

New Vanguard

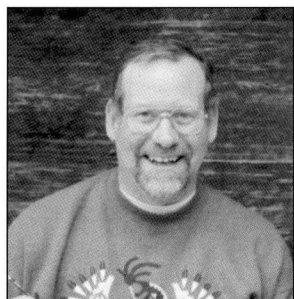
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Fighting Ships of the Far East (1)

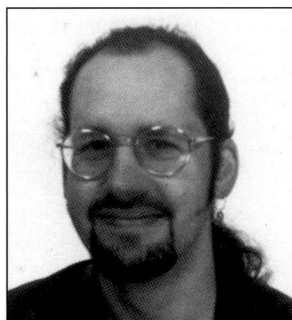
China and Southeast Asia 202 BC–AD 1419



Stephen Turnbull • Illustrated by Wayne Reynolds



STEPHEN TURNBULL is the world's leading English language authority on medieval Japan and the samurai. He has travelled extensively in the Far East, particularly in Japan and Korea and is the author of *The Samurai – A Military History* and *Men-at-Arms 86: Samurai Armies 1550–1615*.



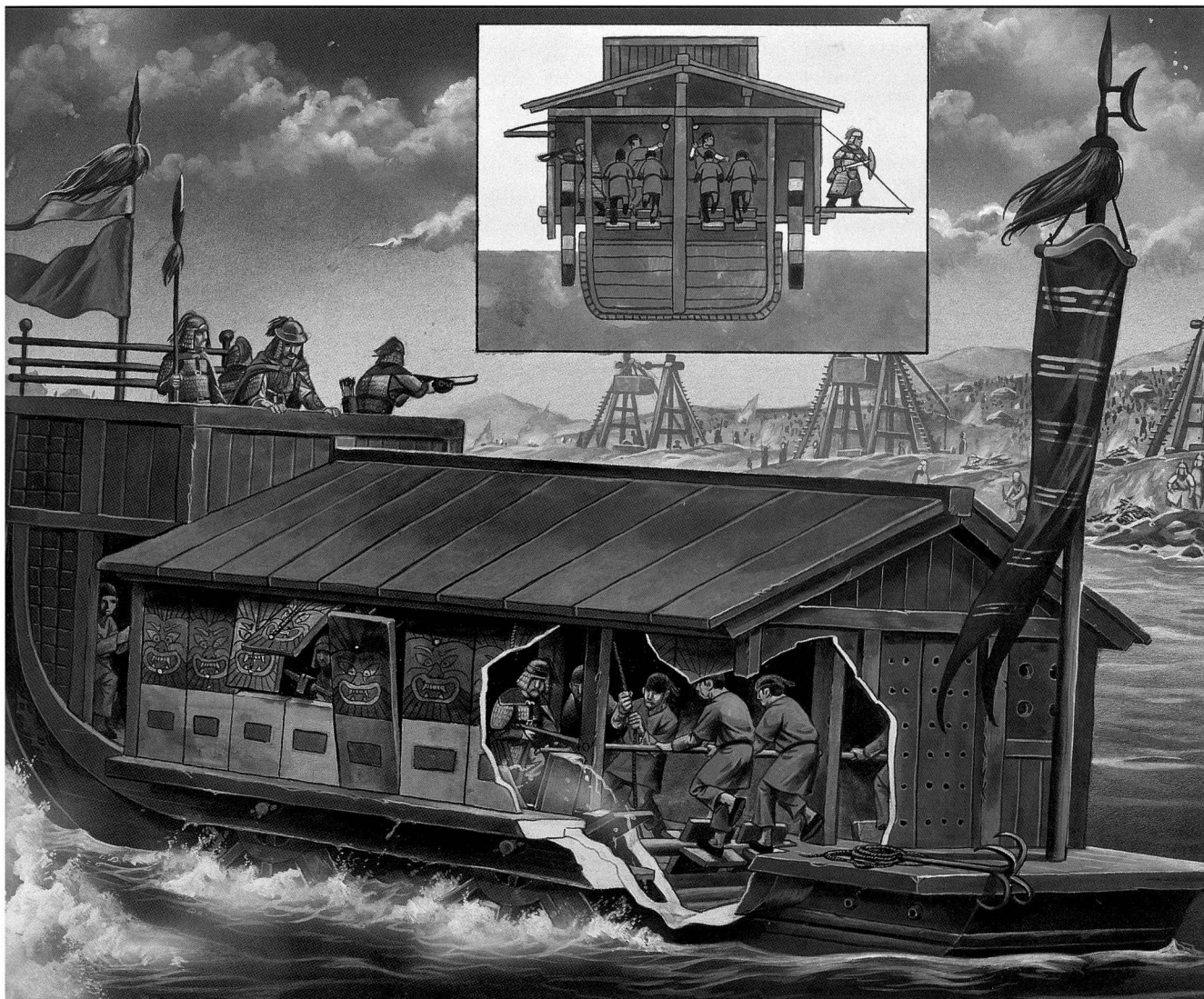
WAYNE REYNOLDS was born in Leeds, UK, and attended art college in Middlesbrough. He has had a life-long passion for illustration, and since 1991 has worked as a professional artist. Wayne has provided illustrations and source material for many gaming companies, creating figures, landscapes and interiors, as well as providing core characterisation. He is perhaps best known though for his work on titles such as *2000AD*, *Slaine*, and *Judge Dredd*. Wayne is also a keen modeller and historical re-enactor.

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Wayne Reynolds, 20 Woodside Place, Burley, Leeds, LS4 2QU, UK

Author's Note

To Stephen Randall

FIGHTING SHIPS OF THE FAR EAST (1) CHINA AND SOUTHEAST ASIA 202 BC-AD 1419

INTRODUCTION

These books complement my two previous volumes in the New Vanguard series that deal with the medieval siege weapons of the Far East. Here the subject is the fighting ships of China, Korea, Japan and Southeast Asia during roughly the same period, where we will see a similar ingenuity applied to military matters over an equally wide range of technology, and with equally impressive results.

The division between the two siege-weapon books was made according to weapon type. Here the division is by country and by time period, and it has seemed most sensible to deal with China and Southeast Asia together in Volume 1. For China the period covered is from the beginning of the Han dynasty to the first half-century of the Ming dynasty. The era covers over 1,600 years, during which there was much development in Chinese fighting ships, but also a remarkable consistency both in naval architecture and the techniques of naval warfare. The Chinese section ends with the classic case study of the epic naval battle of Lake Poyang in 1363, won by the man who five years later became the first Ming emperor.

The classic sea-going Chinese junk, shown here during the disastrous attempt by the Yuan dynasty to invade Japan in 1281.



The connections between the Chinese dynasties and Southeast Asia are also explored, firstly, because there are strong links between the two areas in terms of the transmission of military technology, and secondly because the major naval campaigns of the Yuan dynasty were directed against Vietnam and Java, whose war barges and river warfare complete the survey.

As space is limited I have no wish to repeat earlier material, so I shall confine technical descriptions of such weapons as trebuchets and incendiary bombs to the modifications made to them for use in naval warfare rather than in a siege situation. Instead the focus will be on the ships themselves and how they were used in war, from multi-storey Chinese battleships to Cambodian war barges.

Many organisations and individuals have been more than helpful in the preparation of this volume, but I would particularly like to thank the Royal Armouries Museum, Leeds; Cambridge University Library; and the Museum of Chinese History in Beijing.

FIGHTING SHIPS AND NAVAL WARFARE IN THE ANCIENT AND MEDIEVAL FAR EAST

Fighting ships from Ancient China to the Tang

The countries covered in this volume have a long history in the use of fighting ships in naval conflict, and just as in the case of siege weapons, the tradition begins in ancient China.

As early as 486 BC, during the Chun Qiu ('Spring and Autumn') Period, we read of warships possessing similar characteristics to those that would be met centuries later, particularly the use of 'marines' fighting from deck castles. In 219 BC a similarly equipped fleet was sent to war by the Qin emperor. Large battle fleets were found during the Han dynasty (202 BC–AD 220), including one sent against Korea in 108 BC, and there are lively tales of warships in the accounts of the Three Kingdoms Period (AD 221–265). This is the time that is thought of by the Chinese as the era of military romance *par excellence*, where accounts tell us of double-hulled battleships being attacked by small boats whose bows were tipped with iron rams. Huge battleships then helped bring about the downfall of the former Three Kingdoms state of Wu in 285. Three centuries later in 584 a naval genius called Yang Su was commissioned by the Sui emperor to destroy the Chen dynasty, and constructed a one-hulled, five-storey tower ship. By the time of the Tang

The use of sampan-type boats for military purposes as depicted on the wall of a stone tomb in AD 147.





The 'sand boat', a word sometimes used for a Chinese warship, which is shown here crudely drawn and full of armed men. One source says, 'their bottoms are flat and broad; they can sail over shoals and moor near sandbanks, frequenting sandy creeks and havens without getting stuck'.

dynasty in the 8th century we have become used to references to ships of three storeys in height possessing 'bulwarks, arms, flags and catapults', and now read as well of Greek Fire being projected from ships.

The fighting ships of the Song dynasty

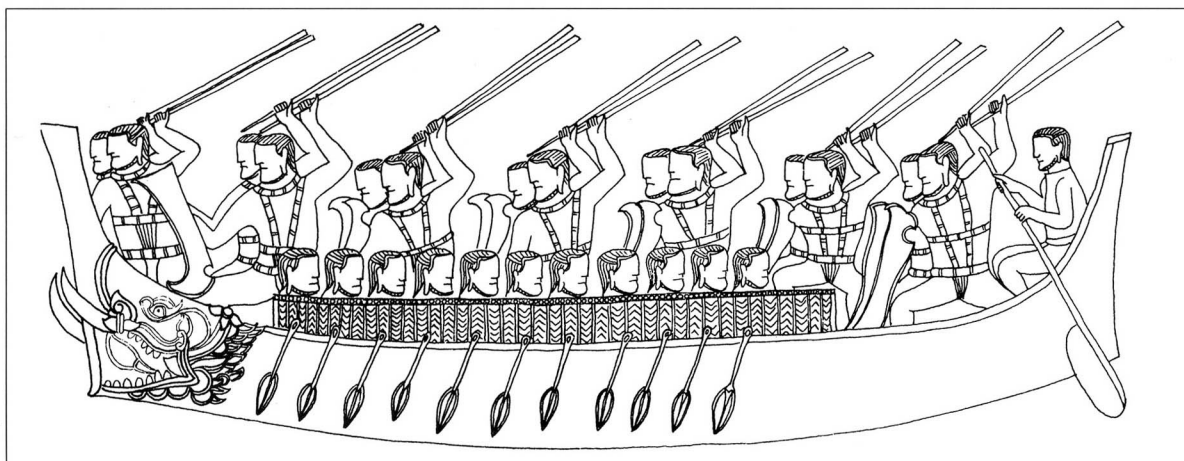
The Song dynasty, which replaced the Tang and reigned from AD 960 to 1279 in spite of interruptions and interregnums brought about by other dynasties, developed a considerable naval capacity, and shipyards were established in Hangzhou and elsewhere. The first Song emperor attached great importance to shipbuilding, and often made personal visits to the yards. Defence against pirate raids provided the initial stimulus for this enthusiasm, but the Song fleet soon proved vital in combating the Jin dynasty. During the 12th century the Jin fought a long war against the Song, and captured Kaifeng, the Song capital, in 1126. From this time on, Song hegemony was limited to southern China, so the dynasty became known as the Southern Song. It continued to fight back against the Jin, conducting operations from their new capital of Hangzhou from 1135 onwards, and much naval fighting took place.

Southeast Asia in the 12th century AD

The last quarter of the 12th century also saw the rivers and estuaries of Southeast Asia resound to naval warfare. While the Song were fighting the Jin, hundreds of miles to the south war barges and war canoes were going into action on behalf of the Khmer empire of Cambodia and the Chams of Champa (present day Vietnam). The war was indecisive for some time, but in 1177 King Jaya Indravarman decided on an invasion of Cambodia by sea. His fleet sailed up river to the Khmer capital of Angkor. The city was pillaged, and the Chams occupied Cambodia for the next four years. Other countries then took advantage of Cambodia's weakness. Ceylon sent a naval and military expedition against the Khmers in 1180, and this state of affairs continued until the future Cambodian king Jayavarman VII staged a revolt. He defeated the Chams in a great naval battle in 1181, an epic river fight commemorated forever in the bas-reliefs carved into the walls of Banteay Chmar and the Bayon in Cambodia. Further naval action followed 13 years later when King Jayavarman VII took his revenge on Champa. The defeated King Suryavarmadeva of Champa fled with his followers in more than 200 junks, and being warned that the local dignitary with whom he had taken refuge was planning to murder him, Suryavarmadeva set fire to his rival's junks while their guards slept, and then escaped in the confusion.

The rise of the Mongols

The early 13th century saw the rise of the Mongols, whose initial operations launched overland from the grassy steppes did not require



ABOVE A fine representation of a Khmer war barge going into action. The spearmen are at the ready. All have shields and apparently some form of simple armour.

BELOW A fanciful drawing of a fighting ship shaped like a dragon.

them to undertake any naval warfare. Even siege warfare was foreign to them at first, but when the neighbouring Xixia kingdom was conquered the Jin emperor considered it wise to put a barrier of water between himself and these wild horsemen. He accordingly moved from Zhongdu (modern Beijing) to the Jin's southern capital of Kaifeng, which was protected to the north by the natural moat of the Yellow River. The Mongols then overran Beijing and became the masters of northern China.

In spite of the new threat from the Mongols the Jin continued to fight the Southern Song, and we will note some further naval operations in this endeavour. The death of Genghis Khan in 1227 gave both kingdoms a brief respite from Mongol attentions, but in 1230 his successor Ogodei Khan began a large-scale operation against the Jin, culminating in 1232 in the celebrated capture of Kaifeng by the Mongols under their famous general Subadai. The Mongols pursued the Jin emperor to nearby Caizhou where he had taken refuge, and with his suicide in 1234 the Jin dynasty came to an end.

The founding of the Mongol navy

The conquest of the Southern Song was hindered temporarily by the death of Mongke Khan in 1259. The effort was resumed by Khubilai Khan, and became a colossal military undertaking that faced numerous obstacles. The Mongol armies were not used to the naval warfare that was now required in order to secure the rivers and ports of southern China, so the development of a Mongol navy became a top priority. In fact, transport by sea, and naval warfare in general, had not been needed at all until the invasion of Korea in 1231, but that campaign had taught the Mongols a very valuable lesson. The initial operation had been totally land-based. But when both sides suffered a



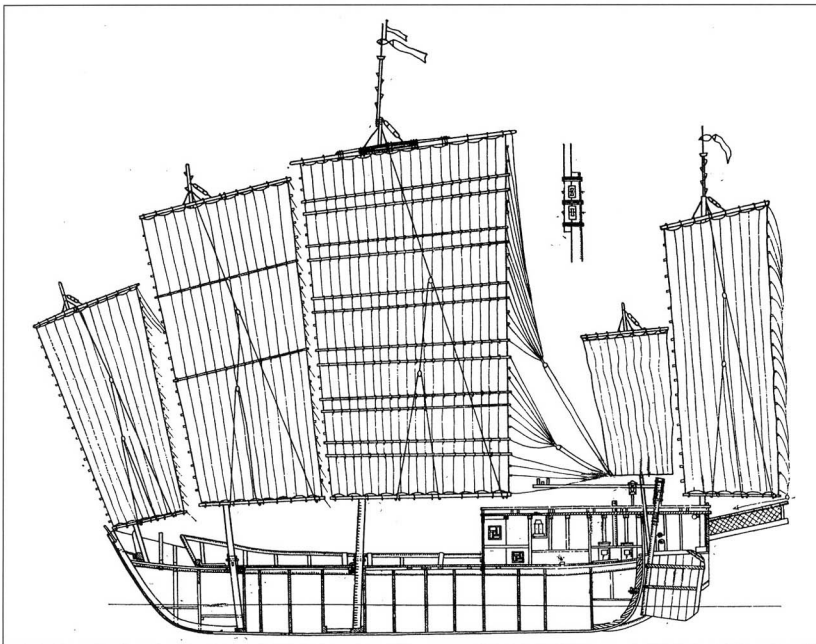
stalemate during the protracted siege of the town of Kuju in what is now North Korea, the Korean king took advantage of the opportunity to slip away with all his court from the capital at Kaesong to the island of Kanghwa. There he formed a government in exile, and resisted all Mongol attempts to capture him, even though the distance from Kanghwa to the mainland was only half a mile!

In addition to the lack of sea-going transport, the Mongol horsemen of the steppes were also faced with great rivers that would somehow have to be crossed and navigated in the unfamiliar climate and terrain of southern China. The first steps towards creating a Mongol navy occurred early in 1265 with a major battle at Diaoyu in Sichuan Province. The Mongols not only won the battle but captured 146 ships that then became the core of their fleet. The speed with which the Mongol navy then began to grow impressed a Chinese historian, who wrote, 'the alacrity with which the Mongols, a nation of horsemen unacquainted with the sea, took to naval warfare was amazing'.

Further defections from the Southern Song followed, and in 1273 an additional 500 ships entered Mongol service from a very unlikely source. Over the centuries, silt at the mouth of the Yangtze had produced a number of islands, and on the largest of these, Chongming, two pirates called Zhu Qing and Zhang Xuan had established themselves. They offered their services to the Mongol leaders, and soon found themselves in positions of responsibility. A further boost was given to the Mongol maritime capacity when the king of Korea saw his country ravaged around him and abandoned his offshore refuge. The resulting peace settlement handed the vast naval resources of Korea to Khubilai Khan, and the first use he made of them was in 1274 when the Mongols attempted to invade Japan. This well-known operation, which only lasted a couple of days and was essentially a reconnaissance in force, was nonetheless a considerable naval campaign.

The advance against the Southern Song continued using the Mongols' newly acquired skills in both naval and siege warfare, and in fact it was a sea battle that brought about the final eclipse of the Southern Song. Bayan crossed the Yangtze in 1275, and from 1277 the war against the Song developed into a seaborne chase from one port to another. The pursuit reached its climax in 1279 in a sea battle off Guangdong. The Mongols blockaded the Song fleet, which attempted to break out. In the fight that followed the Song imperial ship was one of the

The sha chuan or Jiangsu freighter, a sea-going junk that was probably the parent type for many kinds of Chinese ships, including ocean-going war junks. The largest types could reach nearly 200 feet in length, but this example is 85 feet long.



casualties, so an official took the child emperor in his arms and jumped into the sea, drowning them both.

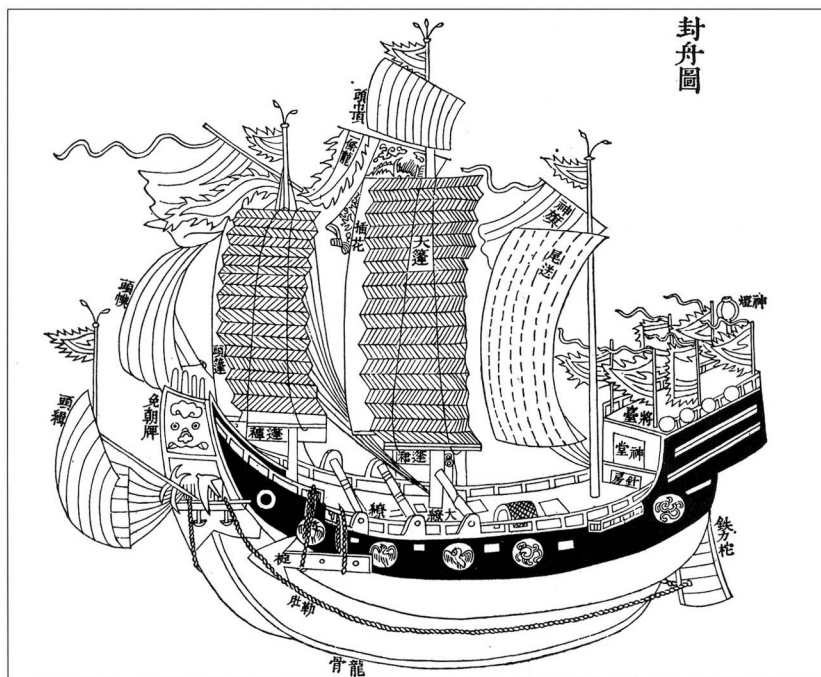
On completion of the conquest of the Southern Song the newly created Emperor Khubilai Khan of the Yuan dynasty of China turned his attentions once more towards Japan. He carried out a second invasion in 1281, but this attempt was no more successful than the first, and the fledgling Yuan fleet was smashed to matchwood by the *kami kaze*, the 'divine tempest' that saved Japan. Within a year the sailors of the Yuan dynasty had a new role, that of shipping and guarding grain convoys by sea from southern China to the Yuan capital at Beijing. This new enterprise was placed in the hands of the ex-pirates Zhu and Zhang, and was found to be a workable alternative to river transport. It also provided useful experience for the forthcoming series of naval expeditions to Southeast Asia.

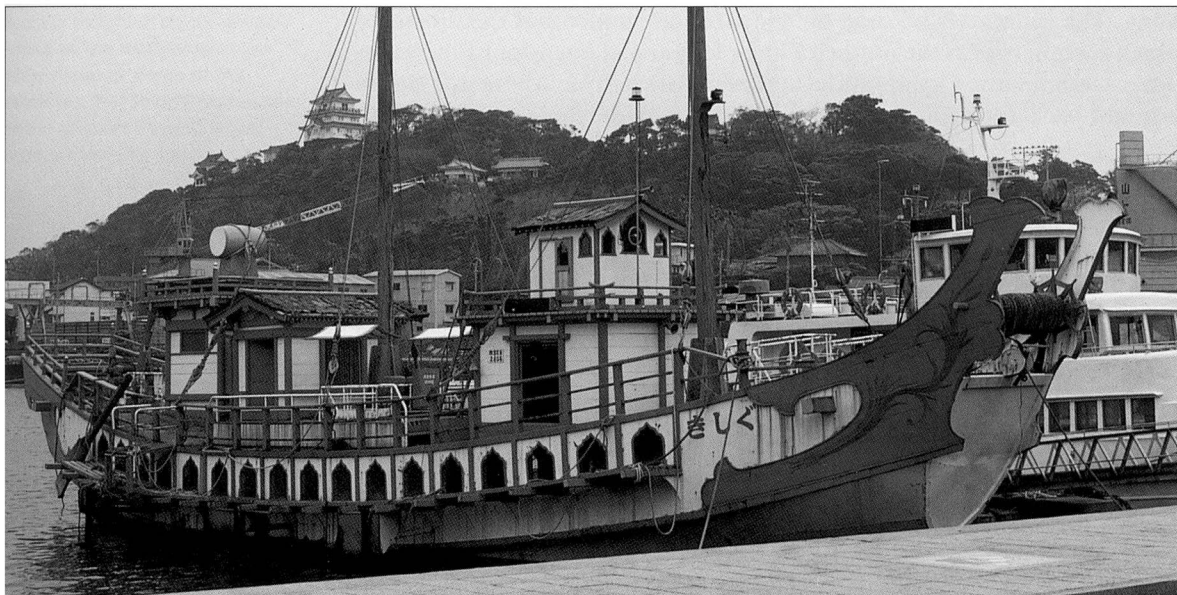
The Mongol naval campaigns in Southeast Asia

The greatest test for the Yuan navy came with their campaigns in Southeast Asia that added dense jungles, long rivers, insects and diseases to the Mongol learning curve. Vietnam was the first objective. At the time Vietnam was divided into two kingdoms: Annam in the north, with its capital at Hanoi, and Champa, home of the Chams, in the south. In 1281 the king of Champa aroused Mongol wrath by refusing to pay homage. Khubilai responded by sending Sodur, one of his leading officials, on a punitive expedition by sea with 100 ships and 5,000 men. This was an amphibious exercise on the model of the Japanese invasion, but the king withdrew to the mountains, and fierce guerrilla warfare prevented the Mongols from making any headway.

A Mongol expedition against Annam reached Hanoi by 1287 and the Annamese king fled. Not satisfied with his victory, the Yuan general Toghon unwisely returned during the hot season of 1288. This time a fierce naval battle took place in the estuary of the Bach Dang River off Haiphong, where a celebrated Vietnamese general had defeated a Chinese army several centuries before. General Tran Hung Dao now repeated the victory, using the same tactics, against the Mongols. He waited until high tide, and lured the Mongol fleet into advancing over an area of shallow water where iron-tipped stakes had been planted. When the tide turned the Mongol ships were caught on the projections, and suffered great

An ocean-going junk depicted in a printed work of 1757, but showing many traditional features.





A replica Chinese junk in the style of the ships of the Yuan dynasty that tried to invade Japan is seen here moored in the harbour of Hirado in Japan.

loss. On land too, they were forced to retreat because of the heat and the environment, much to Khubilai's anger, and the efforts to conquer Vietnam were effectively over.

A large naval force carried out the Mongol expedition against Java in 1292. The fleet set sail from Quanzhou and took several months to reach Java because they chose an open sea route, calling at small islands, rather than following the coast through Malacca and Sumatra. We are told that 'the wind was strong and the sea very rough, so that the ships rolled heavily and the soldiers could not eat for many days'. The Mongols landed near present-day Rembang, on the north-eastern coast, early in 1293. The Mongol commander disembarked half his army and instructed them to march overland in a show of force, while the rest of the troops continued eastwards by sea. The Chinese account tells us how 'the fleet in the river and the cavalry and infantry on shore then advanced together, and Hi-ning-kuan [the Javanese commander], seeing this, left his boat and fled overnight, whereupon more than a hundred large ships, with devils' heads on the stem, were captured'.

After four months of fighting the Mongol army began to suffer from the equatorial heat; so taking with them what prisoners and treasure they had gained, the fleet set sail for China and home.

Naval power in the founding of the Ming dynasty

It was not long before the Yuan dynasty in turn 'lost the mandate of Heaven to rule'. A rebel army under Zhu Yuanzhang captured Nanjing in 1356 and, with this as their base, began a campaign to overthrow the Yuan, although they had other rivals who wished to steal the prize from them. It was a naval battle fought on an inland lake that decided which of several rebel groups would succeed the Yuan as the new dynasty. This was the battle of Lake Poyang in 1363, described later as a case study in Chinese naval warfare. Zhu Yuanzhang, the victor of Poyang, took Beijing in 1368, and that same year proclaimed himself the first emperor of the

Ming. The Ming navy became the glory of the empire and the means by which such heroes as the eunuch Zheng He carried out astonishing expeditions to Sumatra, Ceylon, India and even Africa, from where in 1419 he brought back a spectacular cargo of lions, leopards, camels and giraffes.

TECHNIQUES AND TYPES OF CHINESE SHIPS AND SHIPBUILDING

The first Chinese ships

In common with many countries, the fighting ships of ancient and medieval China do not represent a development entirely separate from that of other craft, but were adapted from boats and ships designed for peaceful purposes. For this reason we will begin the study by taking an overview of Chinese ship design.

The history of shipbuilding in China is lost in the mists of legend and antiquity. Some of the ancient Chinese classics attribute the inspiration for the earliest craft to Fu Xi, one of the Five Great Rulers of the legendary period, from about 2852 to 2205 BC. Fu Xi is said to have made important contributions to divination and philosophy, and also to have introduced rafts to the Chinese people. The use of the word 'raft' is interesting because although many adjacent countries developed their craft through the medium of the dugout, China does not appear to have done the same. It seems quite reasonable to conclude that China's development of built-up craft came straight from the raft. In southern and central China rafts were generally made from bamboo, of which there was a local abundance, while in the Yellow River basin rafts based upon inflated hides were more common.

Until comparatively modern times similar rafts made from sheepskins or goatskins were still being used for passenger traffic or light cargo on the Yellow River. Single skins like waterwings were also used to support swimmers for short distances. In the case of larger rafts the skins were taken from yaks or bullocks. The prepared skins were stuffed with wool or tobacco leaves (to escape paying duty!) and inflated. The legs, pointing upwards, were lashed to the wooden framework of the raft, and the skins were tied together. A small 'one-man' raft consisted of a wooden platform about seven feet square, supported by between nine and 12 skins. Large rafts would be about 30–40 feet long and used up to 200 skins.

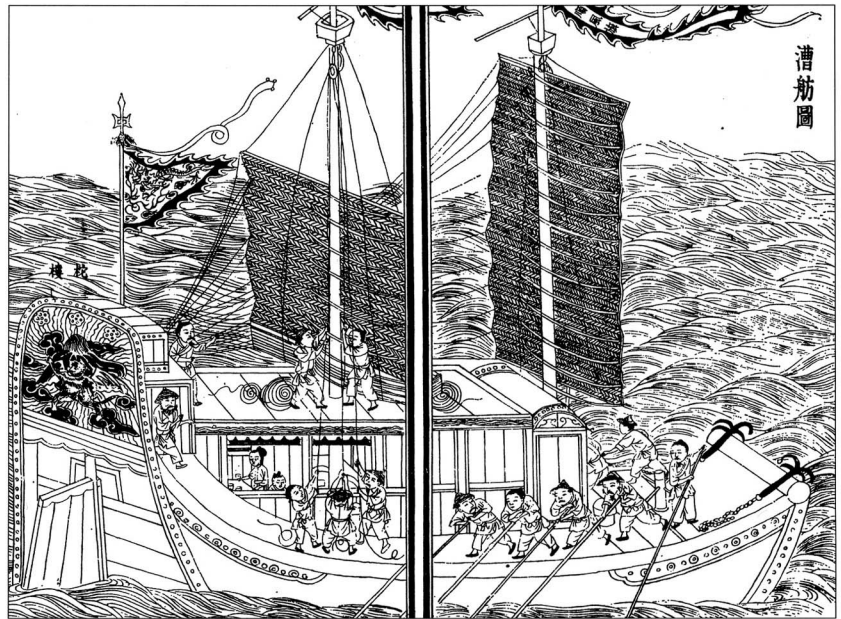
The sampan

When we turn to the first all-wooden boats in China we encounter a word that was to become very well known. The word 'sampan' is derived from the Chinese 'san' meaning 'three' and 'pan' meaning 'planks', the whole being a symbolic representation of a small boat. As a class it represents

A simple drawing of a Chinese fighting ship suitable for ocean-going work. Lots of lively military activity is going on.



A grain freighter on the Grand Canal at the beginning of the Ming dynasty. Some of the warships that fought during the battle of Lake Poyang would have looked like this.



a boat in its most rudimentary form, and doubtless the derivation of its popular name indicated its origin from a raft of three planks or logs. If its construction is studied, it becomes apparent how, through a process of evolution, it would occur to the ancient naval architects to build up the fore end of the raft to create a bow. Later improvements would have included the introduction of a transom in the stern. Ancient stone carvings give us our first pictures of Chinese sampans, and it is fascinating to note that one representation, dating from AD 147, shows sampans being used for naval warfare. The boats are of a characteristic shape, and we see combatants armed with swords and shields, while one has a bow and arrow. A single oarsman in the stern propels the sampans.

The eternal Chinese junk

The most commonly used word to describe any Chinese or even East Asian ship is 'junk'. This familiar expression was first used in a Western-language source in 1555, and is probably derived from a mishearing of *chuan*, the Chinese word for boat or ship. Unfortunately, the pejorative connotations of 'junk', in English at least, have tended to lead to a presumption that Asian ships were somehow inferior to Western ones, an impression that even a knowledge of the Ming voyages to Africa has done little to dispel. Yet in many respects Chinese ships were years ahead of their European counterparts, displaying such features as watertight bulkheads, balanced rudders and sails extended with battens long before these innovations were seen on Western ships. The expression 'junk' will occur frequently in the pages that follow, although a more useful nomenclature will enable us to identify warship types, including fighting junks, more precisely where this is possible.

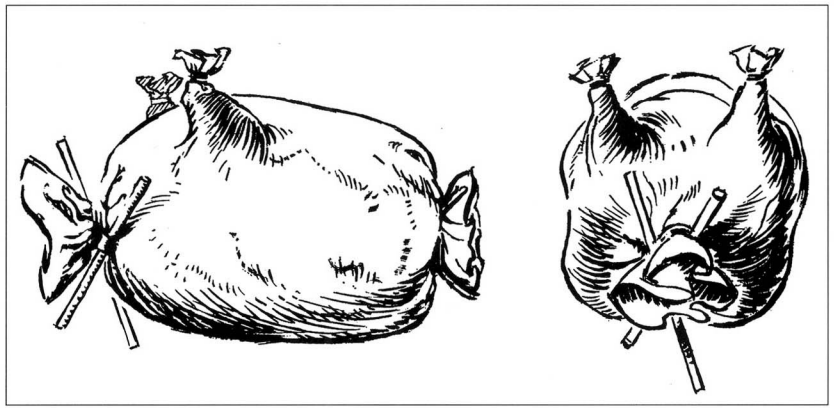
The construction of a Chinese junk

When a man decided to build a junk, he was not confronted with any difficulties in choosing its design. That was decided for him centuries

before, for certain types were proper to certain districts. Some slight modifications were permitted to meet particular requirements, but they were in no way allowed to interfere with the essential design. The methods employed in building a junk varied according to the locality and the type and size of the craft, but the following process may be taken as typical and would form the basis even for the different types of specialist warships described below.

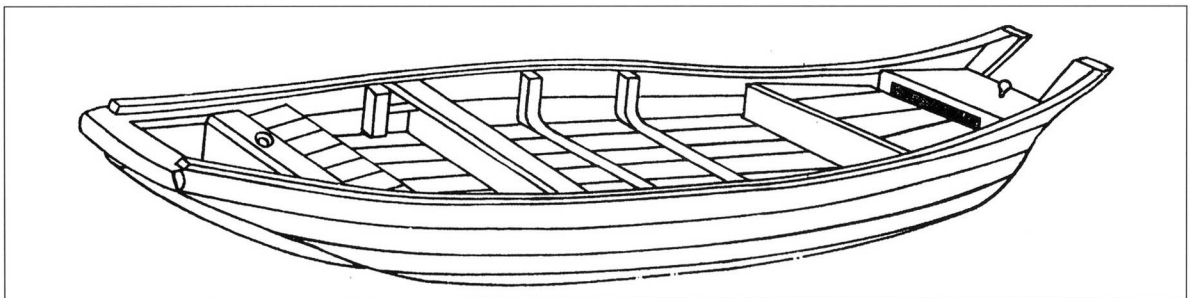
The initial operation was essentially to lay the flat planks for the bottom boards side by side on the ground over a central keel (where one was fitted) and secure them together. This was done using wrought-iron double-ended nails, the planks being knocked together to form a solid whole. At suitable intervals, according to the length of the junk and the strength of the construction desired, transverse bulkheads or ribs were placed in position on the bottom planks, each being fastened in the same manner. The carpenters, who worked without a rule, using only the carpenter's string, cut the side planks of the hull and the wales to shape. The side planks were then placed in position, hove down with ropes and finally nailed to the bulkheads. Deck beams, usually of hardwood, rested on all the bulkheads, their ends being let into the topmost side planks. Frames, when fitted, were next built into the junks. These consisted of two, three or more members scarfed and joined by heavy nails. The bow and stern were built up in more or less the same way according to the traditional design usual in the district. When the hull was complete the deck planking was added. Caulking was vital, and was carried out using a compound of lime and wood oil. The caulk set hard and white within about 48 hours to produce a watertight join.

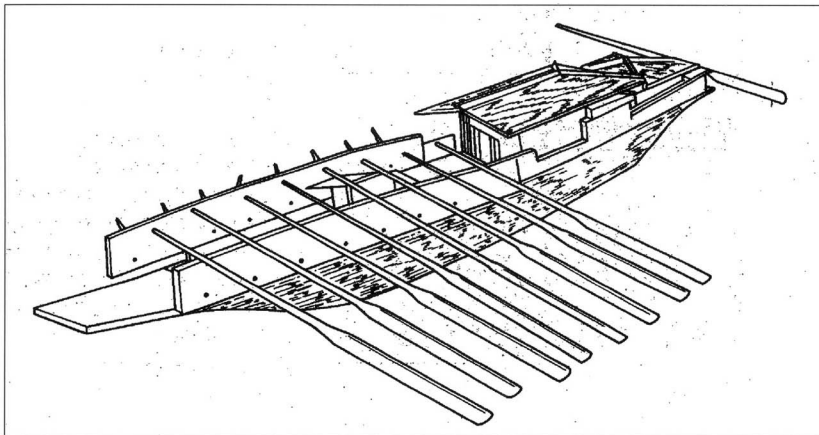
Sea-going commercial junks were important vessels in their own right, and there are good sources for them from the Song and Yuan dynasties. There is also an important pictorial source for a Chinese junk on one of the bas-reliefs at Angkor Thom in Cambodia, which may be dated to 1185. Similar vessels acted as warships during the Mongols'



The simplest form of water transport, still used in China until comparatively recently, was the inflated bullock skin. It could be used by an individual person, or tied together under hurdles to make simple rafts. Several cultures are known to have made military use of this simple vessel.

The sampan. The word derives from a Chinese expression for 'three planks'.





A drawing of a Han dynasty boat model excavated from a tomb. It is a flat-bottomed barge operated by oarsmen, with a steersman in the stern and a simple wooden 'cabin'.

masts, and he was fascinated to see that the design of the larger vessels meant that they possessed watertight compartments, something unknown in contemporary Europe: 'so that if by accident the ship is staved in one place, namely that whether it strikes a rock, or a whale-fish striking against it in search of food staves it in ... the water cannot pass from one hold to another'.

We may also note the 'sand ships', which were sea-going vessels: 'as their bottoms are flat and broad they can sail over shoals and moor near sandbanks, frequenting sandy creeks and havens without getting stuck'. These were simple junks without a keel.

Oar propulsion

One important characteristic of many types of Chinese vessel, both military and civilian, was the use of an oar known as the *yuloh*. This type of oar was radically different from conventional Western oars, and may also be seen in Korean and Japanese craft. Instead of being dragged through the water the *yuloh* operated on the principle of a screw, and consisted of a broad blade of hardwood joined to a central section or 'staff', which in turn was fixed to a handle or 'loom'. A rope was fastened at one end to the loom, and at the other end to a ring bolt on the deck. The *yuloh* rested on a fulcrum at about its point of balance. The rope balanced the weight of the blade and kept it at the correct angle as it was moved. A pull on the rope also controlled the feathering of the blade. In contrast to Western practice, instead of multiplying the number of oars to increase the power, more men were added to the same number of *yuloh*.

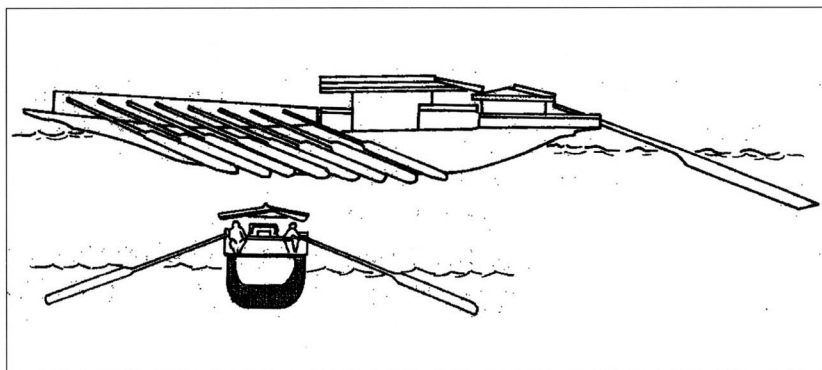
Sails, rudders and anchors

Sea-going junks would make use of wind power. The characteristic sail of China is known as the 'balance lug', whereby between one-sixth and one-third of the sail area was before the mast. The actual design depended on the traditions and environment of the particular area, but the overall construction was the same everywhere. Battens of bamboo, each of which connected with, and indeed formed part of, the sheet, stiffened the sail. The sail was therefore kept very flat. The battens also had other advantages that would be appreciated in a war situation. The sail could be half-full of holes and still be drawing well, and a man

overseas naval campaigns, as attested to in the paintings of Mongol ships that appear on the Mongol Invasion Scroll that illustrates the expeditions to Japan of 1274 and 1281. Marco Polo, who was in China between 1275 and 1292, adds more detail about junks. Among many other features, he noted with some approval one deck with little cabins, a good rudder and four

could use the battens to climb up the mast to throw bombs down on to an enemy deck from the crow's nest. In about 1100 an observer commented on a junk's employment of wind power as follows: 'Their masts are firmly stepped, and the sails are hoisted beside them. One side of the sail is close to the mast like a door on its hinges. The sails are made of matting ... At sea they can use not only wind from abaft, but winds from onshore or offshore ... When the wind is dead ahead they cast anchor and stop.'

Chinese junks were fitted with stern post rudders for steering. Some were very large, but all were superbly balanced. The anchors looked very crude, being usually made from a stone thrust through a piece of timber, but were very efficient.



The Han dynasty boat model reconstructed with side elevation.

THE CHINESE FIGHTING SHIP

Early specialist warships

The earliest known representation of a Chinese fighting ship may be found on a bronze vase of the 4th century BC preserved in Beijing. This is contemporaneous with the written records of deck castles on ships during the Warring States Period (463–221 BC). It is clearly a two-storey vessel. The rowers occupy the lower storey, while above them flags are flying as warriors engage with dagger-axe halberds and short swords. The other similar picture is from a later bronze of the Early Han Period (202–209 BC). Archers are more prominent here, and on the right-hand vessel one man is beating a drum. The inclusion of soldiers in the water alongside the fishes is interesting. They may represent guardian spirits, but as they are attired the same as the crews, and two of them appear to be engaged in combat, it is most likely that the fight is continuing under water.

Clay models of boats from archaeological excavations may be added to this picture to build up a good idea of what Han warships looked like, and a wooden model of a river boat found in a prince's tomb has also provided vital clues as to the appearance of a simple war vessel of the Han dynasty. It is a flat-bottomed barge operated by oarsmen, with a steersman in the stern and a simple wooden 'cabin'. The larger multi-storey vessels are likely to have been built as rafts mounted over two similar flat-bottomed hulls like an ungainly catamaran, with very simple multi-storey deck castles decreasing in size like a wedding cake (see Plate A). The ships would be used exclusively on rivers or estuaries. Details of sea-going craft of the later Han dynasty (AD 25–220) are also known, and these have typically bluff square-ended bows and sterns and flat bottoms, a style of naval architecture that was to become the traditional 'Chinese junk'.

The typology of Chinese warships

More types of ship are found as we move into the Three Kingdoms Period (AD 221–265), but their study is bedevilled by a bewildering range of names for Chinese fighting ships in the literature. However, a very useful document is the *Wu Jing Zong Yao* of 1044, which is derived from an earlier work of 759, which describes six types of fighting ship. These types constantly recur in the source material for the next ten centuries, and they provide the overall framework for discussing Chinese fighting ships from the Tang dynasty onwards. The classifications are:

1. Lou chuan

The literal translation is ‘tower ships’. These were three-storey battleships with fortified upper decks described in detail below. Unlike the Han multi-storey ships, they had flush sidewalls above a single hull, although there were many variations.

2. Zhan xian or Dou xian

Literally ‘war junks’ or ‘combat junks’, these craft resembled the tower ships in their design but were of a smaller-sized, one-storey construction and were less well protected. Just as with the tower ships, the oarsmen operated outside the central deckhouse, but there was a raised stern castle from where the captain directed operations.

3. Meng chong

The two characters *meng* (cover) and *chong* (swoop) imply a vessel that was covered over but still able to swoop on to its prey. These fast and light warships were the ‘destroyers’ of medieval China. Unlike the above two types, the wall of the two-storey meng chong was continuous with its hull, so that the oarsmen who occupied the lower deck were fully protected, while missile troops went into action above their heads. Close-combat grappling was therefore not a primary function of these ships. The ‘armour plating’ was of wood or rhinoceros hide, and there was a fierce tiger’s face painted on the bow.

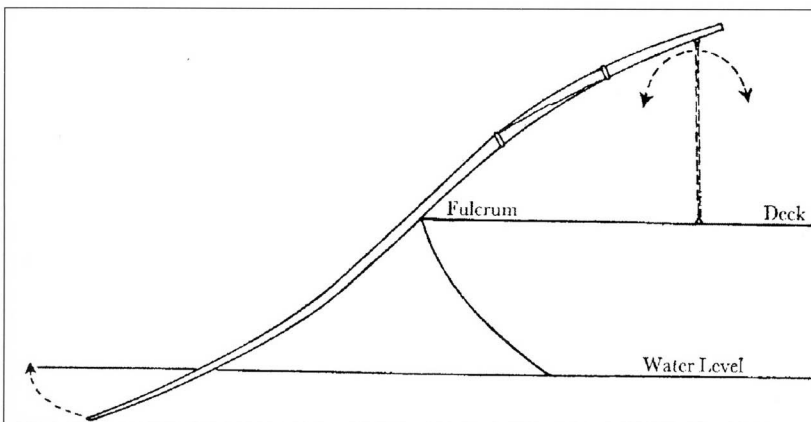
4. Zou ge

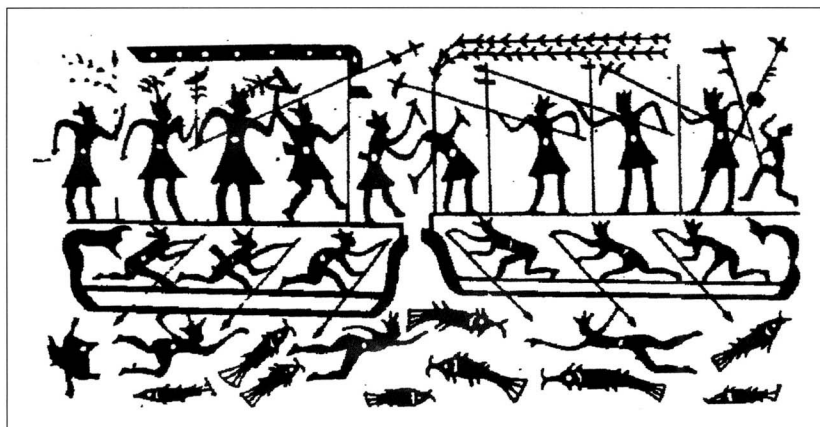
These smaller fast ships had one open deck with protective bulwarks, and carried ‘the best and bravest soldiers’, who were transported rapidly to and from the scene of action. The design meant that the soldiers were on deck alongside the rowers.

5. You ting

These simple patrol boats were used for scouting and reconnaissance, and were not primarily fighting ships as such, although they would have a small detachment of marines on board for self-defence.

The yuloh-type oar, showing its component parts and mode of action by rotation.





The earliest known representation of a Chinese fighting ship on a bronze vase of the 4th century BC preserved in Beijing. It is a two-storey vessel. The rowers occupy the lower storey, while above them flags are flying as warriors engage with dagger-axe halberds and short swords.

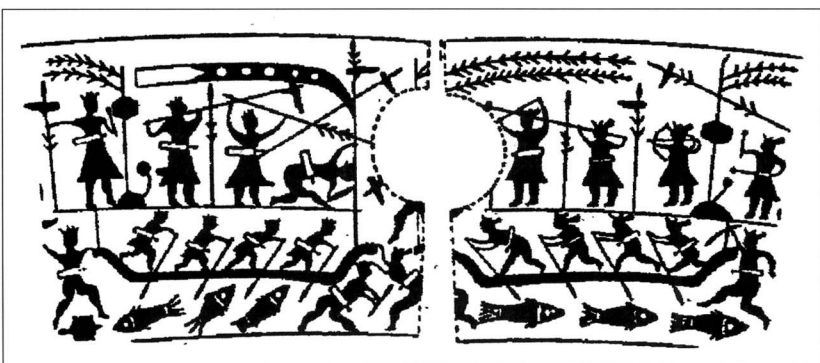
6. Hai hu

Literally 'sea hawks', these were converted merchant vessels to which protective features were added for use in war.

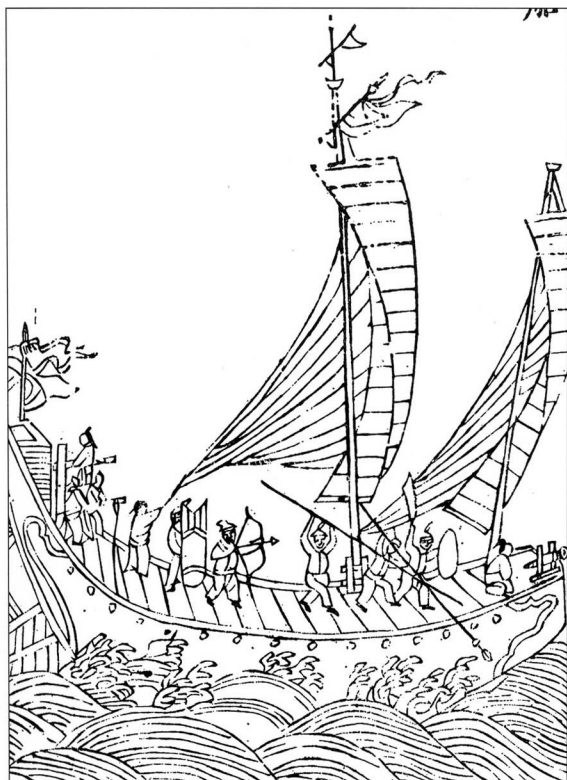
Lou chuan: The medieval Chinese battleship

There are so many accounts of the important lou chuan, the tower ships of the fleet from the Han dynasty to the Ming, that we can have a fairly good idea of what they looked like. They were multi-storey in construction and had portholes and other openings for crossbows and lances. Trebuchets (both traction and counterweighted) were mounted on the uppermost deck beside portable forges for molten iron projectiles. In later varieties under the Ming dynasty, cannon and other firearms replaced the trebuchets. On its wide and curved bow was painted a fierce tiger's face in lieu of a carved figurehead. A door gave access to the bow areas and the sides from the castled area. The whole ensemble, says an early description, resembled a city wall.

Variations on the theme of the tower ship are encountered throughout history, as the following selection of examples will show, and their great size made them almost literally 'floating fortresses'. This was in fact the exact consideration entered upon in 285 in a war against the former Three Kingdoms state of Wu. Their enemies controlled no strong points on the borders of their territory, and decided to remedy this deficiency by building what amounted to a wooden castle and floating it downstream. The naval architect was one



Warship from a bronze of the Early Han Period (209–202 BC). Archers are more prominent here, and on the right-hand vessel one man is beating a drum. The inclusion of soldiers in the water indicates that the fight is continuing under water.



A smaller warship of Jiangsu style depicted in the *Wu Bei Zhi* of 1628. The vessel carries a small cannon in its bow.

Wang Chun, nicknamed the 'prancing dragon admiral', who produced a square-shaped tower ship with multiple hulls (perhaps four sets of four), 600 feet along each side and capable of holding 2,000 men. Horses could be ridden round its wooden ramparts. At the bows there were decorations of birds and animals 'to overawe the river spirits'. The ship was built in Sichuan Province, and warning was given to the Wu by pieces of scrap wood that floated downstream. The Wu prepared accordingly by erecting iron chain booms and planting iron stakes in the river. But the advance of the floating fortress down the Yangtze was preceded by piloted rafts that took the impact of and broke the underwater obstacles. The boats holding the chains were then set on fire and the river was cleared of all hindrances for the great ship's magnificent descent.

As no other descriptions of the huge ship exist we cannot be precise about whether it was the earlier Han dynasty type of 'wedding cake' warship, or the later lou chuan. But it is almost certainly the latter version that is being described in 584 when Yang Su was commissioned by the Sui emperor to destroy the Chen dynasty. He

constructed a one-hulled, five-storey tower ship of which one feature was a set of the strange 'striking arms' as described below. Multi-decked lou chuan battleships are also reported in 934, and in 1048 the Liao dynasty built warships that could carry horses below decks and men above, and these worked effectively as landing craft along the Yellow River. Finally, in 1170, a traveller on the Yangtze watched naval manoeuvres carried out by 700 ships, each about 100 feet long with castles, towers, flags flying and drums beating as they moved rapidly even against the current.

We will look in detail at the armaments of all six categories of ship in a later section, but it is worth noting that there are many variations of style within these categories. Some vessels were simply adaptations of sea-going transport junks, which enabled fighting to take place on the open seas rather than on rivers and coastal waters. The earlier list quoted above is also non-specific about the motive power of the vessels, so the paddle-wheel ship is not directly identified. This is such an important category of warship that the section that follows will be devoted solely to it.

Paddle-wheel fighting ships

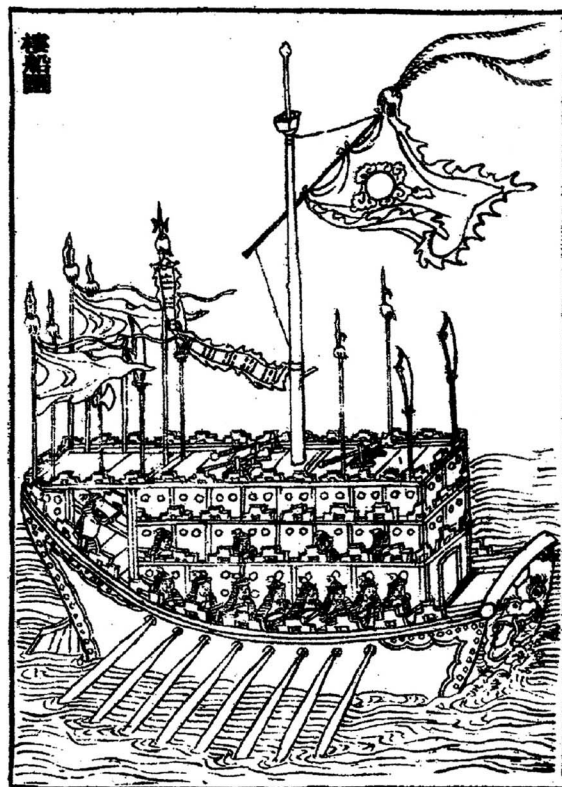
In 1842, during the Opium Wars, a naval battle took place in the estuary of the Yangtze between Chinese ships and vessels of the Royal Navy. When the British commanding officer wrote an account of the incident he drew particular attention to the fact that while the British used steam-powered paddle-wheel ships of the very latest design, the Chinese ships were also powered by paddle-wheels, but in their case the motive force was

provided by manpower. He concluded rather patronisingly that this idea 'must have been suggested to them by the reports they received concerning the wonderful power of our steamers or wheeled vessels', all of which showed the rapid changes that the Chinese were making towards modernisation when they were confronted by superior Western technology. In fact the reality of the situation lay in exactly the opposite direction, because the Chinese paddle-wheel vessels were a 19th-century manifestation of a type of warship that had been used by them for hundreds of years. If anything, the British were the copyists, having simply applied steam power to the established principle of paddle-boat design in the mid-18th century.

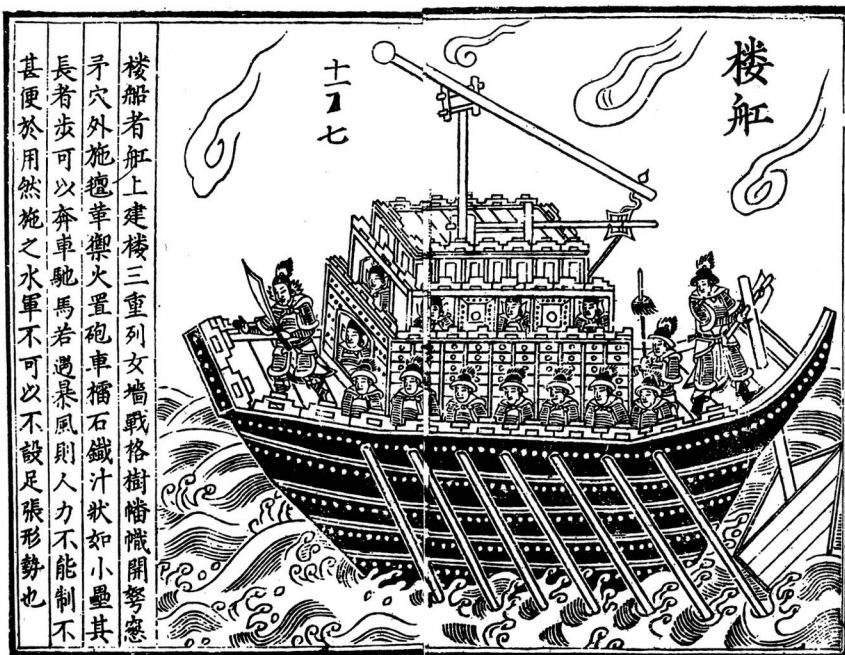
Even before the Spring and Autumn Period there are references in the Chinese literature which imply the existence of paddle-wheel ships. Here are descriptions of vessels that could cover considerable distances 'without the help of wind', where 'the men propelling the boats were all inside the vessels'. Their enemies, noting the absence of oars and oarsmen, concluded that they were operated by spirits. A reference to a battle that took place in AD 418 notes the ships moving away from their moorings 'apparently by themselves', and a century and a half later we read of 'foot boats', which gives a further clue as to how the manpower was converted into motive power. This matter was further clarified in AD 782, when, 'Li Gao, always eager about ingenious machines, caused naval vessels to be constructed, each of which had two wheels attached to the side of the boat, and made to revolve by treadmills. The ships moved like the wind, raising waves as if sails were set.'

By 'treadmill' however, we must not conjure up images of prisoners walking inside some enormous wheel. The treadmills that operated the paddle-wheels were smaller devices, with pedals projecting radially from the axle, upon which a man, or a team of men, trod from an external position, a principle similar to that of the 'pedalo' found on holiday beaches. As all the Chinese texts remark on the speed attained, some form of gearing may also have been incorporated.

It was during the time of the Southern Song that paddle-wheel warships really came into their own as war vessels. When the Song dynasty was driven south by the Jin, the Yangtze River became its 'Great Wall', and paddle-wheel ships were regularly used for patrolling the river against Jin incursions. They were employed in battle in 1130 when the Jin were trying to withdraw across the Yangtze after one of their raids, and in 1132 a report noted that 'to defend the thousand-li vastness of the Great River it is necessary to have warships'. The writer then reported that he had designed a 'flying tiger warship' with four wheels at the sides. Each wheel had eight blades and was rotated by four men. The ship could travel 1,000 li a day.



A four-decker lou chuan battleship armed with counterweight trebuchets, which dates it to after 1272.



The lou chuan (battleship) in the 1520 edition of *Wu Jing Zong Yao* (AD 1044). It has the characteristic open construction whereby the oarsmen are protected only by the ship's gunwales. Its offensive armament is a counterweight trebuchet.

driven by 20 or even 23 wheels then followed from Gao Xuan's drawing board, and the sources tell us that his largest ships were 200–300 feet long and could carry 700–800 men. Unfortunately the technology fell into the wrong hands when a pirate fleet captured two eight-wheeled paddleships that had become stranded in a tidal river. On board one of them was Gao Xuan himself, who was taken captive. The pirates forced him to work for them, and within two months they had built paddle-wheel ships that were better than the imperial originals, which their rebel fleet then proceeded to ram and bombard with traction trebuchets. The account goes on to say that the imperial forces in their turn copied the rebels' large paddle-wheel ships and replied with the exploding bombs described in a later section.

The eventual government triumph in 1135 came about from a curious stratagem that took advantage of a design weakness in the paddle-wheel ship. General Yo Fei, one of China's greatest naval heroes, covered the surface of the water of one arm of the lake with masses of floating weeds and rotten logs, and lured the pirate fleet on so that their paddle-wheels became entangled and could not move. His boarding parties then swarmed on board and won a notable victory.

In 1161 there occurred the most celebrated naval battle between the Southern Song and the Jin, when the latter, who were that day under the personal command of their emperor, attempted to force a crossing of the Yangtze at Caishi. The Song paddle-wheel fighting ships went into action as they had against the pirates and moved rapidly round the island of Jinshan to bombard the Jin with traction trebuchets:

But our fleet was hidden behind Jinshan, with orders to come out when a flag signal was given. So a horseman was sent up to the top of the mountain with a hidden flag, and then our ships rushed forth from behind on both sides. The men inside them paddled

At about the same time another inventor called Gao Xuan produced an eight-wheeled version, which was tested in battle when it was deployed against a peasant revolt that had degenerated into numerous pirate raids on the settlements on the shores of Lake Dongting. The eight-wheeler 'proved speedy and easy to handle whether going forward or backward. It had planks on both sides to protect the wheels so that they themselves were not visible. Seeing the boat move by itself like a dragon, onlookers thought it was miraculous.' Larger ships

fast on the treadmills, and the ships glided forward as though they were flying, yet no one was visible on board.

The Jin had no vessels of their own that could compare to these rapid and manoeuvrable warships, and were so badly defeated that the Jin emperor was assassinated on board his flagship by his own followers.

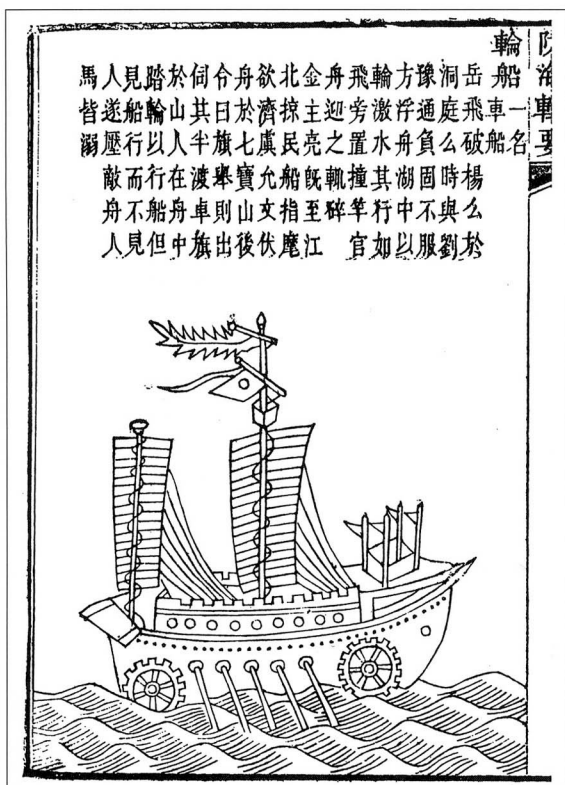
Throughout the literature on the Southern Song paddle-wheel fighting ships we find references to large vessels having an odd number of paddle-wheels. This implies that one wheel was fitted at the stern, which is not surprising, because if we assume that a ship's manoeuvrability (which is regularly admired) arises from the wheels on the port

and starboard sides being operated independently of each other, then the ship could be steered and reversed without the need of a rudder. This would leave ample space for a larger paddle-wheel at the stern. As for the numbers of the men providing the power, a four-wheeled ship of 1203 is recorded as needing 28 men, while a larger version, but still of only four wheels, has 42. The largest number of pedallers mentioned in any of the sources is 200, which may imply either relays of men or a system known to have been used during the 19th century (of which the technology was known to the Song) whereby several shafts were joined to the wheel by coupling rods and eccentrics, so that each paddle-wheel could be operated by three groups of pedallers at once.

The most famous use of paddle-wheel fighting ships in Chinese warfare took place during the epic siege of Xiangyang (modern Xiangfan in Hubei Province) between 1267 and 1272, the war which saw the most desperate rearguard action by the Southern Song against the advancing Mongols. The siege of Xiangyang is best known today because it was the occasion when counterweight trebuchets made their first appearance in China, but the use of paddle-wheel warships is equally striking. Two heroes of the Song called Zhang Shun and Zhang Gui took a relief convoy of 100 paddle-boats laden with clothing and other supplies to the help of the beleaguered twin cities of Xiangyang and Fancheng that lay opposite each other on the river. The Mongol commander, Achu, destroyed them as they approached, and Zhang Shun was killed. The convoy waited until dark to make their return voyage, but Achu burned



A four-wheeled paddle-wheel warship, with tigers' faces painted on to the sides, which could be let down for boarding.



A charming drawing of a Chinese paddle-wheel warship of the Song dynasty which appeared in an 1842 edition of a work on coastal defence.

approaching the enemy those inside can loose bombs, incendiary arrows and fire lances. With all this the enemy cannot even see us. The enemy being somewhat weakened, our sailors suddenly lift up and fully open the bulwark hatches, [the walls] acting like a shield, and stand ready within. In addition, raw ox hides are stretched out to protect the crew while from inside they throw incendiary bombs and toxic smoke bombs and shoot iron-pointed javelins [perhaps from large siege crossbows?] and use grappling hooks. Thus the enemy ships must be burnt and destroyed.

The Chinese paddle-wheel warships were formidable vessels indeed. Their use would of course be greatly restricted on the open sea, but on rivers and in estuaries they were to prove their worth for centuries to come, with only their armaments differing greatly from the originals on a craft that served successive dynasties so well and for so long.

THE CHINESE FIGHTING SHIP IN ACTION

Armour plating on Chinese warships

The use of paddle-wheels gave Chinese shipwrights the opportunity to provide their ships with close covering, or even armoured protection, in a way that projecting banks of yuloh oars or sails on masts would not allow. It is also interesting to see a reference to the principle of

bales of straw on the riverbank to give illumination, and this time Zhang Gui was also killed.

Later in the same year we find paddle-wheel ships being used by the Mongols against Xiangyang, but in a very different way. These vessels had almost certainly been captured from the Southern Song defenders, and were used against a floating bridge which the Song had constructed between Xiangyang and Fanzheng. The ships were anchored in midstream next to the bridge, and the current was used to turn the paddle-wheels to operate mechanical saws that cut through the timbers of the bridge.

A Ming account of the 15th century gives vivid details about what happened when a paddle-wheel fighting ship closed with its enemy, a situation that can have been little different in Song times, because it was clearly written before the advent of cannon:

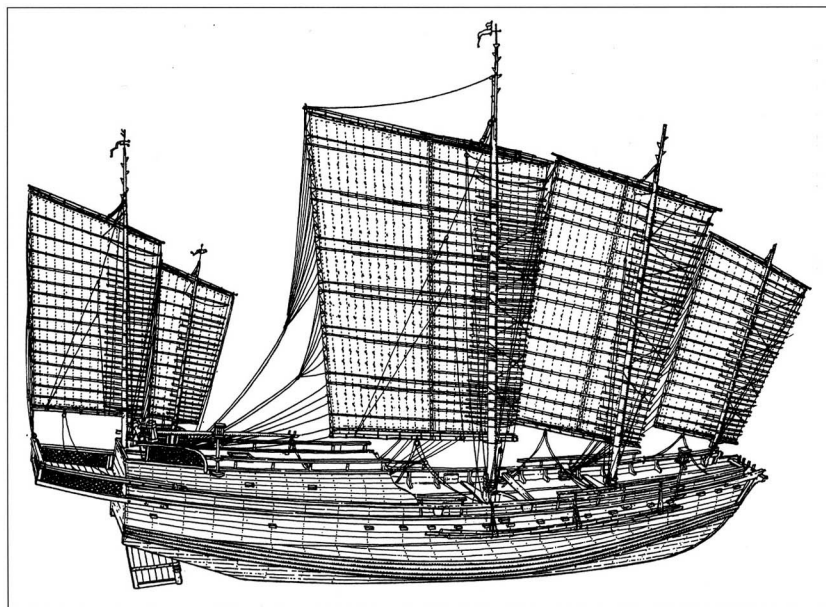
Above the hold the deckhouse gives through communication fore and aft, with a great beam supporting bulwark boards on each side, each plank being five feet long and two feet wide. Below this are fixed turning pulleys like those which raise hanging windows. When

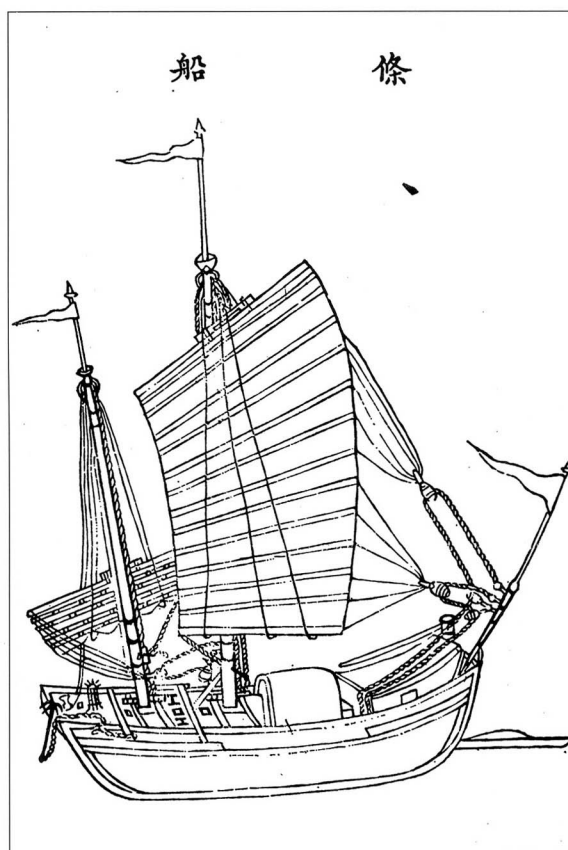
protective bulwarks being adopted by the Jin, whose naval practices were inferior to the Song, at the battle of Huang Tian Dang in 1130. The Jin sailors built protective bulwarks (of what materials we are not told) with oar ports in them, and attacked the becalmed Song fleet with fire arrows. Yet such methods of defence were nothing new, because the wars of the Three Kingdoms Period had already involved the use of fast warships on which the bulwarks were covered with wetted hides as a protection against incendiaries. In the battle of the Red Cliff in 207 a fleet was destroyed by fireships, which were rendered more effective because the enemy ships were tied together as a precaution against seasickness, a strange remedy that turned out to have been suggested by a traitor!

The use of some limited form of metal armour plating (as distinct from 'ironclad battleships' of course) on Chinese warships is also well attested. Its origin is probably the very mundane one of applying sheets of thin metal to the undersides of ships for preservative reasons. As the predominant Chinese naval fighting technique was that of using missile weapons from a distance rather than close-combat grappling and boarding, to extend this protection to the upper reaches of the ship would have been perfectly natural, with thin plates of forged wrought iron replacing the rhinoceros hides noted earlier. How much iron was used on the ship and where it was placed depended on a number of factors, and an excellent example is provided by the Ming expedition of 1370 against Sichuanese rebels, who had seized the opportunity for independence when the Yuan dynasty collapsed. The following passage is so rich in other details of naval warfare that it is worth quoting at some length:

Where the cliffs are very precipitous and the water most dangerous, the Sichuanese had set up iron chains as booms and bridges to block the gorge horizontally so that no ships could get through. Liao Yung-zhong therefore sent several hundred men with supplies of food and water to make a portage with small boats, so that they appeared up river beyond these defences. Now the mountains of Sichuan are so well-wooded that he had ordered the soldiers to wear green garments and sleeveless raincoats made of leaves, and thus they descended through the forests and rocks. At the fifth night watch the general assault began both by water and land.

Drawing of a five-masted freighter, which gives a good idea of the probable build of the Ming dynasty treasure ships. These were the vessels that took Zheng He to Africa in the early 15th century.





A standard transport junk, used for coastal and river work, from an illustration that shows very well the details of sails and rigging. As usual, the stern is higher than the bow, where the capstan and grapple may be noted. This ship shows a remarkable resemblance to the junks used by Khubilai Khan in the invasions of Japan as depicted on the Mongol Invasion Scroll.

The bows of the naval ships were sheathed with iron and all kinds of firearms were made ready on them ... The three bridges were all burned, and the iron chains all cut.

If the bow of a ship was sheathed in iron there is a clear implication that it would be used for ramming, perhaps to break through the iron chains, but it is difficult to extrapolate beyond this 14th-century modification of existing vessels towards any generalisation about Chinese ships being used for ramming like Greek triremes. In fact the opposite conclusion would appear to be warranted, because the traditional design of the junk with its raised, flat bow was not suitable for ramming. Nevertheless there are occasional references to the practice, as for example in AD 220 when 'they used ships with oars which butted into each other as if with horns', and we know that during the Han dynasty small boats were tipped with iron rams in their bows.

The use of striking arms

Chinese ships, like Chinese armies, went into battle with flags flying and drums beating, and throughout Chinese history accounts of naval fighting, whether on river, sea or lake, illustrate a wide range of techniques and technology for

ship-to-ship combat. Some have parallels with the more familiar Western experience, while others are very different, and an outstanding example of the latter concerns the use of weapons that may have been casually described as 'grappling irons', but which actually served the opposite purpose. In conventional thinking, grappling irons are devices such as hooks, chains and rakes that are used to pull an enemy ship close and hold it there so that boarding parties can storm the ship and just as easily withdraw. However, in Chinese naval warfare the preferred tactic was usually not boarding but bombardment, whether by catapult projectiles or a heavy fire from crossbows. This led to a unique Chinese variation on the grappling iron that was designed to keep an enemy ship at a chosen distance rather than secure it alongside. They were called 'striking arms', and consisted of some form of 'hammer head', such as heavy iron spikes, mounted on the ends of 50-foot-long poles that were securely hinged to the attacking vessel's superstructure. An illustration from the Tang dynasty shows three arms mounted on each side of a tower ship. When the ship came alongside an enemy vessel the striking arms would be released and would fall in an arc to hit the deck of the opponent.

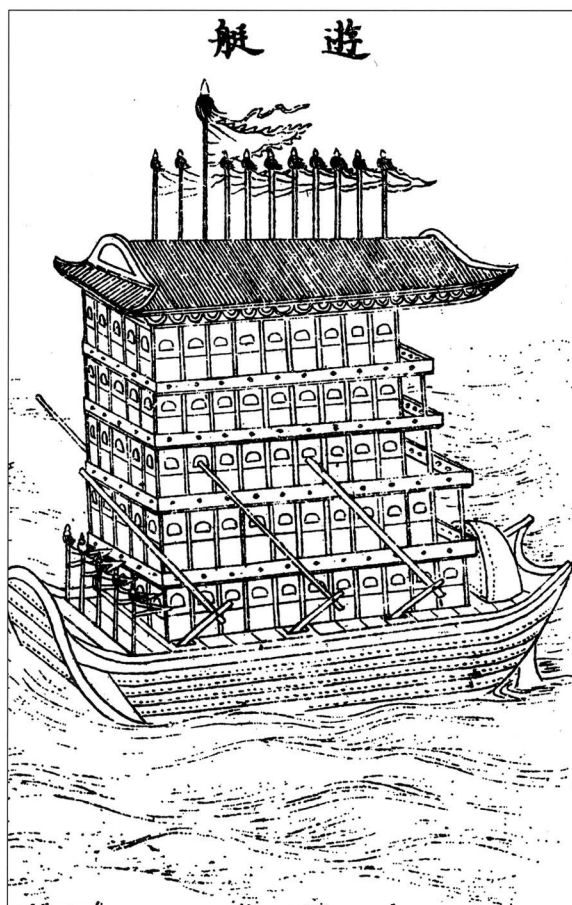
In the case of a small-sized boat the hammer smashing through the woodwork might well sink it. If the enemy ship was still afloat it would of course now be held fast to the attacker, but the primary intention of this was never to provide a platform for boarding. Instead the arms would hold the ship securely at a distance suitable for close-range crossbow

work, a technique described in the account of the Song's war against the rebels on Lake Dongting in 1135. Here the weapons used by the pirates appear to be less sophisticated, because they are described as being on the ends of 30-foot-long bamboo poles 'which prevented the government marines from boarding and attacking at close quarters'. The actual hammer used is described in one version as being a piece of wood three feet long and sharpened at both ends. As was the case with the paddle-wheel vessels themselves, however, the imperialists had similar weapons too, and finally won the day.

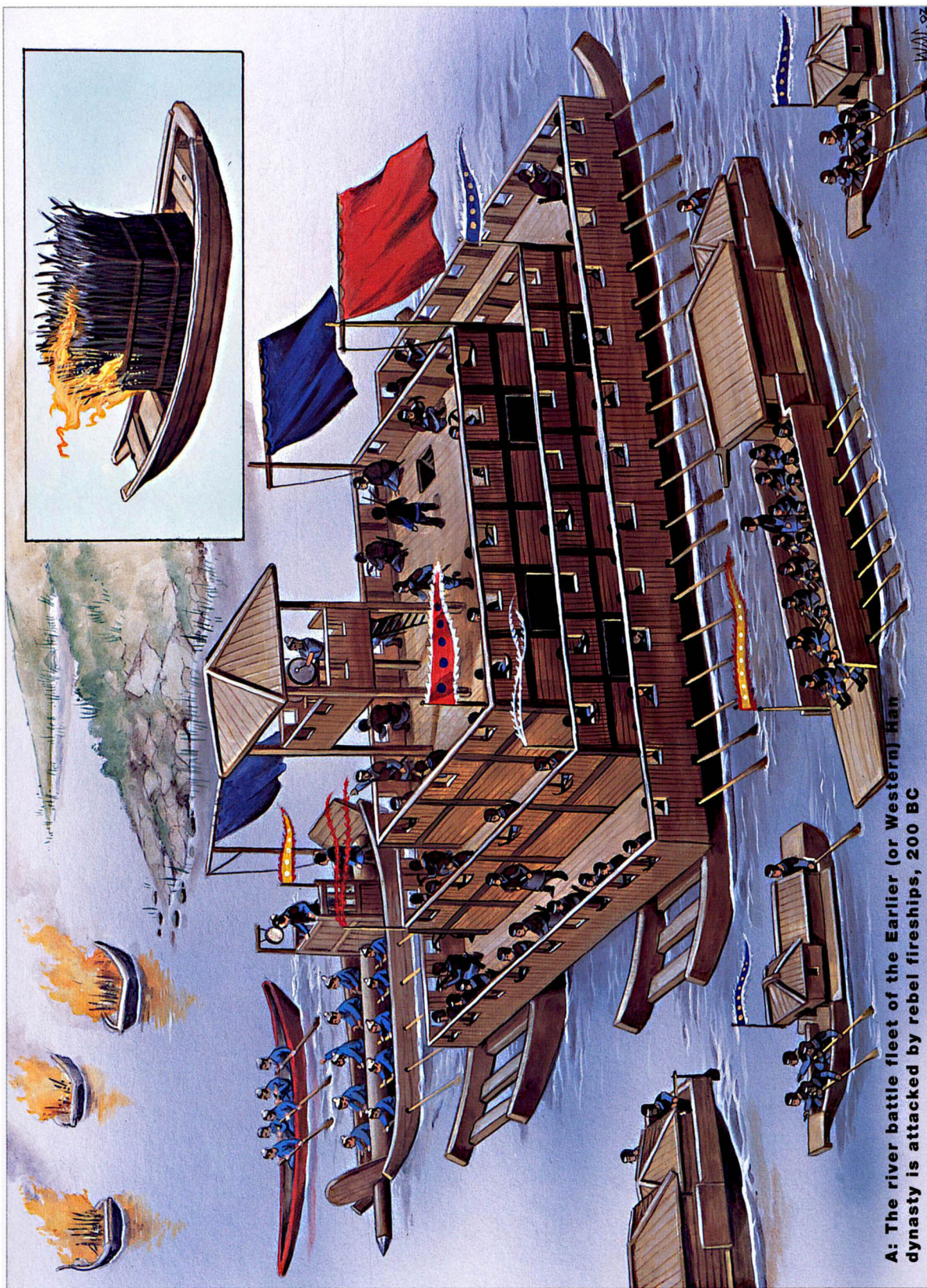
An alternative technique, which neatly combined to the attackers' advantage the two contrasting principles of grappling and fending, occurs in an account of the battle of Huang Tian Dang in 1130. The Song admiral equipped his ships with chains fitted with hooks at the end. Somehow these chains were either thrown or dropped on to the Jin ships, and then the Song ships, which, one must presume, were paddle-wheel vessels, reversed and began to tow the prize away, the outstretched chains giving the required distance for sustained crossbow fire. An account of 1140 mentions another variation, whereby the ships were fitted with masts 100 feet high from which rocks, hauled up by pulleys, could be swung out and dropped on to an enemy ship. This was essentially an alternative to catapult bombardment.

Boarding parties and close combat

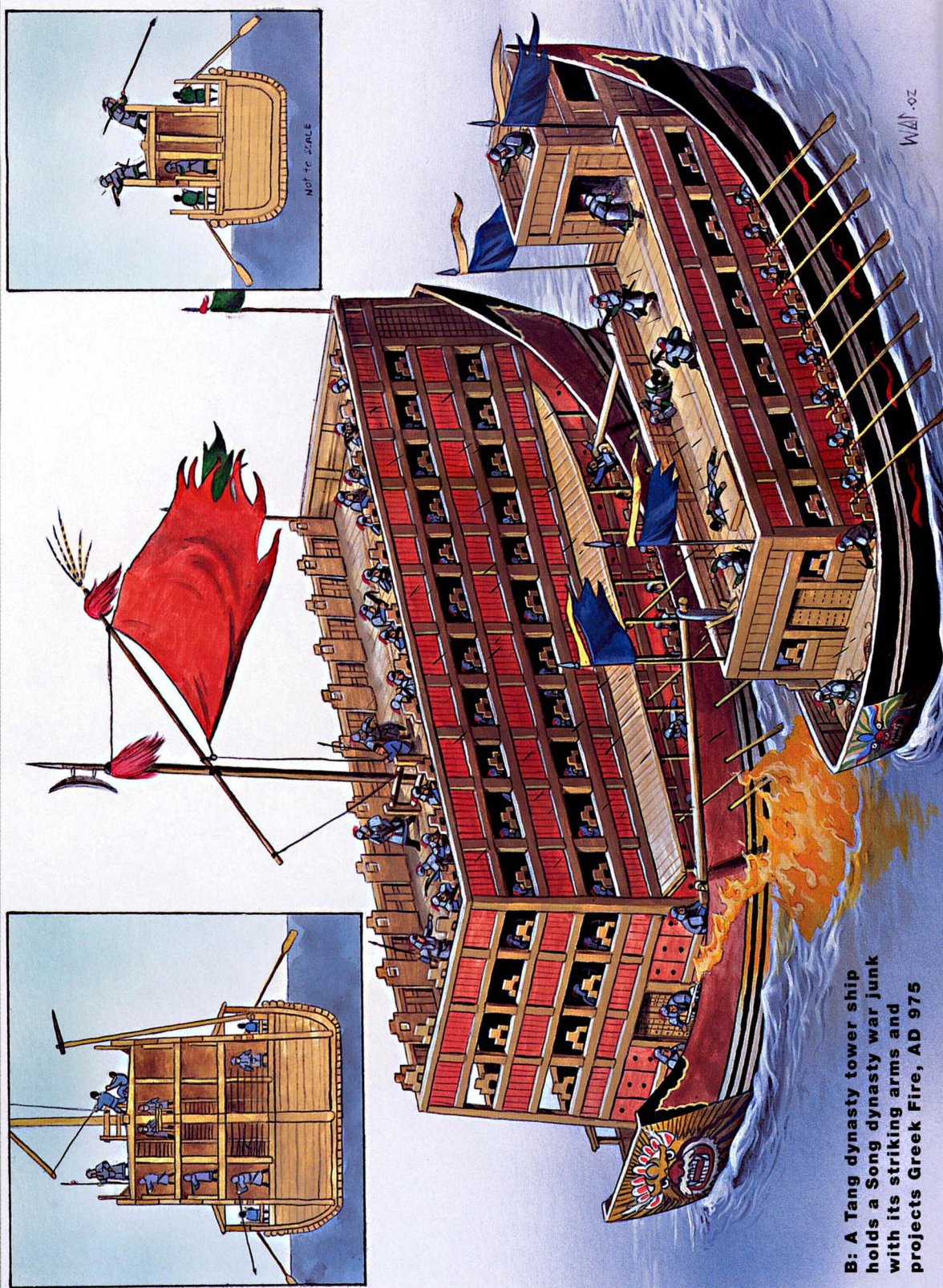
Although the use of boarding parties may not have been the preferred method of Chinese naval warfare, there were times when it was both inevitable and necessary, as attested to in the large numbers of soldiers or marines carried on Chinese warships. All the illustrations indicate that when on board ship the soldiers wore armour and helmets identical to those worn on land, and would be armed with the usual polearm weapons such as long straight spears, curved bladed halberds, and the dagger-axe halberds, which we noted on the earliest illustrations of ship-to-ship combat where the cutting blade was like a short sword fitted at right angles to the shaft. We may also imagine the use of the more fantastically shaped multi-bladed polearms that appear in Chinese illustrations. Swords and daggers would be the weapons for close hand-to-hand fighting, and ceramic hand grenades would supplement the longer-range missile weapons of crossbows, and later arquebuses. There is an amusing anecdote told about one captain whose commander ordered him to obtain 100,000 arrows for naval use. The man fitted out 20 ships with bales of straw and sailed up close to the enemy fleet, whose archers obligingly delivered safely into the straw bales all the arrows they could possibly need.



A multi-towered ship with the 'striking arms' that were effectively anti-grappling irons. Their purpose was to seize the enemy ship and keep it at a convenient distance for bombardment. The impact of the falling hammers could also hole a ship's deck. When the ship came alongside an enemy vessel the striking arms would be released and would fall in an arc to hit the deck of the opponent. If the enemy ship was still afloat it would of course now be held fast to the attacker, but the primary intention of this was never to provide a platform for boarding. Instead the arms would hold the ship securely at a distance suitable for close-range crossbow work, a technique described in the account of the Song's war against the rebels on Lake Dongting in 1135.



A: The river battle fleet of the Earlier (or Western) Han dynasty is attacked by rebel fireships, 200 BC



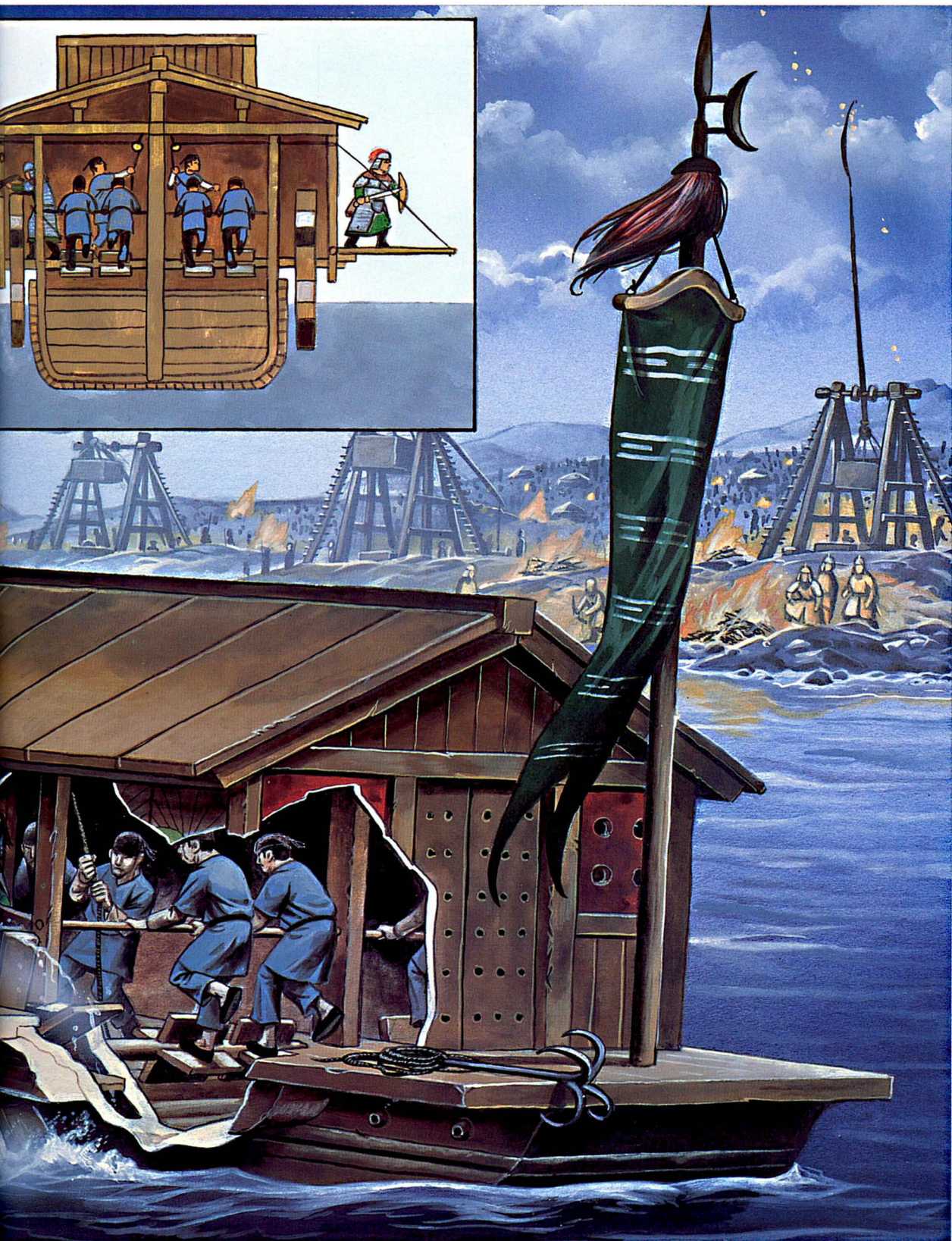
B: A Tang dynasty tower ship holds a Song dynasty war junk with its striking arms and projects Greek Fire, AD 975

C: Khmer (Cambodian) and Cham (Vietnamese) river war canoes come to grips during the revolt of Jayavarman VII, AD 1181

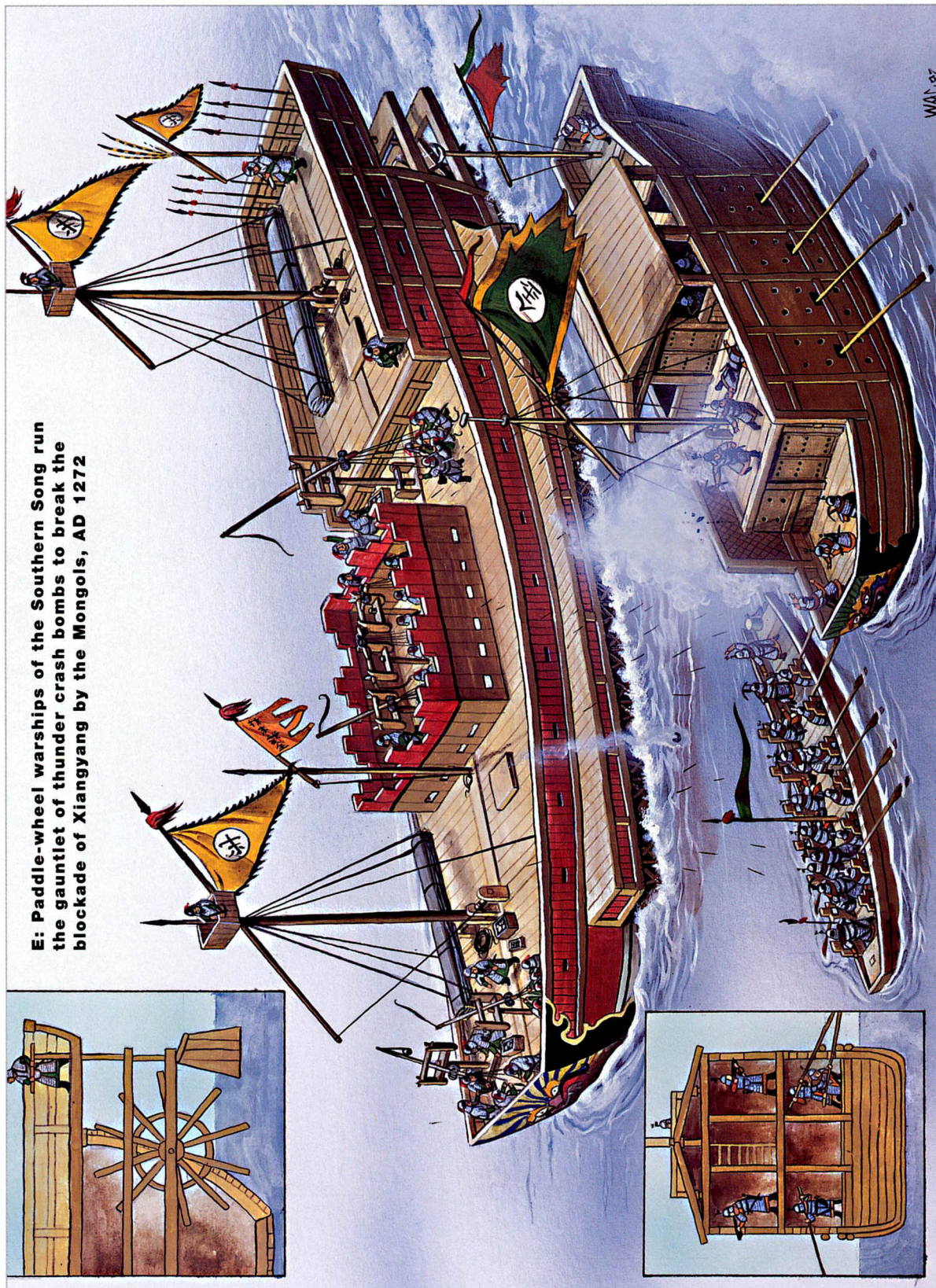




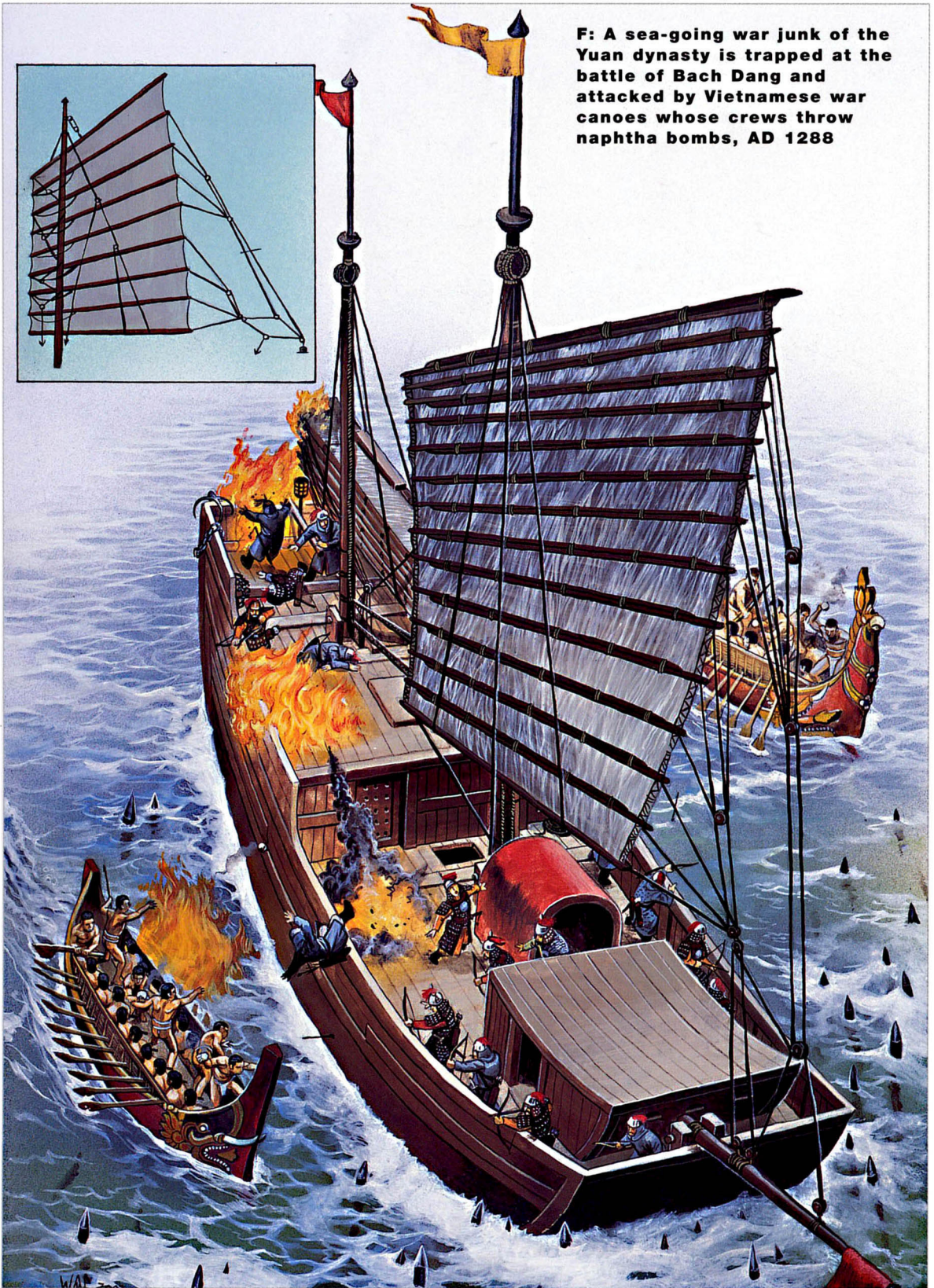
D: A 23-wheel paddleship of the Song dynasty bombards a Jin destroyer with lime bombs hurled by traction trebuchets at the battle of Caishi, AD 1161



E: Paddle-wheel warships of the Southern Song run the gauntlet of thunder crash bombs to break the blockade of Xiangyang by the Mongols, AD 1272



F: A sea-going war junk of the Yuan dynasty is trapped at the battle of Bach Dang and attacked by Vietnamese war canoes whose crews throw naphtha bombs, AD 1288





G:A split-hulled minelayer of the Ming places its charge against a strategic bridge held by their rivals, the Han, AD 1363

Catapults and bombs

The traction and counterweight trebuchets described for siege situations in *Siege Weapons of the Far East Volume 1* had their exact counterparts in naval warfare. When the Song dynasty paddle-wheel ships took on the rebels on Lake Dongting in 1135 they used trebuchets firing containers of lime, as the following account tells us:

Against the paddle-wheel fighting ship of Yang Yao, the government forces used lime bombs thrown from trebuchet catapults. For these they used pottery containers with very thin walls, inside which were placed poisonous drugs [probably arsenic], lime and fragments of scrap iron (as well as gunpowder). When these were hurled on to the rebel ships during engagements, the lime filled the air like smoke or fog so that their sailors could not open their eyes. The rebels wished to copy this device but as the right containers could not be found or made within the territories held by them, they failed.

Reference was also made above to the battle of Caishi in 1161, where the Song paddle-wheel ships defeated the Jin. This battle saw the use of soft-cased explosive 'thunderclap bombs' thrown by traction trebuchets. The bombs were fitted with time fuses that caused them to explode on hitting the surface of the water. The bomb cases rebounded and broke, scattering noxious clouds from the lime that had been mixed in with the

gunpowder, and 'our ships then went forward to attack theirs, and their men and horses were all drowned'.

On several occasions the location of a Chinese fortress on a river blurs the distinction between siege warfare and naval warfare. For example, the Southern Song's defence of Xianyang in 1207 against the Jin is notable for the use of thunderclap bombs being loosed from the city walls, but later in the same account we read of an attack from the Han River, probably by paddle-wheel ships:

On the evening of the 25th day, taking advantage of the rain and overcast sky, the commander urgently sent Zhang Fu and Hao Yan to prepare boats large

A ship filled with soldiers or marines. They are armed with halberds, and a large drum is being beaten. All illustrations indicate that when on board ship the soldiers wore armour and helmets identical to those worn on land, and would be armed with the usual polearm weapons such as long straight spears, curved bladed halberds, and the dagger-axe halberds, which we noted on the earliest illustrations of ship-to-ship combat where the cutting blade was like a short sword fitted at right angles to the shaft.



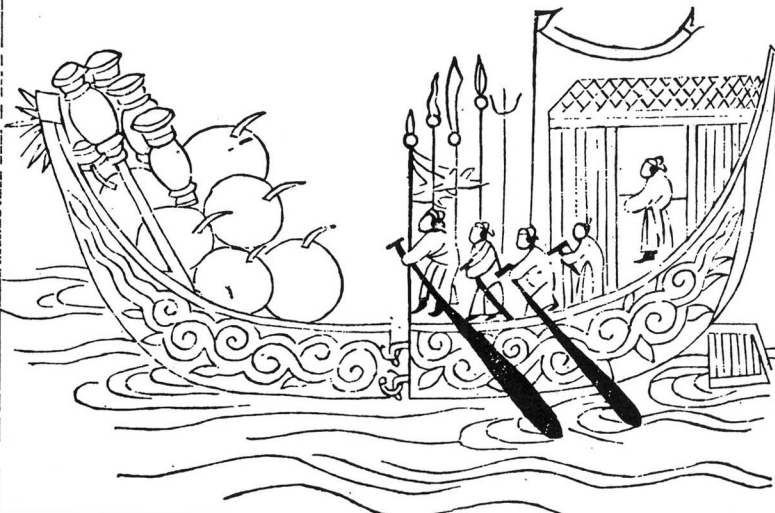
and small, more than thirty in number, enough to carry 1,000 crossbowmen, 500 trident spearmen, and 100 drummers, together with thunderclap bombs, and gunpowder arrows. They took cover by the river bank below the enemy's encampment ... Then at the stroke of a drum the crossbowmen let fly a volley, and immediately following this all the drums sounded and the crossbows were fired. Simultaneously the thunderclap bombs and the fire arrows were sent into the enemy's camp.

It was during the Jin's last campaigns against the Southern Song that the introduction of hard-case exploding iron bombs marked a further step forward in Chinese military technology. The fragments produced when the bombs exploded could cause great personal injury, and one Southern Song officer was blinded in an explosion that wounded half a dozen other men. Their first recorded use in war dates from the siege by the Jin of the Southern Song city of Qizhou in 1221, but they soon appeared in naval warfare, and the year 1231 was to find a Jin army in Hezhong using iron bombs to defend themselves against a Mongol army that was supported by a river-borne fleet. When the city fell the Jin escaped along the Yellow River, and we are told that they fired bombs at the Mongol fleet to break through the cordon. 'The flashes and flames could be distinctly seen. The Northerners [i.e. Mongols] had not many troops on their barges, so eventually the Jin fleet broke through.'

The story of the Song paddle-wheel fleet that went to the relief of Xiangyang in 1272 was told earlier, but there is material to add concerning trebuchets and bombs, because 'they took up a rectangular formation, every ship being equipped with firelances, trebuchets and bombs, burning charcoal, large axes and heavy crossbows. When the night had worn on three quarter hours by the water clock, the fleet hoisted anchor and sailed out into the river using red lamps as signals.' But the Mongols now had iron-cased bombs too, and

The sea mine called the submarine dragon king was made of iron and was carried on a wooden board weighted down with stones. The mine was enclosed within an ox bladder, and an incense stick floated above it in a container to determine when the fuse would be ignited. An air supply was maintained through a long piece of goat's intestine.





An articulated barge being used as a minelayer. The front end will be disengaged and left adjacent to the target. The origin of such boats is to be found on the Grand Canal, which gradually became silted up. The two halves of the boat could be uncoupled and the resulting separate sections could then negotiate shallow channels where larger boats would have to wait until the water level rose.

ox bladder, and an incense stick floated above it in a container to determine when the fuse would be ignited. An air supply was maintained through a long piece of goat's intestine. 'On a dark night', says the description, 'the mine is sent downstream, and when the joss-stick has burned down to the fuse, there is a great explosion.'

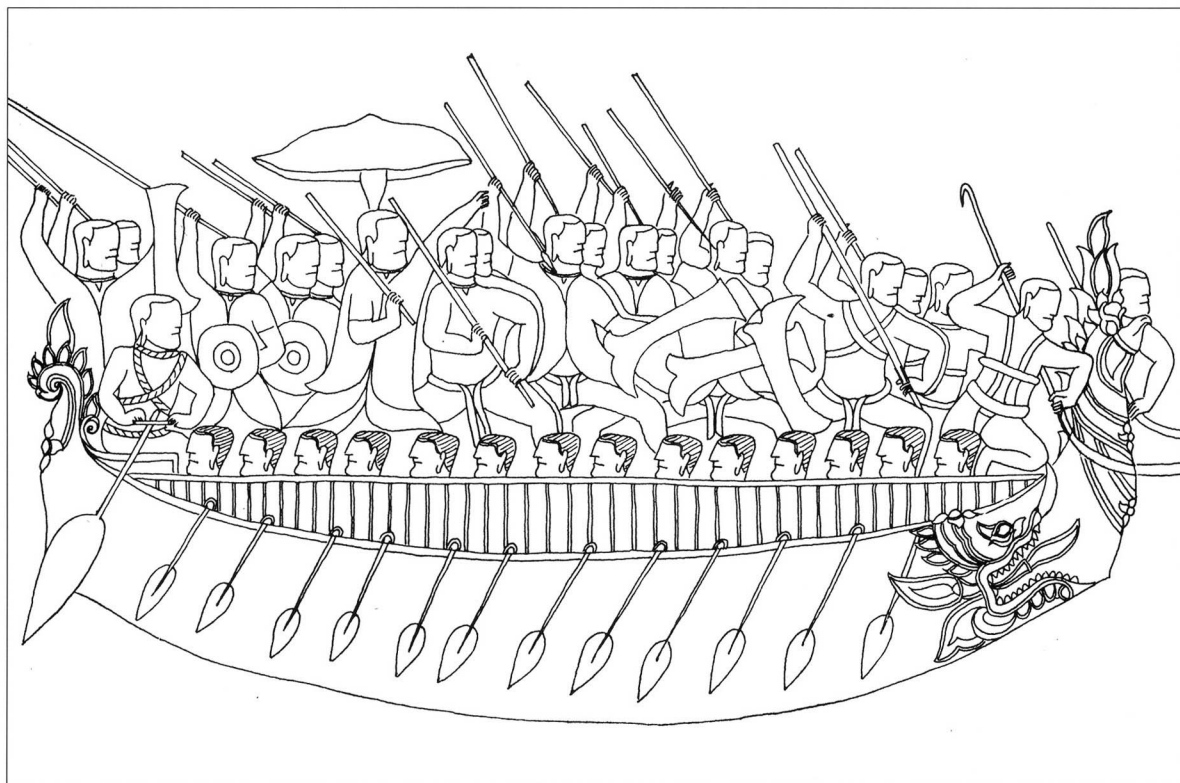
Delayed-action explosive charges could also be delivered to the enemy by a very unusual boat, and the accompanying illustration shows the remarkable design that allowed it to operate, because it was in two halves joined by couplings. The origin of such boats is to be found on the Grand Canal, which gradually became silted up. The two halves of the boat could be uncoupled and the resulting separate sections could then negotiate shallow channels where larger boats would have to wait until the water level rose. In its form as a minelayer, the aim was to approach a city or a bridge under the cover of darkness, uncouple the bow section in which the explosives were located, and leave it with a fuse burning while the assailants made a rapid getaway in the stern section.

Naval incendiary weapons

Greek Fire, the secret weapon of Byzantium that consisted in burning petroleum projected under pressure, was another siege weapon adopted

used them when the Song fleet approached; 'bomb shells were thrown with great noise and loud reports, and our army attacked fiercely for a space of more than 30 li. On the ships they were up to their ankles in blood.' In 1274 the Mongols used exploding iron bombs during the first invasion of Japan. They were probably launched from the single-pole rotating 'whirlwind' traction trebuchets, but we do not know if they were the wheeled variety or static ones fixed on to the decks of the Mongol ships.

A 14th-century source gives a detailed description of another source of sea-borne explosion: the sea mine. It reads, 'The sea mine called the submarine dragon king is made of wrought iron and carried on a wooden board.' This board would be weighted down with stones. The mine itself was enclosed within an



Khmer troops are shown here going into action against the Chams in fine style. The war barge is packed with soldiers who have spears and grappling hooks.

for naval use in China, but in a battle on the Yangtze near Nanjing in 975 between the Song and the Tang the weapon almost literally backfired when the Tang 'quickly projected petrol from flame throwers to destroy the enemy'. The Song forces could not have withstood this, but all of a sudden a north wind sprang up and swept the smoke and flames over the sky towards the Tang's own ships and men. As many as 150,000 soldiers and sailors were caught up in this and overwhelmed, whereupon the admiral, being overcome with grief, flung himself into the flames and died. A century later a far more successful use of Greek Fire was made when General Li Gang of the Song attempted to prevent the Jin from crossing the Yellow River before the siege of Kaifeng in 1126.

The Chinese also developed techniques for coping with incendiary attacks in naval warfare. In 1279, during the last encounter between the Southern Song and the new Yuan dynasty off the coast of Guangdong, the Mongol commander made fireships from a number of captured boats by filling them with oil-soaked straw and setting them ablaze and waiting for a favourable wind to carry them down against the Song fleet. But the Song were ready for them, and had plastered their ships with mud – a technique also noted in siege warfare. In addition they had 'countless water tubes', probably fed from water tanks on the decks. The bales of burning straw were pulled to pieces using long-hooked poles, and water was pumped out to extinguish them through the hoses, which appear to have been suspended from the Song ships in a similar fashion to the striking arms noted above. They even beat off a Mongol night attack, but these techniques did not allow the Song to prevail, and only 16 of their ships broke through the Mongol blockade.

A CASE STUDY OF CHINESE FIGHTING SHIPS

The battle of Lake Poyang, 1363

The finest case study of medieval Chinese naval warfare, involving many of the points discussed above, is provided by an epic encounter on an inland waterway. Poyang Hu (Lake Poyang) in Jianxi Province is China's largest freshwater lake, and in the summer of 1363 a battle occurred when a Ming fleet attempted to come to the relief of a city besieged by an enemy fleet.

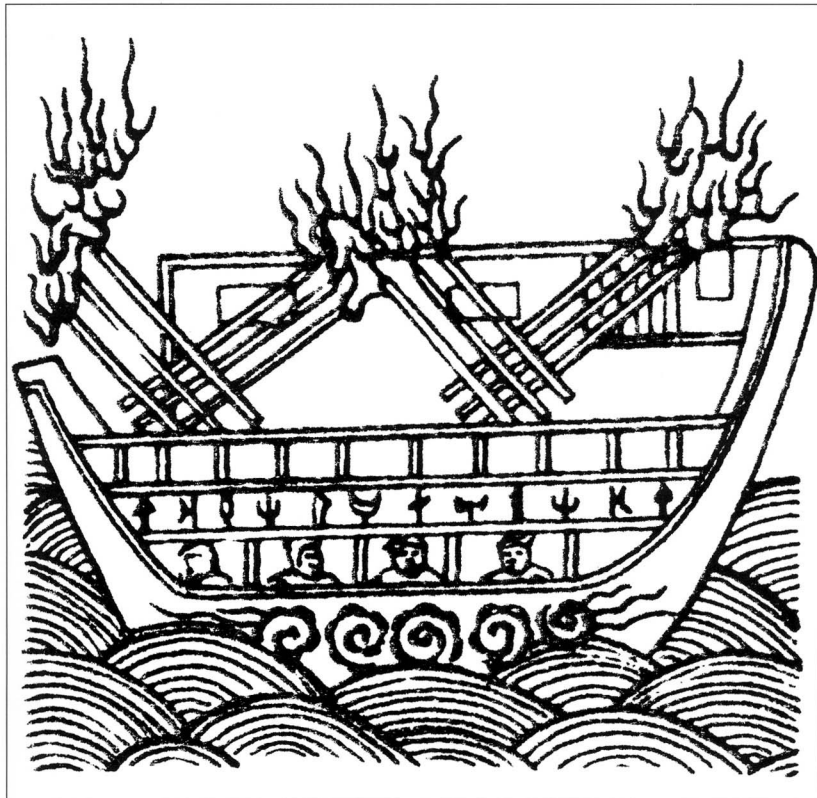
Zhu Yuanzhang, the future Ming emperor, had a smaller naval capacity than either of his two rivals, the Han and the Wu. Nevertheless he had used it both wisely and successfully. But while the main Ming force was engaged elsewhere against the Wu, the Han laid siege to the important Ming-held town of Nanchang in Jianxi Province, which lies on the Gan River south of where the Gan feeds into Lake Poyang. The lake in turn empties into the Yangtze. A contemporary source described the Han warships that sailed into Lake Poyang as follows: 'The outside was painted with red lacquer. From top to bottom there were three decks. On the decks were erected tents for the riding horses. Below were placed several tens of oars, protected by coverings made of boards ... The archers' towers were covered with iron.'

The description implies a formidable type of multi-storey lou chuan (tower ship) vessel with fighting platforms that could overlook city walls,

but one that was probably comparatively slow and of deep draught, a point which Zhu Yuanzhang clearly anticipated, because he was to postpone naval action until the river levels were low.

The siege began as soon as the Han fleet arrived, but the Ming commander at Nanchang had been well prepared for a siege, and fought off an assault on a landward gate from troops disembarked from the Han fleet. Direct attacks from the ships had no greater success; because Nanchang's new walls had been built tall, the multi-storey battleships had no height advantage. A series of other attacks followed, and eventually a brave volunteer managed to evade the Han blockade to get a

A stylised drawing of a Ming fireship. In the battle of the Red Cliff in AD 207 a fleet was destroyed by fireships, which were rendered more effective because the enemy ships were tied together as a precaution against seasickness, a strange remedy that turned out to have been suggested by a traitor.

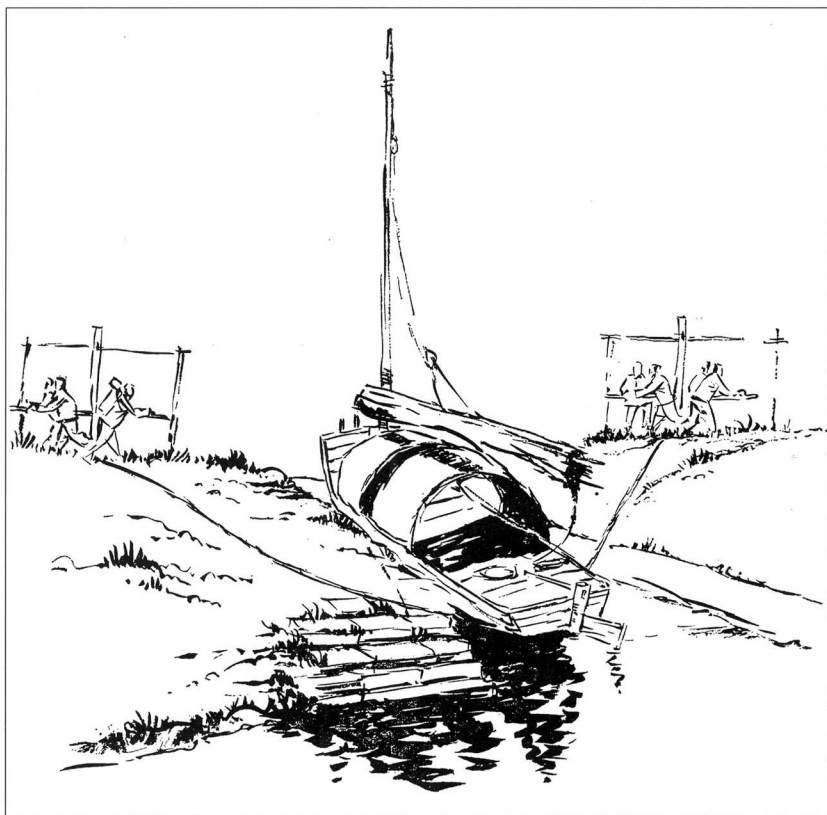


message out asking for help. He reported their plight to Zhu Yuanzhang, and added the vital information that the water levels in the lakes and river were dropping in the summer heat.

The Ming fleet that sailed from Nanjing consisted of ships that were on the whole smaller than those of the Han fleet. The voyage upstream of 250 miles to the mouth of Lake Poyang took nine days and was largely without incident, and the presence of a large dolphin-like fish, which fancy took to be an accompanying dragon, was naturally taken as a good omen. The city of Hukuo fell to the Ming without a struggle on 25 August. One detachment of the army was sent to fortify a position across the Yangtze to the north, while the Ming army were disembarked to march west and outflank the besiegers of Nanchang.

Meanwhile the Han naval commander, Chen Youliang, had realised that Nanchang was not going to surrender, and if he now had to fight the Ming navy that controlled his exit to the Yangtze, then the vast watery surface of Lake Poyang would be the best place to do it. He knew that he might be at a disadvantage in a naval battle, because the Han ships had been built to their excessive size for the purpose of serving as a highly mobile siege train, rather than for ship-to-ship warfare, and Chen Youliang had gambled on a short campaign that would be carried out when the Yangtze was in flood.

The Ming fleet was divided into 11 squadrons, with their heavier ships in the centre, and both navies dropped anchor for the night. The first fighting of the battle began on the morning of 30 August 1363. While the main body of the Han responded to a frontal attack by the Ming involving close combat, the greater manoeuvrability of the Ming ships allowed them to gain the weather position from which catapult bombs could be launched or fireships floated, so a separate squadron gained the windward position and launched incendiaries from trebuchets, setting fire to more than 20 Han ships. But this failed to break the Han line. Indeed the opposite was happening because the flagship of the Ming vanguard had caught fire and the Han ships were naturally concentrating their attacks on it. Zhu Yuanzhang went to the rescue in person and the fires were extinguished as the Han attackers drew off to concentrate on the enemy commander, for whom disaster struck when



A small junk being hauled from one river to another. This was sometimes necessary in the confused layout of Chinese waterways.

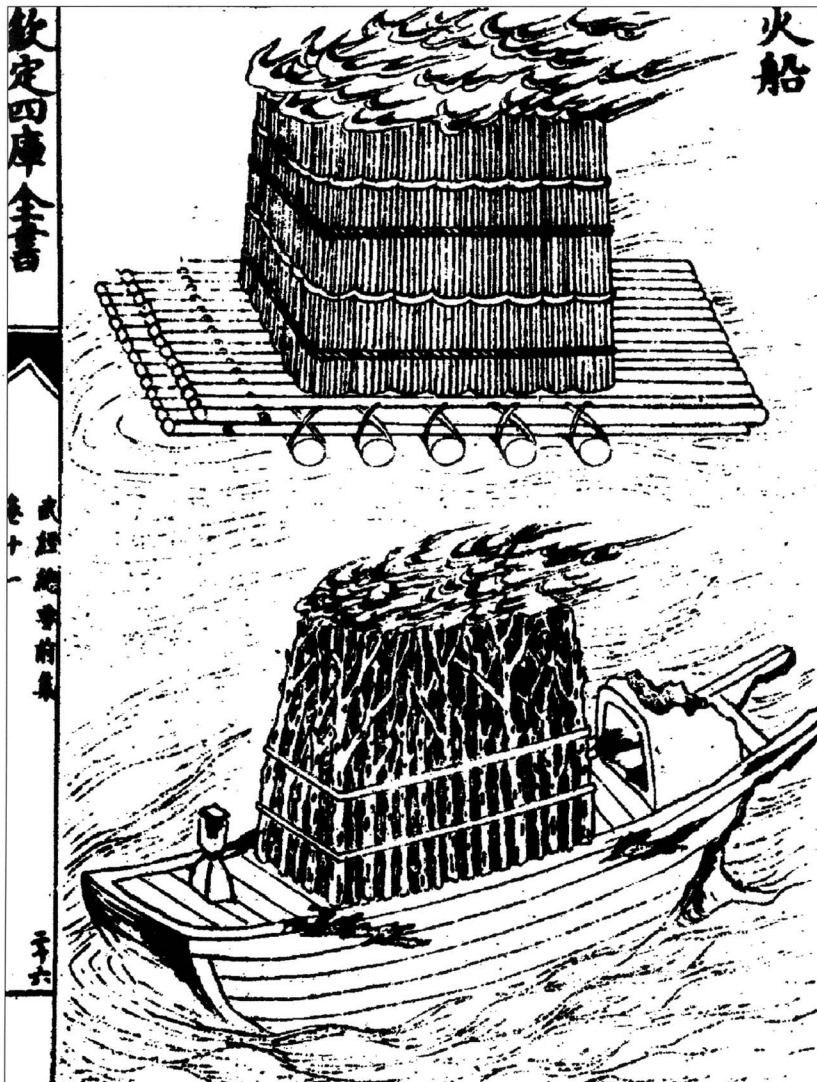
his ship ran aground on a sand bar and stuck fast. The Han ships encircled it at a distance to avoid a similar fate and poured in arrows and fire. Other Ming ships came bravely to the rescue of their leader, and the ships moved so swiftly that Zhu Yuanzhang's vessel was shaken free by the waves. Then another Ming ship ran aground, but was also knocked free when a friendly vessel accidentally collided with it. It may seem surprising that so many Ming vessels ran aground rather than the heavier Han ships, but this is partly explained by the fact that the Ming, realising that they would be at a disadvantage in ship-to-ship counter-battery work, had tried to fight the battle with boarding parties, and their bold advance to encircle the Han ships had led them into unexpectedly shallow waters.

So far the battle had been a profound disappointment for Zhu Yuanzhang, whose plans had so visibly failed, but the battle was by no means over. During the night the damaged ships were withdrawn and sent downstream towards Nanjing and safety, but when battle resumed on

the morrow the Ming captains were dismayed to see that Chen Youliang had massed his largest warships together in a continuous battle line, leaving his smaller ships room to manoeuvre at the edges of the formation. Some of the Ming commanders even refused to advance and were beheaded for their treason. But in spite of such draconian measures the Ming were worsted again that morning. One renowned commander committed suicide when he realised that his ship was doomed, while another died standing up, covered in sword cuts.

It was then that Zhu Yuanzhang changed his tactics and ordered the construction of fireships. Fishing boats were gathered and laden with straw and gunpowder, while dummy soldiers wearing helmets and armour and carrying weapons were placed inside to fool the Han into thinking that the small boats were actually armed warships. In the afternoon a

Fireships were a useful technique of naval warfare. The upper one is a simple raft with burning brushwood bundles, while the lower one is more sophisticated.

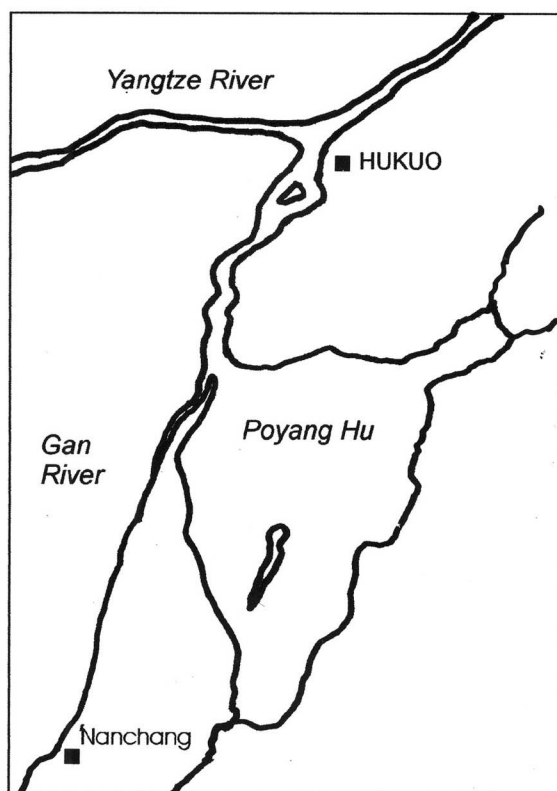


favourable wind sprang up, and the closely packed line of Han ships could not avoid the approach of the fireships. In the carnage that followed many Han troops were either burned or drowned, and the Ming boarded the stricken vessels, taking many heads.

Amazingly, there was still another day of fighting left, but this did not happen on the following day, because both sides had suffered grievously and needed to regroup. On 2 September battle recommenced. Chen Youliang kept what remained of his large ships in open order to avoid any further fireship attack, but this allowed the Ming vessels to close with them one-to-one in the grappling and boarding warfare they had originally intended. 'From dawn until noon the enemy fleet suffered defeat; abandoned banners, drums, weapons and equipment covered the surface and shores of the lake.'

By this time Zhu Yuanzhang must have been informed of the good news that the army sent to cut off Nanchang had not only outflanked the besiegers but had succeeded in relieving the city. His objective in the Poyang campaign had thus been achieved, but a long war of attrition was not to his liking, so Zhu gave orders for a withdrawal. On the night of 2 September, with a lantern mounted on the stern of each ship, the Ming sailed in single file towards the mouth of the lake. This gave them the security of the confluence of the Gan and the Yangtze, but they could not simply withdraw to Nanjing, because the Han fleet was still floating on Lake Poyang and would certainly try to escape. One month later the final battle of the epic conflict on Lake Poyang took place when the Han tried to break out. Fireships were used again, and during this encounter Chen Youliang was hit in the eye by a stray arrow that penetrated deeply into his skull and killed him instantly. On 4 October the remains of the Han fleet surrendered.

Five years later Zhu Yuanzhang proclaimed himself as the first Ming emperor, a position largely secured by the long and bitter fight on Lake Poyang, the archetypal conflict of the medieval Chinese fighting ship.



Map of the battle of Lake Poyang.

SOUTHEAST ASIAN FIGHTING SHIPS

The war barge

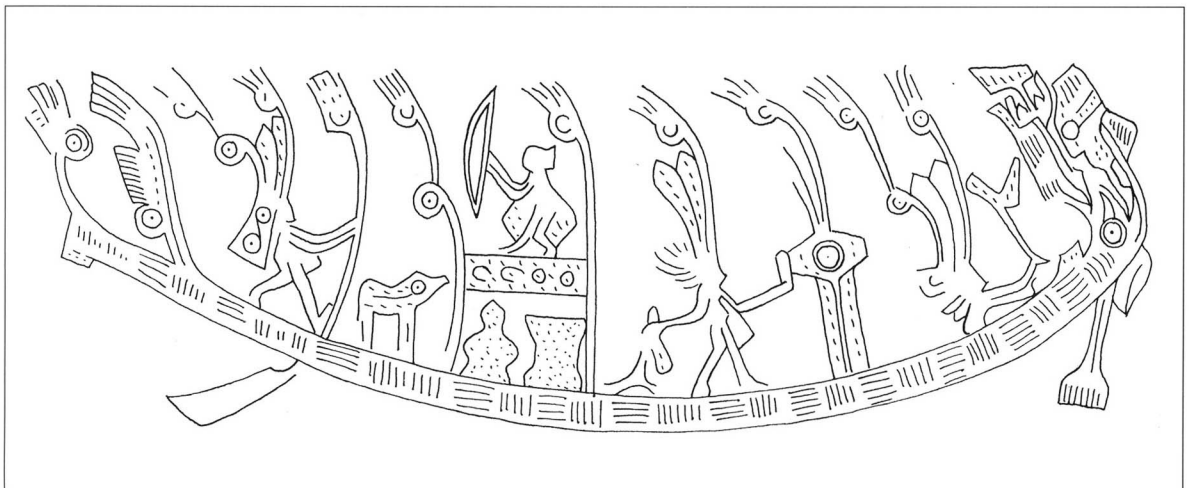
Both the Chams and the Khmers used navies during their 12th-century wars, the former often employing fleets of more than 100 vessels. Some of these ships were war junks, which saw active service in coastal fighting against the Chinese and during the Mongol invasions of Vietnam between 1281 and 1288, but the most common form of warship among both peoples was the war barge or war canoe propelled by oarsmen. These were most often found in river warfare

or fighting off the coast in support of land armies: they could not venture far from a friendly shore because of the need to replenish their fresh water supplies. Accounts of the Mongol invasion of Java strongly suggest that Javanese war canoes were very similar to the Khmer and Cham models.

Our main sources of information on the fighting ships of the Khmers and the Chams and the nature of their warfare are the bas-reliefs carved into the walls of Banteay Chmar and the Bayon of Angkor Thom in Cambodia. They are believed to illustrate the battles that took place when the Khmers were liberated from the Cham invasion in 1181, and are therefore biased towards the Cambodian point of view, but their detail is unparalleled as a historical source. River fighting is illustrated, as shown by the absence of marine life in the depictions of the river and the presence of crocodiles.

The war barges were very large dugout canoes. Similar ones, but fitted with outriggers, enabled the brave navigators of Polynesia to make oceanic voyages, but the Cambodian and Vietnamese varieties are clearly fitted out as warships for river fighting. In one relief 23 oarsmen may be counted on each side of the barge, which must be about 100 feet long. The barges have striking figureheads carved to resemble monsters, and complementary curved 'tails' at the stern, which makes them look rather like Viking ships. The two sides can be distinguished because the Khmer oarsmen are shown bareheaded while the Chams wear the flower-like headgear depicted elsewhere in the Cambodian temples in reliefs of land warfare. All the oarsmen are facing backwards except for the crew on the Khmer royal barge, who are shown operating their oars like yulohs while facing forwards. These fellows have no physical protection, unlike the other crews who have long lattice shields through which their oars protrude. No doubt this is meant to show their great bravery in the presence of their king, who stands, larger than life, in the middle of the royal barge and shoots an arrow. In a neat exercise in Khmer propaganda the rival Cham king is shown as having turned to flee from the battle. Other Cham ships are in retreat, and some of their soldiers have fallen into the water where they are being consumed by the waiting crocodiles.

War boats of Indo-China, done in the peculiar and characteristic style of the Dongson culture on a bronze drum of the 1st century BC. These are the forerunners of the war barges seen at Angkor, and appear to have steering oars at each end. There is an archer on the roof of the deck castle. These figures are contemporary with Han China.



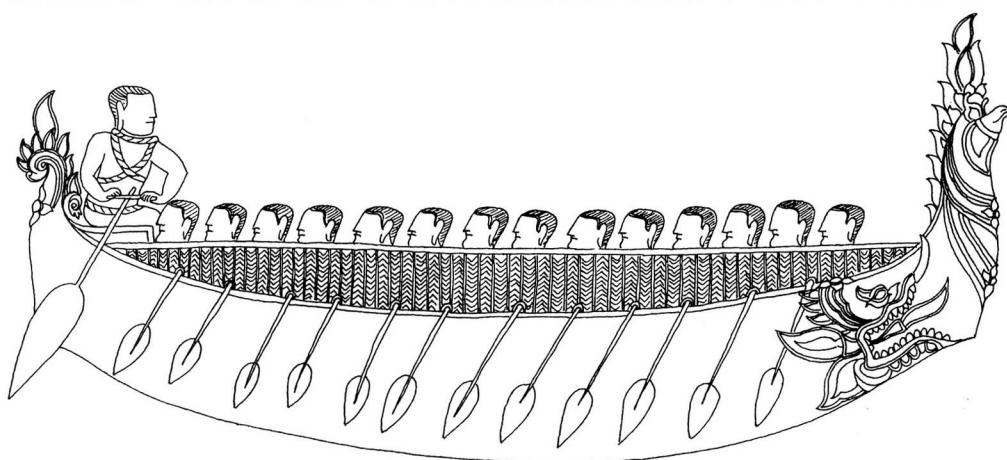
Such vessels were still in use a century later, because in 1279 a Chinese official visited Cambodia and left an eyewitness account of how both ships and dugouts were built. He noted in particular how the techniques differed from conventional Chinese practice, in that hatchets were used instead of saws, which meant that carving a plank took a long time. The ships were held together with iron nails, and roofed with woven matting held in place by strips of palm. The dugouts were carved with the help of fire and water.

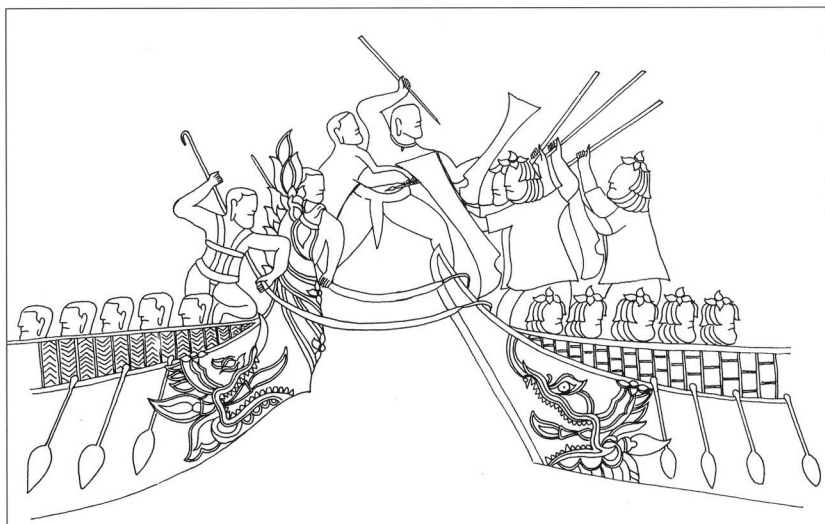
War barge fighting techniques

The Cambodian reliefs clearly show that grappling and boarding, rather than long-range bombardment in the Chinese style, was the preferred technique for river fighting, although one of the rearward Khmer barges is crammed with archers, who were probably used before the boarding took place. The Khmer soldiers who fill the barges behind the oarsmen are also shown bareheaded, and are taking the fight to the Chams with great gusto. In one picture a barge is sinking as if it has been rammed, but the collision has obviously taken place by accident because two Khmer vessels are involved, one at each end, and some Khmer soldiers are going down with the enemy ship. In the normal circumstances of battle depicted elsewhere there is an exchange of arrows, and then the barges close with each other either head-on or alongside. Grappling irons are thrown, and while men haul on the rattan cables that keep the barges together boarding takes place under the direction of a Khmer officer who controls operations from beneath his parasol in the centre of the barge. The soldiers of both sides are armed with long spears and shields. The war barges deployed against the invading Mongols in Vietnam and Java would have carried very similar fighting men.

War barges were also used as troop transports and supply vessels. In one Cambodian relief Cham barges are shown approaching a landing place with Khmer prisoners on board, while civilians flee from them on the shore. Such boats were also used in siege warfare, with attacks on defences being made from river or coastal fleets. More complex siege techniques involved employing numerous war barges to lay a blockade around a defended place. In such a case the barges could be lashed

A Khmer war barge. It has a striking figurehead carved to resemble a monster, and a complementary curved 'tail' at the stern, which makes it look rather like a Viking ship. The crew's allegiance can be distinguished because the Khmer oarsmen are shown bareheaded.





The climax of the battle is about to be reached as the two boats are secured to each other by grappling irons.

of 'fierce fire oil' to the court at Kaifeng. There is therefore one weapon known to have been used by the Chams in naval warfare that does not appear on any Cambodian bas-reliefs, so we have to rely on an account of 1298 for a description of naphtha grenades (called in this account 'mud oil') being thrown by hand in naval warfare from the tops of masts of what must have been junks rather than war barges:

Little bottles are filled with it, and a roll of betel-nut husk is used as a stopper. When this is lit it acts like a fuse. Then the bottles are thrown down from on high, and when the mud oil [bottles] hit the deck they [break and] burst into flames which spread everywhere and continue to burn. If water is thrown on it it blazes all the more fiercely, and nothing but dried earth and stove ashes will put it out. Nowadays our official naval ships do not like to approach these shallow-draught barbarian vessels because of this fearsome weapon.

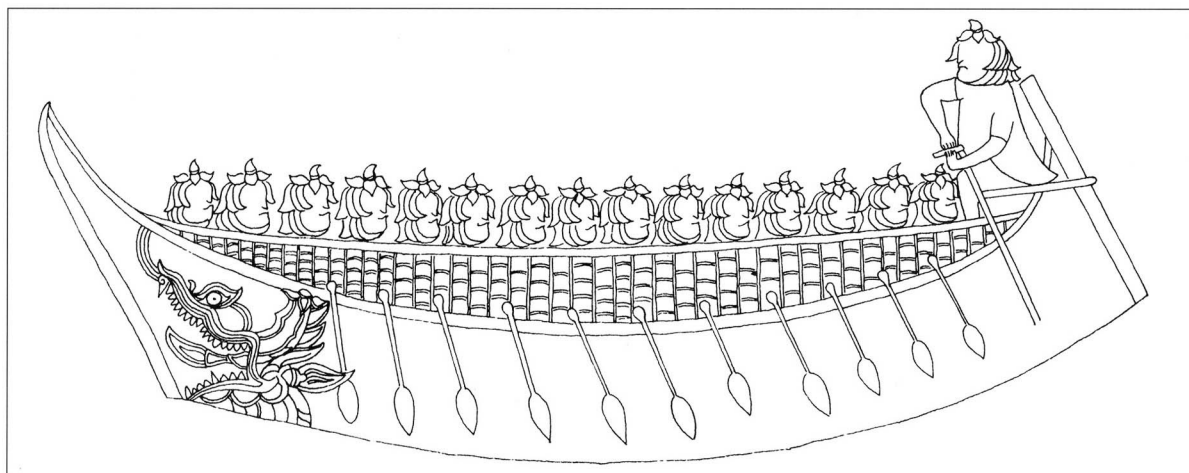
One can imagine them being deployed in this way against the Mongol invaders of Vietnam in 1287–88, but the weapons employed against them in naval warfare in Java are likely to have been far more primitive.

SUGGESTIONS FOR FURTHER READING

- Needham, Joseph, *Science and Civilisation in China, Volume 4: Physics and Physical Technology Part III: Civil Engineering and Nautics* (Cambridge: Cambridge University Press, 1971)
- Turnbull, Stephen, *Siege Weapons of the Far East, Volumes 1 and 2* (Osprey New Vanguard Series, 2001 and 2002)
- Worcester, G.R.G., *Sail and Sweep in China* (London: HMSO, 1966)
- Worcester, G.R.G., *The Junks and Sampans of the Yangtze* (Annapolis, Maryland: Naval Institute Press, 1971)

together, as noted in a contemporary inscription that describes 'thousands of fresh white ships, connected by rattans, which extended on all sides'.

The Vietnamese had incendiary weapons before the Chinese because the transmission route to China for petroleum-based incendiary weapons that originated in the Byzantine Empire appears to have gone through Southeast Asia via Arab traders. In 958 an envoy from the king of Champa presented a bottle



A: THE RIVER BATTLE FLEET OF THE EARLIER (OR WESTERN) HAN DYNASTY IS ATTACKED BY REBEL FIRESHIPs, 200 BC

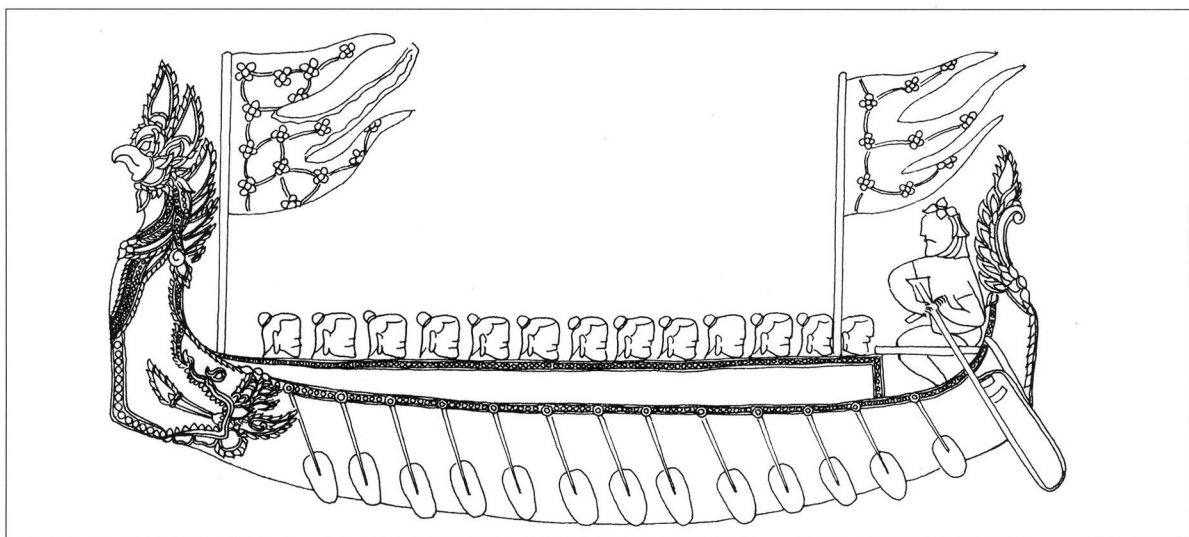
The Earlier (or Western) Han dynasty took over from the Qin dynasty in 202 BC. Here we see their river battle fleet coming under attack from rebels who have floated crude fireships down the river towards them. Much of the detail of the Han battleships is conjecture, because only crude illustrations have survived, so these have to be augmented by eyewitness descriptions. The large multi-storey vessels are likely to have been built as rafts mounted over two similar flat-bottomed hulls like an ungainly catamaran, with very simple multi-storey deck castles decreasing in size like a wedding cake. There are

BELOW Another Cham barge. This has an elaborate figurehead and is flying banners from bow and stern. The steersman is clearly shown.

ABOVE A Cham war barge. The Chams wear the flower-like headgear depicted elsewhere in the Cambodian temples in reliefs of land warfare. The decoration on the bows is somewhat less flamboyant than that of the Khmers, but this may just be Khmer propaganda.

simple bulwarks round the lower deck level of the ship, which are repeated as the storeys increase. The commander stands proud and undaunted in the prow. In the uppermost tower of the ship a drummer encourages the men into action, a display of power that is added to by the numerous flags that the vessel is flying. The ship's offensive armament is provided by hand-held crossbows.

Beside the big ship are simpler and smaller boats. The largest of these is based on a wooden model of a river boat found in a prince's tomb, which has provided vital clues to the appearance of a simple war vessel of the Han dynasty. It



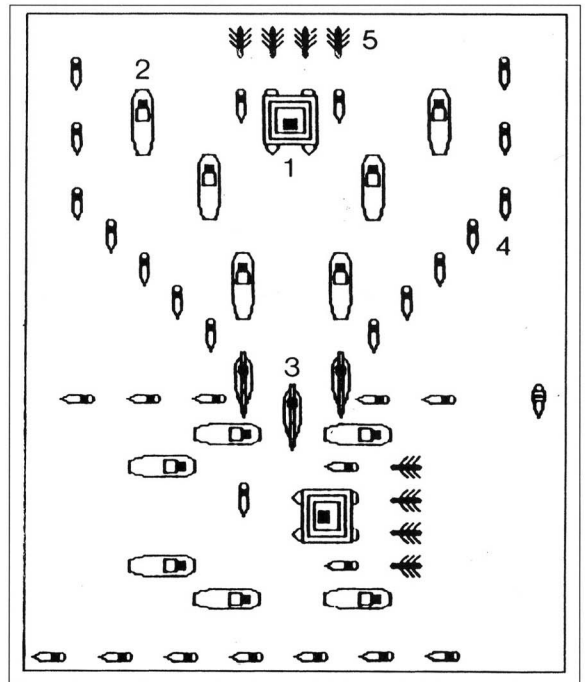
is a flat-bottomed barge operated by oarsmen, with a steersman in the stern and a simple wooden 'cabin'. There are also two smaller versions, one of which has an iron-tipped ram mounted on its bows. The ram itself is a carved tree trunk that stretches the entire length of the boat. Finally, 'war canoes' are paddled by five men. Details of the equipment worn by the 'marines' are taken from the famous near-contemporary terracotta army of the Qin emperor at Xian, together with carvings from the Early Han Period, which show a remarkable similarity. The helmets, where worn, are of leather or iron, and have a strange modern look to them. The fireships have been made by converting simple sampans.

B: A TANG DYNASTY TOWER SHIP HOLDS A SONG DYNASTY WAR JUNK WITH ITS STRIKING ARMS AND PROJECTS GREEK FIRE, AD 975

In this plate we see a battle on the Yangtze River near Nanjing in 975 between the Song and the Tang, who were competing for power. The Tang are fighting from a three-storey *lou chuan* (tower ship). These classic Chinese battleships were of multi-storey construction, but with straight sides, unlike the Han dynasty ships seen in Plate A. There were portholes and other openings for crossbows and lances. Trebuchets were mounted on the uppermost deck beside portable forges for molten iron projectiles. On its wide and curved bow was painted a fierce tiger's face in lieu of a carved figurehead. A door gave access to the bow areas and the sides from the castled area.

The war junks resembled the tower ships in their design but were of a smaller-sized, one-storey construction and less well protected. Just as with the tower ships, the oarsmen operated outside the central deckhouse, but there was a raised stern castle from where the captain directed operations.

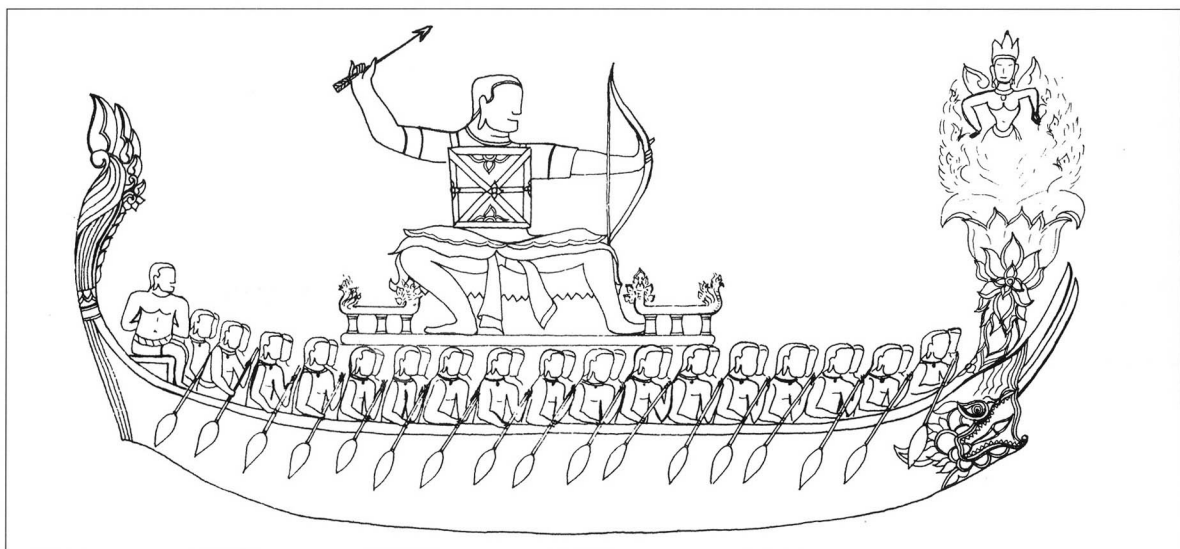
This plate shows a remarkable addition to the tower ship's usual armament. In Chinese naval warfare the preferred tactic was usually not boarding but bombardment, whether by catapult projectiles or a heavy fire from crossbows. This led to a unique Chinese variation on the grappling iron that was designed to keep an enemy ship at a chosen distance rather than secure it alongside. They were called 'striking arms', and consisted of some form of 'hammer head', such as heavy iron spikes, mounted on the ends of 50-foot-long poles which were securely hinged to the attacking vessel's superstructure. An illustration from the Tang dynasty shows three arms mounted on each side of a tower ship. When the ship came alongside an enemy vessel the striking arms would be released and would fall in an arc to hit the deck of the opponent. In the case of a small-sized boat the hammer smashing through the woodwork might well sink it. If the enemy ship was still afloat it would of course now be held fast to the attacker, but the primary intention of this was never to provide a platform for boarding. Instead the arms would hold the ship securely at a distance suitable for close-range work, in this case Greek Fire, the secret weapon of Byzantium transmitted to China and used both in naval warfare and siege work. However, records tell us that on this occasion the weapon almost literally backfired, because when the Tang projected the petrol from the flame throwers a sudden north wind sprang up and swept the smoke and flames over the sky towards their own ships. The Song marines fight back with crossbows.



A diagram of a Chinese naval battle formation of the Han dynasty, showing the ideal way for one fleet to break into another. Key: 1. Double-hulled battleships. 2. Large-oared open boats. 3. Small boats tipped with iron rams in the bows. 4. Small patrol boats. 5. Five-man open 'canoes'.

C: KHMER (CAMBODIAN) AND CHAM (VIETNAMESE) RIVER WAR CANOES COME TO GRIPS DURING THE REVOLT OF JAYAVARMAN VII, AD 1181

In 1177 King Jaya Indravarman of Champa (Vietnam) invaded Cambodia by sea. His fleet was guided along the coast and sailed up river to the Khmer capital of Angkor. The city was pillaged, and the Chams occupied Cambodia for the next four years until the future Cambodian king Jayavarman VII staged a revolt. He defeated the Chams in a great naval battle in 1181, an epic river fight commemorated forever in the bas-reliefs carved into the walls of Banteay Chmar and the Bayon in Cambodia. Here we see Khmer and Cham war canoes grappling in a fierce river battle. The boats have grotesque figureheads and are filled with scores of archers and spearmen. The two sides can be distinguished because the Khmer oarsmen are shown bareheaded while the Chams wear the flower-like headgear depicted elsewhere in the Cambodian temples in reliefs of land warfare. All the oarsmen are facing backwards except for the crew on the Khmer royal barge, who are shown operating their oars while facing forwards. These fellows have no physical protection, unlike the other crews who have long lattice shields through which their oars protrude. No doubt this is meant to show their great bravery in the presence of their king, who stands, larger than life, in the middle of the royal barge and shoots an arrow. There is an exchange of arrows, and then the barges close



with each other either head-on or alongside. Grappling irons are thrown, and while men haul on the rattan cables that keep the barges together boarding takes place under the direction of a Khmer officer who controls operations from beneath his parasol in the centre of the barge. The soldiers of both sides are armed with long spears and shields, and crocodiles consume anyone who falls overboard.

D: A 23-WHEEL PADDLESHIP OF THE SONG DYNASTY BOMBARDS A JIN DESTROYER WITH LIME BOMBS HURLED BY TRACTION TREBUCHETS AT THE BATTLE OF CAISHI, AD 1161

This plate shows a contest between two very different forms of warship, both of which could be fast and manoeuvrable. In 1161 there occurred the most celebrated naval battle between the Southern Song and the Jin, when the latter, who were that day under the personal command of their emperor, attempted to force a crossing of the Yangtze at Caishi. The Song paddle-wheel fighting ships moved rapidly round the island of Jinshan to bombard the Jin with traction trebuchets. The men inside them paddled fast on the treadmills, and the ships glided forward as though they were flying. In this reconstruction one paddle-wheel has been placed at the stern, and there is a flag flying which reads 'Support the Song. Destroy the Jin'. The Jin were so badly defeated at Caishi that the Jin emperor was assassinated on board his flagship by his own followers.

The ships used by the Jin in this plate are the fast and light warships that were the 'destroyers' of medieval China. Unlike tower ships and war junks, the walls of these two-storey ships were continuous with the hull, so that the oarsmen occupied the lower deck and were fully protected, while missile troops went into action above their heads. Close-combat grappling was therefore not a primary function of these ships. The 'armour plating' was of wood or rhinoceros hide, and there was a fierce tiger's face painted on the bow.

To combat these fast-moving ships the Song used lime bombs thrown by trebuchet catapults. The bombs were pottery containers with very thin walls, inside which were

The Khmer royal barge. The crew are shown operating their oars while facing forwards. These fellows have no physical protection, unlike the crews on other boats who have long lattice shields through which their oars protrude. No doubt this is to show their great bravery in the presence of their king, who stands, larger than life, in the middle of the royal barge and shoots an arrow.

placed poisonous drugs (probably arsenic), lime and fragments of scrap iron as well as gunpowder. When these were hurled on to Jin ships the lime filled the air with smoke so that their sailors could not open their eyes. The explosive devices were almost identical to soft-cased explosive 'thunderclap bombs' thrown by traction trebuchets. The bombs were fitted with time fuses that caused them to explode on hitting the surface of the water. The bomb cases rebounded and broke, scattering noxious clouds from the lime that had been mixed in with the gunpowder.

E: PADDLE-WHEEL WARSHIPS OF THE SOUTHERN SONG RUN THE GAUNTLET OF THUNDER CRASH BOMBS TO BREAK THE BLOCKADE OF XIANGYANG BY THE MONGOLS, AD 1272

The most famous use of paddle-wheel fighting ships in Chinese warfare took place during the epic siege of Xiangyang (modern Xiangfan in Hubei Province) between 1267 and 1272, the war which saw the most desperate rearguard action by the Southern Song against the advancing Mongols. The siege of Xiangyang is best known today because it was the occasion when counterweight trebuchets made their first appearance in China, but the use of paddle-wheel warships is equally striking. Two heroes of the Song took a relief convoy of 100 paddle-boats laden with clothing and other supplies to the help of the beleaguered twin cities of Xiangyang and Fancheng that lay opposite each other on the river. The convoy waited until dark to make their return voyage, but the Mongols burned bales of straw on the riverbank to give illumination. The Song paddleships took up a rectangular formation, every ship being equipped



with firelances, trebuchets and bombs, burning charcoal, large axes and heavy crossbows, and sailed out into the river using red lamps as signals. But the Mongols fired iron-cased bombs from counterweight and traction trebuchets when the Song fleet approached, so that the Song crewmen were 'up to their ankles in blood'.

The design of these paddleships gave them offensive as well as defensive potential, because bulwark boards were on each side, each plank being five feet long and two feet wide. Below this were fixed turning pulleys like those which raise hanging windows. When approaching the enemy, those inside could loose bombs, incendiary arrows and firelances. On closing with the enemy the sailors suddenly lifted up and fully opened the bulwark hatches so that the walls acted like a shield.

F: A SEA-GOING WAR JUNK OF THE YUAN DYNASTY IS TRAPPED AT THE BATTLE OF BACH DANG AND ATTACKED BY VIETNAMESE WAR CANOES WHOSE CREWS THROW NAPHTHA BOMBS, AD 1288

The Yuan (Mongol) general Toghon unwisely attacked Annam (Vietnam) during the hot season of 1288, and a fierce naval battle took place in the estuary of the Bach Dang River off Haiphong, where a celebrated Vietnamese general had defeated a Chinese army several centuries before. General Tran Hung Dao now repeated the victory, using the same tactics, against the Mongols. He waited until high tide, and lured the Mongol fleet into advancing over an area of shallow water where iron-tipped stakes had been planted. When the tide turned the Mongol ships were caught on the projections and suffered great loss.

The Yuan dynasty sea-going war junks were simply adaptations from sea-going transport junks, which enabled fighting to take place on the open seas rather than mainly on rivers and coastal waters. Sea-going commercial junks were important vessels in their own right, and there are good sources for them from the Song and Yuan dynasties. In about 1100 an observer noted their employment of sails. Similar vessels acted as warships during the Mongols' overseas naval campaigns, as attested to in the paintings of Mongol ships that appear on the Mongol Invasion Scroll,

Ming soldiers use a sampan to repel Japanese wako (pirates). The wako were the curse of the Far East for much of the 14th and 15th centuries, raiding Korea and China.

which illustrates the expeditions to Japan of 1274 and 1281.

The Vietnamese are fighting from war canoes not dissimilar to those formerly used against the Khmers. They also use incendiary weapons, in the form of naphtha grenades (called 'mud oil') thrown by hand. Little ceramic bottles are filled with it, and a roll of betel-nut husk is used as a stopper. When this was lit it acted like a fuse. Then the bottles are thrown, and when the mud-oil bottles hit the deck they brake and burst into flames.

G: A SPLIT-HULLED MINELAYER OF THE MING PLACES ITS CHARGE AGAINST A STRATEGIC BRIDGE HELD BY THEIR RIVALS, THE HAN, AD 1363

When the Yuan dynasty was nearing collapse several rivals competed for power. This process reached its culmination in the naval battle of Lake Poyang in 1363, but here we see a step towards that process when a Ming minelayer attempts to blow up a strategic Han position. The delayed-action explosive charge is being delivered to the enemy by a very unusual boat of two halves joined by couplings. The origin of such boats is to be found on the Grand Canal, which gradually became silted up. The two halves of the boat could be uncoupled and the resulting separate sections could then negotiate shallow channels where larger boats would have to wait until the water level rose. In its form as a minelayer, the aim was to approach a city or a bridge under the cover of darkness, uncouple the bow section in which the explosives were located, and leave it with a fuse burning while the assailants made a rapid getaway in the stern section.

The attack has taken place under cover of darkness, and the crew of a Han zou ge, the smaller and faster ships of an ordinary Chinese river-based battle fleet, sleep in the background. These ships had one open deck with protective bulwarks and carried 'the best and bravest soldiers', who were transported rapidly to and from the scene of action. The design meant that the soldiers were on deck alongside the rowers.

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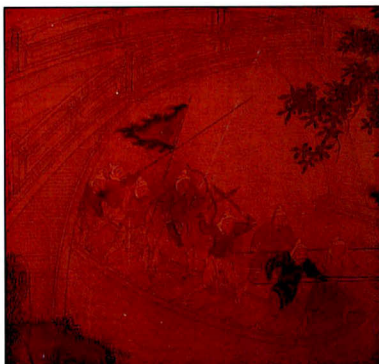
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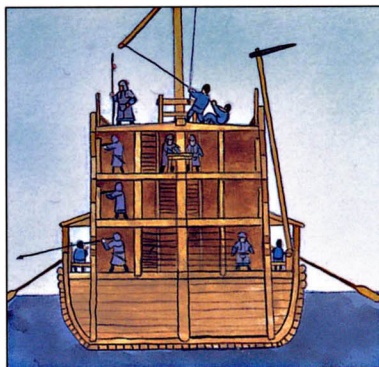
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