the beak, the line of the parodus or outside gangway, the wickerwork cancelli, @@1 the shields ranged in order along the side of the bulwark, and the heads of a typical crew on deck (the *πpωpevς* looking out in front in the forecastle, an *eπιβdτηs,* two chiefs by the mast, and, aft, the κeλeυσττ∕s and *κvβcpvητη).* The supporting timbers of the deck are just indicated. The mast and yard and fore and back stays, with the double steering paddle, complete the picture.

But, although there can be little doubt that the Phoenicians, after the Egyptians, led the way in the development of the shipwright’s art, yet the informa­tion that we can gather concerning them is so meagre that we must go to other sources for the description of the ancient ship. The Phoenicians at an early date con­structed merchant vessels capable of carrying large car­goes, and of traversing the length and breadth of the Mediterranean, perhaps even of trading to the far Cassi­terides and of circumnavigating Africa. They in all probability (if not the Egyptians) invented the bireme and trireme, solving the problem by which increased oar- power and consequently speed could be obtained without any great increase in the length of the vessel.

It is, however, to the Greeks that we must turn for any detailed account of these inventions. The Homeric vessels were aphract and not even decked throughout their entire length. They carried crews averaging from fifty to a hundred and twenty men, who, we are expressly told by Thucydides, all took part in the labour of rowing, except perhaps the chiefs. The galleys do not appear to have been armed as yet with the beak, though later poets attri­bute this feature to the Homeric vessel. But they had great poles used in fighting, and the term employed to describe these (*vavμaχa)* implies a knowledge of naval warfare. The general characteristics are indicated by the epithets in use throughout the *Iliad* and the *Odyssey.* The Homeric ship is sharp *(θoη)* and swift *(ωκcιd)∙,* it is hollow *(κo∣λη, yλaφvpη,μeγaκηrηζ),* black, vermilion-cheeked *(μυ∖τoτrapΥ∣oς),* dark-prowed *(κνανόπρωρος),* curved (κopωvtς, *aμxf>ιtλισσa),* well-timbered *(tvσσeλμoς),* with many thwarts *(πoλvζvγoς, ∈κaτoζυγoς).* The stems and sterns are high, upraised, and resemble the horns of oxen *(opθoκpaipcu).* They present a type parallel in the history of the shipping of the Mediterranean with that of the vikings’ vessels of the North Sea.

On the vases, the earliest of which may date between 700 and 600 b.c., we find the bireme with the bows finished off into a beak shaped as the head of some sea monster, and an elevated forecastle with a bulwark evidently as a means of defence. The craft portrayed in some instances are evidently pirate vessels, and exhibit a striking contrast to the trader, the broad ship of burden (φopτ ∈υpetα), which they are overhauling. The trireme, which was developed from the bireme and became the Greek ship of war (the long ship, *vas μ,ακρά, navis lonya, par excel­lence),* dates, so far as Greek use is concerned, from about 700 b.c. according to Thucydides, having been first built at Corinth by Aminocles. The earliest sea-fight that the same author knew of he places at a somewhat later date, —664 b.c., more than ten centuries later than some of those portrayed in the Egyptian tomb paintings.

The trireme was the war ship of Athens during her prime, and, though succeeded and in a measure superseded by the larger rates,—quadrireme, quinquereme, and so on, up to vessels of sixteen banks of oars *(inhabilis prope magnitudinis),—*yet, as containing in itself the principle of which the larger rates merely exhibited an expansion, a difference in degree and not in kind, has, ever since the revival of letters, concentrated upon itself the attention of

the learned who were interested in such matters. The literature connected with the question of ancient ships, if collected, would fill a small library, and the greater part of it turns upon the construction of the trireme and the disposition of the rowers therein.

During the present century much light has been thrown upon the disputed points by the discovery (1834) at the Piraeus of some records of the Athenian dockyard super­intendents, which have been published and admirably elucidated by Boeckh. Further researches carried out by his pupil Dr Graser, who united a practical knowledge of ships and shipbuilding with all the scholarship and industry and acumen necessary for such a task, have cleared up most of the difficulties which beset the problem, and enable us to describe with tolerable certainty the details of construction and the disposition of the rowers in the ancient ship of war.

One point it is necessary to insist on at the outset, because upon it depends the right understanding of the problem to be solved. The ancients did not employ more than one man to an oar. The method employed in mediæval galleys is entirely alien to the ancient system. M. Jal, Admiral Fincati, Admiral Jurien de la Gravière, and a host of other authorities have all been led to erroneous views by neglect of the ancient texts which overwhelmingly establish this as an axiom of the ancient marine—“one oar one man.”

The distinction between “aphract” and “cataphract” vessels must not be overlooked in a description of the ancient vessels. The words, meaning “unfenced” and “fenced,” refer to the bulwarks which covered the upper tier of rowers from attack. In the aphract vessels these side plankings were absent and the upper tier of rowers was exposed to view from the side. Both classes of vessels had upper and lower decks, but the aphract class carried their decks on a lower level than the cataphract. The system of side planking with a view to the protection of the rowers dates from a very early period, as may be seen in some of the Egyptian repre­sentations, but among the Greeks it does not seem to have been adopted till long after the Homeric period. The Thasians are credited with the introduction of the improvement.

In describing the trireme it will be convenient to deal first with the disposition of the rowers and subsequently with the con­struction of the vessel itself. The object of arranging the oars in banks was to economize horizontal space and to obtain an increase in the number of oars without having to lengthen the vessel. We know from Vitruvius that the “interscalmium,” or space horizontally measured from oar to oar, was 2 cubits. This is exactly borne out by the proportions of an Attic aphract trireme, as shown on a fragment of a bas-relief found in the Acropolis. The rowers in all classes of banked vessels sat in the same vertical plane, the seats ascending in a lino obliquely towards the stern of the vessel. Thus in a trireme the thranite, or oarsman of the highest bank, was nearest the stern of the set of three to which he belonged. Next behind him and somewhat below him sat his zygite, or oarsman of the second bank ; and next below and behind the zygite sat the thalamite, or oarsman of the lowest bank. The vertical distance between these seats was 2 feet, the horizontal distance about 1 foot. The horizontal distance, it is well to repeat, between each seat in the same bank was 3 feet (the seat itself about 9 inches broad). Each man had a resting place for his feet, somewhat wide apart, fixed to the bench of the . man on the row next below and in front of him. In rowing, the upper hand, as is shown in most of the representations which remain, was held with the palm turned inwards towards the body. This is accounted for by the angle at which the oar was worked. The lowest rank used the shortest oars, and the difference of the length of the oars on board was caused by the curvature of the ship’s side. Thus, looked at from within, the rowers amidship seemed to he using the longest oars, but outside the vessel, as we are expressly told, all the oar-blades of the same bank took the water in the same longitudinal line. The lowest or thalamite oar-ports were 3 feet, the zygite 41/4 feet, the thranite 5 1/2 feet above the water. Each oar-port was protected by an *ascoma* or leather bag, which fitted over the oar, closing the aperture against the wash of the sea with­out impeding the action of the oar. The oar was tied by a thong, against which it was probably rowed, which itself was attached to a thowl (σκαλμοί). The port-hole was probably oval in shape (the Egyptian and Assyrian pictures show an oblong). We know that it was large enough for a man’s head to he thrust through it.

The benches on which the rowers sat ran from the vessel’s side to timbers which, inclined at an angle of about 64° towards the ship’s stern, reached from the lower to the upper deck. These timbers were, according to Graser, called the diaphragmata. In the trireme each diaphragma supported three, in the quin­quereme five, in the octireme eight, and in the famous tessera-

@@@1 See Rawlinson, *Ancient Monarchies,* vol. ii p. 176.