *kleithra*.

I found thirty occurrences, including one in an inscription, of the locution *λίμην κλειστός* (TAB. 1) since its first dated appearance in Thucydides (7.38.2), which points

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follow Liddell and Scott and Theasaurus Linguae
Latinae.

Abbreviations for Greek inscriptions are those
in use in PHI. [https://epigraphy.packhum.org/
biblio#b437]. Names of ancient authors and works

¹ On these points, see CHANKOWSKI 2007; CAR-
RARA, 2014. ² X., *Vect.* 3.1.

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Tab. 1. Closed ports after written sources
(in part after LEHMANN-HARTLEBEN 1923, pp. 70-71).

Place	Source	Text
Alexandria	STR. 17.1.6 and 9	ποιεῖ δὲ καὶ τοῦτο ἄλλον λιμένα τὸν τοῦ Εὐνόστου καλούμενον· πρόκειται δ' οὗτος τοῦ ὄρυκτοῦ καὶ κλειστοῦ λιμένος· (...)εἰσπλεύσαντι δ' ἐν ἀριστερᾷ ἔστι συνεχῆ τοῖς ἐν τῇ Λοχιάδι τὰ ἐνδοτέρω βασιλεία, πολλὰς καὶ ποικίλας ἔχοντα διαίτας καὶ ἄλση· τούτοις δ' ὑπόκειται ὁ τε ὄρυκτός λιμὴν καὶ κλειστός, ἴδιος τῶν βασιλέων, καὶ ἡ Ἀντίροδος νησίον προκειμένον τοῦ ὄρυκτοῦ λιμένος,
Ambracia	SCYL.33	Ἔστι δὲ καὶ ἐπὶ θαλάττης τεῖχος καὶ λιμὴν κλειστός.
	D.P. 29-30	ἔστ' ἐν αὐτῇ καὶ λιμὴν κλειστός
Arados	STR. 16.2.23	συνῆπται δὲ χώματι πρὸς τὴν ἠπειρον, ὃ κατεσκεύασε πολιορκῶν Ἀλέξανδρος· δύο δ' ἔχει λιμένας τὸν μὲν κλειστόν τὸν δ' ἀνειμένον, ὃν Αἰγύπτιον καλοῦσιν.
Athens	PHILOCH. (F3b,328, F frgt 203 Jacoby) OF MENECL. (FHG 4)	ἔχει δὲ ὁ Πειραιεὺς λιμένας τρεῖς, πάντας κλειστούς· εἷς μὲν ἔστιν ὁ Κανθάρου λιμὴν καλούμενος, ἐν ᾧ τὰ νεώρια ἐξήκοντα (?), εἶτα Ἀφροδίσιον, εἶτα κύκλω τοῦ λιμένος στοαὶ πέντε.
	ATH. 12. 49. 10	ἡ δὲ τριήρης ἐφ' ἧς αὐτὸς κατέπλει μέχρι μὲν τῶν κλειθρῶν τοῦ Πειραιεῶς προέτρεχεν ἀλουργοῖς ἰστίοις·
Byzantium	D.C. 74.10.5	οἱ τε λιμένες ἐντὸς τεύχους ἀμφοτέροι κλειστοὶ ἀλύσειν ἦσαν, καὶ αἱ χηλαὶ αὐτῶν πύργους ἐφ' ἐκάτερα πολὺ προέχοντας ἔφερον, ὥστ' ἄπορον τῷ πολέμῳ τὸν πρόσπλουν ποιεῖν
Caunos	SCYL. 99	Καῦνος Καρικὴ πόλις καὶ λιμὴν κλειστός
	STR. 14.2.3	Ἔχει δ' ἡ πόλις νεώρια καὶ λιμένα κλειστόν·
Cnide	STR. 14.2.15	Κνίδος δύο λιμένας ἔχουσα, ὧν τὸν ἕτερον κλειστόν τριηρικὸν καὶ ναύσταθμον ναυσὶν εἴκοσι.
Corcyre	SCYL. 29	νῆσός ἐστι Κόρκυρα, καὶ πόλις Ἑλληνίς ἐν αὐτῇ, λιμένας ἔχουσα τρεῖς κατὰ τὴν πόλιν· τούτων ὁ εἷς κλειστός.
Cos	SCYL. 99	νῆσος Κῶς καὶ πόλις καὶ λιμὴν κλειστός.
Cydonia	SCYL. 47	Κυδωνία καὶ λιμὴν κλειστός πρὸς βορέαν·
Cyzicus	STR. 12.8.11.	ἔχει δὲ ὁμώνυμον πόλιν πρὸς αὐταῖς ταῖς γεφύραις καὶ λιμένας δύο κλειστούς καὶ νεωσοίκους πλείους τῶν διακοσίων·
Genetes (Chalybes)	SCYL. 88	Γενήτης λιμὴν κλειστός

Place	Source	Text
Genetes (Chalybes)	SCYL. 88	Γενήτης λιμὴν κλειστός
Halicarnassus	SCYL. 99	Ἄλικαρνασσός καὶ λιμὴν κλειστός καὶ ἄλλος λιμὴν περὶ τὴν νῆσον καὶ ποταμὸς
Kition (Cyprus)	STR. 14.6.3	ἔχει δὲ λιμένα κλειστόν·
Milet	VON GERKAN 1935, nr. 400	Βιάρης Βιάρου ἐπιστατήσας τοῦ ναοῦ τοῦ Ἀπόλλωνος τοῦ Διδυμέως καὶ τειχῶν κ[αί] πύργων καὶ τῆς περὶ τὸν κλεισ- ⁵ τὸν λιμένα ἀσφαλῆσας Ἀπόλ[λωνι] Διδυμεῖ καὶ Ἀρτέμιδι Πυθ[είη] καὶ τῶι Δῆμῳ ἰδρύσατο τὸν βωμόν.
Mytilene	STR. 13.2.2	ἔχει δ' ἡ Μιτυλήνη λιμένας δύο, ὧν ὁ νότιος κλειστός τριηρικὸς ναυσὶ πενήκοντα, ὁ δὲ βόρειος μέγας καὶ βαθύς, χῶματι σκεπαζόμενος
Paros	SCYL. 58	Πάρος λιμένας ἔχουσα δύο, ὧν τὸν ἓνα κλειστόν·
Phalasarna	SCYL. 47	Φαλασάρνα καὶ λιμὴν κλειστός
	D.P. 119-122	Φαλάσαρνα κειμένην πρὸς ἥλιον δύνοντα, κλειστόν λιμέν' ἔχουσαν ἱερὸν Ἀρτέμιδος ἅγιον καὶ καλεῖσθαι τὴν θεὸν Δίκτυνναν·
Priene	SCYL. 98	Πριήνη λιμένας ἔχουσα δύο, ὧν τὸν ἓνα κλειστόν
Salamine de Chypre	SCYL. 103	Σαλαμίς Ἑλληνίς, λιμένα ἔχουσα κλειστόν χειμερινόν
Samos	SCYL. 98	Σάμος ἐστὶ νῆσος πόλιν ἔχουσα καὶ λιμένα κλειστόν
Sidon	SCYL. 104	Σιδῶν πόλις καὶ λιμὴν κλειστός
Smyrna	STR. 14.1.37	ἔστι δὲ πρὸς τῇ ἄλλῃ κατασκευῇ τῆς πόλεως καὶ λιμὴν κλειστός.
Syracuse (temporary)	TH. 7.38.2	ὀγκάδας προώρμισε πρὸ τοῦ σφετέρου σταυρώματος, ὃ αὐτοῖς πρὸ τῶν νεῶν, ἀντὶ λιμένος κληστοῦ ἐν τῇ θαλάσῃ ἐπεπήγει
Thasos	SCYL. 67	Θάσος νῆσος καὶ πόλις καὶ λιμένες δύο· τούτων ὁ εἷς κλειστός.
Tyre	STR. 16.2.23	δύο δ' ἔχει λιμένας τὸν μὲν κλειστόν τὸν δ' ἀνειμένον, ὃν Αἰγύπτιον καλοῦσιν
	ARR. An. 2.24.1	Οἱ δὲ ἐπὶ τῶν νεῶν, οἳ τε Φοίνικες κατὰ τὸν λιμένα τὸν πρὸς Αἰγύπτου, καθ' ὄνπερ καὶ ἐφορμοῦντες ἐτύγγανον, βιασάμενοι καὶ τὰ κλεῖθρα διασπᾶσαντες ἔκοπτον τὰς ναῦς ἐν τῷ λιμένι (...), καὶ οἱ Κύπριοι κατὰ τὸν ἄλλον λιμένα τὸν ἐκ Σιδῶνος φέροντα οὐδὲ κλεῖθρον τοῦτόν γε ἔχοντα εἰσπλεύσαντες εἶλον εὐθὺς ταύτη τὴν πόλιν.



to a non-permanent structure serving as a closed port. An accurate determination of what distinguishes a «closed port» from one that would be «open»¹ remains a matter of debate, as well as the question of whether there is a precise underlying archaeological reality. Less attention has been paid to the question of how a logic of restricting access to the port has been combined with the need for a smooth traffic – an essential feature for the optimal functioning of commercial ports: what is closed, how, and why?

1. THE ΛΙΜΗΝ ΚΛΕΙΣΤΟΣ: ACCESS TO THE PORT IS CLOSED BY A DEVICE

Reflections on the nature of closed ports are not new, but a certain vagueness still surrounds this notion. Twenty-six ports have been characterized by ancient sources as «closed ports», or *λίμην κλειστός* (see TAB. 1). They are mostly cited by Pseudo-Scylax and by authors who relied heavily on the late classical and Hellenistic tradition, such as Strabo.

While some believe that a closed port is simply a port protected by artificial, man-made breakwaters,² other scholars tend to be of the opinion that the locution «closed port» refers to a port whose entrance could be closed to ships by an obstructive device, and more broadly to a «secure naval harbour».³ Others⁴ define it as a harbour with an entrance narrow enough to constitute a defence in itself, as suggested by the archaeological evidence relating to ports expressly designated as *limenes kleistoi*.

A deeper study of the ancient sources provides clear evidence that a *limen kleistos* was a port whose access was restrained by a closing device. The texts distinguish *limen kleistos* from other periphrases referring to the closure of a port. Describing the port of Taranto, Strabo⁵ does speak of a port closed by a «large bridge» (γεφύρα κλειόμενος μεγάλη), while referring to events that took place in 212 BC, Livy (25.11.15) just mentions *claustra*, a Latin word that might translate the Greek κλειθρα. What precisely Strabo had in mind is difficult to establish. This could be a pier or open arcades commonly referred to as *pilae* of a type quite common in Italy since the end of the Republic,⁶ especially at Pozzuoli, and later further on as far as Ephesus.⁷ It could also be a bridge over the entrance of the port, of a type attested by iconographic sources.⁸ Moreover, there are occurrences of *gephyra* used as a synonym for *zeugma*, with the meaning of a floating pontoon made of ships tied to one another.⁹ Strabo might also refer to something like the *heptastadion* between Pharos and Alexandria, which had a bridge that allowed for the passage of boats from one port to the other.¹⁰ Whatever the interpretation, Strabo clearly did not use the expression *limen kleistos*,

¹ STR. 16.2.23 describing the ports of Tyre, he opposed the closed port to the open one (ἀνιμέμενον).

² For instance, BALANDIER 2017, p. 325; DÜN-DAR, KOÇAK 2021. ³ BAIKA 2013, p. 212.

⁴ MAURO 2020; MAURO, GAMBASH 2020.

⁵ 6.3.1: Τοῦ δὲ κόλπου παντὸς τοῦ Ταραντίνου τὸ πλέον ἀλιμέμενον ὄντος, ἐνταῦθα δὴ λίμην ἐστὶ μέγιστος καὶ κάλλιστος γεφύρα κλειόμενος μεγάλη, σταδίων δ' ἐστὶν ἑκατὸν τὴν περίμετρον. *Although the Gulf of Taranto is for the most part deprived of*

sheltered areas, there is very large and excellent one, closed by a large bridge, and it has a circumference of a hundred stades.

⁶ FELICI 2006. ⁷ *I Eph 23 and Add. p. 2 = SEG 19.684 = AE 1967. 480, dated AD 147: τὰς κατασκευασθεισας ἐπι φυλακῆ τοῦ λιμέμενος πείλας, the pilae that have been set up for the protection of the harbour.*

⁸ ARNAUD 2019/2020.

⁹ MURRAY 2012, p. 74 n. 8 quoting especially HDT. 1.205.2; 3.134.4; 7.37.1.

¹⁰ J. AJ 12.103.

which he uses on several occasions (cf. TAB. 1), because it referred to some technical solution different from the one Strabo intended to describe at Taranto, which was apparently original for a Greek reader of early imperial times, and which Strabo chose to describe as «a bridge». Another passage of Strabo about the port of Alexandria describes it as closed by a guard post. Again, he carefully avoids using the expression *limèn kleistos*, which, in other passages, he reserves for the dug-out inner port of Alexandria (cf. TAB. 1) and prefers the participle *κεκλεισμένον*.¹ The reason is likely that Strabo only wanted to express the deterrent effect of a guard post without the need for any closing device, such as those that would create the *limen kleistos*. The choice of this wording suggests that the locution *limèn kleistos* had a technical meaning that did not characterise either a protection by dikes or a military presence to prevent the entrance of ships, but rather a device for closing the port by means of a mobile obstruction. An inscription from Miletus² shows that the locution *limen kleistos* was still in use at the time of the Mithridatic wars and that, at Miletus, it used to be the customary name of one of the two ports of the city. This would be the port better known today as the ‘Port of the Lions’ in Miletus, for the ‘theatre port’ was widely opened and half of it was silted up as early as classical times, and the other ports could not be closed in any way. The ‘Port of the Lions’ is essentially a natural port, whose dikes seem to have had the main function of narrowing the access channel, probably to facilitate its closure by a suitable device.³

It is worth to mention a few texts where a closed port was clearly defined as a port provided with a device for closing its entrance channel. The authors of the late classical and Hellenistic ages never urged to explain a notion that seemed self-evident to them, but they have nevertheless left us some clues. Describing the attempted assault against Piraeus planned by Knémos and Brasidas at the beginning of the bad season, in 429 BC, Thucydides tells us that Piraeus «was neither guarded (*ἀφύλακτος*), nor closed (*ἄκλιηστος*), which is not surprising, given the vast naval superiority (of the Athenians)» and a few lines later, he concludes: «after this, the guarding of the ports of Piraeus was henceforth improved by closing them and by making a series of other arrangements».⁴ He uses here the negative form of *kleistos*, *ἄκλιηστος*, “unclosed”, in order to state that this was not yet a *limen kleistos*. Diodorus Siculus tells us that following the failed assault, the Athenians «fortified the Piraeus, cutting it off with *kleithra* and sufficient guards». ⁵ These additions transformed the *ἄκλιηστος* port into a *limen kleistos*.

Another passage in Thucydides tells us that Nicias had a palisade built in front of his ships in Syracuse. What made this rudimentary port something to serve as a «closed port» was not this stockade, but the cargo ships used as closing devices.⁶ These

¹ 2.3.5: τοσαύτη φρουρᾷ κεκλεισμένου τοῦ λιμένος. *The port being closed by such a guard post.*

² VON GERKAN 1935, p. 131 n°400; for full text see below p. 27.

³ BRÜCKNER, HERDA, MÜLLENHOFF 2014; FEUSER 2020, p. 23-72.

⁴ 2.93.1: ἐβούλοντο διδασκάντων Μεγαρέων ἀποπειρᾶσαι τοῦ Πειραιῶς τοῦ λιμένος τῶν Ἀθηναίων. ἦν δὲ ἀφύλακτος καὶ ἄκλιηστος εἰκότως διὰ τὸ

ἐπικρατεῖν πολὺ τῷ ναυτικῷ; 2.94.4: καὶ μετὰ τοῦτο φυλακὴν ἤδη τοῦ Πειραιῶς μᾶλλον τὸ λοιπὸν ἐποιοῦντο λιμένων τε κλήσει καὶ τῇ ἄλλῃ ἐπιμελείᾳ.

⁵ 12.49.5: τὸν δὲ Πειραιᾶ κλείθροις καὶ φυλακαῖς ἱκαναῖς διαλαβόντες ὠχύρωσαν.

⁶ 7.38.2: ὁ δὲ Νικίας (...) ὀκνάδας προώρμισε πρὸ τοῦ σφετέρου σταυρώματος, ὃ αὐτοῖς πρὸ τῶν νεῶν, ἀντὶ λιμένος κληστοῦ ἐν τῇ θαλάσῃ

two occurrences show us that around 400 BC the notion of a «closed port» was already explicit enough for a reader to understand what device was involved, well before the first systematic occurrences of the locution in Pseudo-Scylax, whose compilation dates back to the last third of the 4th century BC.¹ In his account of Poliorcetes' entry into Athens in 307, Plutarch explains that, due to a misunderstanding of the identity of the arriving fleet, the entrance (*stomata*) of the ports had not been closed by the Athenians and that Demetrios was thus able to enter the harbours without striking a blow.² An inscription from Athens,³ dated 337/6 BC, states that the ports must be closed by a device. Unfortunately, this was described in a lost part of the text. A document by Aeneas Tacticus (11.3), to which we shall pay more attention below, explains that at Chio, removing this device meant opening up the port to the enemy. Another writing by the same Aeneas tells us that the purpose of what he generically calls «barriers» (φράγματα) was both to deny access to the port to enemy ships and to trap ships that have entered the port.⁴

Some pieces of evidence describe more precisely how the port was being closed in practice and the kind of devices that were being used. Curtius describes precisely how, in 332, the port of Chio was opened to Aristonicos and his fleet of pirates only to close the *claustra* behind them as soon as they arrived near the quay, trapping them all inside the port.⁵ Here the Latin *claustra* is clearly a translation of the Greek κλειθρα, which Curtius had found in his source. As for Tyre, the parallel between Strabo and Arrian is enlightening.⁶ Strabo tells us that at the time of Alexander's siege, the city had two ports, one «closed» (*kleistos*) and the other «open» (*aneimenos*). Strabo's expression, which was compressed to the extreme, led him to refer to the closed port as the Egyptian port. Arrian, describing the same episode, never mentioned a *limen kleistos*, but preferred to state the presence or absence of closing devices, which he mentions. According to him, the Egyptian port was closed by a device that he refers to as *kleithra*, which the Phoenicians broke to enter the port and destroy the ships, while the Sidonian port was lacking any *kleithron*, which should have been the closing device, if any (οὐδὲ κλειθρον τοῦτον γε ἔχοντα).

These pieces of evidence state that the ability to open or close the entrance channel of a port at will and quite quickly with a permanent mobile device were the distinc-

ἐπεπήγει. Nicias (...) sent cargo ships to anchor in front of the pier which he had founded in the sea, in front of his ships, to be instead of a closed port.

¹ Exact dates still are under debate, but all clues converge to this period, cf. BRILLANTE 2020, p. 9. 44.

² PLU. *Demetr.* 8.6: τοῖς γὰρ στόμασι τῶν λιμένων ἀκλειστοῖς ἐπιτυχῶν ὁ Δημήτριος καὶ διεξέλασας, ἐντὸς ἦν ἤδη καταφανῆς πᾶσι, καὶ διεσήμηνεν ἀπὸ τῆς νεῶς ἀλτησιν ἡσυχίας καὶ σιωπῆς. For Demetrios had found the entrance to the harbours wide open and had passed through them, he was already inside, visible to all and from his ship, he was signalling to remain quiet and silent. See also CVRT. 4.5.19-21.

³ IG II² 244 = IG II³, 1 429 = SEG 19.57 = SEG 35, 62, l. 40: ὅπως δ' ἂν καὶ οἱ λιμένες κλειώνται [κλειθροῖς ὡς ἀσφαλεστάτους εἰσενεγκεῖν τοὺς ἀρχιτέκτονας τοὺς πα-] | ρὰ τῆς πόλεως μισθοφοροῦντας καὶ ἄλλον τὸμ βουλόμενον συγγραφέ[ς συγγράψαντας... ⁴ AEN. TACT. 8.2.

⁵ CVRT. 4.5.19-21.

⁶ STR. 16.2.24: δύο δ' ἔχει λιμένας τὸν μὲν κλειστὸν τὸν δ' ἀνειμένον, ὃν Αἰγύπτιον καλοῦσιν; ARR. AN. 2.24.1: Οἱ δὲ ἐπὶ τῶν νεῶν, οἱ τε Φοίνικες κατὰ τὸν λιμένα τὸν πρὸς Αἰγύπτου, καθ' ὄνπερ καὶ ἐφορμοῦντες ἐτύγχανον, βιασάμενοι καὶ τὰ κλειθρα διασπάσαντες ἔκοπτον τὰς ναῦς ἐν τῷ λιμένι (...), καὶ οἱ Κύπριοι κατὰ τὸν ἄλλον λιμένα τὸν ἐκ Σιδῶνος φέροντα οὐδὲ κλειθρον τοῦτον γε ἔχοντα εἰσπλεύσαντες εἶλον εὐθύς ταύτη τὴν πόλιν.

tive traits of a «closed port». This device is usually referred to as κλειθρον or, in the plural form, κλειθρα. Two later texts, heavily influenced by classical and Hellenistic literature and written by Plutarch¹ and Aelius Aristides (*Or.* 1. 113 Jebb) use the metaphor of the closed port and confirm our analysis. Plutarch's text clearly defines a «closed port» not only as one that is protected from the fury of the sea, but as one that has been equipped with a device to open the port to certain ships and to deny access to others. In Aelius Aristides' passage, the metaphor of the closed port is part of a larger military extended metaphor. The scholiasts of the *Panathenaic Oration* of Aelius Aristides saw fit to comment on a locution whose meaning was apparently no longer clear to their contemporaries:

«As by closed ports – artificial ports that are built on the outskirts of cities and protected by walls (AC).

In effect the ports are closed at their opening (entrance) (D)».²

According to the commentary of the scholiasts, a closed harbour would therefore be not only a harbour whose pass could be closed at will, but also a fortified harbour protected by a wall (*teichos*) which cannot be reduced to a simple dock (*chōma*). This last point seems to be confirmed by an inscription from Miletus dated to the time of Mithridates (TAB. 1), which considers the «closed port» of Miletus as part of the defensive system placed under the responsibility of an *epistates*. In fact, ports were often protected by walls on both the land and sea sides. Surrounded by a fortified enclosure, they could constitute real bastions that were an integral part of the city's defensive system, or even one of its key pieces.³ The closed port thus became a sort of fortified gateway between the sea and the city and one of its defensive bastions.

2. PIVOTING CLOSING DEVICES: KLEITHRON AND KLEITHRA, PHRAGMA, PYLAI

In the same way that cities were closed and accessible through their gates, a closed port was blocked by devices that classical authors most often refer to as *kleithra* (in this sense translated into Latin as *claustra*, apparently with the general meaning of closing device)⁴ protected by guards, which could defend and operate them. Several texts⁵ describe the absence of any *kleithron* or the breaking or opening of the *kleithra* as the key to the entry of an enemy fleet into the harbour, which leaves little doubt on the fact that the word indicates a closing device. Some ancient authors make a distinction between *phragmata*, which seems to have a general meaning – «a fence», characterising an unspecified closing device – and *kleithron*, which seems to refer to a more specific device, especially at the singular form.⁶ Both words intend to describe a device

¹ PLU. *Moralia* 823a: οἰκίαν τε παρέχων ἀκλειστον ὡς λιμένα φύξιμον ἀεὶ τοῖς χροήζουσι. *And such a man will provide a home that is not closed, like a harbour that is a perpetually accessible shelter for all who want it.*

² SCHOLIA IN AELIUM ARISTIDEM (scholia vetera), *ad Panath.* 113,7 Jebb: [ὡςπερ λιμέσι κλειστοῖς] οὐδ' χειροποιήτους διὰ τειχῶν περὶ τὰς πόλεις ποιοῦνται. AC. εἰσὶ γὰρ λιμένες κλειόμενοι περὶ τὰ στόματα. D.

³ LEHMANN-HARTLEBEN 1923, p. 65-67; BLACKMAN 1982, p. 93-94; HADJIDAKI 1988, p. 479; STEFANAKIS 2006; ARNAUD 2017; MAURO 2019, p. 46-52; MAURO 2020; MAURO, GAMBASH 2020.

⁴ CVRT. 4.5.19-21 about events at Chio, 332 BC; LIV. 25.11.15 about Taranto, 212 BC; FLOR. 2.13.19-20 about Brentesion March 17, 49 BC. See also CIC. *fam.* 12.13.3 about Corycus in Cilicia.

⁵ AEN. TACT. 11.3; ARR. *An.* 2.24.1; D.S. 13.15.4.

⁶ AEN. TACT. 8.2: τοῖς τε ἐν τῇ χώρᾳ καὶ τῇ πόλει λιμέσιν οἶα εἰς τούτους δεῖ φράγματα

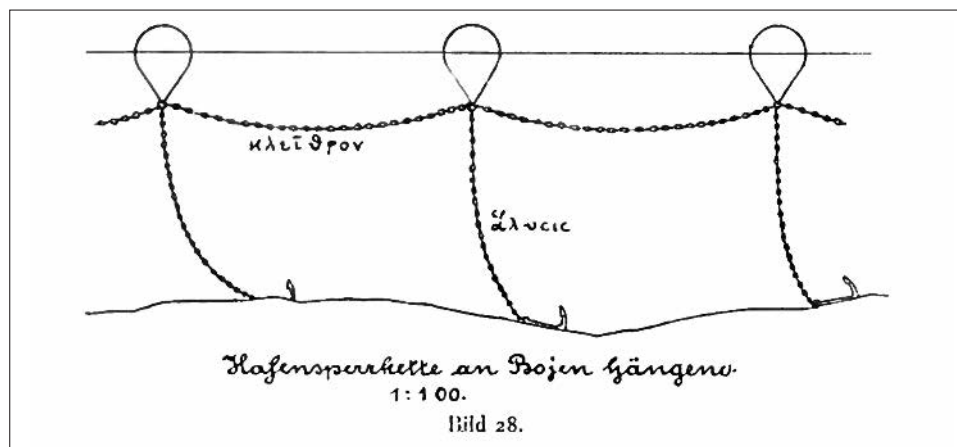


FIG. 1. The *kleithron* of Philo of Byzantium as imagined by Diels (fig. 28).

meant to prevent ships from entering or leaving a port. However, it cannot be ruled out that *phragma* may also refer to a simple device, consisting of a simple beam or boom across the passage, while *kleithron*, or «lock», might have been a more elaborate and specific device. In recent times, scholars have generally recognised these *kleithra* as chains, a bar, a boom, or a beam, and the «artistic evocations» produced to illustrate the closing devices consistently depict chains or booms.¹

Many scholars, thinking they were following the testimony of Philo of Byzantium, believed that it was some kind of a «floating barrier»,² in this case a chain held by anchored buoys between two waters (FIG. 1). In reality, they were following the brutal and totally fanciful reconstruction of Philo's text made by H. Diels, author of the reference edition of Philo's work (and subsequently by the most recent edition of this text).³ This interpretation, which was born from the imagination of H. Diels alone and has no basis in evidence, **has to be abandoned once and for all.**

As far as we know, there is only one instance of a «floating palisade» (which has nothing to do with Philo's alleged floating chain), mentioned by Diodorus Siculus in his account of the **Poliorcetes' siege of Rhodes.**⁴ However, in this case it was not a device for closing the harbour, but a solution to protect the siege machinery embarked on

παρασκευάζεσθαι πρὸς τὸ μὴ εἰσπλεῖν ἢ τὰ εἰσπλεύσαντα μὴ δύνασθαι ἐκπλεῦσαι. As for the ports of the territory and the city, barriers must be put in place to prevent ships from entering them, and to prevent ships that have entered them from leaving. PH. p. 98 Thévenot (Diels 4.23): τὴν δὲ διάσπασιν τοῦ φράγματος καὶ τῶν κλειθρῶν ἢ ταῖς ἐμβολαῖς τῶν νηῶν ποιητέον ἐστὶν ἢ ταῖς ἐνάψεσι τῶν ἀγκυρῶν <δ>νεύοντα ἐκ τῶν προσαχθεισῶν ὀγκάδων. To break the fence (phragma) and the kleithra, one must either use the rams of warships or attach grappling hooks to them and winch these from cargo ships that will have been brought there.

¹ BAIKA 2013.

² MURRAY 2012, p. 135; MURRAY 2017, p. 479.

³ DIELS, SCHRAMM 1920; WHITEHEAD 2016, p. 312-313.

⁴ 20.85.2: κατεσκεύασε δὲ καὶ χάρακα πλωτὸν ἐπὶ τετραπέδων ξύλων καθηλωμένον, ὅπως προπλέων οὗτος κωλύη τοὺς πολεμίους ἐπιπλέοντας ἐμβολὰς διδόναι τοῖς φέρουσι τὰς μηχανὰς πλοίοις. Demetrius erected a floating palisade on squared joists, nailed together, in order to prevent enemy ships from ramming the boats on which the war machines were placed.

ships from the attack by warships of the besieged; hence it is not referred to as a *kleithron*, but as a «floating palisade», an expression deliberately chosen to evoke a linear fortification rather than the closure of the entrance of the port.

Strong evidence suggests that the word *kleithron* meant a specific closing system, which was quite familiar to the Greeks of the Classical and Hellenistic ages, even if they never felt the necessity of describing it. At the beginning of the second half of the 3rd century, Philo of Byzantium, writing a treatise on poliorcetics, considered that it was necessary to give the technical specifications, but unfortunately, this passage was corrupted, as we shall see shortly. In any case, it is certain that under this name, Philo was referring to a specific technical object and not to any device intended to close the port. In another passage, he distinguishes between the *kleithra*, which he considered a particular kind of harbour closure, and an original device, the *zeugma*, which was a static, temporary barrier made of assembled boats tied to one another.¹

In addition, it is worth pointing out that when Thucydides (2.94.4) describes the changes made to Piraeus to ensure its closure after the failed Megaro-Corinthian raid of October-November 429 BC, instead of using the technical word *kleithra*, he prefers a more abstract word *κλιθισις*, whereas Diodorus Siculus (12.49.5) later refers to the setting up of *kleithra* and guard posts. As a witness of these events, Thucydides likely knew that the device immediately used for protecting the port was not a *kleithron* in the fullest sense but some more rudimentary system, while Diodorus had in mind the device that was already deployed.

Classical authors knew perfectly well how to name and describe chains (*alyseis*) and Appian can mention the *kleithron* and the chains used as a device for closing the port as distinct things.² However, no author – and least of all Philo, who knew perfectly well how to name and describe chains³ – describes the use of chains as a closing device for the entrance to a port before the first Punic war. Chains are never associated with the mention of a *kleithron*. Authors mention either chains or *kleithron*, as if they were devices of a different nature. The only exception to this is the mention, at the time of the Mithridatic Wars, of a bronze chain (note the use of the singular form) by which the *kleithron* of Chalcedon was “attached” and thus locked.⁴ But in this case, the chain did not close the entrance of the port, but the *kleithron* did. The chain was used to lock the *kleithron* in closed position as chains usually locked the *kleithron* of a house’s door.⁵ Eventually Mithridates broke the *kleithron*, not the chain to enter the port. At this point it seems clear that *kleithron* and *kleithra* were not vague designations, but technical terms familiar to the Greeks of the classical age, and that they did not mean chains.

¹ PH. p. 98 Thévenot (Diels 3.55). MURRAY 2012, p. 136 comments on the *zeugma* as follows: «the best kind of barrier was a «yoked» affair called a *zeugma* comprised of warships and small boats joined together into a more or less rigid unit by timbers».

² APP. *Mith.* 10.71 (303); *Pun.* 20.96 (452); BC 4.10.82.

³ PH. p. 100 Thévenot (Diels 53.1-2).

⁴ APP. *Mith.* 10.71 (303): ὁ τε Μιθριδάτης τῆ φορᾶ τῆς εὐτυχίας χρώμενος ἐπήγγεν αὐτῆς ἡμέρας ἐπὶ τὸν λιμένα τὰς ναῦς καὶ τὸ κλειθρον, ἀλύσει χαλκῆ δεδεμένον, ἀπορρήξας τέσσαρας μὲν ἐνέπρησε τῶν πολεμίων. *Mithridates made the most of his success. He led his ships towards the harbour, broke the kleithron, which was bound by a bronze chain, and burnt four of the enemy’s ships.*

⁵ HLD. 7.15. 2.

As in the case of *limèn kleistos*, the earliest occurrence of *kleithra* of a port is found in the 4th century BC, in Aeneas Tacticus (11.3), but the device the word refers to appears in connection with earlier military episodes, which go back to the last third of the 5th century,¹ when, as it seems, they had already become very common. According to Thucydides (2.93.1), only an excess of confidence in their naval strength might have led the Athenians not to install a closing device at Piraeus. Such devices would therefore be quite common in 429 BC. The latest occurrences are related to events that took place in 74 BC in Chalcedon and Cyzicus.² The mentions of *kleithra* and, in Latin, *claustra* point to the whole Greek world, including Magna Graecia, but do not go beyond the boundaries of the Greek world.³

That said, what evidence do we have to figure out what precisely the device referred to as *kleithron* or *kleithra* might have been, if, as we believe, these words refer to a particular device?

First, one must have in mind that the singular and the plural forms designate different things. The singular characterises the closure device, while the plural designates both the complete system, including the guards and its location. This feature was preserved in the Latin narrative of Curtius (4.5.19-21), which differentiates the *claustrum*, which is the movable part of the closing device, from the complete device (or the place where it stood at the exit of the harbour), referred to as *claustra*. The *kleithra* would be a topographical location in several ports, notably in Cos after 198 BC,⁴ and in Zea, where the name survives well into the Augustan age, at a time when the device was perhaps no longer functional.⁵ One of the keys to the defeat of the Athenians, locked in by a barrage (*zeugma*) of enemy ships in the Great Harbour of Syracuse, was the moment when they abandoned the *kleithra*, which closed the passage between the island of Ortygia and Syracuse and opened or closed the connecting passage between the Great Harbour and the Lakkaion. There was no longer any obstacle to the transfer of the enemy fleet in the Great Port from the Lakkaion (D.S. 13.15.4).

A text by Aeneas Tacticus⁶ provides an essential piece of evidence for understanding what a *kleithron* was. This narrates an episode in the history of Chio in the months before the Athenian raid of 424 BC. It let us know that once dismantled, the *kleithron*

¹ D.S. 18.64.4; 18.64.4, about the closing of the entrance to Piraeus after the raid of 429; AEN. TACT. 11.3 about the supposed betrayal of Chio, in 425-424; D.S. 13.15.4, about Syracuse in 413; ATH. 12.49.5, about the return of Alcibiades, in 407 BC.

² APP. Mith. 10.71 [303] and 12.75 [323].

³ One must be aware that the Latin *claustra* has a more general meaning, unless it translates the Greek *kleithron*, see for instance. VERG. Georg. 2.161; LIV. 37.14.6; FLOR. Epit. 2.13.

⁴ *Inscr. di Cos* 178 = SEG 43.549 = SEG 49.1112 = SEG 50.762, fgt b 3-5: τῶν νεωρίων τῶν κατεσκευασμένων ἐν τῶν κλειθροῖς διαλείπων εἰσοδοῦν] ⁵ ἐκ τῶν ναυπαγίων. *Leaving the access of rigged ships to the kleithra of the dockyards from the yard area.*

⁵ IG II² 1035 add. (pt. 1.2 p. 671) = SEG 14.78 = SEG 26.121 = SEG 33.136: πρὸς τ[οῦ] νεωρίου τοῦ λιμένος τοῦ ἐν Ζέαι πρὸς τοῖς κλεί[θροισι]. *Near the dockyards of the part of the port of Zea that is close to the kleithra.* Cf. ATH. 12.49: ἡ δὲ τριήρης ἐφ' ἧς αὐτὸς κατέπλει μέχρι μὲν τῶν κλειθρῶν τοῦ Πειραιεῶς προέτρεχεν ἀλουργοῖς ἰστίοις. *The trireme on which he was returning sailed ahead to the kleithra of Piraeus under purple sails.* The *kleithra* mark the place beyond which one cannot go under sail.

⁶ AEN. TACT. 11.3: τοῦ τε λιμένος τὸ κλειθρον εἰς γῆν ἀνασπᾶσαντας ξηρᾶναι δεῖ καὶ πισσαλοῖ φῆσαι.

was not easy to put back in place and that it was complex and valuable enough to be put away after having first been hoisted to the shore, dried and coated with pitch. Aeneas did not provide a description of a *kleithron* as he was convinced that his reader was familiar with its construction. Instead, the details he provides rely on the reader's familiarity with this object. Despite a large amount of implicitness, these details provide us with two essential clues: pitching and drying indicates that the *kleithron* was made mainly of wood and that it was at least partly immersed, which is confirmed by the fact that it was first put out to dry.

Once in position, the *kleithron* was apparently a fairly simple device to manoeuvre and the *kleithra* a highly protected one, since *kleithra* had to remain operational when an enemy fleet had entered the harbour in order to trap the enemy inside by closing the *kleithron* on it (AEN. TACT. 8.2). The conditions of the capture of Aristonicus at Chio in 332 BC are a perfect illustration: the device – which was quick to manoeuvre – was protected by a guard appropriate for a sensitive installation that gave access to the port. The guards let Aristonicus in, like a friend, before blocking his way back with the *kleithron*¹ and trapping him in.

The only surviving description of *kleithra* can be found in Philo of Byzantium,² which is therefore the main piece of evidence. Unfortunately, the text of the manuscripts is corrupted. This is the only point on which the editors agree. Modern scholars who relied on this text thought they were relying on the genuine text by Philo of Byzantium, whereas they were relying on a text recomposed and interpreted in a highly questionable way by H. Diels. As mentioned above, Diels concluded that this device was composed of cones anchored to the bottom and used as buoys to support a chain suspended near the surface (FIG. 1). This interpretation, which ends on the reconstruction of a static device, does not fit with the need for closing and opening the device quickly and at will, nor is it based on an acceptable correction of the text, nor on the known meaning of the words. Last, but not least, it is inconsistent with another passage of the same Philo.

The text of manuscripts reads as follows: τὰ δὲ στόματα τῶν λιμένων φράττειν μὴ τοῖς κλείθροις, ἐν οἷς εἰσι περιτρέχουσι καὶ στρογγύλαι, σιδηροῦς δὲ κόλπους ἔχουσας.

The words *μὴ τοῖς* and the syntax are obviously corrupted. H. Diels, and D. Whitehead after him, therefore corrected the text in the following way: τὰ δὲ στόματα τῶν λιμένων φράττειν <ι>μητοῖς κλείθροις, ἐν οἷς <χῶναί> εἰσι περιτρέχουσαι καὶ στρογγύλαι, σιδηροῦς δὲ κόλπους ἔχουσαι. In order to achieve the theoretical reconstruction of his imagined device, Diels not only had to correct the text, but he also had to force the meaning of the words he himself had introduced. He thus understands *ἰμητοῖς* as 'immersed', although there is not a single occurrence of this meaning for that word.³ He then interprets *χῶναί* as bi-truncated floats, whereas the word is never attested to characterize a bi-truncated object. It normally denotes a funnel,

¹ CVRT. 4.5.19-21: *obicitur a vigilibus claustrum.*

² PH. p. 94 Thévenot (Diels 3.52). In WHITEHEAD 2016 both the text and its interpretation are exactly the same as Diels'.

³ The adjective has the meaning of «of a well», «relating to a well», or according to ancient lexicographers, «irrigated» from the water of a well, but in no case does it mean «immersed».

and appears in another passage of Philo,¹ with a very uncertain precise meaning, but certainly different from that proposed here. In this other passage, possibly corrupted too, it characterises an unclear device intended to protect the anchor lines from divers trying to cut them (probably a kind of sheath). The only certainty is that this is not the float imagined by Diels. Finally, Diels' interpretation assumes that the expression *σιδηροῦς δὲ κόλπους* refers to chains, whereas the word *ἔλυσις* describes them much better than this strange periphrasis, and that this word is well known to Philo, in the same passage that describes the protective device of the anchor lines.

The correction *τμητοῖς* («cut-out» or «openwork») proposed by Buecheler is much more credible. The ports should therefore be closed with a *kleithra* that would have been, at least in part, some kind of a lattice or openwork fence. Other acceptable (though more difficult) corrections have been proposed: Thévenot suggested, for example, to delete *μή* and Haase to replace it with *μέν*...

The key for understanding the words that follow *κλείθροις* could be provided by an inventory of an arsenal in Piraeus,² which, in 330-329 BC, among the items transferred from the *skeuotheke* to the «big storeroom close to the Gate», lists «four round iron hinges that come from the *kleithron*» (*ἀνφιδέαι σιδηραὶ στρογγύλαι ἀπὸ κλείθρου*- IIII-). The parallel with Philo's passage is obvious. It shows that a *kleithron* from the port was a device rotating on four iron hinges. It also strongly suggests that Philo was describing first the appearance of the *kleithron*, as an openwork object, and then, its system of female hinges (*περιτρέχουσαι καὶ στρογγύλαι, σιδηροῦς δὲ κόλπους ἔχουσαι*), which were to rotate around a vertical wooden axis, the whole constituting the complete hinges of the *kleithron*. With all due caution, one could imagine that the original text read roughly as follows: *τὰ δὲ στόματα τῶν λιμένων φράττειν τμητοῖς κλείθροις, ἐν οἷς εἰσι ἀνφιδέαι περιτρέχουσαι καὶ στρογγύλαι, σιδηροῦς κόλπους ἔχουσαι*... «To fence the passes of harbours with *kleithra* in which are round female hinges, with iron eyes». The same inventory follows with the mention of ten *kleithra* stored in the same place and moved from the «*skeuotheke*» of the wooden apparatus, suggesting it was made of timber.

Another passage in Philo is essential for understanding what *kleithra* would be. It describes how to breach or break these,³ differentiating them from a simple barrier or boom (*phragma*), in such a way that it is unclear whether *kleithra* and *phragmata* were two distinct solutions or complementary devices. Both *phragma* and *kleithra*, he says, can be attacked with the ram of a large warship. This is hardly compatible with

¹ PH. p. 100 Thévenot (Diels 4.53): *πρὸς δὲ τὰς ἀποτμήσεις τῶν ἀγκυρείων ἐὰν βαθὺς ὁ τόπος, ἀλύσεις, ἐὰν δὲ τεναγώδης, τὰς ἀγκύρας τῶν πλοίων χῶναι καθέξουσιν. Against the cutting of anchor lines, in deep waters cones, in shallow waters cones, will hold fast the anchors.*

² IG II² 1627 (330/29 BC), ll. 317 sq.

³ PH. p. 98 Thévenot (4.22-23 Diels): (22) *καὶ διασκάψας ταῖς μεγίσταις σκαφίσι τὸ κλείθρον τοῦ λιμένος, ἐὰν ἔχῃς καταφράκτους ναῦς, ποιήσαι τὴν προσβολὴν τοῖς ἐμπειροτάτοις οὖσι καὶ δυναμένοις κινδυνεύειν καὶ μάλιστα κατὰ θάλασ-*

σαν. (23) *τὴν δὲ διάσπασιν τοῦ φράγματος καὶ τῶν κλείθρων ἢ ταῖς ἐμβολαῖς τῶν νηῶν ποιητέον ἐστὶν ἢ ταῖς ἐνάψαι τῶν ἀγκυρῶν <δ>νεύοντα ἐκ τῶν προσαχθειςῶν ὀγκάδων.* (22) *After breaching the kleithron with the largest ships, if cataphracted ships are available, an entry must be made with the most experienced and boldest, especially at sea.* (23) *To break through the barrier and the kleithra, either the rams of warships should be used, or grappling hooks should be hooked on them and winched from cargo ships brought there.*

the device imagined by Diels, and, more generally, with a chain, which keeps, even in tension, enough elasticity to absorb most of the ram's impact. In fact, the use of the ram once again points us towards a wooden structure. It also points us towards a device of which at least a part was flush with the water or immersed: for instance, the head of the Athlit ram¹ is less than 50 cm high, of which only 30 cm protruded from the surface of the water once the ship was in its lines. The use of a large ship also indicates that the object to be destroyed was of significant size and strength. It was also possible, Philo adds, to send grappling hooks onto the structure and destroy it by winching the hooks from cargo ships, which were heavier than warships. These latter details suggest a significant elevation of the device above the water, as the grappling manoeuvre would make more sense if it were to take down a vertical structure than to dismantle a horizontal one. These converging clues make it necessary to consider Diels' hypothesis as pure fantasy, even though it has been followed by many a major modern scholar, who took in good faith Philo's text as genuine, while it was actually re-written and interpreted by Diels.²

If a beam or boom can be meant by *phragma*, and likely was used too for closing ports, the *kleithron* seems to have been a more impressive and complex device. All the evidence we have examined seems to point towards a kind of wooden gate, at least partly openwork, pivoting around a vertical axis, and suggests that part of it was immersed.

The hypothesis of a device situated entirely above the water, which scholars have often been tempted to identify with a simple beam or boom,³ is at first sight supported by a passage of Appian,⁴ which takes place during the siege of Cyzicus by Mithridates, in 74 BC, on the day of the festivals of Proserpine: «when the day of the feast came on which they sacrifice a black calf, for want of one, they made an imitation of it out of flour paste, but a black calf swam towards them from the sea, passed under the *kleithron* of the mouth (of the harbour), made its way towards the city, and from there continued its way to the sanctuary until it came to stand before the altars».

If we take Appian's account at face value, it is certainly unlikely that a calf dived under the device, which should therefore be entirely above water, but the text aims entirely at describing a mere extraordinary and ominous miracle, which consists in both the announcement of Mithridates' failure and a means of dramatizing his impiety as the cause for his final failure. Nothing resists the prodigious animal, which breaks the siege on its way to its own sacrifice: it swims in from the open sea, then dives (this is indeed the sole meaning of the verb *ὑποδύω* in the context of swimming) under the *kleithron*, enters the besieged city, walks through it, and spontaneously presents itself for sacrifice ... Each of these episodes is, and has to be, incredible, and contributes to the extraordinary character of this prodigy, on a par with Mithridates' impiety, when he refuses to acknowledge its premonitory, ominous nature. Once replaced in its context, this text cannot be taken for granted, nor is it possible to rely

¹ ORON 2006, p. 66, fig. 4.

² For instance, MURRAY 2012, p. 291.

³ BAIKA, 2013, p. 213; LØVÉN 2021, p. 24-28.

⁴ APP. *Mith.* 12.75 [323]: ἐπελθούσης δὲ τῆς ἑορτῆς, ἐν ἧ θύουσι βοῦν μέλαιναν, οἱ μὲν οὐκ

ἔχοντες ἐπλαττον ἀπὸ σίτου, μέλαινα δὲ βοῦς ἐκ πελάγους πρὸς αὐτοὺς διενήχθητο, καὶ τὸ κλειθρον τοῦ στόματος ὑποδύσα τε καὶ ἐς τὴν πόλιν ἐσδραμούσα ὠδευσεν ἀφ' ἑαυτῆς ἐς τὸ ἱερὸν καὶ τοῖς βωμοῖς παρέστη.

on its sole testimony to establish that the *kleithron* was a barrier or a beam located above the water, which would not fit well with Philo's description about how to destroy it. This passage tells us exactly the contrary: to get through a *kleithron* a swimmer had to dive under it, which means that the *kleithron* was at the best a flush device, and more likely a partially immersed device, but not so deep that the tip could reach the sea-bottom.

In the current state of the art, archaeology does not provide any decisive answer. The negative impressions of a wooden device located at the entrance to the port of Halieis have been interpreted as the remains of a rotating device, which some have reconstructed, in a rather hypothetical way, as a beam supported by a chain and pivoting around a vertical axis.¹ Thus restored, it would be a device entirely located above water. But the restitution of this device, preserved only under the form of a hollow in the structure of the quay, has been contested in its entirety.²

The idea of a simple movable beam above the water cannot be ruled out, but today it raises at least as many problems as it solves, especially when it comes to its length. In the case of a 50m wide pass, such as those in the ports of Piraeus, one must imagine a length of at least 25m per gate, unless the passage was divided by turrets. Such large spans would create a considerable cantilever and shear effect on the vertical axis of the rotation system. To limit this effect, the end of the beam opposite the hinge would be supported either by a floating device or by an outrigger attached to a guyed mast. None of these solutions was technically out of reach of the Ancients.

Conversely, the idea of larger devices, of which at least a part would have been submerged, is supported by several clues, as we could see above. In addition to this evidence, Th. Theodoulou kindly informed me of the existence of a submerged hinge device at the entrance to the port of Samos, which would mean a partially submerged device, but this discovery is still unpublished. If confirmed, it would reinforce our interpretation of the Piraeus inventory and the new interpretation of Philo that we may draw from it.

A simple door (with one or two leaves) seems to be excluded, although doors could be used to close the entrance of a port. Diodorus explicitly mentions a door that closed the basin of the neoria of Ortygia built by Dionysius the Elder in Syracuse around 404 BC.³ This gate closed a channel that allowed only one ship to enter at a time. This probably represents a total span of 12 to 18m, which was to become a standard width in the Hellenistic age, corresponding to the width of a trier under oars or a Syracusan Five using only the lower row of oars,⁴ and gates 6-9m wide per leaf. It is remarkable that Diodorus does not use the word *kleithra*, which he uses several times elsewhere, either literally or figuratively, but rather the word *pyle*. If one admits

¹ JAMESON 1969, p. 335-336.

² FROST 1985, p. 63-66.

³ D.S. 14.7: ὠκοδόμησε δ' ἐν αὐτῇ πολυτελεῶς ὠχυρωμένην ἀκρόπολιν πρὸς τὰς αἰφνιδίους καταφυγὰς, καὶ συμπεριέλαβε τῷ ταύτης τείχει τὰ πρὸς τῷ μικρῷ λιμένι τῷ Λακκίῳ καλουμένῳ νεώρια· ταῦτα δ' ἐξήκοντα τριήρεις χωροῦντα πύλην εἶχε κλειομένην, δι' ἧς κατὰ μίαν τῶν νεῶν εἰσπλεῖν συνέβαινε. *He also built on the island, at*

great expense, a fortified acropolis designed as a place of refuge in case of immediate need, and within this enclosure he included an arsenal that communicated with the Small Harbour, also known as the Lakkaion, this arsenal had a capacity of sixty triers and its entrance was closed by a gate through which only one ship could sail at a time.

⁴ MORRISON 1996, p. 56-57.

– but this remains a pure hypothesis – that Diodorus had a precise idea of what he was describing under the name of *kleithra*, these would be in his eyes a device that was different from simple doors.

A major piece of evidence to imagine what *kleithra* could be is provided by Strabo in the description of the canal which, from the Nile, led to Lake Moeris and allowed for regulating the water flows between the Nile and this gigantic natural reservoir.¹ We learn that *kleithra* were located at the «mouths» (*stomata*) of the canal, in the same way as those of the ports were located at their mouths (*stomata*). Strabo obviously chose to use the word *kleithra* by analogy with those of the ports to designate the sluices located at the entrances of this canal, the Bahr Yussuf, and used to regulate the flows. The use of a word obviously inspired by the closing device of the harbour passes gave the reader the image of a known and similar device in order to understand by analogy the sluices of the Nile. It is unclear whether *kleithra* was a technical word for sluices or just a metaphor. In any case, the synonymy entitles us to think that there was a strong analogy in form and design between the sluices of the Bahr Yusuf and the harbour *kleithra*. If our conclusion is right, *kleithra* would have been composed of immersed gates much similar in aspect to those of sluices and were likely using the same apparatus and organisation for opening and closing the gates.

Another lexical parallel could complete our hypothetic reconstruction of harbour *kleithra*. The Latin word *clatri*/-*a* (also *clathri*/-*a*), directly derived from *kleithra*, by metathesis, characterizes the openwork structure of windows, especially in thermal baths and basilicas,² or partition walls, especially to limit spaces or in livestock pens, and all types of window bars.³ A mosaic from Hippo⁴ illustrates the appearance of these *clatri* and gives them the form of openwork lattices, in wood or stone. The semantic field that emerges is twofold: that of a barrier and that of a sort of openwork grid, as suggested by Buecheler's edition of the controversial passage by Philo of Byzantium.

One might argue that the width of some of the passes is as much as 50m in Mounichia and Kantharos (TAB. 1). The necessary span would therefore reach 25m per clapper, which may at first sight seem excessive, but, if one assumes that the immersed part of each gate was compact, like in a sluice gate, and that only the aerial parts were openwork like *clatri* to minimise overall weight, then the Archimedean thrust might have limited the shear effect on the axis. *Kleithra* in the plural form would anyway mean a complex system such as that of sluices.

To summarise, from the analysis of the occurrences and semantic fields attached to each of the words used by our sources, it seems that the Greek Mediterranean mainly knew, from the second half of the 5th century BC at the latest, three types of harbour closing devices based on pivoting obstructions. The lightest, the *phragma*, may have been a simple boom or beam slightly above the water. The use of a regular gate (*pyle*),

¹ STR. 17.1.37: ἐπίκειται δὲ τοῖς στόμασιν ἀμφοτέρους τῆς διώρυγος κλειθρα οἷς ταμιεύουσιν οἱ ἀρχιτέκτονες τὸ τε εἰσρέον ὕδωρ καὶ τὸ ἐκρέον. *And kleithra are located at both mouths (of the canal), which allow their designers to regulate the flow of water running to and from the lake.*

² CIL VI, 260 (p. 3756) = D 5448; CIL VI, 636; CATO, Agr. 14. 2.

³ DEMANGEL 1935.

⁴ BOULINGUEZ, NAPOLI 2008.

probably protected by towers, was limited to narrow passes (less than 20m, and probably closer to the width of a trier under oars, i.e., 12m).

Between these two models stood the *kleithron*, irreducible to the two previous solutions. The *kleithra* seem to us to be rather a system based on gates comparable to sluice gates, except for the aerial part, which would be openwork. These kinds of gates would have been mounted on hinges; they were protected by fortifications and provided with flanking towers in imitation of urban gates. Characteristic of the classical Greek world, this type of closure seems to have gradually disappeared from our documentation during the 1st century BC, as the use of chains spread in the Mediterranean from the Punic world, as we shall see in next issue of this Journal.

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