conteres forty seats of rowers, who all belonged to the same “complexus,” though each to a different bank. In effect, when once the principle of construction had been established in the trireme, the increase to larger rates was effected, so far as the motive power was concerned, by lengthening the diaphragmata upwards, while the increase in the length of the vessel gave a greater number of rowers to each bank. The upper tiers of oars­men exceeded in number those below, as the contraction of the sides of the vessel left less available space towards the bows.

Of the length of the oars in the trireme we have an indication in the fact that the length of supernumerary oars *(πeρivtφ)* rowed from the gangway above the thranites, and therefore probably slightly exceeding the thranitic oars in leugth, is given in the Attic tables as 14 feet 3 inches. The thranites were probably about 14 feet. The zygite, in proportion to the measurement, must have been 101/2, the thalamite 71/2 feet long. Comparing modern oars with these, we find that the longest oars used in the British navy are 18 feet. The university race is rowed with oars 12 feet 9 inches. The pro­portion of the loom inboard was about one third, but the oars of the rowers amidship must have been somewhat longer inboard. The size of the loom inboard preserved the necessary equilibrium. The long oars of the larger rates were weighted inboard with lead. Thus the topmost oars of the tesseraconteres, of which the length was 53 feet, were exactly balanced at the rowlock.

Let us now consider the construction of the vessel itself. In the cataphract class the lower deck was 1 foot above the water­line. Below this deck was the hold, which contained a certain amount of ballast, and through an aperture in this deck the buckets for baling were worked, entailing a labour which was constant and severe on board an ancient ship at sea. The keel (τpoπιs) appears to have had considerable camber. Under it was a strong false keel (χeλurrμ,α), very necessary for vessels that were constantly drawn up on the shore. Above the keel was the kelson (δpuoχoj∕), under which the ribs were fastened. These were so arranged as to give the necessary intervals for the oar-ports above. Above the kelson lay the upper false keel, into which the mast was stepped. The stem (στiΓpα) rose from the keel at an angle of about 70° to the water. Within was an apron (≠<xλκts), which was a strong piece of timber curved and fitting to the end of the keel and beginning of the stern-post and firmly bolted into both, thus giving solidity to the bows, which had to bear the beak and sustain the shock of ramming. The stem was carried upwards and curved generally backwards towards the forecastle and rising above it, and then curving forwards again terminated in an ornament which was called the acrostolion. The stern-post was carried up at a similar angle to the bow, and, rising high over the poop, was curved round into an ornament which was called “aplustre” *(άφλαστον).* But, inasmuch as the steering was effected by means of two rudders (πηδάλια), one on either side, there was no need to carry out the stern into a rudder post as with modern ships, and the stern was left therefore much more free, an advantage in respect of the manœuvring of the ancient Greek man-of-war, the weapon being the beak or rostrum, and the power of turning quickly being of the highest importance.

Behind the “aplustre,” and curving backwards, was the “cheniscus” *(χηvισκos),* or goose-head, symbolizing the floating powers of the vessel. After the ribs had been set up and covered in on both sides with planking, the sides of the vessel were further strengthened by waling-pieces carried from stern to stem and meeting in front of the stern-post. These were further strengthened with additional balks of timber, the lower waling-pieces meeting about the water-level and prolonged into a sharp three-toothed spur, of which the middle tooth was the longest. This was covered with hard metal (generally bronze) and formed the beak. The whole structure of the beak projected about 10 feet beyond the stern- post. Above it, but projecting much less beyond the stern-post, was the “ proembolion ” *(πρoeμβoλιov),* or second beak, in which the prolongation of the upper set of waling-pieces met. This was generally fashioned into the figure of a ram’s head, also covered with metal ; and sometimes again between this and the beak the second line of waling-pieces met in another metal boss called the *πρoeμβoλis.* These bosses, when a vessel was rammed, completed the work of destruction begun by the sharp beak at the water-level, giving a racking blow which caused it to heel over and so eased it off the beak, and releasing the latter before the weight of the sinking vessel could come upon it. At the point where the pro­longation of the second and third waling-pieces began to converge inwards towards the stem on either side of the vessel stout catheads (iπαm'δes) projected, which were of use, not only as supports for the anchors, but also as a means of inflicting damage on the upper part of an enemy’s vessel, while protecting the side gangways of its own and the banks of oars that worked under them. The catheads were strengthened by strong balks of timber, which were firmly bolted to them under either extremity and both within and without, and ran to the ship’s side. Above the curvature of the upper waling-pieces into the *πρoeμβdλιov* were the cheeks of the vessel, generally painted red, and in the upper part of these the

eyes *(οφθαλμοί),* answering to our hawse holes, through which ran the cables for the anchors. On either side the trireme, at about the level of the thranitic benches, projected a gangway (πάροδοί) supported by brackets (j8tαχα) springing from the upper waling- piece, and resting against the ribs of the vessel. This projection was of about 18 to 24 inches, which gave a space, increased to about 3 feet by the inward curve of the prolongation of the ribs to form supports for the deck, for a passage on either side of the vessel. This gangway was planked in along its outer side so as to afford protection to the seamen and marines, who could pass along its whole length without impeding the rowers. Here, in action, the sailors were posted as light-armed troops, and when needed could use the long supernumerary oars *(πtpivιω)* mentioned above. The ribs, prolonged upwards upon an inward curve, supported on their upper ends the cross beams (στρωτηpej) which tied the two sides of the vessel together and carried the deck. In the cataphract class these took the place of the thwarts *(ζυya)* which in the earlier vessels, at a lower level, yoked together the sides of the vessel, and formed also benches for the rowers to sit on, from which the latter had their name ({,υγΓται), having been the uppermost tier of oarsmen in the bireme ; while those who sat behind and below them in the hold of the vessel were called *Θaλaμ7τaι* or *θaλdμaκeς* (from *θάλαμος).* In the trireme the additional upper tier was named from the elevated bench *(θρcivoς)* on which they were placed *(θρav7τai).* On the deck were stationed the marines *(lπιβdτaι),* fighting men in heavy armour, few in number in the Attic trireme in its palmy days, but many in the Roman quinquereme, when the ramming tactics were antiquated, and wherever, as in the great battles in the harbour at Syracuse, land tactics took the place of the maritime skill which gave victory to the ram in the open sea. The space occupied by the rowers was termed *tyκωπov.* Beyond this, fore and aft, were the παp∈ξezρ0nα, or parts outside the rowers. These occupied 11 feet of the bows and 14 feet in the stern. In the fore part was the forecastle, with its raised deck, on which was stationed the πpωpeυs with his men. In the stern the decks (f∕rpzα) rose in two or three gradations, upon which was a kind of deck-house for the captain and a seat for the steerer *∖κυβepvηr-ηs),* who steered by means of ropes attached to the tillers fixed in the upper part of the paddles, which, in later times at least, ran over wheels (τροχζλίαι), giving him the power of changing his vessel’s course with great rapidity. Behind the deck-house rose the flagstaff, on which was hoisted the pennant, and from which probably signals were given in the case of an admiral’s ship. On either side of the deck ran a balustrade *(cancelli),* which was covered for protection during action with felt *(cilicium, παραρρύματα τρίχινα)* or canvas (π. *λeυκa).* Above was stretched a strong awning of hide *(κατάβλημα),* as a protection against grappling irons and missiles of all kinds. In Roman vessels towers were carried up fore and aft from which darts could be showered on the enemy’s deck ; the heavy corvus or boarding bridge swung sus­pended by a chain near the bows ; and the ponderous *δtλφις* hung at the ends of the yards ready to fall on a vessel that came near enough alongside. But these were later inventions and for larger ships. The Attic trireme was built light for speed and for ramming purposes. Her dimensions, so far as we can gather them from the scattered notices of antiquity, were probably approximately as follows :—length of rowing space *(Zyκωπov)* 93 feet ; bows 11 feet ; stern 14 feet; total 118 feet; add 10 feet for the beak. The breadth at the water-line is calculated at 14 feet, and above at the broadest part 18 feet, exclusive of the gangways ; the space between the diaphragmata mentioned above was 7 feet. The deck was 11 feet above the water-line and the draught about 8 to 9 feet. All the Attic triremes appear to have been built upon the same model, and their gear was interchangeable. The Athenians had a peculiar system of girding the ships with long cables *(iπoζωμaτa),* each trireme having two or more, which, passing through eyeholes in front of the stern-post, ran all round the vessel lengthwise immedi­ately under the waling-pieces. They were fastened at the stern and tightened up with levers. These cables, by shrinking as soon as they were wet, tightened the whole fabric of the vessel, and in action, in all probability, relieved the hull from part of the shock of ramming, the strain of which would be sustained by the waling- pieces convergent in the beaks. These rope-girdles are not to be confused with the process of undergirding or trapping, such as is narrated of the vessel in which St Paul was being carried to Italy. The trireme appears to have had three masts. The mainmast carried square sails, probably two in number. The foremast and the mizen carried lateen sails. In action the Greeks did not use sails, and everything that could be lowered was stowed below. The mainmasts and larger sails were often left ashore if a conflict was expected.

The crew of the Attic trireme consisted of from 200 to 225 men in all. Of these 174 were rowers,—54 on the lower bank (thalamites), 58 on the middle bank (zygites), and 62 on the upper bank (thranites),—the upper oars being more numerous because of the contraction of the space available for the lower tiers near the bow and stern. Besides the rowers were about 10 marines *(tπtβaτai)* and 20 seamen. The officers were the trierarch and next