



MODEL OF A PENTERRE IN THE TIME OF ALEXANDER THE GREAT.

## NAVAL ARCHITECTURE IN ANCIENT TIMES.

[TRANSLATED FOR THE "C. I. NEWS," FROM THE GERMAN OF CAPT. WERNER.]

During the last forty years a great revolution in the marine of civilized nations has taken place. The application of steam to navigation, the invention of the screw, the large increase of international commerce with the competition resulting from it; the iron-clads, and connected therewith, the constant enlarging of ordnance, have exercised the greatest influence on the building of merchant vessels and men-of-war. A comparison of our iron-clads with Nelson's flag-ship "Victory," or of the "Great Eastern" with any trading vessel at the commencement of this century, shows strikingly what giant progress in naval architecture has been made in so comparatively short a time, and we have a right to be proud of such results. Navigation has ever been promoted as the education of mankind has improved, and each is dependent on the other.

A retrospect of the marine of the time when the culture of Greece and Rome had progressed so far as to be even now a model for some branches of art, will therefore not be without interest to him who makes this branch of science his study. He will notice the correctness of the remark that education and navigation are reciprocally connected, but at the same time he must confess that we have no reason to be proud of the development of our navigation, inasmuch as the progress made in ship-building during 2000 years is but comparatively small.

As to the date when navigation was first introduced, we can only make conjectures; it is clear, however, that it goes back to the remotest period; if we take the figures in the Bible, according to which Noah's ark was 600 feet long, 120 broad, and 60 high, we find that the vessel was about the same dimensions as the leviathan ship "Great Eastern."

The difficulty of crossing rivers which impeded the spread of mankind, naturally led to the first means of navigation: trees were felled into the water, out of which rafts—the first type of the vessel of to-day—were formed; next came the canoe, hollowed out of a tree by means of fire or a stone, and then, as necessity demanded, appeared the river-craft and sea-going vessel, which were composed of several parts, and provided with sails, helm, anchor, and all those thousand things which make the modern ship a little world of its own.

The invention of those different improvements is ascribed by the ancient writers to mythic persons; thus is the sail to Dedalus and Aeolus, the helm to Typhis, &c.

Recent discoveries prove to a certainty the advanced state of the art of navigation in pre-historic times. A German explorer, Dr. D., who made the discoveries, has brought with him from Egypt a highly interesting collection of photographs and drawings of sculptures, inscriptions, &c., taken from the tombs belonging to the time of the first Egyptian dynasties, i.e., 4000 years before Christ, and this collection promises to be of the greatest importance to the students of archaeology. The same contains also images of ships, and in such colossal proportions as to give a pretty correct idea of their construction, size, and management. These vessels were moved by oars and one sail, the mast being in the middle; their length was

from 50 to 60 feet, and usually held from 30 to 40 people; they had neither anchor nor helm, and we take it for granted that they were only river-crafts; the steering was done by means of oars which were larger than those used in propelling the vessel.

Two thousand years after the period to which Dr. D.'s discoveries extend, the colonization of Greece by Egyptians commenced; in the 19th, 16th and 15th centuries B. C. Inachus, Cecrops and Danaus landed in that country; we also learn that about the latter period Sesostris built a fleet of 400 vessels, but have no information as to the state of marine architecture at that time.

We are better acquainted with the Phenicians, those bold traders and sea-farers who, two thousand years before the Christian era, navigated and colonized the different coasts of the Mediterranean, and are even said to have visited England and the Baltic shores. Navigation on the Mediterranean, with its sudden heavy gales, requires sea-fit vessels, strong enough to sail to the north of Europe. The Argonautic expedition appears to have been the first voyage of the Greeks, though it is not proved in history. We have more particular information of the Trojan expedition, which took place in 1100 B. C.; the fleet taking over the Grecian army consisted of 1,186 vessels, the largest of which could carry 120 men and the smallest 50; they had one mast and a row of oarsmen, but their construction needed no great perfection or strength, as the Egean sea they had to cross is very quiet in summer, and is interspersed with so many islands which offer protection by land every four or five miles. Such historical facts make also very doubtful the historical faithfulness of father Homer with reference to the ten years' roving by Ulysses.

The Grecian navy improved considerably in the following centuries; and at the commencement of the Persian wars, about 500 B. C., they had fleets of men-of-war with three tiers of oars; while at Salamis and in the Peloponnesian war battles were fought with three-decked vessels, and when Syracuse aspired to the sway over the Mediterranean, the navy was brought to a high state of perfection, combining the superiority of Grecian and Carthaginian architecture.

Ships with four to five decks were built, with which Philip of Macedonia, and his great son at the head of Greece, snatched from the Syracusans the sway over the Eastern Mediterranean.

Till lately we were at a loss as to the construction, size and strength of the ancient vessels, as the statements made by the classic writers were, in many cases, imperfect and exaggerated, and far less could the figures on coins, &c., of that period, be relied upon.

It is only within the last ten years that any doubts entertained on this subject have been solved, and this by getting an insight into the nautical affairs of Athens at the time of Alexander the Great.

In the year 1834, while digging the foundation for a magazine at Piræus, the port of Athens, the workmen found the ruins of a colonnade, belonging to the late Roman period, with seventeen marble plates, all bearing inscriptions of date 330 to 310 B. C., from which we gather information of the state of

the Athenian marine of that period; although this information does not reach us in a direct way, we are yet enabled, by drawing conclusions, making calculations, &c., to form a very correct idea of it. From the dimensions of parts of vessels given on the plates referred to, a German professor has constructed a model of an antique five-decked vessel, which was rigged out in the royal dock-yard at Dantzie. From an inspection of this vessel we have a very fair idea of the state of the navy two thousand years ago, and cannot help being struck with the progress made in ship-building at that time.

In former times the greatest difficulty for the explorer was to place the men, the number of which, according to the old writers, often amounted to one thousand men on one vessel. Vessels of eight, sixteen, and even forty tiers are spoken of by these writers. They do not, however, explain how so many oars could be managed; we now learn that the seats were arranged one above the other like steps, placing the men in such a position that the head and shoulders of one were between the legs of the one above him.

From these records we also learn particulars regarding the dimensions and crews of such ships, i.e., five-deckers, were 168 feet long, 22 to 26 feet broad, and drew 12 feet of water; their tonnage was 534 tons. The crew numbered 275; of these 310 were oarsmen, 15 to 20 marines, and the remainder, officers. The proportion of length to breadth of these men-of-war is very remarkable, being on the average 1 to 16, while the proportion on ships of our time is 1 to 6. The difference in these proportions is easily accounted for, from the fact that vessels of the olden time had no means of fighting unless brought in contact with each other. Their tactics in a naval engagement consisted almost entirely in running each other down; the greatest swiftness and skill of manœuvring was therefore necessary. Sails alone being insufficient, the oars were the chief means of moving vessels which, consequently, were built very long in proportion to breadth.

The extraordinary length of the ships required a very firm, and at the same time elastic, construction, to enable them to overcome the motions of the waves and to defeat their adversaries without suffering any injury themselves.

This problem was solved in a masterly manner by the ancients, and as at that time the supremacy over the Mediterranean signified as much as the supremacy over the whole, then known world, we can easily understand that the naval powers should have directed their whole energy to the improvement of ship-architecture, in which we find they have been most successful. The fine and slender forms of their ships excite our admiration even at the present day. The principles of constructing ships were at that time the same as at present; the exterior form of the antique vessels, however, differed from ours, in so far as both their fore and aft parts were pointed. The helm was arranged in a different way from ours, which being hooked on the stern-post, passes through an opening into the inside of the vessel; their stern-post was bent and did not allow the helm to be hooked on it; they were obliged to hang the helm at the side of the stern-post, and to place its axis in the opening of the ship. This fastening was very deficient; they tried to remedy it, partly by availing themselves of two smaller helms instead of one large one (one at