

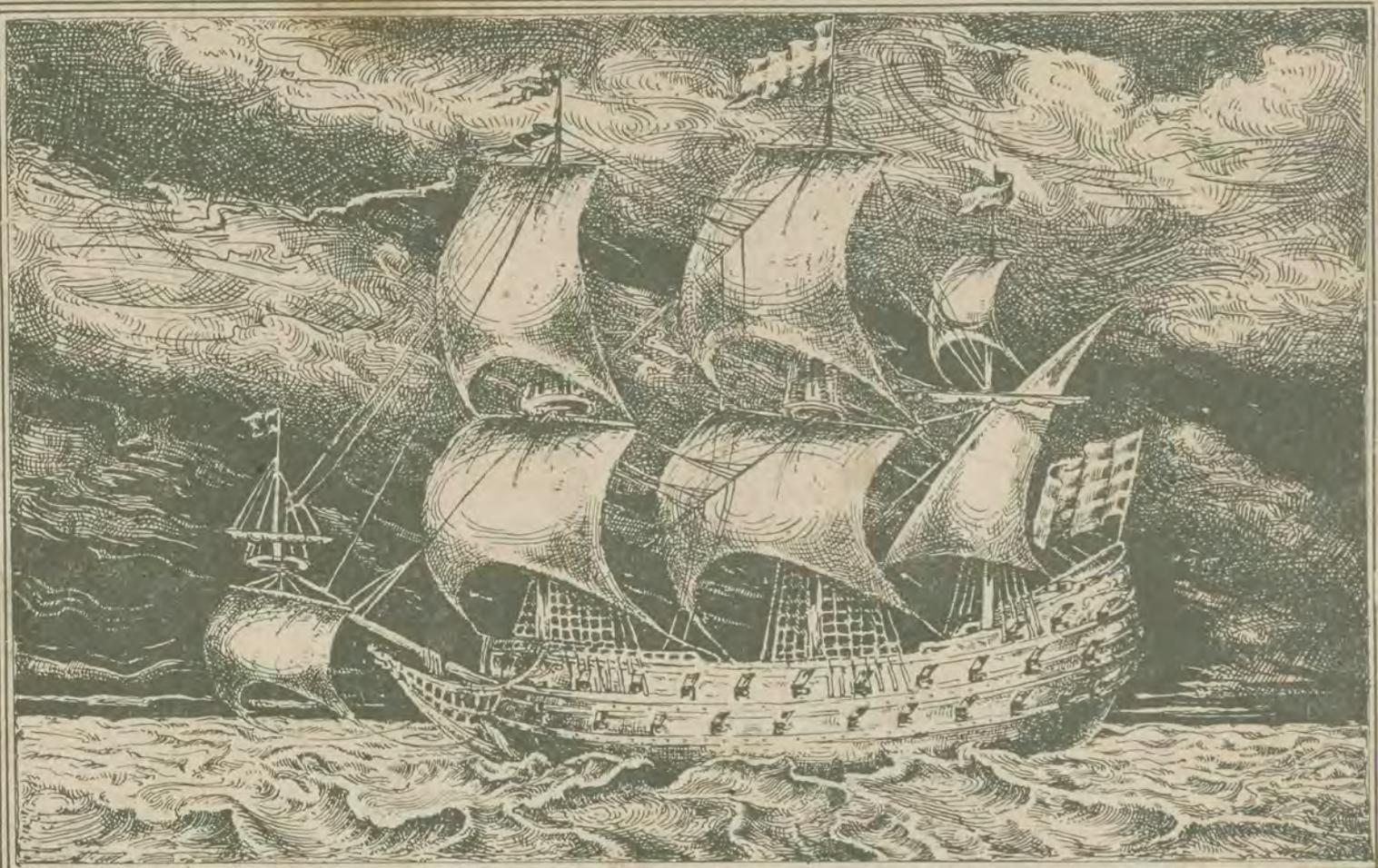
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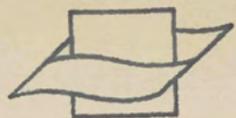




SHIPBUILDING  
FROM  
ITS BEGINNINGS







Vlaams Instituut voor de Zee  
Flanders Marine Institute

226828

# SHIPBUILDING FROM ITS BEGINNINGS

BY

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*ENGINEER OF THE RIJKSWATERSTAAT OF THE NETHERLANDS*

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HOLLAND'S struggle for life has been a constant battle against the invasion of water. If this has been, on the one hand, an enemy to be feared, it has been, on the other, the natural line of communication above all others which has made our ancestors, since time immemorial, a nation of seamen. The boat was a necessity as indispensable as the house.

It is impossible to say who invented the boat; every one has contributed his mite to its building and this has given rise to its gradual development. The discovery that wood would float was due, evidently, to chance.

Use must have been made first of the trunk of a single tree, and afterwards several must have been joined together to make a raft.

Then came the hollowed trunk which was followed, in its turn, by a boat with a framework covered with skins from which the finished boat was born.

(1) Necessity has taught us naval architecture and the art of war, which give the means by which to dominate the nations.

Between the floating trunk of a tree and the most complete ship, there have come into existence all sorts of intermediate forms, of which most are still to be found even in our day.

Noah, according to the writers of antiquity, must have been the first shipwright. The old authors enter into circumstantial details on this subject and give various drawings of Noah's "ark". Several of these drawings are reproduced in the atlas of this work. The only value of these reproductions of the ark lies in the fact that they probably represent a ship of the time of their author. It must also be noted that the first shipbuilder is as entirely unknown as the first inventor of the boat. That which is beyond any doubt is; that the mutual influences of various nations have been important factors in the evolution of the ship. This latter, on its side, served to bring into contact nations widely separated by water and to open up countries as yet unexplored.

Hence shipbuilding must first have shone forth, under these conditions, among the most civilized races.

Mexico and Peru excepted, it may be said that civilization was developed first among the Chinese in the valley of the Hoang-Ho, then among the Babylonians in the valley of the Tigris and Euphrates, and among the Egyptians in the valley of the Nile.

The question of knowing whether the Babylonians learned shipbuilding from the Chinese, or the reverse, is one of minor importance. It is certain however that reciprocal influences were at work among the races of Asia Minor and there is no doubt that the Babylonians influenced the Phœnicians, the pioneer shipwrights of the Mediterranean. The Egyptians, who were not a seafaring people do not here enter into consideration.

As the Netherlands lay under the action exercised in Europe, where the development of naval architecture went on about two independent centres, that of the Baltic and that of the Mediterranean, Asia may be set aside in so far as its parts not bordering on the Mediterranean are concerned.

After the Baltic, which will be called the *northern centre*, had introduced shipbuilding among us, this centre, in so far as over seas navigation is concerned, came into contact with the Mediterranean, which will be called the *southern centre*, through the

movements of commerce and navigation, and finally the two became fused with each other.

It is easy to see that the influence of the northern centre was preponderant on our naval architecture, hence its importance is capital for us.

The few vessels of ancient times which have been found show us what a high degree of perfection shipbuilding had already reached in almost prehistoric times; the finish of these vessels and the care given to their ornamentation might also be noticed. These observations are not extraordinary, when the large part played by the ship in the existence of nations is borne in mind; the contrary would rather have caused surprise. Nor is it astonishing that the chances of the sea should have been faced with small boats. For are not the valiant fishermen of to day seen facing the waves of the sea, in still smaller boats than those of the ancients, to ply their rude and perillous trade, and that too during the entire year? For let it not be forgotten indeed, that ocean navigation during the Middle Ages was, as a matter of fact, carried on only in Summer. Nic. WITSEN wrote in 1671, p. 195 of his book, on this subject: " dat men oulinckx in deze landen  
" nimmer 't zee ging als naer besloten boeken, besproken uiterste  
" wille en met God zich te hebben verzoent: wanneer men het  
" gevaar meer ontzag als heden nu dorst men althans zee kiezen

" zonder aanzien van tijdt of weer van outs wiert de zee gesloten  
" in de quaetste tijden van het jaar! " (1)

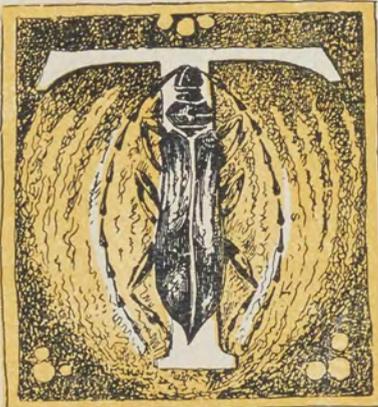
To know what we can do, to know of what we are capable, and, above all, to know what there is still to be learned and even what has to be imitated, are the most important demands of all individual education as they are the fundamental requirements of a race which, after all, is but an unit in the series of the nations.

May this book add its mite to a knowledge of the gradual evolution of shipbuilding; may it also cause to disappear this ridiculous way in which ancient ships used to be represented and, most of all, may it awaken the love for the building of ships.

I am, in this connection, fully of the opinion expressed by WITSEN as follows: " Zoo groot dunkt mij de waerdigheit dezer  
" wetenschap te zijn dat niemant derzelve hier ten lande, daar  
" de zeevaert de sterkste zenuwe van den staet is, behoorde  
" onkundig te zijn. " (2)

(1) That, in this country, in former times, when greater fear was felt of the dangers of the sea than is now the case when they are faced in all kinds of weather, people never put off from shore without first having settled their accounts, made their wills and partaken of the Holy Communion. In the old days, the sea was closed during the bad season.

(2) The value of this science seems to me so great that none of my fellow countrymen can afford not to be acquainted with it, as navigation is the nerve and sinew of the nation.



THE Egyptians were not a nation of mariners. Their navigation, at the beginning, was limited to the Nile alone; it was only later that they ventured out to sea, preceded and assisted by the Phœnicians. Their vessels were and continued to be river boats. The question of knowing whether the Egyptians borrowed the art of building them from the Babylonians, or whether their art was developed independently of any

other is of little importance here and, furthermore, it cannot be solved by the nautical knowledge which we possess. (ERMANN, p. 679. — Dr. MORITZ RÜHLMAN, pp. 25-33.)

That which is certain is that the Babylonians and the Egyptians had their vessels already in the most remote antiquity; this follows (L'Anthropologie, 1899, Vol. X, p. 517, and HOLMES, 1900, p. 9) from the decorations on ancient vases which are supposed to date from 6,000 to 4,000 years B. C.

Doubts have arisen at times — but wrongly in my opinion — as to the question of knowing whether the decorations in question really do represent vessels. Although the drawings are too primitive to furnish any data relating to the form of the boats, it can surely be said, however, that only vessels propelled by oars are there shown and that sailing vessels were probably still unknown at this time. The lines at the bottom of the boats, considered sometimes, but wrongly, as indicating fishing apparatus (*Recherches sur les Origines de l'Égypte*, DE MORGAN, pp. 91 and 92), represent the propelling oars, and the long strokes at the stern of the boat, the steering oars. The boats were not moved forward by oars but by paddles, which is the oldest mode of the propulsion used, as can

still be seen by the interrupted line of rowers found again, still later, among the Egyptians.

The reasons for the almost exclusive use of the oar or the paddle for propelling boats are to be sought in the mobility of the bottom and hence in variations of the navigable passages of the Nile. To these should also be added the great changes in the height of the water and the sudden dead calms. Sails were used later, it is true, but rowing and towing still continued to be employed along with the sails.

The shape of the vessel depended upon the use for which it was intended, so that there can be distinguished among the Egyptians : boats for transportation, boats for towing and boats for fishing. It is not known whether they had any war vessels. Pleasure boats and boats used for travelling by persons of rank formed a large flotilla. (Dr. MORITZ RÜHLMAN, p. 25, and *Aegypten* by ADOLPHE ERMANN, p. 639.)

The Egyptian boats were flat, as a rule, with the bow and stern rising with a slight slope above the water, the stern generally higher than the bow in order, so it seems, to give the steersmen a better purchase. (*Aegypten*, ADOLPHE ERMANN, p. 637.)

Under the ancient Empire, about 5,000 to 3,200 B. C., boats were moved by paddles, the boatmen facing the bow. Still, even in these distant times, oars were already employed and, toward the end of this period, they were in general use. This is shown clearly by figures on the monuments of this age, where the rowers no longer face the bow but are turned toward the stern. (HOLMES, p. 13; ERMANN, p. 640; *Ancient Ships* by CECIL TOR, 1894.) Paddling was kept in use only for boats made of papyrus. When the boats were driven by oars, the latter passed through the side of the vessel or through rings arranged for this purpose. Each oar was worked by a single oarsman. The boat was steered by means of oars, rather larger than the others, and handled also each by a single man. The number of steering oars, as well as the number of steersmen, depended on the number of oarsmen (ERMANN, p. 641.) For example : for eight oarsmen there were at least two steersmen; for fourteen there were three steersmen, and four for twenty-one oarsmen, etc.

Already, under the ancient Empire, the sail is shown alongside

11 14 of the oar. The mast, placed in the middle of the boat, was composed of two posts placed crossways and fastened together at the top; this form of procedure is characteristic of the time of the old Empire.

The rigging, set in the longitudinal axis of the vessel, was composed of a heavy rope leading forward and of several lighter ones, generally from six to twelve, leading aft.

The sail, which was rectangular in shape, was always attached between two yards, one of which held the head, the other the foot of the sail, a system followed exclusively in Egypt. Two ropes led aft from the upper yard, which was fastened to the top of the mast, so as to give the means to turn the sail to the wind.

Here are a few figures which will give some idea of the dimensions which were in use.

A relatively large boat, 16 metres long, had ordinary oars 3 metres long, steering oars of 6 metres, a mast 10 metres high with a yard of 6 metres. The area of the sail was about 60 to 70 square metres, hence it was higher than it was wide. (ERMANN, p. 639.) In calm weather, which was not infrequent, the vessel was driven by oars or else was towed. The mast was then lowered and wrapped in the sail.

In order to attach the rope which connected the vessel with the towing boat, there was used generally a piece of wood set either in the bow alone, or in the bow and the stern : this was the arrangement especially for freight boats. These latter had no rigging, as a rule; they could scarcely make room for a few oarsmen, because the greater part of the boat was occupied by the cabin.

As a general rule, small rowboats were used for towing.

The art of shipbuilding made a great advance under the middle Empire (B. C. 3200-2100). Except for the small papyrus boat, vessels were all propelled by oars and no longer by paddles. The steering oars, which were difficult to handle, were replaced by a single large rudder which could be worked by one man.

The rigging was also changed. The upper yard no longer rested *on* the mast; it was attached thereto in such a way that it could be removed. The sail was less high, its width was increased and the mast became relatively shorter; finally, the double mast, which was so characteristic of the ancient Empire, was replaced by a single mast.

Under the new Empire, (inclusive of the interregnum of thy 11 8 Hytkos B. C. 2100 to 1600) B. C. 1600 to 730, the art of shipbuilding made no advance. Luxury only increased, especially for the cabins which had already appeared during the time of the middle Empire.

The special feature of this period was the increasing width of the sail. This width was so great that the yards had to be made of two pieces joined near the mast. The following figures give an idea of this constant increase of the sail. (ERMANN, pp. 643 et suiv.)

Under the ancient Empire, the mast was 10 metres long and the yard was 6 metres. Under the middle Empire, these lengths 11 18 etc. were, respectively, 5 and 6 metres, and under the new Empire they were 5 and 10 metres.

As the result of this constant increase of the width of the sail, the rigging became more complicated and a top was placed at the head of the mast in order to handle the lines from there.

The scarceness of wood in Egypt was the cause, from the most distant times, of recourse being had to other materials for the construction of vessels. Papyrus answered this purpose very well. This aquatic plant when cut, dried and made up in bundles, formed 11 4 the material of which the boats were made.

The papyri were laid side by side and a whole was made of 11 5 them by ties placed at close intervals. (ERMANN, p. 593; NICOLAS WITSEN, p. 6; *Archéologie navale*, by A. JAL, Vol. I, p. 91.)

Several drawings found on old monuments show us the Egyptians engaged in this work.

The papyrus barks formed a sort of rafts of reeds, judging by these drawings which represent the oarsmen standing upright on the boats.

These latter were small; attempts made later to build them of larger size appear to have failed. As a general rule, the wood intended for the construction of the larger vessels had to be imported.

The many pictures on monuments and the large number of models found, enable a very fair idea of the shape of the ancient Egyptian ship to be formed, and it can be seen at the same time that these shapes were little changed.

Before describing these models, it will be rather interesting to note that, as a general rule, the oldest ones are not reproduced in

accordance with the proportions adopted in practice; they are too high and too broad for the length. Taken by themselves, the stem and the sternpost are well shown, but the intermediate body is too short. The cause of this must be sought in the fact that these models are made from nature and not by taking the dimensions of the boats from carefully prepared drawings. Proceeding in this way, it is very difficult to give exactly the relative dimensions of the boats, especially in the relations between length and breadth. This is why the vessels are drawn so often with too little length. So, many old models must be accepted with the necessary reserves.

The vessels shown in mural paintings are generally much better proportioned than those represented by models. In the mural paintings, when the boat is shown in profile, there was no reason to consider the beam; all the same, the figures are often too large.

According to BELGER (*Zeitschrift für « Aegyptische Sprache und Altertumskunde »*, XXXIII, p. 24), the models which have been found should be placed in two classes :

a) solid models made from a massive piece of wood, and

b) hollow models which are, evidently, a more faithful reproduction of the ship.

Belger also shows that, in group *a*, the parts painted *white* must be considered as not existing, while those painted *brown* really do exist.

It appears, generally, from the examination of these models that the Egyptian boats were not of deep draught; they had, necessarily, to draw but little water on account of the small depth and the frequent changes in the navigable portions of the river. The mural paintings, on their side, show that the bottom length was one-third of the total length. (ERMANN, p. 637; BELGER, p. 25, XXXIII-1895, et id. p. 26.)

The boats were flat-bottomed with very low sides, so that, in order to prevent the water from coming in, movable upper sides were often used. The outside planking was smooth (all the models are worked in this way) and the boats were finished with neither stem nor sternpost. The keel, in like manner, was not shown on the models, but this would not allow us to say, however, that it never really existed.

11 B

How then could the vessel have sufficient strength under these conditions?

This explanation is given by the representation of an ancient boat, exhumed about eleven years ago, shown in « *Wassersport* »<sup>11 10</sup> of January 4, 1906, (No 1). The form of this boat shows that there were neither frames nor keel; but, on the other hand, the planking is very thick (36 millimetres) and is formed of joists close laid and dovetailed together; the middle joist which takes the place of the keel is, besides, thicker than the others but it does not project below the hull of the boat. The latter is therefore perfectly smooth on the outside. The keelson forms a whole with the floor and follows up to the very ends of the bow and stern.

The benches for the rowers served as braces for the sides of the vessel; and when this was quite large, the sides, by reason of their greater length, were supported near the middle by a timber laid in the longitudinal axis of the vessel.

At the point where the mast was put up, this timber was made double and embraced the foot of the mast to which it gave the required support. In smaller boats, where this beam is not met with, the support for the mast was formed by a special arrangement which is found in the models.

The bow and stern are always shown to be solid (painted brown), which allows it to be supposed that there were decks at the two ends.

The benches for the rowers passed through the planking and gave greater stiffness to the boats; these benches are indicated on most of the reliefs by small squares on the sides of the vessel. The steering oar was supported, on the other hand, by a beam which passed across the boat and which is shown by a small rectangle.

It has been sometimes believed, but wrongly, in my opinion, that these rectangles were windows in the cabin. (See Dr. MORITZ RÜHLMANN, p. 22.)

A very nearly identical method of proceeding can be noted in the barks formerly used by the Arabs of the Black Sea, and reproduced in PARIS's work, Vol. I, No 59 (see also the models from the Dutch East Indies which appear in the collection of the Technical University at Delft).

This wholly original mode of construction, which was never in

use in the North of Europe, bears witness to the fact that the art of shipbuilding in Egypt was more closely related to that of Asia (India and China) than to that of Northern Europe. But this should not be a matter of astonishment.

11 11 The proof that these little rectangles, just mentioned, do not represent windows is given by a figure, found in the temple of Dês-el-Bahari (*Ancient and Modern Ships*, HOLMES, p. 20), which reproduces a boat carrying an obelisk. In the side of this vessel, there are not one, but three superposed rows of these little rectangles. This ship was made exceptionally strong, in proportion to the loads which it had to carry. It would be hard to admit that the side would have been pierced by three superposed rows of windows. An endeavor rather has been made to put in a suitable cross bracing. In the boat which tows the larger vessel, furthermore, there is but one row of rectangles, and these are placed below the gunwale, at the points where the rowers sit. Here it has been considered enough to let the benches of the oarsmen pass through.

*Boats intended for carrying freight* were a little shorter and more round than the others and were towed, as a rule. They had generally a towing bitt at the top of the bow and sometimes even a second one at the top of the stern. A few had sails and rigging, but generally they could also be propelled by oars. The free space on deck was occupied ordinarily by a cabin (made of laths and covered with cloth). Rather flat at the bow, these boats rose sensibly toward the stern.

As has been said already, it is not known whether the Egyptians had any vessels built exclusively for military purposes. It would seem not, if it be remembered that most of the actions between vessels had no other scene than the river. Furthermore, only one single representation of a naval fight at sea is found, 11 20 it having taken place under Ramses III (B. C. 1180-1150). Here is another proof that the Egyptians were not a race of seamen, and this is all the more marked as the war ships seen are not of pure Egyptian type. The subject will be taken up again.

JAL gives in his celebrated work, *Archéologie navale*, p. 68, a few figures about the size of Egyptian boats. According to this author, the largest boats were not more than 39.00 m. long nor more than 5.19 m., or say 5.20 m. wide. The width was to the length,

therefore, as 1 to 7.5, a proportion which was maintained for vessels with oars up to the middle ages.

In the matter of the speed of ships, the same author puts it at about 9 kilometres an hour (p. 110). In order to reduce the speed at the rapids of the rivers, there was attached to the boat a rope of which the free end was made fast to a block of stone. This stone slid along the bed of the river and offered a sufficient resistance; although the anchor was not known to the Egyptians, they were, as a matter of fact, its inventors. (JAL, *Archéologie navale*, p. 103.)

Before ending this chapter, a few more remarks will be made which are applicable to nearly all Egyptian vessels.

The benches for the oarsmen were always perpendicular to the longitudinal axis of the boat, this being necessary in view of the special construction of the vessels.

Under the Middle Empire, small extra elevations supplied with a hand rail were erected on the forecastle and poop decks. They were, respectively, the posts of the captain and helmsman.

The mast, erected near the middle of the ship, was movable on all vessels. The double mast under the Old Empire rested in two shoes set on either side of the longitudinal axis. The single mast (under the Middle and New Empires) went down to the bottom of the hold and rested against the beams which held up the rowers' benches; it was also fixed by ropes (this appears clearly on several reliefs), either directly or by means of a step, as is shown on the 11 20 model at Berlin. (See BELGER, pp. 27-29.) In this latter case, the mast was fastened to the step itself, a manner of consolidating which is still applied even now. In this respect, a relief coming from a mortuary chamber and now at the museum of Gizeh offers a great deal of interest. This relief shows a mast being let down, and Belger, the author already quoted, calls attention, in this connection, to the fact that the sculptor let the extreme part of the mast fall behind the coat of the man who is occupied with the task, probably because he did not know what to do with it. Then too only two of the five oarsmen of this style of boat appear in this reproduction, whereas, if the drawing were well made, it would follow therefrom that the brackets shown on sundry models abaft of the benches of the rowers, were only to serve as a support to the backs of these last. The great length of the boats and their



relatively small immersed length, required special precautions against the hogging of the ship. A rope was stretched from bow to stern along the longitudinal axis of the vessel. This rope was supported on forks and was fastened bow and stern to a cable

11 20 which ran around the boat. (Dr. MORITZ RÜHLMANN, p. 32.)

11 12 The operation of putting up some of these forks is seen in a number of the pictures. Ermann calls attention to the fact, but wrongly in my opinion, that in one of these figures, the crew is occupied in stretching the rope in order to give to the boat the desired curve. (ERMANN, p. 604.) That this is not so comes out clearly, for me, first from the fact that the boat is already shored and hence has already received its final shape. In the second place, the shores would not be kept in position if the form of the ship were being modified; hence, they would not have been drawn. Finally, it is hard to admit that some of the hands should continue to work quietly on the ship, as shown in the picture, while others are, so to speak, in the act of strengthening its curve; because the sides must have spread, necessarily, during this latter operation. Consequently the men are employed merely in setting up the fork which is to carry the rope. It is easy to understand, besides, that this should be done before the shores are removed because after they are taken away the rope would have become properly taut at the least bending of the ship.

It follows, from what precedes, that the Egyptian boat was not a sea craft. Even the boats which went as far as 11 17 Phœnicia, situated on the Red Sea, and must have been real sea vessels, are represented in the figures in absolutely 11 19 the same way as are the ordinary river craft.

When King Necho (B. C. 612 to 596), who encouraged commerce, felt the need for possessing a fleet, he applied to some Greeks for the construction of sea-going ships, and Phœnicians, not Egyptians, were employed for great maritime expeditions. (ERMANN, p. 646; HOLMES, p. 26; Dr. MORITZ RÜHLMANN, p. 39; G. MASORO, *Histoire Ancienne des Peuples d'Orient*, 1893, pp. 536 and 537.) *It was the Phœnicians, and not the Egyptians, who thus became the pioneers of shipbuilding in the Mediterranean.*

It is a general phenomenon to see nations, who enter into

reciprocal relations, copy very quickly, from each other whatever pertains to the art of shipbuilding. And, could it be otherwise? The struggle for life produces this phenomenon in a perfectly natural way both in military and commercial affairs. When a fleet was not able to stand up against that of the enemy, vessels similar to those of the adversary or even stronger were built. So it was formerly, so it is to day. But the special features which in the past characterized the ships of the different peoples have passed away, and at the present time the nationality of vessels can no longer be recognized save by the flags which they fly. It is not surprising, therefore, that the different nations, which used to dwell on the shores of the Mediterranean and which reached their prime almost simultaneously, or shortly after one other, did not each have a type of boat belonging especially to its own country.

Alas! little remains of the vessels of antiquity and most of the pictures which have been found, are much less clear than are those of the Egyptians. The sculptors devoted their attention more to the beautiful lines of the ship than to the necessity of giving an exact idea of its construction. Writers, on the other hand are distinguished by exaggeration and emphasis when it is a question of the size of vessels.

There is nothing certain known in regard to dimensions, to the form of ships or to the number of oars. It is not likely that ships of extraordinary dimensions existed. JAL expresses this so well, when he says in his work already mentioned the "*Archéologie navale*" : " I do not believe any more in the "*quadraginta ordinum*" galley, 143.43 m. long, 15.27 m. wide and 23.38 m. high above the water than I believe in the long horse which carried the four sons of Aymon " (p. 117.) (See also *Dictionnaire des Antiquités grecques et romaines*, part 36, p. 24; Dr. MORITZ RÜHLMANN, p. 62; JAL, *Archéologie Navale*, 1840, Vol. I, p. 110.)

The art of shipbuilding was developed in the beginning among the Phœnicians and allied peoples, but it is not possible to say exactly which of these nations was its true promoter. The most primitive forms were found at that time side by side with more perfect models. So it is that Herodotus tells us that the peoples of

Asia Minor (Armenians) came down the river toward Babylon in small boats having a hull made of linden branches covered with skins. (See WITSEN, pp. 9 and 16; *Livre d'Hérodote*, I, 194; Dr. MORITZ RÜHLMANN, p. 27; A. JAL, p. 88.) Straw was laid on the bottom of the boat and one or two asses were carried in addition to the cargo. Arrived at Babylon, the boatmen sold their cargo, as well as the straw and the timbers of their boat, and, with the skins loaded on the backs of the asses, made their way back home. The current of the river was too strong to allow taking the boats up stream.

At this same time more perfect boats were navigating the Mediterranean. The oldest picture of boats of a certain tonnage dates from B. C. 1150 and shows the sea fight between the Egyptians and the Barbarians to which allusion has already been made. (See, ROSSELLINI; JAL, *Archéologie navale*, 1845, Vol. I, p. 65; *Jahrbuch des Kaiserlichen Deutschen Archäologischen Instituts*, Vol. VII, 1892, p. 44.) So far as the shape of the boats is concerned, this picture tells little. It merely lets us see that the vessels of the belligerents differed from each other. Moreover, it is seen at once that the Egyptian ships were propelled by oars and that the others were not. Certain authors have deduced from this fact that the vessels of the Barbarians were sailing ships, which, from my view, is not evident. The Egyptians are, in fact, armed with bows and arrows, and the Barbarians with swords. If the former sought their might in quick movements, the latter could only do battle by boarding; under these conditions, the oarsmen could only have been in the way and this explains their absence, or else they also swung the sword; Whereas, among the Egyptians, the vanquished had, probably to act as oarsmen and remained at their oars. (See JAL, *Archéologie navale*, Vol. I, pp. 52 et seq.) It is probable that the sculptor wished to show that the Egyptians fought differently from the other nations. Finally, the Egyptian vessels in question differed sensibly from those described at the beginning of this work. It is more than likely that these vessels were not Egyptian ships of war, but ships built by more northern nations like the Phœnicians or copied from their models. The rigging is not Egyptian; the sail has but one yard.

Let it be mentioned here that there is in the British Museum at

London an amphora coming from the Polledrara (the tomb of Vulci), which Munay (*Journal of Hell. Stud.*, 1889, p. 247) causes to date from the second half of the VIIIth century B. C., and on which is a drawing of a Greek ship with Egyptian rigging; the sail is fastened to two yards, a custom which is characteristic of Egypt. (*Jahrbuch des Kaiserlichen Deutschen Archeologischen Instituts*, Vol. VII, 1892, p. 42.)

The Phœnicians had several kinds of boats and appear to have had more pronounced ships of war. These latter were long and narrow for quick movements; the others, on the contrary, were short and broad for large cargo capacity. (Dr. MORITZ RÜHLMANN-HOLMES, p. 26.)

There are few data about the primitive Phœnician ships. The oldest reproduction is the one given in Layard's work. It is a drawing made from a bas-relief preserved in the palace of Sennacherib (about B. C. 700). But this drawing is rudimentary and the dimensions are out of proportion, the drawing is exaggerated. It also contains some apocryphal additions. Consequently, but little importance can be attached to it.

This reproduction is remarkable under only two respects: in the first place, because it represents biremes, although it may be doubted whether the two banks of oars were used at the same time; secondly, the ships have rams. This peculiarity differentiates the Phœnician ships sensibly from those of the Egyptians. (*Dictionnaire des Antiquité grecques et romaines*, p. 25; Dr. MORITZ RÜHLMANN, p. 30.) It is the oldest reproduction known of boats having rams.

The Phœnicians, by their expeditions along the shores of the Mediterranean, toward Greece, Italy, Africa and even as far as England, according to some authors, while others take them even to the Baltic Sea, exerted a great influence on the art of shipbuilding as it was practised on the Mediterranean. This influence must have made itself felt in the colonies which they founded, and among which Carthage was the most important. There is no doubt that the naval architecture of the Phœnicians differed little from that of the Greeks and from that of the Romans. Let it be remembered, in this connection, that the old models of ships in the Netherlands, for example, remained unchanged for many centuries and that the

same fact has been found everywhere else. It is permissible, then, to assume that the types of boats which existed in the Mediterranean in the Middle Ages do not depart greatly from those which date from the time of the Romans.

If the progressive development of the ship through the ages be considered, it is unlikely that the ancients built ships of fabulous dimensions; on the contrary, their vessels must have been rather small.

The first important changes effected in ships were the consequence of the invention of gunpowder, and are not directly related to the evolution of nations. The new direction given to the art of shipbuilding does not coincide therefore with the end of Ancient History and the beginning of the History of the Middle Ages. It seems, then, inexact, under these conditions, to speak of the art of the ancients as of something which forms an isolated whole.

If, judging by the models exhumed, the Egyptian ship had already reached a high degree of perfection, the Egyptians were still having recourse to the lights of the Phœnicians, it is evident that the Phœnician ship must have been the better. Therefore, all the old reproductions, without distinction, leave much to be desired, the result, doubtless, of the incapacity of the sculptor or the painter, which still happens very often in our own time.

Layard's reproduction shows that biremes have existed since the earliest times. It must not be forgotten, in this connection, to invite attention to the Greek « Dipylon » vases on which two banks of superposed oars men are shown. These reproductions are, however, so primitive that it seems to me hazardous to deduce any conclusions from them. As a matter of fact, it may be assumed up to a certain point that the upper bank of oarsmen represents the after bank and that, instead of being superposed, one set of oarsmen followed after the other.

The oars of the upper bank are not drawn in full, which shows that the rowers followed one another and were not placed the ones above the others. It is deduced from this that all these drawings should be accepted with the greatest circumspection.

In the Middle Ages, there were several oarsmen to an oar; more reliance was placed on a more rapid movement of the oars than on the increase of their numbers, to obtain a greater speed.

It cannot be said exactly when the transition was brought about. *But the oldest method of propulsion is, in any case, the one in which each oar was worked by a single man for a single oar;* it was taken, so it would seem, from the boats using paddles, each paddle being handled by one man.

The relative positions, which might be taken by the rowers who worked superposed banks of oars, have given rise to many suppositions which it is superfluous to examine in detail.

Nothing more will be done than to recall the trials of propulsion by oars, undertaken on the initiative of the Emperor Napoleon III, on a galley built especially for these experiments. It was shown that the trireme was a possible thing but, that a boat of this sort was so encumbered by rowers that no space was left for the cargo. (See the work *Le Musée du Louvre, - Constructions navales dans l'Antiquité. -*)

The result of the researches made may be stated as follows :

All the ideas put forth in regard to the number of banks of oars and to the respective places occupied by the oarsmen rest only on hypotheses. There have been more than one bank of rowers, but it is probable, however, that it was exceptional when there were more than two. Each oar at the beginning was handled by a single man. (*Encyclopædia Britannica*, 9th Edition, p. 806; HOLMES, p. 44; TORR, p. 18; WITSEN, p. 13.)

As a general rule, vessels moved by oars underwent little change after the invention of gun powder. The propelling force could not be developed because it was not possible to increase the number of oars without trouble (*Archéologie Navale*, A. JAL, Vol, I, p. 50; *Dictionnaire des Antiquités grecques et romaines*, p. 40; idem p. 30).

So, JAL, in the « *Archéologie Navale* », refuses to admit that there were ships as large as the « Great Eastern » in the times of the Greeks and Romans.

According to the monument of Prora of Samothrace, thole pins may already have been known to the ancients. DR. ASSMANN gives much information on this point (*Baumeister Denkmälen Seewesen*, p. 1632, fig. 1693).

The habit, not yet wholly given up, of painting an eye at the bow, on each side of the stem, proves how long old customs may

last. It was already a habit of the Phœnicians, the Greeks and the Romans, and it is still found on a few Italian and Portuguese vessels (See : *Das Seewesen, der Griechen und Römer* by DR EMIL LÜBECK, 1890, p. 43; ASSMANN, *Seewesen*, p. 1597; *Jahrbuch des Deutsch. Archeol. Instituts*, 1889, p. 99; *Archéologie Navale*, JAL, p. 105; *Ancient Ships* by TORR, p. 69).

These eyes were a symbol: they were intended to show that the ship was seeking its own path, they have been considered sometimes, but wrongly, to be hawse holes.

Old forms have also been long preserved, and among these the ram is the most remarkable.

<sup>1154</sup> In this order of ideas, the *Speronara* of Malta, which appears in Paris's work, Vol. IV, n° 203 (n° 164, etc.) is the most interesting example of the Mediterranean. The stem of this boat rises vertically from the water and is provided with a ram; even the eyes too are there.

<sup>1159</sup> Maltese boats without a ram are to be seen in the same figure, but these vessels differ little from the *Speronara*.

By bringing Layard's drawing above mentioned close to this one, there will be seen in each some boats having a ram and a mast while others have none, but have stems which rise vertically above the water.

It can be concluded from this that, as far back as the times of the Phœnicians, ships already presented these same differences.

Hence there is no doubt that the *Speronara* represents a Phœnician type of boat, in which the steering oar is replaced by a rudder.

There is no entire agreement as to the place occupied by the ram. Some persons place it above, others below the load-water line. Be this as it may, it is found on all the ancient models and, in most cases, the bottom line of the ship is prolonged in a straight or a slightly curved line as far as the ram.

The constant presence of this latter element in the reproductions, allows the conclusion that it was placed not *below* but *above* the water. If the *contrary* had been the case, the ram could not have made so great an impression on the painters and sculptors. As for the rest, all the ancient types, on which

traces of a ram are found, carry this element above the water line.

The fact that the bottom line ended in the ram, does not prove that this latter was below the water, for this line was invisible, and the draughtsmen, who were uninitiated in the art of shipbuilding, not knowing any other means for representing it, cut the ship off at the water line; but as the drawing then appeared rather strange, they added a curved line joining the ram to the sternpost.

If several of the old pictures be considered from this standpoint and if the curious bottom lines drawn by the draughtmen be covered by better lines borrowed from the *Speronara* or from ancient galleys, these reproductions acquire a wholly different meaning.

If little be known about the ancient Phœnician boat, a more thorough knowledge of the Greek or Roman ship has been reached, through researches, especially in the matter of dimensions.

It is settled that the Ancients had dock yards containing sheds for the shelter of vessels from which the running rigging had been removed while the standing parts were left. (See : *Das Seewesen der Gr. und R.* by Dr. EM. LÜBECK, 1890, p. 2.) These sheds give an idea of the sizes of their ships.

The excavations made by Lieutenant von Alten (*Das Seewesen der Gr. und R.*, p. 5), attached to the Imperial German Archeological Institute (1876-1877), have shown that the figures given by Graser are inaccurate. The dimensions of eight docks could be measured at Munichia, and these structure were 6.25 m. wide by 21.20 m. long.

Later excavations brought to light at Zoa some docks 5.50 m. wide and about 40 metres long, measured along the bank. (*Das Seewesen der Gr. und R.*, idem p. 6.)

The dimensions of the ships must, therefore, have been relatively small.

It is generally granted that the beam of the Greek ship propelled by oars is less than that of the galleys of the Middle Ages.

According to JAL (*Archéologie Navale*), the ratio of the beam to the length, in the middle ages, was for war vessels: 1:8; for merchant ships it was 1:7. Graser found that among the Greeks

this ratio was 1 : 8 1/4, and according to SERRE (*La Marine de guerre de l'Antiquité*, p. 33) and LEMAITRE (*Revue archéologique* 1833, Vol. 8, pp. 149 *et seq.*) its value was 1 : 9.

Hence the vessels were narrow as compared with their length, which increased their degree of mobility.

Besides, the depth of the docks discovered shows that the boats drew but little and, consequently, that the ships slid along in a way, on the water.

In this respect too, the ancient boats did not differ much from those of the Middle Ages. Neglecting this detail, among others, Graser reaches a type of ship having far too great a draught.

Alongside of the war vessels, *naves longæ*, there were the merchant vessels, *naves onerariæ*. It was natural that great mobility should be sought for the former; it is this which explains the lengthened shape of these boats, whereas the merchant ships were shorter and had more beam.

Later, but still several centuries B. C., when the power of Rome was developed, when its population increased and when the importation of wheat and other provisions became more and more important and had to be made more and more quickly, the ship with oars was used as a merchant vessel in addition to the short, wide boat.

The Roman freight galleys seem, further on, to have been made broader, like those of the Middle Ages, with a view to increasing their capacity. But no *new* type followed from this; it was merely a new application of existing types.

It can be certified that no new type of boat was created later all at once, and that this change was due not to the shifting of lines of trade or to the construction of new ports. This latter condition could, at most, have modified the accepted dimensions.

The different types of antiquity remained in use for centuries and are still to be found to a great extent.

Nothing more will be done than to attract attention to certain ancient pictures where are seen ships having rounded stems. A short time ago, this peculiarity was still to be found in "la Muleta" - a boat of the Tagus, now disappeared. (Compare PARIS, Vol. v. fig. 268; and *Jahrbuch der Deutsch. Archeol. Inst.*, 1889, p. 91)

The size of boats changed little. In order to develop more force, the number of rowers was increased and, as the length of the ship was reduced, the rowers had forcedly to be placed in banks, one above another.

JAL considers that a triple bank of oars must have been an exception, and that the lowest bank must have been separated from the other two by a deck. The celebrated trireme, built at Asnières in 1860, under orders from Napoleon III, was carried out in accordance with this conception; but, as has been said, the experiment tried with this boat did not give satisfactory results. (See, *Das Seewesen der Gr. und R.*, Dr. LÜBECK, p. 49.)

If, however, the experiment did not solve the question of the position of the rowers, it showed sufficiently that, in the trireme, the ship was filled up with rowers.

The ancient vessel had little space for provisions. Care was taken consequently so to arrange matters as to be able to land every evening, and it can be understood from this that most naval battles were fought close to the shore.

But, in order to land everywhere, a small draught of water was necessary. This, according to Assmann and Lemaître, must have been about one metre. (*Das Seewesen der Gr. und R.*, Dr. EMIL LÜBECK, p. 10, note 5.)

The disposable space on board was so restricted that, when it was not possible to go ashore at night, the oarsmen could only sleep in gangs. While the boat was in motion they had, in order not to interfere with each other, to make their movements absolutely together, and even when coming on board a certain order of succession had to be observed. (*Das Seewesen*, *idem* p. 10.)

It is not known exactly when the old method of propulsion, each oar handled by a single man, gave place to the new in which heavy oars were worked by several men. It appears however that the Liburnians already had heavy oars of which the use seems to have been a consequence of the battle of Actium, fought B. C. 31. (*Das Seewesen der Gr. und R.*, Dr. EM. LÜBECK, p. 21.)

As has been seen, there were, alongside of the ships of war or *naves longæ*, merchant ships or freight vessels, *naves onerariæ*. The dimensions of these latter were also rather small; as can be judged by their capacity. Their cargo, as shown by ancient

documents, was stated in Greek talents or in Roman amphora (1 amphora = 26.50 kg.), and later also in midimnes of Attica (1 midimne = 42.50 kg.). (*Das Seewesen der Gr. und R.*, Dr EM. LUBECK, p. 22.)

According to an arrangement regulating the size of merchant vessels, made in the year B. C. 218, the boats which brought goods from the senatorial possessions in Sicily and Sardinia to Rome, had a cargo space of only 786 cubic feet. It is true that descriptions of much larger vessels are found. These ships, from calculations made by Assmann and other authors, must have had a capacity of 26,000 to 200,000 cubic feet. Graser even goes so far as to say, from the quantity of freight carried, that the ship « Alexandria » belonging to Hiero of Syracuse must have had a capacity of 240,000 cubic feet. Mention is even made of one ship having a length of 120 ells, while for another a depth of 29 ells is given.

All these dimensions are not to be despised even now, but, considering the small size of the ports and navigable highways of those days as well as their lack of depth, they must have been an impossibility. Furthermore, all these numerical data rest only on hypotheses, and cannot be exact.

The short, bluff merchant ship of the Ancients was certainly not longer than the vessel with oars and its average size does not seem to have exceeded that of a « tialque ».

The progress of shipbuilding was gradual throughout Western Europe, and as the same may be said of the Mediterranean, since the Middle Ages, what reason is there, then, for supposing that the vessels of Antiquity were of extraordinary dimensions?

In this order of ideas, the *Prora of Samothrace*, discovered in 1863 and dating from B. C. 306, gives an exact idea of the war ship of the Ancients and proves that this vessel differed little in shape and size from the ships of the Middle Ages.

The bottom was slightly curved near the middle and the hull was made slender toward the ends. The mean draught of water was one metre, while that of the largest vessels scarcely exceeded 1.50 m. (*Assmann, Seewesen*, p. 1597, etc.) The stem and the stern post were ornamented with signs which are unimportant for this study.

Ships with oars of which the stern was rounded at the level of

the water line, carried at the bow a ram, which was used to sink the enemy's ships and to smash their oars. A heavy block of wood, ornamented with the head of a ram, prevented the ram from penetrating too far into the side of the ship which it attacked.

The arrangements of the ram varied a good deal as is shown by the figures, but the form of the vessel itself was not influenced thereby. This element was the emblem of power and was meant to inspire terror. There is nothing astonishing then that, in most of the old drawings, the draughtsman should have dwelt rather on this detail than on the ship itself, thus causing the shape of this latter to become an accessory.

The ram, which was already in use among the Phœnicians, did not appear among the Greeks until B. C. 536. (Dr EM. LUBECK, p. 13.) Whence it follows, and it cannot be repeated too often, that the art of shipbuilding had reached a higher degree of perfection with the Phœnicians than among the Greeks and that the former exercised a preponderating influence over the peoples dwelling along the shores of the Mediterranean.

Hence, the thesis of uniformity of the boats of the Mediterranean could be sustained, but this would not imply that each people had known but one type of vessel. Boats of sundry types existed at the same time; there were the short bluff merchant ships side by side with the long vessels driven by oars, and perfected types were crowded against the primitive.

History tells us, that Cæsar put to sea with a fleet thirty days after the cutting of the wood to be used in its construction. (NICOLAS WITSEN, p. 12, col. 1) It would be hard to grant that the boats which composed this fleet were well finished ships moved by oars. They were, doubtless flat bottomed vessels, of the type which is still found in the Adriatic and which is so well reproduced in the « Rascona ». (PARIS, Vol. II, and *Das Seewesen der Gr. und R.* by Dr EM. LUBECK, p. 39.)

The rapid construction of the fleet in question furnishes one proof more in favor of the point raised regarding the small size of ships.

In order to show more clearly what is meant by uniformity in the shape of vessels, attention will be called to the « tialque » type of the Netherlands, which is found, with slight changes and under

other names, from Denmark to Belgium. All the boats of this type have a common fundamental character; but with the tialque are met still other types which are also found elsewhere.

So, from Denmark to Belgium, there is a series of well defined fundamental types and hence we can speak of common forms.

This remark applies also to the Mediterranean (*Dictionnaire des Antiquités grecques et romaines*, 36th part, p. 24; *Navis*, where these fundamental have been preserved for centuries: the old types of wooden vessels to be met with at the present time still give an exact idea of them, save in what relates to the rudder and rig.

Sundry types have evidently been set aside or have undergone changes demanded by local conditions, so that, in order to find among them the fundamental characters belonging to a given country, it is often necessary to seek elsewhere.

So, for example, there are found in Holland, at 's Gravenmoer (North Brabant), an old Rhenish type; in Portugal, small fishing boats which resemble greatly the ancient Egyptian vessels and, in the Arabian Sea, a ship which, aside from the rudder and rigging, resembles, to an astonishing degree, the primitive Roman vessel. And the Arabs claim that they have the oldest and best ships (compare PARIS, Vol. III, n° 135, with the relief of the « port of the Tiber » which appears in BAUMEISTER, *Denkmäler des Klassischen Altertums*, fig. 1688).

If vessels moved by oars underwent no changes as the result of the invention of gun powder, the cause must be sought in the slenderness of their construction required by the small motive power which they could put forth. The number of oarsmen was limited and very soon a maximum was reached which could not be exceeded.

In view of the fact that a practical vessel having more than three banks of rowers could not be constructed, and that the old reproductions which are known never show more than three, it seems permissible to conclude that the ancient writers who speak of four banks of oars and more, have allowed their imaginations to run away with them or, which appears more exact, that they had a way of counting other than the one adopted in our time? Doubtless, it was desired to designate the number

of oars which passed in banks through the side of the ship.

Huys's drawing, according to Breugel (dating from the middle of the XVIth century), shows oars grouped thus in sets of threes, and the same process is found in other old pictures; if these pictures show triremes, the question would be simple to explain.

A reproduction of the trireme, often referred to, is that of the bas-relief of the Acropolis at Athens. (*Baumeister Denkmäler des klassischen Altertums*, fig. 1689.) Copies of it are found in all the works, but they do not always agree and hence can offer nothing certain. (Dr. MORITZ RÜHLMANN, p. 62.)

Let a few more words be said now about merchantmen.

For these, the most beautiful drawing known is certainly the afore-mentioned relief of the port of the Tiber, preserved in the Torlonia Museum. In this is seen a large merchant ship with inclined stem and rounded stern. At about two-thirds of the length of the ship from the bow, the gunwale projects so as to give a support to the steering oar. This mode of construction is still found on several Indian boats, etc. The ordinary mast, set up near the middle of the vessel and provided with a stay, is secured by strong ropes. The square sail can be lowered by means of ropes running through rings fastened thereto. Then the mast carries but a single yard; a jib is attached to its upper end.

A mast called « dolon » stands forward; it was used, in the beginning, to hoist in a small life boat. It is still called the « boat mast » probably for this reason.

The cabin occupies all the available space aft of the mast.

The sails were generally square; they were sometimes of rectangular shape on the Alexandria freight ships.

War ships, like important freight vessels, always had two masts. (Dr. BREUSING, *Die Nautik der Alten*, p. 56.) In action, the sails were furled and the masts lowered, in order to save them from being reached by the ram of the enemy's ships. (Dr. BREUSING, p. 71.)

Attention should not bear alone on large ships, but also on the small merchant vessels. The most beautiful picture of this sort of boat is, unquestionably, the old relief of the Cathedral at Salerno. (*Jahrbuch des Kaiserlichen Deutschen Archeol. Instituts*, 1131

Vol. IV, p. 103, fig. 1c.) Aside from the question of the rudder, the vessel there shown would easily pass for a modern craft.

This boat is in course of being discharged; the bridge is lowered and the forward panel is raised. The mast which is down had to be taken from its step for this purpose; this method was still much in use in our country in the XVIIIth century. The steering oars hang alongside of the vessel, resting against the projecting side.

The boat itself is completed by a stem and a stern post. The step of the mast is about one-third of the length of the boat from the bow, and abaft this is seen the hold. This last, as in our present river boats, is closed by means of panels. Even the grooves (half-rounds), into which the panels are set, can be made out and, in these grooves, even the openings to let the water run off (shown by little marks) are to be seen.

The panels are on a slope, as shown by the upper lines.

The meaning of these little half-circles was not understood by the author of the Jahrbuch afore-named. (*Jahrbuch des Kais. Deutsch. Arch. Instituts*, Vol. IV, 1889, p. 103.)

Two mooring bitts are seen near the bow and four near the stern; their special form allows it to be assumed that they were to be used as a support for oars, which gave the means for going ahead in a calm.

The mast, which is short and thick, is provided with cleats throughout its entire height, hence it may be supposed that these pieces of wood were placed there for climbing the mast. Hence it is probable that this boat did not have rigging sufficiently strong for this purpose. It is true that no ropes are seen in the figure in question, but it cannot be concluded, however, that the vessel had none.

It is my opinion that this boat could not have been larger than a small "tialque". Here is another proof in support of the argument that, in the course of ages, boats have been but little changed and that their construction soon reached a high degree of perfection. There is nothing surprising to be found in this assertion, if the masterpieces bequeathed to us by the Greeks and Romans be considered.

It is matter of regret that no positive data exist in regard

to the position of the oarsmen among the Ancients, because it is just on this point that vessels propelled by oars were modified in the Middle Ages. It was at this period that the oars handled by one man, according to the primitive fashion, gave place to a single bank of heavy oars each of which was worked by several rowers.

This transition was not coincident with the fall of the Western Roman Empire (476). In fact, the Emperor Leo (886 to 911) advised the construction of "dromon" biremes (LA CROIX, p. 75), and even in the XIth century, a writer is seen to speak of a *chélandre* or *sélandre*, to which he attributes a very high speed and which had two banks of oars superposed. (LA CROIX, pp. 75 and 79.)

The change came about gradually, in all probability.

In the XIIIth century, only vessels with one bank of oars, galleys, are mentioned. (See, for banks, VAN YK, p. 11; TORR, *Ancient Ships*, pp. 19 et seq.)

Meanwhile, the rudder arose and its appearance brought about changes in the stern of the vessel.

As a general rule, little is known about the condition of the art of shipbuilding at the beginning of the Middle Ages. All the same, however, this period must have seen an important marine on the Mediterranean and, consequently, the art of shipbuilding must have been flourishing. There is no doubt that the Crusades (1096-1291) had a great influence on the old state of affairs. Venice became the centre of progress and Genoa followed closely.

The importance of the navy at this time is attested by the famous navy yards at Venice and by a great number of edicts which relate to the construction of ships. Thus, there is found in the XIIIth century an edict which determines the water line for the vessel loaded and for the vessel empty. (JAL, p. 267, article 4.)

In regard to the construction of ships with oars, it is only necessary to refer to the edicts of the Emperor Leo which were observed, even to the Xth century. This Emperor ordered that the galleys should be sufficiently strong and swift, involving thus great length and little beam, but the latter was to be, however, proportioned to the length. These edicts were simple, but categorical.



Later on, people were no longer free to build as they pleased. They had to follow the rules laid down regarding the form of the ships which bore a certain relation to the capacity and to the trips to be made.

The length of the boats was not extraordinary: JAL gives, for example, a length of about 44 metres for vessels propelled by oars. This figure, as one can see, differs little from that of the vessels of antiquity, and was little exceeded later on.

Just as in the times of the Greeks and the Romans, the Middle Ages had their galleys, and their merchant vessels of more rounded form. Thus, for example, the city of Genoa sent to Pisa, in 1284, a fleet of eight galleys and caravels. (JAL, p. 250.)

The galleys, however, were not used exclusively as vessels of war; they also served generally, in the XIVth century, as merchantmen. (JAL, p. 250.)

We have from the Middle Ages no drawings or pictures which give the means of deducing with any certainty the shape of the ships. The oldest picture comes to us from Pietro Laurentini, an artist of the XIVth century; then there exists another by the hand of Raphaël (1483-1520), and dating from the beginning of the XVIth century.

These two reproductions appear in JAL's work (*Archéologie navale*), but their small scale almost destroys their value. They are remarkable however from this that the first shows the double mast of the Ancients and the cabin on the after deck, while Raphaël's carries a castle at the bow and stern, as well as the vessel's rudder.

It follows from a comparative examination of old coins that the rudder had come generally into use in the XIIIth century. It is superfluous, however, to recall that, nevertheless, the steering oar was still used on many vessels as a rudder.

The invention of gunpowder, near the middle of the XIVth century, made no changes in the structure of the galleys, because the propelling force was still limited to the strength of the rowers, which made a slender shape a prime necessity for the boat and prevented the mounting of any large number of guns on board.

The galleys reached their apogee in 1600. Shortly afterward,

they began to lose their value as war ships by reason of the increasing power of the big, rounded sea-going vessels.

A striking example of the fighting inferiority of the galleys is found in the naval action between the French ship - Le Bon - and 36 galleys, on July 10, 1684. (PARIS, Vol. III, no. 126.) This vessel was only 41.41 m. long from bow to stern, with a total width of 11.04 m. and a depth of 5.03 m.; the keel was 37.03 long.

The galleys, on the other hand, were 48.77 m. long over all, 21.20 m. on the keel, with a breadth of 5.90 m. on the deck (8.47 m. between the apostis); the oars were 25 metres long.

The higher position of the artillery on - Le Bon -, as well as its more solid frame and thicker planking, allowed this ship to hold the enemy at bay and to escape when the wind rose.

If the strength of the crews be examined, the fighting inferiority of the galleys stands out still more clearly; while the French ship carried only 600 to 800 men, the galleys had on board from 12 000 to 14 000 all told. Consequently, from as far back as the XVIIth century, the galleys were used in France almost exclusively for towing. Thus we read that in 1688, the wind having fallen, Duquesne had his ships brought by galleys under the walls of Algiers in order to bombard that city.

The galleys continued to appear nevertheless in the French navy until 1773.

It was at the battle of Zierikzee, in 1302, where the Flemings fought against the French, the Dutch and the Genoese, that, according to the old Florentine historian Villani, the superiority of the broad-beamed vessels of the North Sea, over the galleys, was first felt. The Count of Flanders had fitted out, for this battle, eighty ships or - coques -, built in accordance with the maritime demands of the place. (Villani says: *ottantia navi, overo cahi, al medo di quello mare.*) According to this historian it was also the first time that vessels of this kind had to be fought.

The battle of Zierikzee was the cause, from this time on, of giving more and more attention, in the Mediterranean, to the building of broad-beamed ships. Besides, necessity forced it. The Crusades brought about more frequent relations with the peoples of the North against whom defense must needs be had.

In the beginning, the people from the North called upon the

Genoese and others along the shores of the Mediterranean to transport the Crusaders to Palestine. The route by the Mediterranean became thus known to them; but they very soon undertook to build ships themselves so as to escape from the exorbitant transportation charges of the Italians. Nevertheless, Venice, Genoa, etc. remained the principal warehouses; and many ships were still built there, especially for France. Philip the Handsome, in his struggle against Edward I of England, in 1295, and Philip of Valois, in his war against Edward III, in 1337, both made use of Genoese vessels. (LA CROIX, p. 92.)

Furthermore, as Jal has written (*Archéologie Navale*, Vol. II, p. 352), it can be granted with certainty that the vessels built in the French ports of the Mediterranean, were identical with those used in Italy. The mutual relations between maritime peoples and their common interests inevitably brought about these imitations. Venice yielded nothing to Genoa; Genoa was close on the heels of Pisa and, in the improvements made in shipbuilding, this last city did not allow herself to be out-done by Barcelona, Marseilles or Constantinople.

Under these circumstances, the writer just quoted was right, then, in saying: "The basin of the Mediterranean had, therefore, - but one navy, at least so far as the principal vessels were - concerned; it is so to-day and it was certainly so in ancient - times. - I add also for my part that the characteristic differences offered by types of vessels among themselves, have undergone no change in the course of ages and this applies not only to the basin of the Mediterranean, but to shipbuilding in general.

These old types, however, are not to be sought among the large vessels, but rather among the small ones and, particularly, among fishing smacks.

Among all nations, even among all sea-faring people, fishermen have most preserved their ancient character and modified their manners and customs least. The exercise of their hard calling on the sea has made them hostile to any innovation coming from the shore and has been unable, except in passing over their bodies, to make them give up the old types of ships, the issue of tradition and usage. Hence, fishermen have kept longest the antique forms and it is to them that we must go to find them. Thus

there are seen in Norway fishing boats which, aside from the rudder, reproduce almost completely the ancient "Viking ship". The Dutch "Bom" is, in like manner, a remnant of the "cog", and Portugal offers barks which call to mind the old mural paintings discovered in Italy.

Naturally many types have disappeared already, and their number is constantly increasing through the use of steel in shipbuilding. Thus it is that there now no longer exist any but a few rare specimens of the galleys and they are used merely for festive occasions (examples: the galley utilized for the naval review of the Hollandsche-Diep, and that used in Portugal on certain holidays).

The oldest work which treats of galleys is called: "Fabbrica di galere". (JAL, *Archéologie Navale*, Vol. II, pp. 6 *et seq.*) The first complete information about them dates from the time of Louis XIV and is given by the Chevalier Barras de la Penne (1698). Nor should the work of Fürstenbach, dating from 1623, be passed by in silence. (WITSEN, p. 186.)

Although the galleys are sufficiently known, a few more words may still be said about them. These boats were long and narrow and rose but little above the water. Their beam was generally one-seventh or one-eighth of their length and the part out of water rose to only 1 m. to 1.50 m. in height. A galley 40.60 m. long, for example, had a beam of only 5.27 m. The total length of the stem was 3.28 m. and of the sternpost it was 3.62 m. The main frame was placed at three-sevenths of the length of the vessel and was flattened on the under side. The vessel narrowed forward and aft and the deck covered its entire length. Near the middle was built the *corsia* (guard bridge) into which were let the benches of the rowers. On each side, close by the planking and parallel to the longitudinal axis of the vessel, were the apostis, heavy timbers into which were let the thole pins. The oars, arranged in a single bank, were each worked by four or five men who rose from their bench as they pushed forward on the loom of the oar, to prepare for a stroke, and fell back on it as the stroke was completed. The oarsmen were stark naked at this work. A man of average strength could stand it, as a rule, for an hour, and yet this work had

sometimes to go on for twelve consecutive hours in time of war. What a painful situation, when it is considered that these men were exposed to the inclemencies of the air and to the fire of the enemy!

In order to strengthen the rowers at their work, bread steeped in wine was put into their mouths. If they fell exhausted, they were mercilessly flogged by the boatswain who walked up and down the bridge, and if they did not rise, death awaited them: they were thrown overboard.

If it be borne in mind, furthermore, that the rowers were rivetted to the ship by irons which were rarely removed; that they generally lived and died on their benches, it will be understood that the galleys were a terror and a shame for the seafaring peoples.

It was rare to meet with volunteers for this trade which included, for the matter of that, only slaves and prisoners of war. Still, the rowers were not all equal; they were divided into three distinct classes: 1° those condemned to the galleys, their hair and beard being shaved; 2° the slaves, among whom were Turks, Moors and Negroes, these last considered to be the best rowers, their distinctive mark was a tuft of hair on the head; 3° the *benevoglie* or volunteers among whom were men who had served their time and been liberated, but who were not able to find a place and so sought a refuge on the galleys, as well as bandits and others who no longer had anything on which to live.

The clothing of the rowers was very simple: they received every year two shirts, two pairs of breeches, a red cloth jacket a sou'wester for winter, a red cap and two blankets per bench of oarsmen.

Rations were issued to them, but they could buy more if the food supplied were not enough.

The part of the hold not occupied by ammunition was reserved for provisions; it also included a bit of a cabin for the captain and officers.

When the galley stopped, a large sail was stretched above and across the ship, one side being raised so as to let the air enter.

Their slender build did not give the galleys sufficient stability at sea, consequently the rowers were often very much tried by the waves.

The armament was simple: three guns were placed at the bow, the principal one of which was in the middle (set in the longitudinal axis of the ship); on the large galleys, there were found, as a rule 18, 48 and 12 pounders and, on the small ships, there were one 12-, one 24- and one 8- pdr.

The fighting value was measured by the amount of iron which could be thrown at once and per man. Take, for example, a galley throwing 44 kilogrammes of iron at once and carrying a crew of about 400 men. There would be hurled, then, 0.110 kg. per man. A galley cost 400,000 francs, or 9,090 francs per kilogramme of iron.

Compare this galley with an ordinary war ship, carrying 55 pieces of artillery with a crew of 1100 men and able to throw 1000 kilogrammes at once (or 0.910 kg. per man), and assume its cost to be 3,000 francs per kg. The lower fighting efficiency, of the galleys and their much greater relative cost can be clearly seen. This ordinary war ship throws at once nine times more iron per man while its cost is less than that of the galley considered.

In conclusion, it will be stated that the speed of the galleys was 250 m. per second or 5.6 miles per hour, and that sails were available in addition to the oars. They carried two masts, one at the bow and the other about midship, both provided with lateen sails (JAL, *Clos. nautique*, p. 749), which were furled while the vessel was in action.

No further demonstration is necessary to show that the galley was not suited to take the Ocean, which was more and more frequented. The invention of gunpowder soon brought out this vessel's inferiority for fighting. Hence endeavors were made to improve it. 11 43

Thus there is seen to arise in the XVIth century a ship, the *galliass*, of which the bow and stern recall the boats of broad beam, and of which the intermediate part brings the galleys to mind. This ship had more beam than the galleys; its breadth being to its length as 1 to 5 1/2. 11 45

With a length of 50.01 m., the *galliass* had a beam of 9.01 m.

and drew 3.35 m.; its greatest depth was 6.52 m. There were 25 oars on each side and the benches of the rowers were 1.30 m. apart. The oars were handled at times by 7 or 8 men and as the sides were higher above the water than those of the galleys, the rowers were better protected against waves.

The galliass carried generally from 700 to 1000 men. Fifty guns were mounted in the towers and between the benches of the rowers.

The galliass was more stable on the water than the galley, protected the rowers better and carried more guns; but, just on account of these advantages, it was less agile as its propelling force was limited by the restricted number of rowers.

The galliass, like the galleys carried three masts furnished with lateen sails. These were very hard to work, so that in violent winds the large sails were replaced by others of smaller size.

It is not astonishing that even the galliass should have been inferior to the broad-beamed ships. Furthermore, they were never numerous; at the end of the XVIth century, in the naval battle of the allied powers against the Turks at Lepanto, only six of them could be assembled. (JAL, *Archéologie Navale*, p. 394.) It is therefore very doubtful whether the invincible "Armada", the famous fleet of 1588, included a division of twenty-two galliass; the greater part of these vessels were undoubtedly galleys.

In the same way, there existed among the Ancients, beside the *naves longæ*, broad beamed ships which were used in the beginning solely for commerce and transportation.

The invention of gun powder, and still more the closing by the Turks of the old route to the Indies, at the end of the XVth century, made a change in this situation. From this time, trade moves toward the ocean; a new route to the Indies is sought and the New World is discovered.

Then too, the nations of the North greedy for riches and no longer content with the Baltic Sea, take their chances toward the South.

All these circumstances brought in a turning point for the history of the naval architecture of the Mediterranean. In spite of the efforts made to preserve the supremacy of the old types of ships, by building larger vessels with oars, such as the galliass etc., it was

necessary to retreat, not only in Italy but also in Spain and Portugal before the more powerful fleets of the peoples of the North.

Hence it can be said, in the order of the ideas already expressed in speaking of the battle of Zierikzee, which occurred in 1302, that the XIVth and XVth centuries saw the naval architecture of the Ocean make its way into the Mediterranean. On the other hand, the art of the Mediterranean was not without its influence on the former.

It is not easy to reconstitute the types of ships inherent to the Mediterranean; indeed, but few data remain concerning these vessels. All that can be done is to refer to the contracts above mentioned of Louis IX. The first reliable information dates from a period subsequent to the middle ages, and notably from the XVIIth century.

All the old drawings known at present leave something to be desired and are always out of proportion. The only conclusion to be drawn from them is that there were several kinds of boats.

It is really to be regretted, as JAL says, that we have no more exact information. There is no doubt, however, that, even in the middle ages, there were good broad-beamed ships (JAL, *Clos, naut.*, p. 1057; LA CROIX, p. 86; idem, p. 96) which allowed at least five hundred fighting men to be carried. (JAL, *Archéologie Navale*, p. 380, 2d part, note.) Even horses were loaded on board. (JAL, *Archéologie Navale*, p. 386, etc. HOLMES, p. 68.)

In order to reconstitute the types inherent to the Mediterranean, it is necessary to find out, first of all, what models were still existing at the end of the XVIIIth century, at the time when wooden vessels exclusively were used.

It will be remarked, before beginning this examination, that boats were constantly beached when not under way; let it also be noted that the waters of the Mediterranean were calm, when compared with those of the Ocean. This latter point especially explains why vessels with oars were there so long in use. (PARIS, Vol. IV, p. 206.)

In order to ground the boats, the bottom of the hull had to be flat and, as a matter of fact, the centre body of the vessels under consideration is wide and flat, wider even than that of the vessels from the North. The beam of these latter was to the length as 1 : 4, while in most of the Mediterranean vessels

this proportion varies between 1 : 2 1/2 and 1 : 3 1/2 (generally, 1 : 3).

The Mediterranean boats are pointed toward the stem and the sternpost, which is the contrary of what exists for the Northern vessels and this shape gives the former an appearance all their own. Furthermore, the sides of these ships do not come at all together toward the top; at most, they are vertical; in other words: the greatest width is at the top.

Among the old models, some are found which have: 1° a straight sloping stem; 2° a straight vertical stem, and 3° a curved stem which is convex or concave at the top.

Alongside of the broad-beamed vessels, there are a few longer ones, of which the beam is to the length as 1 to 5.

Intentionally, no mention has been made of the sternpost as this has been modified in most cases by the adoption of the rudder.

Besides, many boats have a flat projection at the stern furnished with a balustrade, — a detail which is found also on the Greek and Roman vessels. This position was originally reserved for the helmsmen who operated the steering oars.

Among the more important types must be counted the *Xebecs*, with three masts furnished at the beginning with lateen sails. These latter were replaced later on by square sails. The ship thus modified was then called a *mystic Xebec* or a *polacca Xebec*. The *Polacca* also existed at this time.

The length of these vessels — about 15 metres — was to the beam as 3 1/2 to 1. The stem, sensibly straight at the top, becomes curved at the foot and is provided with a ram similar to that of a "Galleon". The sternpost is straight but it leans back and the after deck projects. This type of vessel can be compared to a broad-beamed galley, Astern, the *Polacca* more nearly resembles ocean vessels.

All these vessels are originally from the West of the Mediterranean. (PARIS, Vol. II, nos 78 and 90; *idem*, Vol. I, n° 25.) The Genoese "pink" can be placed in the same category. (PARIS, Vol. II, no. 119.)

There is still found in Tunisia the "Carèbe", from 12 to 15 metres long with a beam of one-third of this length. This

boat seems to have a double stem (the plank sheer reenters). Let this type be compared with the reproduction which appears on the tower of Pisa, etc. (PARIS, Vol. IV, n° 201), which also shows a boat with a double stem.

Alongside of the "Carèbe", are the Arabian "Sandales", 12 metres long, 2.85 m. wide and 1.30 m. deep. Jal considers this kind of boat as one of the oldest types.

The Arabian "Sandale" is a very slender vessel, narrower amid-ships than most of the others.

The Maltese boats, the "Speronare", are still more singular; they are 15 metres long, 4.40 m. beam, 1.20 m. draught with a capacity of about 17 tonnes. The stem and the sternpost are vertical. These boats have sometimes at the stern a flat projection and at the bow a truncated ram.

The same type, 5.30 m. long, 1.95 m. beam and 1 metre deep, becomes a "Tarella". This boat has no ram. There is no doubt that these are very ancient forms. (Compare, for example, the "Speronara" with Layard's reproduction.)

The "Schifarro" and "Laoutello" of Sicily, with their curved stem and sternpost, are not less remarkable. These vessels also recall reproductions of the middle ages which present the same characteristics.

On the East coast of Italy are found the "Tartana", 17.90 m. long, 4.90 m. beam, and drawing 0.80 m. of water and the "Braca da Pasca", 12.20 m. long, 2.30 m. beam and 1.60 m. deep; both of them flat-bottomed and solidly built. (PARIS, Vol. II, pl. 85, 86 and 87.)

It should be noted that still other types of flat-bottomed boats are met with on the Adriatic, among them are the "Rascona", a very narrow vessel for its length (1 to 5), and the "Topo". The former is also steered with the oar.

Greece and Turkey have between them many points of contact. Two types are found there: one with a straight sloping stem, the other with a curved stem: the "Scaphé" and the "Sacobeva". (PARIS, 3, nos 91, 89 and 88.)

The Arabian Sea, to go no further, gives the "Baggala" and the "Dungiyah"; the latter has probably now disappeared. These are very old types with a strongly sloping stem. Allusion

has been made above to Greek figures in which the analogy with these vessels is complete.

Some types have shifted their ground. The best proof of this is the "Balancella" of Spain which came originally in all probability from Naples (PARIS, Vol. II, n° 61) and which resembles greatly the "Trabocola".

All these boats, and only the principal ones have been mentioned, allow the reconstitution of a few fundamental types which are still to be found now and which were in existence several centuries ago. The development of trade, expeditions to points further and further away, which had to be undertaken, have caused the old types to be replaced long since by others intended for navigation beyond the seas. This explains why the primitive types no longer exist except in vessels of small importance. For these latter, it was not necessary to seek new forms, because the small builders continued to follow traditions and to work from models. Steel has gained ground very slowly among them, and insensibly and only as the new generations come to replace the old, will the types of the primitive boats disappear.

Although several types exist, it follows from what precedes that the Mediterranean types are broad in comparison to their length, and flat amidships; besides, they are pointed at bow and stern. With these data, Fürstenbach's work, which dates from 1629, acquires more value in our eyes, because it contains reproductions of a Dutch ship and a few Mediterranean vessels, in which can be discovered many known types, although they are called by separate names.

The difference of form between the types of the North and those of the South, already pointed out before, is shown there clearly; it appears in all its force when the midship frames of the two boats are brought together. (Compare "die Mittlere Stamenale", fig. II, with "die Stamenale" of fig. 16, as well as the plans of the ships.) The difference in the height of the stem and sternpost is not less noticeable, and indeed, the Mediterranean ships really appear higher than ours. It will be seen further on that, under the influence of the South (*i. e.* of the Mediterranean) the people of our country began to make their vessels higher.

It was the South which inaugurated the system of castles

which were built on the ships in the Middle Ages. It is to be noticed that already, in the Xth century, the Emperor Leo laid down rules concerning their construction. (LA CROIX, p. 6.) Some castles are found even on old Roman engravings. Hence, there is every authority for supposing that these castles rose progressively.

The improvements of the means of defense, and hence the changes in military tactics, after the invention of gunpowder, contributed a great deal toward enhancing the importance given to these castles.

It was known in Holland that the Mediterranean vessels were more pointed than ours, and a proof of it is found in the passage (p. 355) from van Yk's well known work, where this author tells us that the special qualities of our ships as sailers was attributed to the greatly curved stern and hence to the full bow. And it is surely not uninteresting, then, to read further on (p. 85A) that the father of the author of the work, accompanied by his three sons, went to Genoa to build vessels able to advance even against the wind something unknown until then in that city. Hence the art of tacking was not known at Genoa at that period, a manœuvre, furthermore, which the lateen sails did not allow. It was not until later that these sails were replaced by square sails. Hence it was not at all strange that ships with oars remained so long in use on the Mediterranean. On the other hand, it may be considered as proved that, from the earliest times, there existed broad vessels alongside of the long craft fitted with oars. (JAL, *Glossaire nautique*, p. 1049.)

Still, the few ancient boats which have been exhumed, seem to have reached such a high degree of perfection, that naval architecture must have attained a wonderful development even in the most distant ages. This should not surprise us, however, when we see the masterpieces left by the Mediterranean races, masterpieces which bear witness to their esthetic and practical sense.

As the progressive developments of the ship in the middle ages are studied and as the dimensions of docks and other installations among the Greeks and Romans are considered, it can be stated positively that giant ships were unknown to Antiquity and that the descriptions given thereof should be examined in the light of the conditions which dictated them to the author. Just, for example,

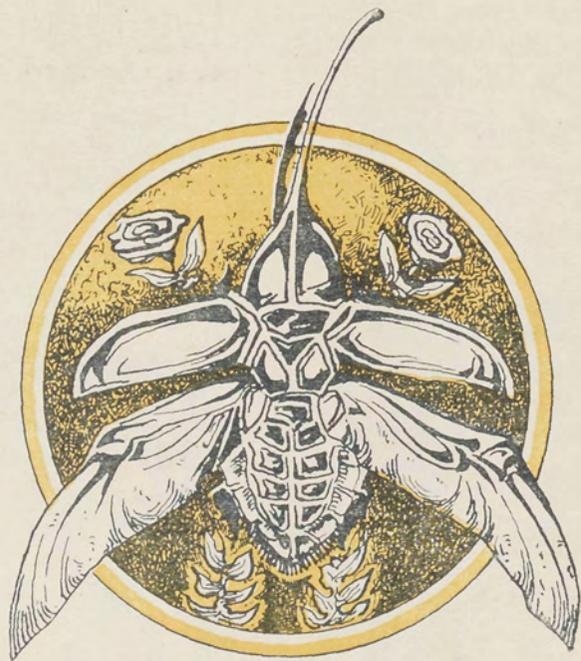
as the importance of the city of Babylon, and the excavations made there show it, was singularly exaggerated by the ancient writers. Besides, do we not daily read communications about the extraordinary sizes of ships and engines, sizes which, after a little while, are surpassed by others still more extraordinary? And so will it ever be.

In conclusion, let it be said that the ancient models are still to be found in small wooden vessels and in fishing smacks. These models have come down through the course of the centuries without other changes than those wrought by the rudder and by decoration.

If then an exact idea of the types of the ships of the Ancients be desired, thorough investigations should be started so soon as possible in order to find them, to measure them and to make of them drawings with dimensions, as has been done for the Netherlands.

This rapid comparative study allows the mutual relations which exist between the nations to be established and to show that the ancient types special to Southern France, to Spain and to Portugal all belong to the Mediterranean family, that is to say: to the Southern centre.









ET varen met weynig volk, het nauw en zober behelpen in leeftocht en ons ingeboren zindelijkheid, die de schepen langdurend maekt, doet den Nederlantschen scheepvaart bloeyen, en niet het scheepsfatzoen.

NICOLAS WITSEN, 1671. (1)

These remarkable words are characteristic and show that something else than the determined forms of ships is necessary to make a people prosperous and great. If

this were not so, our types of vessels, says Witsen, would have been copied immediately by other nations.

Sobriety and cleanliness are two capital virtues of the Dutch race, but, beside these virtues, our ancestors possessed one other important quality: they were builders of economical ships and our present builders have preserved this quality.

Let us hope, with full confidence, that this will always be so in the future.

Witsen maintained — and this fact acquires a certain significance if it be compared with what goes before — that foreigners who have come to Holland to learn our art of shipbuilding, could not after returning home, imitate our processes. I am not surprised, therefore, to see these foreigners write that they could not use our architecture or our measures.

Many a ship, says the author mentioned, has been analyzed and measured abroad, but never has it been imitated; nor have our builders ever harvested any praise for their work.

(1) The Dutch marine owes its prosperity not to the beauty of form of its ships, but to the value of its limited personnel, to the sobriety of its seamen and to the innate cleanliness of the Dutch people.

What Witsen then says about the English is quite characteristic: "In deze braveeren zy (de Engelschen) opentlyk allen Landaert en wanen niemant huns gelyk in deze konst te hebben "(1). He imputes this unfavorable judgment on the Dutch to the fact, that nothing relating to naval architecture has ever been published in the Netherlands. It will be seen, further on, that, as a matter of fact, people abroad hold another opinion.

Data, which may not be doubted, teach us that, even in the highest antiquity, the peoples living on the shores of the Mediterranean were acquainted with navigation. Again, at the present time, the most savage, the least civilized nations, settled by the banks of rivers, had their boats, however primitive their forms may have been. Several ancient ships were exhumed in Northern Europe during the second half of the last century. It may be concluded from this that the people who lived near the water were familiar with navigation from the earliest times.

Moreover, it is evident that the long, narrow "canoe" obtained from the hollowed out trunk of a tree was the oldest form of boat. The pole, which was the primitive mode of propulsion, was soon replaced by the paddle and the oar.

Man, by nature, seeks his ease; hence there is no cause for astonishment that he should from the beginning have called the wind to assist him in moving over the water. This accessory means soon became the principal agent of propulsion.

The oldest inhabitants of the Netherlands were acquainted with navigation, long before the Roman domination, and it is to be supposed that they could only have reached the various points of their territory by water.

Cæsar tells us (HOLMES, p. 52) that the Britains used very light vessels composed of a frame of linden branches covered with skins. On the other hand, Pope Marcellinus (A. D. 293-304) relates to what an extent the Saxons were to be feared because of their agility and adds that their boats were made of buffalo skins stretched tight over flexible wood.

By the side of the long vessels with oars, there must have existed very soon broader and less swift boats. These boats were propelled

(1) On this point, they (the English) openly defy all other nations and believe themselves to be unequalled on the ground of shipbuilding.

by sails and finally they wholly displaced the ships with oars.

Nothing concerning these primitive boats has been preserved.

It is well known that the oldest inhabitants of our country came from the East. They, doubtless, were acquainted with the art of shipbuilding and they must have adapted their types to the necessities forced upon them by the state of the navigable highways of our low-lying lands.

It can be assumed that the cradle of the naval architecture of the Netherlands was in the Baltic Sea. So, let us turn our eyes first in that direction where, from the most distant times, the art of shipbuilding must have reached a high degree of perfection. This follows not only from the vessels of the time of the Vikings which have been found, but also from the researches made in late years. These researches have authorized the conclusion that, even in ancient times, the peoples of the North seem to have crossed the North Sea. The Swedish archeologist Montelius even assumes that there were already continuous relations between the West coast of Sweden and the East coast of England at the close of the age of stone.

Long before the expeditions, properly so called, made toward the South by the Vikings, the latter crossed the sea, and it is settled beyond question that they were given to navigation at the beginning of our era. Tacitus speaks of the powerful fleets of the Swedes which, in his time, did not use sails but only oars. The author of the work *Vesterlandenes indflydelse paa Nordboenes og saerlig Nordmaennenes ydze kulture leveesat og simfundfs Jorhold i Vickingetiden* of ALEXANDER BUGGE (1) 1905, seems authorized, under these conditions, in saying that the navigation of the North owes its origin to the Suevi and the Goths settled on the shores of the Baltic, whence it passed later to the Norsemen and the Danes. It may also be added, we believe, that the same was the case with regard to the Netherlands, Great Britain, Belgium and a part of the North of France.

The celebrated German philologist and archeologist, Professor H. Zimmer, supposes that the Norsemen visited the Shetland Islands between the years 590 and 644. This supposition has been

(1) *Western Influence on the Cultivation, Mode of living and Agriculture of the Children of the North (Norwegians and other Scandinavians) in the Time of the « Vikings »*, by ALEXANDER BUGGE.

confirmed by the researches of Dr Jacob Jacobsen, who lived for a long time in these islands in order to study there the Norse names of the villages and to pick up still other traces of the Norse language. This savant also concluded that the Norsemen must have already visited the Shetland Islands about the year 700.

If these facts be compared with what used to be done on the Mediterranean, where the endeavor was always made to land at night, it is impossible to repress a sentiment of admiration for the Norsemen who crossed the sea fearlessly as far as Iceland and Greenland. Their naval architecture must even then have reached an extraordinary degree of perfection, full proof of which is found in the construction of the superb ships « Oxberg » and « Gokstad », found in the neighborhood of Sandefjord (Christiania Museum of Antiquities).<sup>1175</sup>

Hence it is scarcely probable that the peoples of the North should have learned anything at all about shipbuilding during their expeditions across Western Europe. On the contrary, this part of Europe, including the Netherlands, must have borrowed the art of shipbuilding from them. It was also only very much later that a navy and fleet were spoken of in England. (See HOLMES, *Ancient and Modern Ships*, 1900.)

Afterwards, the Norsemen extended their excursions more and more toward the South; they settled in Normandy and took possession of England. It was in the course of these expeditions that they became acquainted with the naval architecture of the Mediterranean. It is needless to say that they must then have appreciated the perfection which the latter had reached. Furthermore their interest demanded it. They borrowed, in particular from the nations of Southern Europe the anchor which these, in their turn, had learned from the Greeks. The Norse word « akkeri », which means *anchor*, seems to be borrowed from the Anglo-Saxon « ancor », which owes its origin to the Latin word « ancora ». The word « forkr », meaning a boat-hook, is also of foreign origin; it comes from the Anglo-Saxon « forca » and from the Latin « furca ».

The types of the Norse vessels have, however, not been changed as the result of contact with the South. The extraordinary life of the Vikings and their continual piracies justify the conclusion that the merchant ship was not improved among them, but rather among the peoples engaged in a more regular trade. There is really,

in my opinion, no cause for astonishment that this development should have taken place in the North-Western part of Europe. There are some even who claim that the vessel « busse », generally in use during the Middle Ages, came to us from Normandy and dates from the beginning of the XIth century. In order to support this claim, they take their stand on the fact that the word « busse » appears first at about this time in the Chronicles.

J. Steenslup has called attention to a people of seamen called the « Butsecarlas » (mentioned in the old Anglo-Saxon Chronicles of the year 1066 and in the book of Florent Wigorniensis, dating from 1052), who occupied the coasts of Hasting and Yorkshire. This writer also calls attention to the second part of the word, which belongs to the Norse tongue, while the word « buza » occurs frequently in the Old Norse and the Old Swedish, near the XIIIth century, and means a boat of sharply curved form. This word, however, is of Romana origin : it corresponds, so it said, to the Old French *buse* or *buce* (dating from about 1080); hence it is considered that the vessel « buce » is originally from Normandy.

This, however, does not seem to be so sure. It has been shown, as a matter of fact, that the same shapes of ships have been preserved for ages even though under other names.

The fact that the word *buse* is used for the first time about the year 1050 is, therefore, no proof that the type of vessel in question only appeared at this time. I am rather inclined to think that the type under consideration was already in existence, but that it was named *buse* or *buce* in Normandy only toward 1050 and, probably, after having undergone a few unimportant changes.

Shipbuilding was imported from the Baltic into the Netherlands by the most ancient inhabitants of this country, the Frisians and the Saxons, who then developed it aside from any foreign influence.

In this respect, the quotation from Witsen, which appears on page 47 of his well known work, becomes really important : *De Vriezen komt de lof toe van de herstellde scheepsbouw in Nederland, zoo de meeste schryvers willen* (1). The question is, indeed, that of a development of its own in the North-Western part of Europe; the special and identical forms, still found to-day, to a great

(1) It is the opinion of most authors that the Frisians have the honor of having made shipbuilding flourish again in the Netherlands.

extent, from Denmark to Belgium, are sufficient proof of the fact.

This is why the Baltic may be spoken of broadly as the Northern centre, in opposition to the Mediterranean Sea as the Southern centre. The development of shipbuilding had this Northern centre as its starting point and finally reached its highest mark in the Netherlands. France and England came later.

The art of shipbuilding spread gradually through the Netherlands, which continued to go forward until the time when France dominated all by the continental blockade.

Let us return now to the types of ships. It has been said, that several boats of the Vikings have been found. One, especially, was discovered at Haugen in 1867, and another at Gokstad in 1880. Before that, in 1865, three had already been found in Jutland three specimens which seemed to date from the Vth century. The largest of these was 70 feet long. 11 72

A Viking vessel was also discovered at Charbuw, near Pommeren. The last discovery was made in the suburbs of Oxenberg, near Christianiafjord, Norway, in 1904. 11 74

All these boats are for oars; still sails could be used, they being attached to the mast put up in the centre of the vessel. Considering their beam, these ships are not so long as the vessels for oars of the Mediterranean; in fact, their breadth is to their length as 1 : 5. They are full near the middle and become narrower at the bow and stern. The stem and the stern-post, which are both curved, rise very high above the water. An oar attached to the stern was used as a rudder.

Their construction differed also from that of the Mediterranean vessels; here, only ships having smooth sides are met with, whereas the Viking boats are clinker built.

The « Gokstad » is one of the most beautiful specimens of this type. HOLMES has described it in detail, in his fine work *Ancient and Modern Ships*, pp. 55 *et seq.* This vessel is 77 feet and 11 inches long, 16 feet and 7 inches broad and 5 feet and 9 inches deep; it is also clinker built and rivetted.

Turning now toward Norway, let the fishing boats still in use there to-day be considered; the resemblance of these boats to the Viking ship will be found striking both in shape and structure. It is this which makes HOLMES say (p. 60) : « Such 11 76  
11 80

„ an instance of persistency in type is without parallel in the „ history of shipbuilding „.

It has been seen that this fact occurs not only in Norway but among all nations. There is nothing to cause astonishment in again finding the most ancient models in fishing boats. No class is more conservative than are fishermen, who build their barks as their forefathers did and on whom necessity alone can force new forms.

II 103 Aside from the specimens discovered in the North, little is left of the oldest types of ships. There is nothing left of them save a few vague descriptions and imperfect reproductions. In this order of ideas, the coat of arms of the city of Amsterdam is the best known document which the Netherlands supplies. WITSEN'S work contains, on page 362, several reproductions of these arms dating from different epochs.

II 112 HOLMES reproduces, besides, the ships which figure on an old Bayeux tapestry (1066), as well as the „ Sandwich Seal „  
II 105 of 1238, the „ Dover Seal „ of 1284 and the „ Pool Seal „ of  
II 110 1325 (pp. 67 and 68). These three seals agree with the oldest of the arms of Amsterdam and the ship which they carry is, in every respect, similar to that of the said city. Too much importance cannot be attached, however, to this detail, because, just as the lion of heraldry is very little like a real lion, it is to be supposed that the heraldic ship is not a faithful reproduction of the real type.

The old illustrated Bible of 1200-1220, preserved in the Royal Library of The Hague, and which seems to have come from Northern France, contains also a remarkable reproduction; the type of boat which it gives is also like the preceding ones.

II 112 The identity of all these figures allows it to be supposed that a single type of ship ruled in Western Europe; while the clearly pointed out timbers of the planking shows clinker built work.

II 78 The reproduction of the Bayeux tapestry shows, besides, that the sail was very early in use; the pilot of one of the ships shown there holds the sheet in his hand. Besides — and this fact is worthy of notice — these vessels all have sensibly vertical stems and stern-posts, just as they are still found in our times on a few Norwegian fishing boats.

The „ cog „, the vessel in the arms of Amsterdam, is a very well known mediæval type, of which the importance becomes marked in Western and Central Europe from and after the XIIIth century, when the Hanse towns and the Frisians improved it greatly.

This ship, which was very broad for its length, was hard to board, whence its usefulness in time of war.

The „ cog „ seems to date back further than the institution of the Hanseatic league (1250) judging by the fact that its name was known well before this date. Thus, the inhabitants of the Netherlands had to equip several cogs werewith to fight the invasions of the Norsemen (810-1010). It was the application of the feudal system to navigation. (See LA CROIX, p. 88.) It is known that this policy was finally established under Charlemagne who subjugated the Frisians in 785 and the Saxons in 804. (Mr. J. C. DE JONGE, *History of the Navy of the Netherlands*, Vol. 1, p. 6.)

It is needless to say that everything was soon put to work to escape it. A charter of the Roman King Otho I (936-973) calls for a tenth of a „ cog „ (Kogschult) of which the product came to the bishop of Utrecht. It was the commutation for the obligation to serve the prince with cogs. This obligation seems, in principle, to have struck more especially the countries lying along the present Zuyder Zee. (Mr. DE JONGE, Vol. I, p. 7.)

The „ cog „ only appears for the first time in Germany in 1211, when the Emperor Otho IV allowed the inhabitants of Wismar to maintain two „ cogs „ (Cogken), and as many small vessels as they desired.

There are some who claim that the word cog, „ Kuggr „ in old Norse, comes from the Italian „ cocca „, the Spanish „ coca „ or the old French „ coche „ and, consequently, they believe that the word is of Romance origin. This does not seem likely; the „ cog „ is a type of vessel copied from the old Viking boat and adapted to the special conditions of the navigable highways in the low lands of the North-West of Europe. Hence it was robust and full to facilitate grounding.

In reality, the „ cog „ was unknown in the Mediterranean; this follows from what the Florentine historian Villani relates in connection with the battle of Zierikzee. If this vessel had been

a Mediterranean type, the author would not have directed especial attention to this form of ship. Hence the « cog » really belongs to Northern Europe and owes its perfecting to the Frisians and most of all to the Flemings.

The « cog » was generally in use in the XIIIth century and it may be assumed that the Norsemen already knew it in the time of the Vikings. Unfortunately, very little concerning it has come down to us. The oldest reproductions which we possess are those of the seals of Amsterdam and Harderwijk. But the ship which figures in the arms of the former city has undergone many changes in the course of the ages. Witsen says that it is an ill drawn figure and he imputes this defective work to the ignorance of the engravers. (WITSEN, p. 363.)

The arms of Harderwijk agree with those of Damme (JAL, *Gloss. nautique*, p. 1051); there is no doubt that the two seals show the same ship (the only difference being that the Damme boat carries two towers). If then the Harderwijk ship represent a « cog », as is claimed by WITSEN (p. 364, 2d column), the same must be the case with the one of Damme.

In so far as the Amsterdam seals are concerned, Witsen further remarks, that the oldest could not date before the year 1200, as Amsterdam did not rank as a city before that time. He adds that it is clearly seen from these arms « hoe het met de bouvery der Kogschepen oulinx heeft gestaen en hoe haer gestalte steeds is veranderd met den tyt, gelyck men ook hedens-daegs (dus ten tyde van dien schryver) de gestalten der schepen steeds verandern ziet » (bl. 364.) (1).

The cogs were clinker built.

Most of the reproductions show only a rounded bow. It can therefore be deduced that the boat which appears in the arms of Harderwijk is a variation of the ordinary « cog ». It should be noticed that all the old types of Dutch ships show, like the « cog », a slightly rounded bow with no beak.

Although the old Flemish engravings of the XVth century

(1) « How cogs were built in the past, and how much they have changed with the passage of time, just as in our day (the time of the writer) furthermore, the shape of ships is seen to be undergoing constant modifications. » (P. 364.)

show different types of ships, it is to be remarked that none of these latter is called a « cog ». Still all these engravings show thick-set boats, with a rounded bow, which must certainly have been derived from the « cogs » which have been scarcely changed.

There is even a reproduction which dates from the beginning of the XVIth century and which shows a Zeeland « cog ». The bow and stern seem there to be identical in shape; it is to be assumed however, judging by the position of the mast which is at about one-third the length of the ship abaft the stem, that the bow was fuller than the stern. The stem is curved as is also the stern-post; the tiller passes through a *statie* (1). The mast rakes a great deal, as was required by the use of the old sprits; the vessel is also provided with lee-boards.

The reproduction does not show clearly whether the hull is clinker built. It is very possible that the sides were carvel built, because this style of work was already in use at that thime. The boat has no « arcasse » (2); the hold is covered with convex hatch covers.

This Zeeland « cog » is derived, doubtless, from the primitive « cog ». Let us suppose this vessel as having a little fuller ends; as having the mast in the middle; as having a steering oar instead of a rudder; the lee-boards suppressed and a clinker-built hull; we shall have an idea of the « cog ». This being so, the cause of the existence of our « bom » becomes more important; this latter boat, as is well known, has been greatly enlarged during the past century and has gained fullness at the ends so as to increase its capacity. This is noticeable when the bow of a « bom » is compared with that of the boat used for catching shrimps. This latter has still the old rounded forms and is not so wide in proportion to its length.

Let us suppose then that the « bom » is less square at its ends, higher at bow and stern, that is to say : having a little more sheer, like the boats of former times; there will be had a

(1) The *statie* was a sort of secondary bulwark at the stern, rising quite high above the rail. The tiller swung from side to side in an opening made in the bottom plank of the *statie* and above the rail at the stern.

(2) The « arcasse » includes the stern-post and the transoms. It belongs to square-sterned vessels only.

vessel which, with its clinker built sides, will differ little from the old " cog ", still met with as a rarity in our fleet of fishing boats.

III 112 Changed in this way, the " bom " no longer differs so much from the " Egmonderpink " reproduced and described by WITSEN (p. 168); it might even be concluded that it descends therefrom. It can be understood from this how it is, even in our days, that the " bommen " are often called " pinken ".

Thus a picture, in the town Museum of The Hague, shows the beach at Schevening covered, not with " bommen " but with " Egmonderpinken ".

This subject will be taken up again in speaking of fishing boats.

The shrimp fishing boats have been less changed; consequently, aside from the *counter* which was added later, they differed less from the " Egmonderpink " which, finally, are found again almost complete in the Ostend fishing boats, as LELONG II 243 has pointed out in his *Encyclopedia of Naval Architecture*, p. 17.

The " bommen " were still able in the XIXth century to render good service as coast guards. There is nothing to prove that they existed in Witsen's time; the contrary is more likely, as this author does not mention them. He merely says that, beside the " Egmonderpinken ", other and much smaller fishing boats were seen on the beach and that they carried only fore and aft sails. If these boats had differed much in shape from the " pinken ", it is to be believed that mention of the fact would have been made. (See WITSEN, p. 168, 2d column.)

II 187 The artist who reproduced the Zeeland " cog " has left also the drawing of a " Doghboot " which also came from Zeeland (WITSEN, p. 170, 2d col.) and which resembled very much this " cog ". The stem is a little longer, the " statie " is not closed and the vessel has no convex hatch covers. The rig only differs entirely from that of the " pink " and everything leads to the belief that this kind of boat came from the South.

II 189 The same artist gives a figure of a " Heude " or " Heu " from Brabant, which might be called a small Zeeland " cog ".

II 188 Still, there appear to have been larger " Heudes ", judging by the Brussels " Heu " which was a vessel carrying two pieces

of artillery, but of which the reproduction does not give the means for determining the shape of the ship.

It will be well to note here that great circumspection should be used in the matter of these different names adopted to designate such or such vessel. These names have been the cause of much confusion, an example of which is offered by the famous discussion which took place at Groningen, in 1902-1903, as to the question of knowing what a " pram " was.

The crusades, which began in 1096, contributed largely toward perfecting the ship. It was the same with the invention of the compass in the first half of the XIIIth century (HOLMES, p. 66). Commerce and navigation rose higher and higher. Already in the course of the XIIIth century, Damme became the ware house of Northern Europe. Italy, Spain and France brought their products there.

The old maritime customs of Damme served later as the basis of maritime law in Holland, Northern Germany (M. KOENEN, p. 50), Sweden and Denmark.

The XIIIth century saw commercial treaties concluded with the Hanseatic cities and, in 1252, tariffs were fixed (M. KOENEN). " Losbogen, scharpoise, eenvaren " (boats with high sides) and " hekbooten " are in question in these tariffs; and these names are also found in an act made between the Lords of Kuyck and of Dordrecht to settle a difficulty concerning the city duties at the former of these towns.

Among the " losbogen ", are found the boats which were unloaded at the bow or " booge ", as is still done with vessels which carry wood.

The boats used on the Scarp, a tributary of the Scheldt, are placed among the " scharpoises or exarpoises ".

The " eenvaren " were boats handled by a single boatman, and the " hekbooten " were boats which had a square stern.

These few denominations suffice to prove that, even at so early a period, there were different kinds of boats and that alongside of the " cog " there were other vessels of smaller size.

In the beginning, the " cog " was guided by oars, as were other ships; this method was abandoned gradually in the XIIIth century and the steering oar gave place to the rudder.

It is not possible to determine, for Holland, the time when this change occurred; the various coats of arms of Amsterdam can throw no light on this subject. The ship, on many of them, has no rudder, symbolical, doubtless of the fact that people could sail for all parts of the globe (WITSEN, p. 634), and that vessels started from Amsterdam bound to all the countries upon earth.

It is to be assumed, nevertheless, that it was also in the XIIIth century that the rudder was introduced into Holland. Some persons have tried to make out that there was a certain connection between the adoption of the compass and that of the rudder; this latter became forced, they say, when, thanks to the compass, more and more distant expeditions could be undertaken.

For my part, I do not think that there can be the slightest connection between the two events; the Norsemen, in fact, crossed the North Sea before the rudder was known.

The oldest reproductions of the "cog", however primitive they may be, have a mast with the sails and rigging of the boat at the centre. I know of no reproduction showing oars. Hence it can be deduced that the sails and rigging formed the main outfit and that the oars, of which the number, even on the largest "cogs", was limited to a maximum of 32, or 16 on each side, were used only in calm weather. This is what is done at the present time for vessels of less importance, such as the "hoys".

Hence the oars were only an accessory, the reverse of what was seen for the galleys, where the oars were the main feature and the sails and rigging were secondary. That is why, contrary to what is seen for the "cog", no reproduction of a galley without oars has been met with.

It is therefore wrong that the name of galleys should be given sometimes to "cogs". The former were never implanted in the Netherlands, Mr de Jonge has already pointed out the inaccuracy of the passage of the Annexes of *Wagenaar*, vol. 3, p. 50, where that author relates that the eleven hundred ships sent against Antwerp by Count William III were almost exclusively galleys.

However, there is a question of galleys in the history of the Netherlands; but it is not a question of the Mediterranean type. Their number was limited and they were used only on rivers.

An engraving which dates from about the year 1600, and shows

the Scheldt in front of Antwerp, as well as a view of Gouda, shows <sup>II 145</sup> boats of this kind.

These galleys were only large rowboats, a little longer than the ordinary ones (DE JONGE, vol. 1, p. 80) and carried only 32 oars at the most. The largest Netherlands galley belonged to the guard of Amsterdam and was called the Terror of the Zuyder zee. Those which were used in naval battles come from the South.

Any one who knows the national character of the Dutch will not be astonished at seeing that the galley had no success in Holland. The trade of the galley slave was considered too vile and no volunteer rowers were to be found; furthermore slavery did not exist and serfdom had been early suppressed. (WITSEN, p. 194, col. 1.)

However, the galls did not confine themselves to the simple forms which have been sketched. The constant wars, which brought out the fortified castles of the Middle Ages, soon led to the construction on the sea of structures of the same sort, and gradually there were seen to develop among us also the towers which arose at the bow and stern of the ships. The seals of Amsterdam give a striking illustration of this.

Military tactics were not without their influence on this way of building vessels. The crusades and the subsequent relations with the peoples of the Mediterranean, among whom the practice of castles was known, made us familiar with these super-elevated constructions. If, in a first encounter, the enemy's vessel could not be sunk, it was boarded so as to bring about a hand to hand fight. The conqueror was then he who had at hand the most robust ships and who could place himself sufficiently high up to let fly his arrows at the enemy. Nothing was more natural, then, than to imitate on ships the fortified castles with their crenelated towers. If the enemy succeeded in boarding the ship, the defense withdrew to the castles. There should be no cause for astonishment therefore at finding the old tops on the masts and at learning that even the boats were hoisted there in order more surely to crush the adversary under a shower of arrows and stones (Mr. DE JONGE, p. 20).

It can be conceived that the movable castles should not have answered to expectations and, therefore, that an arrangement was soon reached to make but a single body of the castle and the ship, and thence to raise the bow and the stern.

Portugal and Spain, imitating the Mediterranean, had the start of us in constructing castles.

Thus the vessel of the XVIth century is seen to develop gradually and we can understand how the intermediate low part between the forward and after castles should persist.

In the beginning, the deck did not exist in the central part. Then, in order to protect this last against stones and other projectiles, it was covered with a wooden lattice (See, among others, WITSEN, p. 51, col. 2), while its sides were furnished with loopholes covered with pewter, to make it more difficult to scale in case of boarding.

The English seals, more finely and more artistically engraved than ours, give an excellent idea of the progressive development of the castles. Five of them show the sides of the ships as clinker built, while the seal of the city of *Poole* makes the rivets really visible. The castles are so clearly shown in their successive phases of development, that any explanation is unnecessary. The steering oar, which is seen on the oldest seal, is replaced by a rudder on the others. The Boston seal shows a well turned out three-masted vessel with smooth sides.

All the seals, save this last, show the forms of "cogs", which proves once more the identity of the types of ships of the North-West of Europe. (Holmes states, on page 70 of his work, that the Poole seal gives the oldest English reproduction of a ship with a rudder, 1325.)

As has been said already, the adoption of the compass was the signal for cutting loose from the coast and for undertaking more distant voyages. We learn, especially in the *Reygersbergh Chronijk van Zeelant* (published by Boschhorn) Vol. II, p. 212, that about 1440, when the use of the compass had scarcely become general, the Zeelanders worked more and more toward the South, making toward Portugal and Spain.

Before then, these countries seemed so far away that, when starting on a voyage thither, the seamen went to confession and the Holy Sacraments were received.

At the same time with the invention of the compass, another event came to produce a great influence on shipbuilding; it was the invention of gunpowder, with the consequent adoption of artillery.

The history of the Netherlands speaks for the first time of the

use of artillery in connection with the expedition of Duke Albert against the Frisians in 1396. It seems, however, to have been used at the siege of the castle of Rozenburg-lez-Voorschoten, in 1351 (M. DE JONGE, Vol. I, p. 28).

Cannon were not used either at the battle of the Sluis or in the maritime expeditions of King Richard III. But they were in general use on board ship in the XIVth century. (HOLMES, p. 71.) The Genoese and the Venitians in the South, and the Hanseatic cities in the North, who were the masters of all peoples in commerce and navigation, were the first to adopt them. (M. DE JONGE, Vol. I, p. 29.)

It was natural that artillery should modify war tactics and it can be said that the military value of ships depended on the number of guns which they carried. Finally, ships were built exclusively for war, and the practice of the Middle Ages, which was to utilize merchantmen for this purpose, must needs be abandoned.

The United Provinces did not decide at once to build special ships. Hence the dimensions of existing types had to be increased, in order that a larger number of guns could be mounted. The difference between sea-going ships and inland vessels became more and more marked. The war ship was evidently the one which departed the most from the old forms, for the reason that it had to undergo every change which had been advantageously adopted by the enemy.

The earliest guns were not greatly to be feared. The proof of this is found in the fact that the coverings of staterooms and castles were sloped, like roofs, so as to make the bombs thrown by the foe roll off more easily. <sup>1145</sup>

The name of cog disappears as ships increase in size. The vessels met with are generally called "Hulken" and "Baertzen" toward the end of the XIVth and during the XVth centuries; and, after all, says Witsen, they are only types of ships formerly in use in our country. The "Hulk", he adds, the larger of the two, used to sail for distant lands; its capacity was as great, sometimes, as 200 lasts. (WITSEN, p. 494, col. 2.)

The "Baertze" was a ship equipped as much for coast defense



as for war at sea. In 1518, there were built a very large number of them which ran under sail, but which could be moved by oars in calm weather. (WITSEN, p. 483, col. 1.)

Hence these two types were merchantmen, the "Baertze" especially being used for war. Their equipmend included oars too, which were used when the wind failed.

II 124 Nor did the XVth century, itself, see any ships built exclusively for war. This century has left us some very beautiful  
II 131 reproductions of Flemish origin (See, *Der Meister W A* of MAX LEHR, 1895, p. 1), on three of which appear the names of "Beartze", "Barge" and "Kraeck".

The ships shown there have the same characteristics and differ from each other only in their rig. It is seen that they are bluff-bowed and that their bow is rounded as is also their stern.

Aside from the "Kraeck" none of these vessels carries artillery: all have, however, a castle, still of quite simple construction, at bow and stern. The "Kraeck" alone was supplied later  
II 127 with windows in the stern above the gallery.

Then too, in these reproductions, all the castles, except those of the "Kraeck", have no roof. This last vessel is the largest, beyond doubt; its very name brings at once to mind a type of ship of which the size and the strong construction seem to find their origin in the Spanish "Carack", whence the name of "Kraeck".

The form of this vessel scarcely differs, however, from that of the others; the bow especially approaches rather the Dutch type than the type of the Spanish carack or of the galleon  
II 64 (compare the figure reproduced in VAN YK's work, p. 9). Hence it may be supposed that the "Kraeck" should have differed from other vessels only by larger castles, stronger rig and increased size.

The "Barge" and the "Baertze" give, with vessels shown on other reproductions, an idea of the Dutch ship of the XVth century. No "Hulken" are met with among these vessels; they were clinker built (WITSEN, p. 496, col. 1, Caravelle), while all the reproductions unter consideration show only ships with smooth sides.

Besides the "Hulken", there were "Razeilers" and "Krayers" which had also clinker built sides. Here, then, is

found the old way of building "cogs", and it may be stated that we are in the presence of vessels which owe their origin to this type of ship, and only have a different name because of certain changes of detail in the matter of their rig or the construction of their castles.

A Flemish miniature of the XVth century gives a very remarkable reproduction of a vessel of the time. A "cog" with overlapping planks is seen here. In accordance with the custom of the Middle Ages, this ship has three masts with tops, a castle at bow and stern, and guns; there are no gun-ports.

The "cogs" which were in use in the XIIIth century, were replaced in the XIVth by the "Krayers" and "Hulken" which had to give way, in their turn in the XVth century, to the "Barges", "Baertzen" etc. The clinker built sides of large ships only disappeared in this last century, to give room to the smooth sides, a mode of construction which took root with us as the result of our relations with the peoples of the Mediterranean. II 118

An old Record of Hoorn, written by D. Velius, relates that the carvel built side was first applied by "Juliaan" at Zierikzee, and adopted at Hoorn in 1460. The ships built in this way were called "Karviel", "Kraweel" or "Karveel" (WITSEN, p. 496, col. 1) and their type, according to this author, would seem to have been copied from the Latin vessel "Carabus". M. DE JONGE, on his side (vol. I, p. 79, note) remarks that "Juliaan" might well have been an Italian.

Witsen gives of these "Karviel" a description which is well worthy of attention: these vessels were rather narrow at the bow, broader at the stern, thus having the shape of a chisel. In other words, their lines were finer, wherein they differed from the types of ships used in Holland.

Hence we seem to have before us not only a given mode of construction, but also a well determined type which has come from the Mediterranean. JAL, in his *Glossaire Nautique*, pp. 419-420, tells us, as to that, that caravels were already to be found on the Mediterranean in 1307; their dimensions were, however, smaller than those of the ships used by Vasco da Gama and Columbus. Here is what this author says about this style of vessel: "The caravel was a small ship of the family of round.

» stern vessels but with finer lines than the *nefs* of its time  
» and more slender forward. It was also faster, more handy  
» and better fitted for all expeditions where speed in going  
» ahead and great quickness in coming about were required. »

These caravels did not remain in use to act as « Kraecks »;  
but with this vessel we reach the time when the reciprocal  
influence of the two centres begins to be felt.

Two existing Flemish miniatures show clearly the difference  
which existed between the Dutch type and the foreign type;  
<sup>1119</sup> they date from 1482 and 1488 respectively. The first is the  
<sup>1117</sup> picture of the true type of the Dutch vessel; the second shows  
a foreign ship. On the first, the vessel is represented with  
smooth sides; therefore this system of construction was adopted  
among us in the XVth century.

The vessels are not yet made with a square stern, however;  
their stern being still round in accordance with the ancient way.  
As a general rule, they were of small size, and our present sea  
« hoys » could have been compared with them in this respect.  
They had a capacity of 160, 180 and 200 tonnes, or 80, 90 and  
100 « lasts ». Nevertheless, there were also some of 220, 230 and  
240 tonnes, or, 110, 115 and 120 lasts. (M. DE JONGE, Vol. I, p. 80.)

The « Karvielen » and the « Kraecken » disappear in the  
XVIIth century and, at this time, no more types which differ  
from the ordinary Holland type are met with. Hence it can be  
maintained that the « Karvielen » and « Kraecken » did not  
succeed in taking root with us. It will be seen, on the contrary  
that the full-bowed vessels came more and more into use.

The name of « cog » was, therefore, no longer in use in the  
XVth century. Nevertheless this type of vessel continued to  
exist. The « cog » gave birth to the « Hulken » and these latter  
to the « Baertzen ». Although modified, the first form, that of  
the full-bowed ship, remained in use. One single characteristic  
disappeared : that of the slender bows and sterns of the old  
« Viking » boat which are found in all the reproductions known  
in the North-West of Europe, from Denmark to and including  
England and the North of France.

The rigging developed in its turn : the single mast was  
replaced by three pole masts, each having a top and a single

large sail. The ropes were made stronger and channels appeared  
near the end of the XVth century. The steering oar of the old  
« cog » had long since given place to the rudder.

It would be incorrect to call « cogs » the vessels represented  
by Master W. A., as Arenhold has done in his work : *Die allmähl.  
Entwicklung des Segelschiffes von der Römer zeit bis zur Zeit  
der Dampfer*, p. 650 — (*Jahrbuch der Schiffbautechnischen Gesel-  
schaft*, 1906). They are, however, forms which issue from the  
« cog » but not new forms developed alongside of ancient forms.  
If history be consulted, there will be no cause for surprise at  
seeing the effects of the contact of the two Centres appear  
exactly in the XVth century.

The Crusades (1096-1291), which brought the nations very  
much together, had come to an end. The alliance of the Han-  
seatic cities, concluded in 1250, had caused a prodigious growth  
of our trade in the Baltic Sea. The Frisians, especially, had  
devoted themselves to the art of shipbuilding, but the Flemings  
would not let themselves be distanced.

In 1339, there broke out between France and England the  
Hundred Years' war, which led the latter to take up shipbuilding  
much more actively than in the past.

One of the most famous actions of this period was the battle  
of the Sluis (1340), at which the English fleet of two hundred  
ships, under the command of King Edward III, completely defeated  
the Franco-Genoese fleet. This latter, 190 vessels strong, was  
composed of bluff-bowed vessels, galleys, barges and a large  
number of small vessels. Certain chroniclers claim that it includ-  
ed four hundred units. (HOLMES, p. 71.)

The English lost four thousand men in this battle, and the  
French and Genoese twenty-five thousand, which leads to the  
assumption that the latter had a large number of galleys at their  
disposal.

In 1345, Edward III came again to France at the head of a fleet  
of 1000 to 1100 ships and, in 1347, a third expedition, having to do  
with the siege of Calais, was sent against this country.

HOLMES relates (p. 72) that, for this expedition, the greater part  
of the fleet, which counted 745 units and 15895 men, came from En-  
gland ; the other vessels were furnished by the Flanders and Spain.

The size of the crews, which reduces to 21 men per vessel shows sufficiently that the boats of the fleet were relatively small. Under these conditions, a pretty exact idea can be had of this fleet by giving a glance at old engravings which show a flotilla of fishing boats, including some busses and a few «Noordvaarders», putting out to sea.

The castles which ships carried at this time were small and not set up as a permanence.

The medal struck as a commemoration of the battle of the Sluis also shows a «Cog », or at least a vessel which is exactly like it by its clinker built sides. It may be supposed that the type of vessel shown in this reproduction was the one most widely used at this period; so, once more is shown the great affinity which existed among the northern nations.

Military tactics had forced the peoples of the Mediterranean and, later, Spain and Portugal, their imitators, to increase the height of their ships. This is confirmed by HOLMES in the following quotation relating to the battle fought by Edward III, near Winchelsea, against forty Spanish ships : « The tactics of the English consisted » chiefly of boarding, while the Spaniards, whose vessels were » much the higher, attacked with crossbows and heavy stones; the » latter they hurled from their fighting tops into their adversaries' » ships ».

The history of the Netherlands also mentions this fact.

England first made use of artillery at sea in 1372; the Mediterranean saw it used by the Genoese in 1377.

Shipbuilding was only developed much later in France. Nevertheless, there is proof that ships were already built there in the XIVth century and it appears that they had cannons on board even in 1339. Still, it was only on the shores of the Mediterranean that shipbuilding was regularly carried on, under the impulse, it appears, of Jean de Vienne, who was made admiral in 1373. (*Le Musée de Marine du Louvre.*)

It was under the rule of Henri the Navigator (1417) that shipbuilding reached its height in Portugal, a country which was entirely under the influence of the Mediterranean.

Meanwhile, the relations of the Netherlands with the southern countries had developed rapidly.

The closing of the old route to the Indies, which led through the Mediterranean and Asia Minor, brought about a complete upsetting of the commerce of the world. New explorations must needs be undertaken and it is thus that we read in history that after having pushed as far as Guinea with six caravels, in 1446, the Cape Verde Islands were reached soon afterwards.

In 1449, it was the turn of the Azore Islands and, in 1486, Bartholomeo Diaz reached the Cape of Good Hope. Eleven years later, this navigator turned the Cape and landed at the Indies with three vessels, the *San Gabriel*, the *San Raphael* and the *Bonio*. According to existing data, the first of these ships must have had a capacity of 400 tons or 250 to 300 registered tons. (HOLMES, p. 86.)

It is useless to dwell longer on these episodes of which the history is sufficiently well known and of which the last act was the discovery of America by Christopher Columbus in 1492. This latter had at his disposal but three small ships, although Spain was already using, at this time, larger vessels. The best known and the largest of the three was the « Santa-Maria ». <sup>1161</sup> This ship had a length of keel of 60.68 feet and a length over all of 128.25 feet with a total breadth of 25.71 feet. The Chicago Exposition of 1893 exhibited a model of this vessel of which HOLMES'S work gives a reproduction on p. 85.

The discovery of America gave rise to the thirst for gold, drove the nations of North-Western Europe to venture on the high seas and obliged them to go actively into shipbuilding. The rise of the Netherlands then was important; the size of their ships grew greatly, and as far back as the XVIth century, vessels of 300, 400, 500 and 600 tons were found.

However, smaller vessels continued to be used, in preference, for war because they were more easily handled. (See, among others, DE JONGE, vol. I, p. 81.)

After 1500, our shipbuilding became so developed that our country was called the shipyard of Europe. Different from Portugal, where nothing has been preserved, the Netherlands possess a whole series of drawings of the XVIth, XVIIth and XVIIIth centuries, which enable us to form a very exact idea of the progressive development of the ship.

In the old reproductions aforementioned of Maitre W. A., as

well as in the Flemish miniatures at hand, the forward castle projected beyond the bow, but it already forms, however, a component part of the ship and is fastened to a beam let into the stem and resting on a bracket fastened thereto. This construction gives to the stem the appearance of starting upward and then of falling back in the shape of an S. This is evidently only an illusion.

The vessels after 1500 become larger and the castles gain in importance. The projection of the forward castle, however, diminishes gradually and this castle reached only as far as the stem, by the middle of the XVIth century.

II 138 WITSEN, in the appendix of his remarkable work (pp. 8 and 10), gives a fine model of a ship at the end of the XVth century. It is a question of the reproduction of a vessel which, in his time, decorated the arch of the church at Diemer-lez-Amsterdam, built in the year 1500. The rigging of this vessel, as well as the pole mast supplied with tops and carrying large square sails, brings us back to the Middle Ages. The forward castle, which projects beyond the stem, and the after castle are higher than usual. These are no bends such as were used later; several heavy pieces of wood supported on brackets take their place. The sides are evidently smooth and, according to the constant practice of the period, the ship carried on the bow and on the sides pieces of wood for protection.

The stern alone is not clearly shown; there is no rudder to be seen, and this gives the impression that the drawing is at fault.

This vessel had no upper stern, in all probability, for our ships did not yet know this addition. There is a proof of it in the *Noah's Ark*, reproduced in the *Nürnberg Chronik*, folio XI, of 1494, as well as in that of the ship which appears in the *Ecclesiastical Painting of the Middle Ages in Holland*, 1518-1525, n° 14, and which shows Jonah in the water.

II 136 This last picture especially gives a magnificent type of boat of the beginning of the XVIth century. It is not so old as the ship of the Church at Diemer, as to which the rig furnishes proof: the pole of the mast passes through the top and, another characteristic, the forward castle does not project beyond the stem. The ram has been broken off near the frame. Besides, the human figures, as

compared with the ship, are exaggerated. The sides of the vessel are smooth. It brings admirably to mind the Flemish miniature of 1482. II 119

These reproductions are most interesting in view of the development of the ship; we see in them the forms of the castle become more precise, the rigging improve and increase and the vessel itself gain in size.

Attention is called to the fact that the ships in all these drawings carry a bowsprit which was used at first only to hoist the anchor, as is the practice still on the large river lakes.

Let us now turn our eyes to Breugel's pictures of which F. Huis has left some superb engravings.

A close examination of these reproductions brings out different types of ships. Several of them show us important vessels which, by their great rams, their high castles and their broad sterns, differ notably from the old Holland ship. II 132 II 135 II 64

Van Yk's work also shows, on page 9, a reproduction of those big vessels which the author calls Spanish "Caracks" or galleons, two types of ships which arose under the influence of the Mediterranean.

But, alongside of these "caracks", are also found smaller Dutch vessels. An engraving of 1564, of a Breugel picture, shows particularly an Amsterdam merchantman. It has a round stern. It can be compared advantageously with an old Flemish engraving, dating from 1480 or 1490, which shows a "Kraeck" without escutcheon, and of which the castles differ completely in form and size from those carried by the ships seen in the engravings of Maître W. A. These castles agree with the Mediterranean types.

The boat with the square stern had been adopted in Holland, therefore, as far back as the end of the XVIth century.

Square sterns remained in use there, for large vessels up to the end of the XVIIIth century; at that time a return was made to the old structure, in imitation of England which used the square stern for only a short time, seeing that William Pitt (HOLMES, p. 40) introduced the rounded forms there in the XVIIth century. Hence Mr. de Jonge is in error when he says in his work that the vessel with the square stern only appeared in Holland in 1651.

The adoption of the square stern, nevertheless, did not cause the old round-stern, full-bow vessel to disappear; this is an established fact.

Another word about ports. The old reproductions of the XVIth century show ports; some are even found on a miniature of 1428. In any event, their general use dates back to the end of the XVth century; they seem to have been invented by a Frenchman from Brest, named Descharges. (DE JONGE, Vol. I, p. 85)

The masts and rigging also underwent important changes. At the beginning of the Eighty years War (1590), an inhabitant of Enkhuizen, « Kryn Wouterez » by name, according to Brandt (*History of Enkhuizen*, Vol. I, p. 139), invented a process for making masts in several sections (DE JONGE, Vol. I, p. 390). The masts, made first of two pieces, were, by means of this new invention, soon made in three parts each carrying a square sail. From this time, the old medieval rig of one large sail begins to disappear.

In order to facilitate the evolutions of the ship, a square sail was placed on the bowsprit.

Finally, the guns are placed more rationally and, imitating the practice on the Spanish caracks, some were located in the forward and after castles so as to command the deck. This arrangement recalls the practice of the Middle Ages, in accordance with which, in case of boarding, the crew retired into the castles whence a charge was made on the invaders.

II 143 The vessel represented on the engraving of 1594, therefore, arose gradually from the old forms, but not without having felt the influence of the Mediterranean; this evolution leads us to the II 144 « Pinnace » of the XVIIth century. The ship was then richly ornamented and bedecked, and its sails, in accordance with use, carried handsome paintings. This custom disappeared insensibly during the century named, but the custom of decorating ships continued, none the less, for still a long time afterwards.

According to WITSEN, fixed rules governed the construction of vessels from the XVIth century on. One strict rule, among others, did not allow the stem to project more than  $7/6$ , or less than  $5/6$  of its height, nor could the stern-post project more than a fifth or a fourth of its height. The author mentioned pretends that the stem was made with a marked slope, for the reason that it was believed

that, under such conditions, the ships would glide more easily over the water (p. 47, column 2 at the end).

At about one-third of the length of the keel from the stem, were placed from one to four main frames; the ship narrowed aft to such a degree that the wing transom was equal in length to half the greatest beam of the ship. The bow was full, which allowed the water to be thrown more easily aside. (WITSEN, pp. 49 and 50.)

The seams were calked and, in accordance with an old custom, covered with lead plates.

The forward castle had been reduced in height while the after castle, on the contrary, had been raised. A fourth mast was placed in the stern to facilitate the manœuvring of the ship; this mast disappeared later on, when the bowsprit was adopted in the course of the XVIIth century. (WITSEN, p. 139, 2d column.)

The XVIth century was a memorable period for the Netherlands; it was during this century that was laid the foundation of that navy to which, as says Mr DE JONGE, Holland was to owe later her liberty, her greatness and her prosperity. This navy united within itself everything which could concur to bring forth a force able to defend the country, to protect commerce, navigation and the fisheries and to bring to Holland glory and power.

Our marine, in general, and our shipbuilding, in particular, then developed steadily. A long period of struggles began and many battles were fought both before and after the Eighty years War (1568-1648).

According to the old custom, the ships which took part in actions were only merchantmen fitted out for the purpose. (DE JONGE, Vol. I, p. 180.) These vessels, which were called « Vliebooten » or « Vlietbooten » (flyboats), had a small capacity varying from 40 to 140 tons and carried six, eight, ten or twenty guns. The size of the crew was proportioned generally to capacity; a vessel of 50 tons carried 50 men. (DE JONGE, Vol. I, p. 101.)

The « Heuden », already mentioned above, as well as « Boeiers » (tenders), also called « Kromstevens », and other flat-bottomed craft were used on the rivers.

The navy of Zeeland included, in addition to a number of

small boats, a few vessels of more respectable size. "Hulken" were used at the siege of Middleburg; one of them, called the big "Hulk", must have had a capacity of 600 lasts, or 1200 tons, and a crew of at least 500 to 600 men. (VAN METEREN, fol. 81 and 102.)

As a general rule, the vessels of North Holland were larger than those of Zeeland. Their capacity was 50 to 125 last, or 100 to 250 tons and a crew of 50 to 150 sailors and soldiers. The largest vessels carried thirty-two guns. (DE JONGE, Vol. I, p. 187.)

Bor relates (*Guerres de Hollande*, Vol. I, p. 650) that thirteen vessels of this latter category were fitted out in 1575, and that this fleet was filled out by "Kraveelschepen", "Yachten", "Waterschepen" and "Booten", while according to DE JONGE (Vol. I, p. 187), a few galleys were still in service on the Zuyder Zee.

In order to be able to form a more exact idea of the importance of our naval power at this time, the following table, of which the original is preserved in the Archives of the State (DE JONGE, Vol. I, p. 586), has been inserted here to show the navy of the province of Holland in 1587.

NUMBER OF VESSELS	LASTS	GUNS	CREW	REMARKS
1	100	16	95	1 Last = 2 tons.
1	—	14	70	
1	27	14	32	Small calibre.
10	30-90	12	45-76	
35	17-70	8-11	29-75	the largest : 50 to 60 men.
4 Y	—	—	36-50	Y etands for Yachts.
25	8-40	4-7	11-70	the largest : 30 to 40 men.
6	—	1-2	7-11	
1 G	—	1	16	G stands for galley.

In addition to the "Vliebooten", there were vessels of less importance called "Kromstevens", "Kraveelen", "Heuden" or freight vessels, "Krapshuiten", "Potten", "Yachten", "Boeiers".

The largest vessels were still, however, only of modest dimensions. According to the decisions of the Government, dated June 1, 1588, three of the largest vessels were to be equipped for war and it was stipulated that their capacity was to be 200 lasts. (DE JONGE, Vol. I, p. 201, note.)

There are some who claim that only small boats were used at the beginning of our war for independence, because the battles were fought only on rivers and because, furthermore, the financial situation was very bad. (DE JONGE, Vol. I, pp. 203-204.) I consider, for my part, that the latter reason was the main one. Later on, complaints were again made about the unsatisfactory state of the fleet by reason of lack of funds.

Returning new to the shapes of the ships. The "Hulk" has been seen to appear after the "Cog", only to be replaced, itself, by the "Baertze". The "Kraeck" arose alongside of this last type which was followed finally by the "Spiegelschip" under the form of a pinnace and a war vessel.

The full bow lasted, however, in boats of little importance and so the "Vlieboot" or "Vlietboot" was seen to follow the "Baertze". It is the old type of the "Baertze" of which the top-sides tumbled in appreciably.

Hence no new type of boat was characterized by this new denomination which was given in the second half of the XVIth century; it is the old form which, slightly modified, appears under another name. This is a fact which will be met with more than once further on. A comparison between the "Vlieboot", (flyboat), the "Baertze", etc., brings out the analogy between these vessels; the same holds good for the "Buss". All these forms are derived from the "Cog".

The "Flyboat" originated on the Zuider Zee. Its name seems to have come from the "Vlie" which was frequented by boats of this kind. These latter, as has been said, had reentering top-sides, that is convex in shape, hence it was more difficult to board them under these conditions and, consequently, their defense needed but a limited number of men; this was a matter of importance for merchant vessels.

Besides having a respectable cargo capacity, the "Flyboats" were also very handy. There is no doubt that they were the

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forerunners of the flutes, the merchant vessels *par excellence* of the XVIIth and XVIIIth centuries, which England and France borrowed from us.

There is in existence a beautiful reproduction of the « Flyboat » dating from 1647. It shows a relatively large vessel; judging by the beakhead shown which was not carried by our small merchant vessels. The beak had been adopted first in the Mediterranean; it is not, therefore, of Dutch origin. None of the old Dutch types had it, whereas those of the Mediterranean and, even those of the times of the Phœnicians already had them. (See, among others, VAN YK, p. 103.)

Toward the end of the XVIth century the name of « Baertze » gave way to that of « Vlieboot » (flyboat), and at the beginning of the XVIIth century, arose the vessels called « Galioot » (galliot), « Noordvaerder », « Kof » (kuff), « Smakschip » (smack), « Boeier » (tender), together with the flutes and square stern vessels. Still — and this cannot be too often repeated — the primitive forms do not disappear under these different names. The forms have been enlarged and a few exterior characteristics, as well as the rigging, have been modified. The different types just mentioned above have, therefore, as their main and fundamental character the old rounded bow. The vessels of the period under consideration could be divided into three principal groups: *a)* the square-stern ships; *b)* the flutes in the broadest acceptation of the word; and *c)* the « Kof en Smakschepen » (kuffs and smaks).

It is unnecessary to add that the vessels of groups *b* and *c* were round at the stern. Hence, the purest old Dutch types will be found in these two groups.

The XVIIth century is now reached, that century of glory and prosperity for our country, especially from the point of view of shipbuilding. However, before beginning on this period, let us look a little into what was the situation of shipbuilding abroad.

Let us begin with Spain, which was mixed up in our war for independence.

The Spanish naval architecture, which flourished after that of Portugal, felt undoubtedly and intensely the influence of the Mediterranean. The Spanish galleons and caracks recall the Genoese « nefs » and caracks, of which only a few old reproduc-

tions have been preserved, and which came up under the influence of relations with Northern nations.

In addition to the galleons, the galleys and the galliasses held an important place in the Spanish navy. The frequent use of vessels with oars made hand to hand fights quite rare and led to less frequent boarding among the nations of the South, this being the reverse of the practise among the Northern races.

The pictures of the Mediterranean vessels can be consulted to advantage in order to obtain an idea of the Spanish ships.

The sea power of Spain disappeared, as is known, with the Invincible Armada, in 1588. A summary description of this fleet will give an idea of the importance of the ships which composed it. It was made up of one-hundred-and-thirty-two vessels, of which (HOLMES, p. 92) four were galleys, four galliasses, thirty vessels of less than 100 tons and ninety-four ships of 130 to 1550 tons. The round-stern ships had a total capacity of 59 120 tons. There were 2 761 pieces of artillery and the ships companies contained 7 862 seamen and 20 671 soldiers.

The English fleet had one-hundred-and-ninety-seven vessels, of which only thirty-four belonged to the royal navy, all the rest were merchantmen hastily equipped for war.

The largest English ship was the *Triumph*, built in 1561, of 1000 to 1100 tons burden and carrying three hundred sailors, forty gunners and one-hundred-and-sixty soldiers. It mounted forty-six guns. Besides the « *Triumph* », the English fleet had but seven vessels of 600 to 1000 tons whereas the Spanish fleet had forty-five vessels of this size. The total of all hands of the English fleet amounted to 15 551 souls.

In this struggle Holland was with England; it was she that kept the Duke of Parma shut up at Dunkerque. The largest vessels of the Netherlands fleet were of 400 tons. Both in England and with us, merchant ships, which did duty temporarily as men of war, were leased for the war. This old custom of the Middle Ages still survived. Besides, it was all the simpler, at this latter period, to equip merchantmen for war, as artillery was still in its infancy or even unknown.

The following figures (HOLMES, p. 95) show how much larger the vessels of the Southern States were than ours, as a rule. In 1592.

the English captured a Portuguese *carack* of 1600 tons, 165 feet between perpendiculars and showing seven decks.

In 1594, it was the turn of a Spanish *carack* with 1,100 men on board. When Cadiz was taken in 1596, two Spanish galliasses fell into the enemy's hands; they were vessels of 1,200 tons; the flagship « San-Felipo », which was blown up measured 1500 tons.

A Portuguese *carack* of 1600 tons, called the San-Valentino, valued with her guns at a million ducats, was captured at Cezimbra in 1602.

Following our example, it is said, and as there sult of « Kryn Wouterszoon's » invention, the movable top-mast was adopted by the English during the reign of Queen Elizabeth (1588-1603). (HOLMES, p. 86).

Up to this point, the ports were not only irregularly arranged, but the lower row was generally so low that those in this tier had to be kept closed if the sea were at all rough. In England, however, the tendency was to raise the lowest tier (HOLMES, p. 96) and this example was soon generally followed.

France, whose ships so far had not yet appeared on the Mediterranean, began in the XVIIth century, under Richelieu (1624-1692), to develope her navy. Colbert continued this work with ardor.

It has been stated already, in speaking of the Mediterranean, that the older French ships were, in principle just like those of Genoa; until about 1650, galleys were more numerous than other vessels. The North of France and Normandy belonged only — and the old pictures show it — to the Northern Centre. This is by no means surprising, if the Norse invasion be remembered. Even now, boats resembling those of Flanders and of our own country are still found in the North of France.

Let us return now to the Netherlands.

After the discovery by Vasco da Gama, in 1498, of the route to the Indies and when Portugal had secured for herself the monopoly of trade in those lands, Lisbon became the centre of traffic of the world.

In those days, the Dutch sought in Portuguese ports the products of the Indies; but, in 1580, the Duke of Alba took possession of Portugal and annexed it to Spain. Nevertheless,

we were allowed to continue our commerce with the former of these countries until 1585, when all our ships were confiscated.

Hence Holland was reduced to finding for herself a route to the Indies, and it was believed at first that this result could be found by way of the North. Four ships were fitted out for this purpose in 1594, two by Holland and two by Amsterdam. This undertaking failed as did also that of 1595 which was followed by the famous expedition of Heemskerck, Barends and van Rijp, which latter was also fruitless.

Meanwhile a route was sought by way of the South and the Cape of Good Hope. A fleet of four ships, under the command of Keijzers and Houtman started in 1595 and was gone for two years and a half. After a voyage of 446 days, the ships reached Bantam and visited Bali. The return required 168 days. This fleet carried a crew of 248 men.

The results of this expedition, while not brilliant, had, nevertheless, as a consequence, the formation, in 1602, of the East India Company which played such an important part in our history.

It is useless to add that these events had a decisive influence on the development of our naval architecture.

Up to the beginning of the XVIIth century, there was as yet no question of a war fleet properly so-called. Merchant ships were still hired and converted into men-of-war to meet contingencies. Our fleet was made up at that time of all kinds of types of vessels. Among them the square sterned vessels, called pinnaces, the « Vliebooten » or flyboats and the flutes were the most important. There were also some « Hekkebooten » and small « smaks ». So the three kinds of vessels already mentioned above are again found : viz : the square-stern ships, the flyboats and the smacks.

The old Zierikzee model gives an exact idea of the transition from the square-stern ship of the XVIth century to the one of the XVIIth. Although erring, like all the old reproductions, in regard to proportions, this model cannot fail to attract our attention to the marked slope of the stem. It was generally admitted at this time that the ship should draw the least water



possible and have the stem strongly sloping, with an overhanging bow, so as to displace the water more easily or, as it was then said, to carry the water underneath and not around the hull. It was believed that the water was drawn under the sides (VAN YK, p. 353) and that the strongly raking stem allowed the boat to slide more easily over the water. (WITSEN, p. 47, column 2 *in fine*.)

Later, opinion changed and then it was seen that the stem was brought more and more nearly upright until the XIXth century; the vessel thus gains in fullness.

Fürtenbach reproduces for us a Dutch vessel of the beginning of the XVIIth century; the counter, probably to avoid difficulties of drawing, is only sketched in by a few lines. It is seen that the after castle has increased in proportions, and that the part which separates the forward and after castles still remains uncovered. This kind of construction, due to the progressive development of the castles of the Middle Ages, only disappears at the end of the XVIIIth century, when vessels with two and three decks come on the scene.

The forward and after castles, in these last ships, are of the same height; in a word, they are strongly connected to each other and are formed of several superposed decks.

The rigging, too, has undergone new changes, by reason, no doubt, of the raising of the stern. The fourth small mast put up at this point gives way, especially, to a mast carrying a square sail and fixed at the end of the bowsprit. This mast was used only for steering the ship.

The vessels gained in size and the armament was improved by a more rational distribution of the guns. The following figures give the proof of this.

In 1596, a 200-last ship carried only 24 guns; one of 150 lasts carried 17 and one of 100 lasts had only 16 on board.

In 1616, 36 guns were mounted on a ship of 200 lasts; 28 on a ship of 120 lasts, then, in 1628, mention is made of a ship of 200 lasts armed with 39 cannon. (DE JONGE, Vol. II, p. 396.)

Aside from the better arrangement for the guns, the increase of the artillery itself necessitated arming the forecastle and the poop. About 1639, the iron guns were replaced, to a great extent, by

others of bronze, which allowed a greater number of pieces to be taken on board (DE JONGE, Vol. I, p. 400), but these pieces were lacking in unity of calibre and volume. The later adoption of guns of more nearly equal calibre greatly increased the fighting value of the ships.

However great the progress made by our fleet may have been, it was still always inferior to the part imposed on it by a naval war. Hence it became finally a necessity to build war vessels properly so called and to give up fitting out merchant ships. Sixty new war ships were laid down in 1653. This first war fleet constructed in our country set sail in 1658. So the old mediæval custom, which consisted in appropriating merchant vessels to make them serve as men of war, became a thing of the past.

But this fleet was not sufficient by itself, and merchantmen had to do duty as transports. This is why these latter kept guns on board for their own defence.

The war ships mentioned above were called pinnaces and were made with a square stern as well as a large beakhead. Tromp's flagship, the *Aemelia* was a pinnace model. II 146

The fleet was increased in a very short time, in 1664, by sixty new square-stern vessels. (DE JONGE, Vol. II, p. 25.) The main point in view in building these ships (DE JONGE, Vol. II, p. 27) was to provide our navy with vessels which, *so far as our passes and ports would allow*, should be at least as large and as powerful as those of the enemy. By reason of the depth of water in the passes, the number of their guns was placed at 60 to 80. Among these vessels, which were launched in 1665, was Van Ruyter's well known ship *De Zeven Provinciën*. II 147  
III 8  
III 9  
II 150

For economical reasons, most of the ships carried iron as well as bronze guns; but Van Ruyter's flagship had all bronze guns.

The following figures will give some idea of the increasing dimensions of ships.

In 1654, the largest ship measured 150 feet in length, 38 feet beam and 15 feet depth; it carried 58 guns. The next in size was 146 feet long, 26 feet beam and 14 feet deep; it carried 60 guns.

At the beginning of the second war with England, the two

largest ships were 169 to 171 feet long. *De Zeven Provinciën* 163 feet long, 43 feet broad and 15 feet deep. The next in size was 150 to 160 feet in length, 40 to 42 1/2 feet in breadth and 15 feet in depth, etc.

So the length and breadth increased but the greatest depth of 15 feet did not change, as the depth of our passes was against any increase of the draft.

When later, the direction toward larger sizes was continued abroad, and the necessity of following this example was felt among us, the question of the draught of water became a problem which, more and more, called for the attention of our shipbuilders. The larger the ship became and the greater its capacity had to be, the draught of water being limited, put us in a position of inferiority in regard to the vessels of foreign countries which ran more easily under sail. No account had to be taken of shallow passes in those countries, consequently ships of finer form could be built there. (VAN YK, 1697, p. 353.)

When in 1682 the vessels which composed our fleet were divided into classes or "charters", a depth of 16 to 17 feet only is given as the first "charter". The first three-deck ships built in our country belonged later to this last class. Hence it is not a matter of astonishment that, in the long run, our war vessels had to yield before those of other nations which were steadily becoming larger. This state of affairs did not arise from any inferiority on the part of our shipbuilders but had its causes solely in the condition of our passes.

The difference of draught of water appears clearly if the dimensions of the largest French and English ships be compared with those of our largest vessel at the end of the XVIIth and beginning of the XVIIIth centuries. Their dimensions were as follows :

	LENGTH	BREADTH	DEPTH
	m	m	m
for the Dutch ship	49.28	12.88	4.86
» » English ship	49.41	14.33	5.64
» » French »	59.91	14.29	6.61

By depth was understood the inside height of the ship measured up to the load-water line. (WITSEN, p. 74, sub 9.) (See also Fig. XXXII, p. 56 of the same work, etc.)

A ship having a depth of 4 m. 86 required, with the height of the keel etc. included, a depth of water of at least 5 metres. Now, it is known that the depth of water over the "Pampus", near Amsterdam, had already become sensibly less at the end of the XVIIth century. Large ships only succeeded in reaching that city at the cost of serious difficulties.

It was under these circumstances that a certain Meeuwis Meindertz Bakker, a native of Amsterdam, invented the "sea camels" in 1691, and by them vessels could be raised from 5 to 6 feet (VAN YK, p. 360.) These "camels" were straight up and down on one side, the other being fitted to the shape of the ship. Placed on each side of the vessel they inclosed it and formed a sort of floating dock.

Held between two camels which were securely fastened together, the ship was raised as they were emptied of the water which they contained.

These camels are very well shown in VAN YK's work, folio 360, as well as in "Figures de navires et embarcations", 1831, pl. 35, by P. LE COMTE.

Small boats towed the vessel thus raised across the Pampus. As to the depth of water which existed at this place, Le Comte says, p. 38, that, at high tide there were 10 1/2 feet (2.97 ells of the Netherlands) on the Pampus or "Muiderzand" and 9 feet (2.55 ells) at low tide. It was only at extraordinary high tide that a depth of 13 feet (3.68 ells) was to be had.

Later, ships drawing 19 feet (5 m. 38) could be brought to Amsterdam by means of camels.

But the situation was no better at Rotterdam. Here, indeed, is what is related by the builder VAN YK, in his work of 1697, p. 14: "En waarlyk de wytheid der schepen is wel het voor- naamste en beste middel om het ondiepgaan derselve te bevoor- deren, een saak die wy hier te Lande wegens de droogte of » ondieptheid onzer zeegaten, ten hoogste dienen te betrachten; » want (volgens 't getuigenis van ervarenne en de diepte dezer » zeegaten zeer wel bepeild hebbende loodsen) soo kunnen met

III 13

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„ een gemeen geleide uit het Goereesche gat niet meer dan 20, „ uit Texel, omtrent ook soo veel en uit de Maas niet meer als „ 13 voeten diepgaande schepen worden uitgeloost. Waarom dan „ ook somtyds wel is komen te gebeuren, dat eenige, van 's Lands „ oorlogs-schepen, soo nauw gemaakt en om zeilvoerens wil soo „ diep geballast zynde, met een dood getyde en Wind, tot Staats „ groot nadeel, niet konden 't zee geraken, of daar al in synde, „ haar onderste geschut, omdat te naby 't water lag, niet bruik- „ baar werd bevonden » (1). And further on, at page 360, the same author says also : « Want soo heeft men al voor veele jaren, om „ onze groote en diepgaande schepen in zee te brengen, wegens „ de ondiepheid onzer rivieren en zeegeten, getragt, waar 't moge- „ lyk, door ledig vatwerk, so pypen, als voedervaten, op te ligten „ en te doen ryzen. Dog was dit werk, om het byeen schikken der „ vaten, een ellendige talmerij en veel arbeids onderworpen ». (2)

According to the Reports of Proceedings of the Batavian Association at Rotterdam, 1850, pp. 94 *et seq.*, the Briel pass was practicable only for vessels drawing from 3 metres to 3 m. 50 and larger ships had to go by the « Goereesche Gat » to reach Rotterdam, using successively the « Hollandsche Diep » and the « Dortsche Kil ». There was at these places, even at high tide, only a depth sufficient for a maximum draught of 5 m. 70. (See Dr BLINK, « *Nederland en zijne Bewoners* », Vol. I, p. 447.) Navigation along this route, furthermore, was difficult on account

(1) The best and surest means of avoiding a too great draught of water consists in widening the ships. An endeavor should be made to realize this programme, seeing how shallow our passes are. According to the opinion of experienced pilots who have sounded the passes conscientiously, it is not possible to bring ships drawing more than 20 feet through the « Goezee » pass, or ships drawing about an equal amount through the Texel, or more than 13 feet through the Meuse. This is why it has happened more than once that war vessels of the State, of fine lines and deeply ballasted to as to facilitate manoeuvring under sail, could not gain the open sea at low tide or in calm weather, to the great detriment of the country, while outside, the lowest tier of guns could not be used because it was too near the water.

(2) Several years ago, by reason of the shallowness of our rivers and passes, an attempt was made, so far as it was possible, to raise our large, deep draught ships by means of empty casks, so that they could reach the open sea. But this process required an infinite time and great labor just to put the casks into place.

of the narrowness of the channel. It was this condition which made necessary the digging of the canal by way of Voorne (1827-1829). But in spite of this new navigable highway, the maximum draught of water continued to depend, none the less, on the depths to be found, at ordinary high tide in the « Goereesche Gat » and the « Stellegat ». These depths were respectively 5 m. 70 and 5 m. 20 (W. F. LEEMANS : « *De Nieuwe Waterweg* », etc. *Gedenkboek K. Inst. Ing.* p. 13 and p. 130.)

The situation became more critical for the Netherlands navy as ships abroad increased their size, and meanwhile, foreign activity was redoubled! England gave to her navy four-fifths of the revenues of the Crown in 1656-1657, two thirds in 1657-1658, and nearly three-fifths in 1658-1659. (HOLMES, p. 108.)

Four of the the largest vessels built during this period had a capacity greater than one thousand tons. In 1673, was launched *The Royal Charles*, a ship well known to us, which was taken later by the Dutch.

The largest number of English war ships still belonged, at this period, to the third class. The classification was stated as follows in 1666 :

CLASS	LENGTH OF KEEL	BEAM	DEPTH	TONNAGE	GUNS
1	128-146	40-48	17.9-19.8	1100-1740	90-100
2	121-143	37-45	17-19.8	1000-1500	82-90
3	115-140	34-40	14.2-18.3	750-1174	60-74
4	88-108	27-34	11.2-15.6	128-178	32-54
5	72-81	23.6-27	9.9-11	11.6-13.2	26-32

Dimensions are in English feet. 1 foot = 0 m. 3048

The year 1646 saw the first frigate built in England and in 1679 the bomb-ketch, built according to the model invented by the French builder Bernard Renan, was adopted.

After 1700, English naval architecture fell completely under the influence of that of France.

« It may truly be said », writes HOLMES (p. 114) « that during the „ whole of the eighteenth century, the majority of the improvements „ introduced in the forms and proportions of vessels of the Royal „ Navy, were copied from French prizes ».

Scarcely was a French vessel taken ere it was copied, but generally on a larger scale (HOLMES, p. 114). Shipbuilding, in the mean time, had become wonderfully perfected, especially under the Ministry of Colbert (1661), after the first foundations had been laid by Cardinal Richelieu in 1630. Save for a few changes in detail, the rules laid down by Colbert were followed until the XIXth century.

In 1668, the French fleet numbered already 176 vessels, of which one of the most beautiful and famous specimens was the *Soleil Royal*. This fleet was organized on the same footing as that of in Holland (DE JONGE, Vol. III, part I, p. 114). Besides, there existed at this time but little difference between the French and Dutch types.

Dimensions increased greatly at the end of the XVIIth century, under the reign of Louis XIV. This can be seen in the following table, prepared by Barras de la Penne (1698).

RANK AND ORDER	Number of Guns	CALIBRE AND MATERIAL OF THE GUNS	LENGTH	BEAM	DEPTH	NUMBER OF BATTERIES
1st rank, 1st order <i>Soleil Royal</i>	112	1st battery, 8 of 48 the rest, 36 2d battery, 24 3d battery, 18 poop and topgal- lant fore-castle, 12 and 18	M. 56.01 between perpen- diculars 51.54	M. 15.64	M. 7.64	Three covered bat- teries, poop, and forward castle.
1st rank, 2d order	70 to 100	bronze guns	51.91	14.29	6.61	Three covered bat- teries, castle forward and aft.
2d rank, 1st order	60 to 70	bronze guns	48.72	13.47	6.17	idem.
3d rank, 1st order	56 to 66	2/3 bronze 1/3 iron	47.47	12.34	5.68	Two covered decks, poop, and forward castle.
3d rank, 2d order	40 to 50	1/2 bronze 1/2 iron	34.22	12.01	5.41	idem.
4th rank	30 to 40	1/3 bronze 2/3 iron	38.98	10.55	4.71	idem.
5th rank	18 to 30	1/4 bronze 3/4 iron	35.73	8.66	4.55	Two small castles, or only one aft.
Frigates	8 to 16	—	—	—	—	—

Ships of the line.

Do not come into line.

The progress made in naval architecture under the reign of Louis XIV is noted as follows in the work: *Le Musée de Marine du Louvre*. "The rake of the bow is less exaggerated, the after castle is lowered, the artillery is well distributed; the masts are better proportioned and the spread of canvas is much greater, as well as more handy, making the motion more rapid and the manœuvres more easy. The profusion and elegance of the ornaments have reached their highest point; they had the kind of poetry of the old chivalry. Everything in this navy already caused the perfection, which the ship reached quickly under the next two reigns, to be anticipated."

Naval architecture took a great start. Many works were published, of which those of Bernouilli (1738) and of Euler (1749), treating of the stability of ships, are the best known.

The dimensions of vessels continue steadily to increase. Ships mounting 70 guns which, in 1715, were rated in the first class were passed to the sixth class in 1765.

The French fleet in 1750, according to the *Musée de Marine du Louvre*, was composed as follows:

NUMBER OF GUNS	Length between perpendiculars	Beam at main frame	Moulded depth	BATTERIES	Crew	Calibres of guns
THREE DECKERS						
	M.	M.	M.		Men	30 pdrs in lower tier
120	56.84 to 60.42	14.61 to 16.24	7.47 to 8.12	3 covered batteries with forecastles and poops.	1000 to 1200	18 > middle >
110(1)	54.57 to 57.82	14.94 to 15.59	7.31 to 7.80		1000 to 1100	12 > upper >
100	53.27 to 57.49	14.61 to 15.26	7.47 to 7.63		900 to 1000	6 > on fore-castle
90	51.97 to 55.22	14.29 to 14.94	6.81 to 7.46		850 to 900	4 > on poop deck.
DOUBLE DECKERS						
80	50.67 to 54.57	13.96 to 14.61	6.66 to 6.98	2 covered batteries with forecastle and poop	750 to 800	36 pdrs in lower tier 18 > upper > 8 > on fore-castle 4 > on poop
74	48.72 to 53.27	13.64 to 13.96	6.50 to 6.98	2 covered batteries with forecastle and poop	650 to 700	36 or 24 pdrs in lower tier 8 pdrs in upper tier 8 or 6 pdrs on fore-castle 4 pdrs on poop
64 (2)	46.04 to 48.72	12.66 to 12.99	6.00 to 6.50	2 batteries and fore-castle	450 to 500	18 or 12 pdrs in lower tier 24 or 18 pdrs in upper tier 6 pdrs on fore-castle

NUMBER OF GUNS	Length between perpendiculars	Beam at main frame	Moulded depth	BATTERIES	Crew	Calibres of guns
50	43.84 to 45.17	11.36 to 12.01	5.50 to 5.85	2 batteries and fore-castle	300 to 330	12 or 8 pdrs in lower tier 18 or 12 pdrs in upper tier 6 or 4 pdrs on fore-castle.
FRIGATES						
40	38.98 to 42.22	10.71 to 11.04	5.19 to 5.53	Single battery with fore-castle.	280 to 300	12 pdrs in battery 6 or 4 pdrs on fore-castle.
30	35.07 to 38.98	9.74 to 10.39	4.55 to 5.20	do.	200 to 230	
20	33.13 to 35.73	8.77 to 9.10	4.22 to 4.55	do.	130 to 150	
CORVETTES						
12	19.49 to 22.74	7.85 to 8.50	2.92 to 3.25	Single battery without fore-castle.	70 to 80	4 pdrs in barbette battery.
(1) There were a few intermediate types classified with those of this list which they approached nearest. (2) This ship was the smallest of those which could enter the line of battle.						

France also exercised a great influence on the design of ships. (HOLMES, p. 114, *ab initio*.) The most beautiful vessel of this time was the *Sans Pareil*.

The work mentioned above, *Le Musée de Marine du Louvre*, contains a passage relating to the time of Louis XVI (1744-1793) which is well worthy of our attention (Chapter VII) : " It was the moment when the science of shipbuilding, born in Holland, really passed into France ". This does not alter the fact that, even at the end of the XVIIIth century, people still went to Holland to study this art, in spite of the high degree of perfection which it had reached in France. Here indeed is what the above mentioned work says : " People went at the end of the last (XVIIIth) century to take lessons in Holland and, on this subject, the library at Brest has a manuscript of one of the celebrated engineers, Olivier, who had been sent there, about 1780, to study construction. "

Hence the shipbuilding of the Netherlands was still highly appreciated at that time.

The increase in dimensions of the French fleet found its echo in the English fleet; the following are the characteristics of the latter fleet in 1706 :

NUMBER OF GUNS	90	80	70	60	50	40
	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.
Length of gundeck	192 —	156 —	150 —	144 —	130 —	118 —
Breadth at mid-ship frame.....	47 —	43 —	41 —	38 —	35 —	32 —
Depth of hold....	18 6	17 8	17 4	15 8	14 —	13 6
Tonnage.....	1552	1283	1069	914	705	532

Here is what HOLMES writes, p. 115 : " The subject of the superiority in size of the French ships was constantly coming to the front and, in 1719, a new establishment was made for the dimensions of ships in our Royal Navy, according to the following scale :

NUMBER OF GUNS	90	80	70	60	50	40
Increase of :						
Length.....	2 ft.	2 ft.	1 ft.	0	4 ft.	6 ft.
Breadth.....	2 in.	1 ft.	6 in.	1 ft.	1 ft.	1 ft. 2 in.
Tonnage.....	15	67	59	37	51	63

In 1765, vessels were already met with carrying 100 guns, measuring 2,047 tons and having already 21 ft. 6 in. depth of hold. HOLMES writes on this subject (pp. 124-128) : " During the whole of our naval history down to comparatively recent times, improvements in the dimensions and forms of our ships were only carried out after they had been originally adopted by the French, or Spaniards, or more recently by the people of the United States of America. "

In 1719, the process which consisted of heating timbers at an open fire in order to bend them was adopted in England and, in 1736, they were smoked. (HOLMES, p. 115.) Ventilation was improved in 1753 (HOLMES, p. 117) and, in 1761 (HOLMES, p. 121), followed the invention of the process which consisted in covering ships with copper plates. Before this period, lead was used exceptionally for this purpose. Nearly one hundred years earlier,

several vessels in Holland were covered in part or wholly with copper plates, as is shown by a passage from VAN YK's work, *De Nederlandsche Scheepsbouwkunst opengesteld*, in which he says, p. 121: « Dat het schip om de zuid of west bestieren sal, » heeft zy om den houtknagenden worm daarvan te keeren, » stevenswaarts met koper doen bekleeden » (1).

Everything which precedes shows sufficiently how far superior the French and English fleets were to our own, about the middle of the XVIIIth century, in the size of their ships. But experience had demonstrated that the power of a fleet did not lie in numbers alone, but also in the intrinsic value of each ship (DE JONGE, Vol. IV, p. 86), just as Martin Harpertszoon Tromp had also, himself, declared some time before.

In order to give an idea of the extraordinary energy displayed by the United Provinces, it will be mentioned that from 1682 to 1700, hence in eighteen years, there were built 15 three-deckers of 90 to 96 guns each, 2 of 80 to 86, 2 of 70 to 74, 29 of 60 to 68, and 26 of 50 to 56 pieces of artillery, together with 2 frigates of 22 guns, 3 fire ships and 9 ketches, in all 107 vessels. Of this number, seven only were built outside of the provinces of Holland and Zeeland. (DE JONGE, Vol. II, pp. 72 to 75.)

Outside of this fleet of which the cost was defrayed by means of extraordinary credits, there were built during the same period, with ordinary credits, 65 other vessels, of which 7 were of 50 to 52 guns, 18 of 40 to 46, 17 of 30 to 38, 13 of 20 to 26, and 10 of 16 guns at less.

Or, for a period of eighteen years, a total of 107 + 65 = 172 new ships. This increase of the fleet was an absolute necessity. It was necessary, in fact, to make up the losses caused by storms and other misfortunes, and amounting, during the years 1688-1698, to 3 units of 70, 5 of 60, 6 of 50, 8 of 40 to 46 guns, in addition to a few vessels of 30 guns and less, 36 ships in all.

All these works evidently cost large sums. During the period 1682-1702, the expenditures for new ships were about

(1) The vessel which sails to the West or the South shall have the bow covered with copper to protect it against the teredo ».

81,197,000 florins and about 69,954,800 florins for equipment.

Maintenance, equipment, etc. came to about 5,829,000 florins, and in 1697, the costs rose to 7,732,000 florins. (DE JONGE, Vol. II, pp. 80 and 81.) In order to form any exact idea of the importance of this sum, it must be remembered that, at the time under consideration, salaries, etc. were far lower than those of our day. (DE JONGE, Vol. IV, Chap. I, p. 80, note.)

Besides the war ships just mentioned, a large number of merchant ships, vessels of less importance for inland service, and fishing boats were built, so that, if the old writers are to be believed, « there were places where there were counted more boats than houses ».

At the time when Hugo de Groot lived, two thousand vessels were built annually. (KOENEN, *Geschiedenis van Scheepbouw en Zeevaart*, p. 87.) No Hollanders were met with who did not possess a certain amount of knowledge relating to shipbuilding. (Idem, p. 85.)

In order to display such a large amount of energy, shipbuilding must have developed with us in an extraordinary way. The proof of this is found in the works of Nicolas Witsen (1671)<sup>11 154</sup> and of Van Yk (1697). Hence our naval architecture enjoyed an unheard of prosperity at the beginning of the XVIIIth century.

In order to form an idea of the perfection of design which<sup>11 155</sup> our naval architecture had reached toward the middle of the same century, it is enough to consult, in our album, the photographic reproductions of a few drawings made by M. Van Gent in 1750,<sup>11 156</sup> 1751, 1752, the originals of which belong to the remarkable collection of engravings of M. S. Van Gyn, at Dordrecht, as well as the copy of a war ship of 1770 which appears in the collection of colored drawings.

These documents reproduce faithfully the ships with their water lines. But what attracts attention most particularly is the following inscription which is very legible in the drawing of the war ship of 1750: *Property of Admiral Schryver*. This admiral is the one who wrote in 1753 that the shipbuilders, and especially those who built the ships of war of the State during the period extending from 1683 to 1753, were scarcely more than ordinary ship carpenters; that they had no theoretical knowledge, were guided only by experience and, in certain respects, were on the

same level as the master carpenters of Zaandam who, in the face of a failure, had offered as an excuse that "the boat had not let itself be shaped otherwise with an axe".

Admiral Schryver refers, in support of what he says, to various war vessels which were less successful, and among them he mentions, in the first place, five three-deck ships built between 1683 and 1689, the first, it should be said, which our builders had turned out.

No one can be surprised that these vessels did come fully up to what was expected! And if later, better ones were built, it merely proves that our builders had succeeded in solving the great problem of turning out strong ships of which the draught had to be limited, on account of the depth in our passes and rivers.

Still later, imperfections had to be noted; but that does not show, by any means, incapacity on the part of our builders. It happens even in these times, both at home and abroad, that the best yards launch vessels which are not up to their best work or which may need changes.

Admiral Schryver's complaint (DE JONGE, Vol. IV, Chap. I, p. 116) denouncing the incapacity of our constructors seems to be neither founded nor deserved. It is a question here of a headstrong naval officer, imbued with his own ideas and holding only contempt for those of others (DE JONGE, Vol. IV, Chap. I, p. 116), rather than a man thoroughly conversant with our naval architecture. Still, as it has been shown further back, it was not alone during the time of the Grand Pensionary Jean De Witt, and of the illustrious Colbert, as De Jonge tells us (Vol. IV, Chap. I, p. 120), that foreigners came to learn shipbuilding from us; much later still, in 1780, France sent her sons to our yards and it is assumed that it was only under the reign of Louis XVI (1774-1793), that the French navy could throw off Dutch influence entirely.

Our country followed attentively, however, the progress made in France and England in the art of naval construction, as is testified to by the translation of Du Hamel du Monceau's work (appeared in 1757), and the passage therein contained announcing, for later on, a translation of the work of Mungo Murray, the famous builder of the shipyard at Deptford. It is not known whether this latter translation ever saw the light, all the same, it is clear to my

mind, from what precedes, that works appearing abroad were read by us.

It has been shown that drawing was used in connection with shipbuilding at the middle of the XVIIIth century. Hence shipbuilders had broken with the old Dutch method of being guided by lines drawn by ribbands.

The lowest gun ports of ships were placed too near the water; complaint was first made against this by us. The same complaint was soon heard in England where the situation was not remedied, however, until the end of the XVIIIth century, when the French builders were copied. (HOLMES, p. 126).

A certain amount of time went by before Great Britain adopted the improvements made in shipbuilding by the French.

Mr de Jonge, relying on foreign quotations, states that the Czar Peter-the-Great seems to have learned shipbuilding, properly so called, in England. FINCHAM, the historian, even relates (*History of naval architecture*, p. 69) that the Czar Peter preferred English to Dutch construction. Mr. Koenen remarks, in regard to this, that this preference could, at most, only have had to do with war ships, Be this as it may, it is settled that Peter-the-Great resorted, all the same, to Dutch vessels, builders and seamen to form his fleet which, three years before his death, included 41 men-of-war carrying 2106 guns and 14,900 men, which made the Swedes say (DE JONGE, Vol. IV, Chap. II, p. 152, and M. KOENEN, pp. 93-95) : " We see " nothing Muscovitish about the Muscovite fleet unless it be the " flag. We have to fight a Dutch fleet, commanded by Dutchmen, " manned by Dutch seamen and spitting out Dutch powder from " Dutch guns ".

It may be asked then whether the Peter-the-Great would really have called on the Dutch builders if he had been able to find better among the English.

What explanation is to be made as to why our shipbuilders were abandoned about the middle of the XVIIIth century?

The size of ships was constantly increasing in England and in France; and the fleets of foreign powers were ever becoming stronger, while in our country, the shallowness of passes, rivers and ports, prevented the construction of ships which, by their size, could vie with those of other lands. (VAN YK, p. 14). All the

writers of the period point out this situation of which the realness has been shown by means of a few figures.

The disadvantage resulting from the relative shallowness of the Dutch passes was felt as far back as the end of the XVIIth century, and this disadvantage could only become more marked as time went on. Meanwhile, the necessity of building more powerful ships, carrying as many as 90 to 95 guns, became a matter of serious importance. In order to avoid drawing too much water, it became necessary to make the ships fuller, but this also made them heavier and poorer sailers, consequently they were but poor fighting instruments in the hands of our brave admirals. Is it then to be wondered at that the latter complained about them bitterly? In spite of all our courage, the shallowness of our approaches to the sea, to say nothing of the financial situation, made us yield before the foreigner.

This inferiority is wrongly blamed on the Dutch shipbuilders of the day. Naturally, many of them held on for a long time to the old ways, as is shown by Du Hamel du Monceau, in the following terms at page 287 of his work: "The habit of copying mechanically and servilely what was done in the past, has produced all these rules of proportions observed in determining the main frame, the description of models and their designs." And this author adds this interesting detail: "Every ship-carpenter kept these rules as a family secret".

The Dutch builders had no affection for the pen; WITSEN himself has already called attention to this; they were afraid of publishing their secrets, lest they might see their work carried off by others. It was only a few years ago that an engineer engaged in shipbuilding refused to let me see the drawings of one of his ships; he too feared lest his models should be imitated.

How, then, could it be expected that ships should already be built according to scientific rules, at the middle of the XVIIIth century, when in France, which was ahead of all other nations in the matter, these rules were not taken up until 1740? *Le Musée de Marine du Louvre* says in speaking of the XVIIIth century: "It (the vessel) is built in accordance with scientific principles which began to become known in 1697, but which scarcely date from before 1740 and which bring about a great

" ressemblance among the ships of all countries so soon as they are intended for navigating the high seas, as originality no longer exists except for coasting vessels attached to their own shores." (See, among others, M. BONGEUR, 1746, XXIII.)

It was not, then, attachment to tradition, but the natural condition of our passes which kept us from building vessels of war as good as those built abroad. This is what Mr. DE JONGE forgets, while at the same time he attaches too little weight to practice, which still enjoys, even in our time, a great authority even in the matter of shipbuilding. So this honorable writer arrives necessarily at forming, in regard to our builders of the XVIIIth century, an unfavorable and undeserved judgment.

The decline of shipbuilding along the "Zaan", for example was not the consequence of the ignorance of our builders; this cause must be attributed above all to the silting up of the river and of the mouth of the IJ. This occurrence no longer allowed ships of any importance to be taken to sea except at great cost and trouble. (LOOSJES, *De Zaandamsche dorpen*, p. 194. — M. KOENEN, p. 95.)

In order to bring out the difference existing between the French and English styles and the Dutch style, I have placed on one plate of my album the various main frames. This drawing is sufficiently eloquent by itself, still, I must once more call attention, in passing, to the differences which distinguish these various styles. These differences existed at first in the shape and composition of the main frames; then, the English vessels had less sheer, were less high and were not square at the stern. (VAN YK, p. 17.) The English seem also to have used crossed riders, instead of stanchions with vertical faces, to save working; but this process was considered less practical from the point of view of stowage. (VAN YK, p. 17 and figure A, p. 18.) They gave their ships loof (WITSEN, p. 126) and broad sides ("dick in den buik", as WITSEN says on p. 207), the reverse of what was done for the Dutch vessels. "The Dutch ships", says HOLMES (p. 110), "excelled all others in one respect: that they were the first in which the absurd practice of an exaggerated "tumble home" or contraction of the upper deck was abandoned. This fashion", he said further on, "was still carried out to



„ a very great extent by the English and to a less extent by  
„ the French and Spaniards „.

HOLMES speaks also of the light draught of our vessels. He expresses himself on this subject as follows on page III of his work: „ In consequence of the shallowness of the Dutch harbours,  
„ the draught of their ships was also considerably less than that  
„ of the English vessels of corresponding force „.

The English had at their disposal docks for the construction of their ships (WITSEN, p. 206, column I.); they used neither ribands nor shores. Before laying down their ships, says VAN YK (p. 19), they so prepared the models as to give them the shape desired. For this purpose, and before starting construction, they laid out the frames at full size on a floor. This process was, therefore, born in England.

The laying out of the full scale drawings was only adopted with us at the middle of the XVIIIth century. Before this time, only models and ribands were used in our country, as is still the present practice for building the smaller wooden vessels and many fishing boats.

This new method, however, was not introduced without trouble; and the more so as there was doubt of success in applying it to the Dutch ships, which, as VAN YK says (p. 19), „ had rounded sides, to allow them to glide over the water, and sharper angles than the English ships „ which had a more regular contour.

The Swedes and Danes followed the Dutch method in the main. (VAN YK, p. 20.) Their navy was copied after ours (DE JONGE), but their ships were not so full and drew more.

The honor of having endowed the shipbuilding art with scientific principles belongs wholly to the French. All the nations, even the Dutch and the English borrowed these principles from them about the middle of the XVIIIth century. It was however only at the end of this century that the French method for calculating and designing ships forced its way everywhere.

The Netherlands, in addition to their war fleet proper, had a very large merchant marine. (KOENEN, p. 90.) This latter it is said, included, at the beginning of the XVIIth century, 20,000 vessels which had all been built in Holland and, flying the Dutch colors, furrowed the seas in all directions. At the end of this

century, when we must have already lost many of our over-seas possessions, the total tonnage of the English merchant marine amounted to 500,000 tons; that of our country was 900,000 tons, and all other nations together had 2,000,000 tons. (GROEN VAN PINSTEREN, *Handboek*, § 303. — KOENEN, p. 160.)

Our merchantmen obtained quickly a great perfection. Full proof of this can be found in the observations made by Sir Walter Raleigh (1552-1618) about the Dutch ships, in which, as he remarks, a large amount of freight could be stowed while, at the same time, they required a smaller crew than that found necessary for the English ships. (KOENEN, p. 86.)

Our merchant vessels, among which especially „ flutes „ were met with, were copied by the English and French.

Flutes were used preferentially as freight carriers. The following, for example, is found in *Le Musée de Marine du Louvre*: „ The navy has always had transports for supplying squadrons;  
„ they were called at first flutes or transports and later were known  
„ as „ corvettes de charge „ „.

In order to give an idea of the number of vessels in use at the end of the XVIIth century, I have given below a few figures taken from Mr KOENEN'S work, p. 160, which he, in his turn, has borrowed from „ VAN HOOGENDORP. — *Bijdragen tot de huishouding van den Staat* „. (Vol. I, p. 183.)

In 1783, there were in the provinces of North Holland and Friesland: 50 flutes of 400, 450 and 500 lasts (1 last = 2 tons) sailing to Norway and the Baltic Sea, as well as for France and Spain; 30 flutes of 250 to 280 lasts; 18 flutes of 160 to 180 lasts frequenting the port of Archangel, the Mediterranean and the West Indies and having served originally for the Greenland fisheries; then 16 craft of 160 to 180 lasts and 80 howkers or galliots, of which 13 were of 300 to 350 lasts, 18 from 240 to 280, 12 from 200 to 220, 17 from 160 to 180 and 20 from 150, which sailed to Archangel, the Baltic, the Mediterranean and the West Indies. There were also, 60 frigates „ snauwen „ and brigantines, of which 10 of 150 to 200 lasts; 30 from 100 to 140 and 20 from 70 to 90 lasts; 5 „ hekbootschepen „ of 200 to 300 lasts and 140 vessels including howkers, frigates „ snauwen „ and brigantines varying from 60 to 300 lasts. Finally there were

still 36 vessels frequenting the East and West Indies, 150 "kuffs" and smacks of 50 to 70 lasts, 90 "kuffs" and galliots of 70 to 100 lasts and, at the end, 120 galliots, (howkers) and "kuffs" of 100 to 150 lasts; in all, 819 vessels.

There should be added to this number, for Leeuwarden: 20 "kuffs" and "smacks" varying from 50 to 100 lasts and over; for Groningen, 30 vessels of 50 to 70 lasts; for Harlingen, 9 vessels of 100 to 150 lasts, 1 of 180, and 3 from 200 to 300 lasts; for Makkum, 14 ships of 60 to 100 lasts and over; for Workum, 2 of 60 to 70, 24 of 80 to 100 and 23 of 100 lasts and more.

Bolsward, Woudsend, Drylst, Dokkum, Sneek, Grouwsloten, etc., counted together 30 ships of 50 to 70 lasts; 40 of 70 to 100 and 50 of 100 lasts and above. Finally, Lemmer had 40 vessels of 50 to 100 lasts and upward.

There were also a large number of vessels of less importance, such as hoys, etc. having a carrying capacity of 20 to 30 lasts, and a not smaller quantity of fishing boats, which were not included in the above figures.

There is found thus a total of about 1105 vessels exclusive of small boats.

But it was not the mere number of ships which was large; there existed at the same time, as could be seen by the different denominations, a great variety of types of ships.

Merchant vessels, in particular, will be taken up in the next chapter. But, before leaving the ships of war, let it be once more remarked that, from the beginning of the XVIIth century, our country had its frigates. This type of ship was unknown among us before this time, but circumstances had forced its use in the end.

The inhabitants of Dunkirk had caused us heavy losses; from 1631 to 1637, they had captured at Maassluis more than two-hundred fishing vessels valued at over a million florins. (DE JONGE, Vol. I. p. 373.) In order to carry on their piracies with greater impunity, they had obtained from the Mediterranean a ship of fine lines which, although not large (it carried only 6 to 12 guns), was none the less a fine sailer; it was the frigate.

In order to struggle more effectively against the inhabitants

of Dunkirk, we too began to build the vessel in question and their number increased rapidly under the urgent advice of our great Admiral Tromp. (DE JONGE, Vol. I, pp. 388 and 389.) Later on they were built of larger size.

As has just been said the frigate was imported into France<sup>III 18</sup> by the inhabitants of Dunkirk; thence it passed into England, in 1741, (HOLMES, p. 121); all the same, this latter country had already had some of smaller size in 1646.

The frigates played an important part in the Anglo-American war.

Fire was one of the greatest enemies of wooden ships. Hence recourse was had to this element from the earliest times, in order to destroy an enemy's fleet. It was not enough to throw burning pitch; more effective means were invented and the Ancients were already using fireboats to set fire to the hostile fleet.

Time will not be wasted in conjectures about the fireships of the Ancients, which could only have been ordinary vessels. A summary description will rather be given of those used in the XVIIth century they being the only ones mentioned in Witsen's well known work, pp. 166 and 167.

Vessels of rather small size acted as fireboats, preferentially flutes or pinnaces. Later, "spiegelschepen" of 70 or 80 lasts were used. These vessels had a smooth continuous deck in which were made holes having an area of about 1.5 square feet. A trough starting from the poop ran forward for the entire length of the vessel, with side troughs leading athwartships, in a word, a train was formed which would let the fire run easily and quickly throughout the ship. For this purpose, the troughs were filled with a mixture composed half of gunpowder by volume, quarter of saltpetre and the remaining quarter made up of equal parts of resin and sulphur, the whole mixed with a little linseed oil.

The troughs thus filled were covered with shavings which, in their turn, disappeared under faggots of light branches soaked in a mixture of resin, cod-liver oil, powder and saltpetre. In addition to this, the vessel was filled with other inflammable materials; the deck and the inside walls were smeared with grease and covered with a layer of finely powdered resin.

Sometimes the fireships were loaded with open barrels

filled with shavings soaked in tar. Special care was also taken that all ports and hatches should be left open so as to give plenty of draught.

In order more surely to have the fireship catch the enemy's vessel, strong grapnels were attached to the end of the bowsprit and to the ends of the yards; these grapnels could be detached by means of ropes laid along the ship.

In order to deceive the enemy and to save appearances, quaker guns were stationed in the ports. Two iron guns only were placed aft for defence against attacks.

A large trap was made in the poop to allow the crew to quit the vessel, after having lighted the fire and let go the grapnels, and to get away in a launch attached to the fireship underneath the trap.

The service with fireships was naturally a perilous task, so only the bravest men were selected for this duty and they, on account of the great danger incurred, received double pay.

In case of need, the fireships were started straight at the enemy, so that the latter's ship was taken face on and not by the side. Under these conditions, the rigging of the two vessels became entangled at once and it became impossible then to separate them

The fireships were only old ships as a rule, yet new vessels were sometimes employed, for the construction of which, as Witsen says, "a very ordinary, very light and very inflammable wood was used."

Externally the fireships did not differ from ordinary vessels; anything else would not have been practical, because the enemy would have recognized them at once under these conditions. Their crew was as few in numbers as possible and every precaution was taken to allow it to leave the vessel as soon as the latter was well on fire and had reached the desired point.

The changes made in our war ships during the XIXth century are sufficiently well known; consequently it will not be necessary to dwell on them. Nothing more will be said than this: that the sheer of these vessels became less, that the stem and the sternpost approached more nearly the vertical and that the old ornaments disappeared almost entirely.

11 158

11 161

Toward the end of the XVIIIth century, the rounded shape of the stern was adopted, according to the English fashion. It was<sup>11 165</sup> the death blow to the old square stern ship, but already, long before that, it had been called *ship of war*. This new denomination changed nothing in its construction.

Our shipbuilding had gone to pieces under the French occupation, and the continental blockade completed the ruin. Still, toward the end of the first half of the XIXth century it succeeded in reviving. It is true that in 1824 only three ships, measuring in all 1440 tons, were built; but, in 1827, this number had already gone up to 59 vessels with a total tonnage of 19,758 tons. These data relate only to vessels of more than 100 tons. (KOENEN, p. 101.)

In 1853, says M. Koenen, there were in the province of Groningen 89 shipyards for both inland and ocean navigation. In Friesland, there were large yards at Harlingen and at Lemmen devoted exclusively to the construction of sea-going vessels. In North Holland, ocean shipping was under construction at Amsterdam, Medenblik, Monnickendam, Muiden and Nieuwendam. Shipbuilding was flourishing at Rotterdam, Schiedam, Alblasserdam and Dordrecht.

In this same year, 1853, adds the author above named, 125 ships built in our country were registered, and our merchant marine included 1971 vessels with a total tonnage of 224,432 lasts (= 448,864 tons).

Steam, too, had appeared among us during the first half of the XIXth century and sailing vessels for this reason were relegated to the background. The adoption of iron for the frames of ships also brought about great changes; but the importance of this new material was not everywhere sufficiently taken into account, and many shipyards which continued to hold to building in wood underwent a rapid decline. Others, on the contrary, which had taken up iron construction from the moment of its appearance, became largely prosperous and contributed greatly toward maintaining the ancient fame of our naval architecture.

The first iron ship turned out in the Netherlands was built by Fop Smit, who appears also to have been the inventor of iron masts. The first Dutch steamboats were built at Feyenoord

(1834-1835) in the yard which now belongs to the Society of Naval and Mechanical Constructions. (See *Gedenkboek Kon. Instituut van Ingenieurs*, p. 209, etc.)

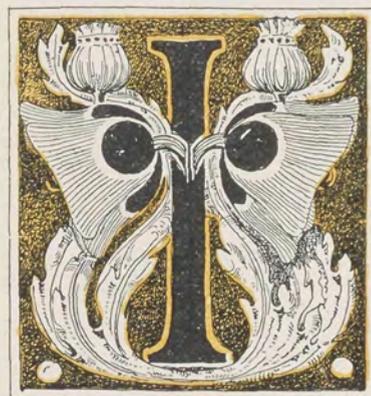
The revolution wrought by the introduction of steel in the construction of war ships is sufficiently well known; but these vessels have lost all character of their own and they can no longer be recognized except by the flag which they fly. Such is the present situation for ocean navigation, and such will also be the situation for inland navigation. Here too steel has been adopted for the construction of the frames of vessels, and the old forms are passing away to give place to types which will soon be in general use.

But, when that time comes, river boats will also have lost all national character and search will be made in vain to know what were the characteristics of the past. And yet, in spite of the

uniformity which even now exists, the vessels which Holland has turned out can still always be recognized by their solid and elegant forms.

And may it thus ever be; may our builders ever carry higher the fair fame of Dutch naval construction; and may Dutch capital also continue to second them and to understand that the strength of our land lies in a flourishing marine. But the latter needs in its turn excellent lines of communication; the XIXth century, as we all know, has seen the rise of new communications by water and the improvement of the old lines; the obstacles, arising from insufficient depth in the channels leading to our commercial centres, have disappeared, and it has become possible for us to compete with foreign nations in the arena of the construction of large ships.





It was seen in the preceding chapter that it was not until the second half of the XVIIth century that the construction of vessels of war, as such, was begun in Holland. Up to that moment merchant ships were equipped and used for military purposes. In proportion as commerce developed and as dangers from enemies at sea increased, the armament of merchant ships became more and more important. So, personal interest

was the cause of partially equipping merchantmen as men of war. It was for this reason that the East India Company built ships which may be considered as types of the kind.

Consequently it was just the largest merchant vessels which were most changed as time rolled by. The old types are, therefore, no longer found in this category of vessels; it is among the small craft that they are best preserved.

The oldest type of Dutch ship is the « Koggeschip » (Cog) from which are descended the « Krayers » and « Hulken ». These vessels are all clinker built. The « Barges », « Baertsen », etc. appeared in the XVth century. Their planking was smooth. The gradually drove out the « Krayers » and « Hulken », from which they really differed little in form.

At the end of the XVth century are found the « Kraak » (carack or galleon) which came to us from the nations of the South, just as we took from them the « Spiegelschip » (a square-sterned vessel) at the close of the XVIth century. The names of « Barges », etc. now give place to the « Koffen » (koffs) and « Smakken » (smacks); but the old forms do not disappear by reason of this fact; the same types of vessels merely change

their name as the result of a few changes in details. It is thus that of the « Tjalken » (tialks), which are not mentioned by Witsen although they existed in his day and were then called « Smalschepen » or « Wijdschepen ». Several other examples of this sort could be given. The likeness of form is even so striking that, at the beginning of the XIXth century, our fleet still showed perfectly the types of Witsen's time. The changes introduced were merely those of detail.

In examining the old types, which are now still in use, it is well not to lose sight of the fact that our ships have, during the XIXth century, increased greatly their length and beam and proportionally also their draught as the result of the improvements of our navigable highways and the digging of new channels.

The result of this has been the failling off of certain types, to which the appearance of iron in shipbuilding has also largely contributed.

For other types, the improvement of the navigable highways and the creation of ports have brought about their complete disappearance. Thus the construction of the « Bommenhaven » will soon have, as its consequence, the total disappearance of the old « Bommen » of which more will be said further on (fishing boats).

The smaller boats will give, under these conditions, the best idea of the old forms, and, as has been seen in what precedes, the most beautiful specimens will be found among the fishing boats. The fishing vessels best reveal the origin of the forms of our ships, so a special chapter will be devoted to this kind of craft.

It has been seen that the essential difference between merchant ships and men-of-war was marked by the narrow deck of the former which allowed the size of the crew to be reduced (WITSEN, pp. 54, 263, 266), and it has been told that the Dutch were always quoted as examples in this matter. It is thus that the « Vliebooten » (flyboats) appeared, the precursors of the « Fluiten » (flutes), which are known in England by the name of the « Dutch Flight ».

Trips both to northern and southern countries give rise to changes from which are developed a great number of types of

boats all which are derived, however, from a same fundamental type. WITSEN writes on this subject (page 53).

« Noortsche deelhaelders laeden het meest wanneer na den » vierkante hellen, kooren schepen en die op stukgoederen aen- » leggen, als ze rondtachtig zijn en veel springen. Oost en » Noortsvaerders die grove waeren laeden zijn grooter in 't gemeen » als die stukgoederen wijnen en diergelijke laeden gelijk ook de » zouthaelders » (1).

These are all variations of a same type of vessel.

When the size of ships increased, it was necessary to make them still more bulging on account of the limited depth of the arms of the sea, and this brought about the disappearance of differences in the fundamental forms.

Thus we read in VAN YK (page 348).

« Maar als men hiertegen aanmerkt dat wegens de door- » gaans ondiepe gronden en lastvoerens wil alle schepen van » tijd tot tijd vierkanter werden gebouwd sulks dat heden » desen aangaande niet so veel onderscheid tusschen d'een en » d'andere soort van schepen als wel voor dezen gevonden werd. » Want een hedendaags welgebouwde kaag sal in Lasten te » voeren 't Smalschip dat in Lengte, Wijdte en Holte daaraan » gelijk is, weinig wijken willen. En de Damschuit die wel gemaakt » is sal den Damlooper bijna ook evenaren kunnen. » (2)

The narrow deck of merchant vessels had still another origin which referred to the way of gauging vessels and gave rise to the construction of strongly bulging ships.

(1) Vessels bringing wood from the North take on larger cargoes as they approach more nearly the rectangular form; those carrying grain and crops when they are rounded. Vessels from the North and the Indies carrying heavy freights are generally larger than those which carry crops, wines, etc., as are also the boats which carry salt.

(2) But if it be remembered that, by reason of deep holds and better loading, all boats tend more and more toward the rectangular shape, it is seen that now there are no longer found as many differences in the various forms of vessels as used formerly to exist. For a well built modern hull will be, so far as cargo capacity is concerned, but little inferior to the Smalschip which resembles it in length, beam and draught of water. And the well built " Damschuit ,, will also be able to hold its own against the " Damlooper ,, up to a certain point.

WITSEN says (p. 160) on this point :

« Het uitbreecken deser schepen (Noortsvaerders) voor en » achter bracht hier in den schipper profijt aan dat ze vele goe- » deren meer stouden als de maat der schepen hielt. » (1)

This applies especially to boats going to load wood or grain at the Baltic ports, on account of the tolls which had to be paid to the King of Denmark, tolls of which the amount was determined by the treaty of 1647, by calculating the capacity of the vessel in terms of the length, the beam on deck and the depth of hold. But, when this treaty was modified in 1666, this unsightly way of building and this exaggerated bulging gradually disappeared (werd dit mismaekt bouwen en geweldigh uitspringen achterwege gelaten). (WITSEN, p. 160.)

Nevertheless, the construction of large numbers of merchant ships with narrow decks was still persisted in and, even at the beginning of the XIXth century, « Fluitschepen » (flutes) are still met with. A beautiful model of one of these « Dutch Flights » exists at the museum of antiquities at Dordrecht.

The greater bulging of merchant vessels kept pace with the straightening of the stern post and stem. On another side, the idea that the volume of the submerged part of a vessel should be reduced to a minimum, was abandoned toward the end of the XVIIth century.

The straightening of the stern-post brought about the shortening of the beakhead which, at the beginning of the XVIIth century, measured one-fifth of the total length of the vessel and only one-eighth of this length at its end. This difference is clearly seen by comparing the Zierikzee model with that of the « Bleijswijk ». The beakhead, which had come down to us from ancient times (VAN YK, p. 103), was used only « als Heimelijke gevoeg-plaatsen » (as a W. C.) for the crew, and those who had been guilty of some unimportant misdemeanor were also shut up there, as VAN YK says (p. 104), « des devotie des overspelenden zeewaters » (at the mercy of the waves).

(1) The rounding of these boats forward and aft was of advantage to the boatman as they could take on a much larger load than that given by their gänge.

Fire was the great enemy of our merchant ships. The stoppage of leaks was also more difficult for these vessels than for men-of-war because it was impossible, as a rule, on the former to reach the leak from the inside and through the cargo.

Water tight bulkheads did not exist, but, for all that, the stoppage of the leak was none the less indispensable. WITSEN tells us how it was all handled (p. 276), and, after explaining how a fire was put out, he continues thus :

« Wanneer een geschoten gat onder water van binnen niet gestopt kan worden, hetzij den last in den weg is of anderzins, wordt een man buiten boord met een prop in de hant op een plankje gezet, daar een dreg aan vast is, die hem onder water haalt. En aldus stopt of dekt hij de opening. Men geeft hem een geoliede lap in den mont om het water uit het lichaem te weeren » (1).

Before going on to the classification, properly so called, of the principal categories of vessels which have just been sketched out, a few more remarks, about the ship in general and a few details in particular, should be made.

The old builders of wooden vessels determined the ship's length by the work for which it was intended. This length was measured from the forward side of the stem to the after side of the sternpost. The beam and the depth were deduced from the length; the beam being taken equal to one-fourth of the length, and for the depth, one foot was taken for each 10 feet of length, at the point where the vessels height was least. It was only for esthetic reasons that the sternpost was made higher than the stem.

When the keel was laid down, the stern-post and the stem put up, the wing transom was made fast to the fashion timbers, then the main frame and the frame at the junction of the stem were reared. Another frame was raised between the main frame

(1) When a hole, caused by a cannon ball below the water line, cannot be stopped from the inside, because the cargo, for example, interferes with the operation, a man is placed outside the boat on a plank to which is secured a step which lets him go under water to close the hole. He takes an oiled rag in his mouth to prevent the water from getting inside of his body.

and the sternpost. « Centen » (thin flexible boards, called ribands in English) were then made fast to these frames so as to determine in this way the shape of the ship and to deduce therefrom the other frames.

According to VAN YK (p. 77), these boards are not called « centen », but « certen », because the form of the vessel is fixed by means of these boards and made « certain ». Other authors pretend that the word comes from « Kanten » or « Kenten » from the word « bekendheid » (knowledge).

The shape of the ship was thus determined by trial after having settled, in the first place, on the main frame and the length. The smaller the vessel, the more sheer it had and the more ribands were required exactly to determine its shape.

On the other hand it was customary to give the ship some sheer (zeegte), that is : to make it higher at the ends than at the middle. This sheer was obtained, after setting the ribands, by means of sheerstrakes of which the fastening was begun at the lowest point of the height of the ship. These sheerstrakes rose forward at the rate of 1 inch for every 6 feet of length, and aft at the rate of 5 inches for every 6 feet. The wales which served to protect the ship were laid according to the sheerstrakes. The sheer in large vessels (spiegelschepen) was gradually reduced and the effort was made insensibly to build ships with a flat deck in imitation of England and later of America. The sheer still exists in boats for inland waters, like the « Tjalken », « Poonen », etc. Only one wale or bend is used for small vessels, the larger ones, such as the « Tjalken » and « Smakken » require three bends superposed.

It is noticed, as a rule, that the bends became lighter in the XVIIIth century, just as did the sternpost and the stem. The engravings which show boats prior to 1500, show also several equidistant bends, and it was only at the end of the XVIth century that the single bends of later days are seen to appear. Moreover, it is certain that the improvement of the navigable highways was one of the causes of the lighter construction of ships.

These old engravings show that the planking is in very short pieces so as to avoid marked curves; but, in order to give, all the same, sufficient stiffness to the vessel, many bends became necessary.

In the old shipbuilding, where the pieces of the planking nailed together clinker ways make the construction more solid, the bends were exceptional. The old « Koggeschepen » (Cogs), for example, <sup>II 138</sup> had none, but the reproduction of a small boat preserved at the church at Diemer shows them.

These wales are then supported by round wooden brackets which are still found in a few old « Poonen ».

In the matter of the wales, the rule was that when the vessel was seen from in front they seemed to be convex, with the convexity on top, whereas, seen from the side, they look concave, that is, with the convexity underneath.

It has been said in what precedes that the method of ribands (« centen ») was abandoned for large ships, about the middle of the XVIIth century, and that, after that time, work was done from sketches in putting up the frames and in building the ship.

The rudder was handled by means of a tiller, and on large vessels this is often held up by a piece of wood (luierwagen) which is still seen on many small inland vessels.

In order readily to work the tiller of large vessels, a hole was cut in the poop deck immediately over the free end of the tiller in its middle position. A lever passed upward through this hole and was hung on a pivot of which the axis lay fore and aft. The lower end of the lever was attached to the free end of the tiller while the upper end was loose. By swinging the top of the lever to one side or the other of the ship, a corresponding motion was given to the tiller and so to the rudder. This manœuvre was, naturally, not easy in heavy weather and required assistance. A pulley, around which ran a rope or steering line having one end made fast to the tiller, was set in the deck so as better to operate the rudder. (WITSEN, p. 274, 2d column.)

This rope, which was served by two men, formed with the pulley the precursor of the steering wheel which appeared on the continent in the XVIIIth century, after having been already in use in England, as certain authors try to make out.

It is claimed sometimes that the rudder could only swing a little to either side. This, however, is a mistake. WITSEN says, as a matter of fact, p. 58 : « The greater the swing of the rudder,

the harder is the manœuvre ». It is evident that Witsen would have said nothing about the swing if it had been small. It follows clearly from the quotation from VAN YK (p. 121) in regard to the « luierwagens » that the helmsman must have put forth a great deal of strength : « Hij (de luierwagen) diend om de Roerpen, » aan 't vooreinde t' ondersteunen nademaal deze, wegens deszelfs » langte, om sig selven te dragen immers *om 't geweld dat de » man te Roer daaraan verrichten moet, uit te staan; al te zwak » soude wezen »* (1).

Finally, M. Bouguer (1746) says in his work, p. 83, « that the rudder should make with the prolongation of the keel an angle of about 55° 44', etc. ».

Hence it is incorrect to say that the swing of the rudder could only reach a few degrees. (PARIS, vol. 4, p. 221.)

Furthermore, vessels should be able to come about more quickly in our rivers, with their narrow channels and small depth of water, hence the rudder should be able to swing more than a few degrees.

On small inland boats, the rudder is frequently lengthened on reaching shallow water. This elongation was made by means of an isolated board or a movable part (VAN YK, p. 221), a thing which happens still very often at the present time.

If the tiller can be turned entirely above the bulwarks, which is called in Dutch « geen statie voeren » (without statie), the vessel is said to have a *draai over boord* in contradistinction to vessels with « statie ». The « statie » means the part of the bulwarks which rises above the tiller (2).

The tiller passes in this case through an opening in the « statie », which prevents the rudder being brought hard over.

The length of the lee-boards is taken at twice the depth of the hold.

As many rivers and lakes are lacking in depth, the length of the lee-boards is reduced for inland vessels, in order to prevent

(1) It (de luierwagen) serves to support the forward end of the tiller and also to resist the force exerted by the helmsman on the tiller of the rudder.

(2) A long opening worked in the bulwarks at the stern of the vessel, allowed the tiller to swing well from side to side. *Draai over boord* means simply that the tiller can swing entirely clear above the rail.



them from touching bottom, consequently their width was increased.

The lee-boards for the ocean and for the rivers of Zeeland are long and narrow.

New modifications were made in the rigging of vessels toward the middle of the XVIIIth century. The small bowsprit disappeared in order to make place for the fore-masts which have remained in use since that time.

The rigging of the large vessels is sufficiently well known.

<sup>III 145</sup> etc. It is desired merely to dwell on the fact that fore-masts have been placed wrongly on various models of the XVIIth century.

A vessel of which the planking is rabbetted into the stem is called a « vaartuig ». The « Aak » (ake) is a boat without a stem and its planking forms a plane up to the bow. The planking ends then at the plane in front. If this occurs for a « Tjalk », there is obtained what is known as an « Aak Tjalk ».

When the after deck is raised so as to come up to the level of the main rail, the vessel is said to be supplied with a « paviljoen ». Thus, for example, a « Statiepaviljoenpoon », is a « poon » with a raised deck. If the after deck be not raised, the vessel is simply a « Statiepoon ».

Vessels can be grouped, then, in the following way:

## CLASSIFICATION OF SHIPS

### I. WAR VESSELS.

### II. MERCHANTINEN.

- a) For over seas trade;
- b) For coasting trade and tidal streams.

### III. FERRIES.

### IV. BOATS FOR SUNDRY USES AND NOT BELONGING TO THE PRECEDING GROUPS.

### V. BOATS FREQUENTING THE UPPER PARTS OF RIVERS (BOVENLANDERS).

- a) For the Rhine;
- b) For the Meuse;
- c) For the Upper Rhine and the basin included between the Rhine and the Meuse.

### VI. FISHING VESSELS.

- a) For deep sea fishing;
- b) For the coasting and river fisheries.

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### I.

### WAR VESSELS.

In the matter of the evolution of the war ship, properly so-called, the reader needs merely to be referred to the preceding chapters.

Before about 1675, there were, as a first war ship proper: the *Pinasschip* (Pinace) and later the *Spiegelschip* (a square stern ship). The square sterned *Spiegel* disappeared and then round sterns were again taken up, whence resulted the war ship called *Schip van oorlog*. At the beginning, this class of vessels was made up exclusively of ships with two decks. At the end of the XVIIth century, however, a few types with three decks were built in the Netherlands.

Use was often made of the « Fluitschip » (flute or transport), of ships of the East India Company (« Oost-Indische Compagnie schip »), of « yachts » (« Jachten ») and of various sorts of vessels of less importance, as auxiliary war ships, and of tenders (« Boeier »), galliots (« Galjoot »), galeas (« Galeas »), « Bommen », kuffs (« Koffs ») and smacks (« Smaks ») as coast defence vessels.

All these vessels belong rather to the category of merchant ships and will be uscribed in the next chapter.

Among the types imitated from abroad there may be mentioned the *Fregat* (frigate), and later the *Brik* (brig), the *Schooner* and the *Bark*.

## II.

### MERCHANT VESSELS.

#### A) *For over seas navigation.*

The oldest merchant ship was the cog "Koggeschip", from which are descended the "Hulken" and "Krayers". The planking of these ships is clinker laid. Then vessels were built with more nearly rounded bottoms and the carvel-built side appeared in the second half of the XVth century. The resulting type was the *Barge* or "Baertze".

Meanwhile, the construction of castles was begun on these ships, just as on the old cogs. These castles became gradually more important, imitating what had been done on the Spanish, Portuguese and Genoese ships. A type of vessel which, in accordance with the Spanish model, carried large castles was the *Carack* or *Galleon* ("Kraak").

This vessel disappeared from our country in the course of the XVIth century, at the end of which appeared the flyboats ("Vlie" or *Vlietbooten*) called later *Flutes* ("fluiten").

These vessels departed from the preceding types by having a marked tumble in of the topsides. Hence the hull was full and the deck was narrow. The flutes were the merchantmen "par excellence" up to the beginning of the XIXth century.

The "Spiegelschip" also appeared toward the end of the XVIth century; it acted as a merchantman in the same way as the similar vessel of the Mediterranean. This vessel was called, at the beginning of the XVIIth century, *Pinnace* ("Pinasschip").

The *Pinnace* became more rounded in the second half of the XVIIth century; it carried also a more nearly vertical stern and a smaller beakhead. From it came the East India Company's ship ("Oost-Indisch Compagnie Schip").

The flutes continued to hold their own alongside of the various

types of vessels, but changes were made to adapt them better to the use for which they were intended, and so it was that the *Noordvaerder* or *Walvischvaerder* (whaling ship) and *Oostvaerder* (vessel of the Baltic Sea) made their appearance.

Small "Spiegelschepen", having a lighter rig than the others, appeared elsewhere in the XVIIIth century under the name of *Rinds* ("Snauschepen").

Two other types of large fishing vessels for the open sea were built, viz: the *howker* or *hoy* ("Hoeker") and the *bush* ("Buys") which will be found under the chapter of fishing vessels.

Still another ship comes to us from abroad as a merchantman: the *Frigate*, while the *Tenders* ("Boeiers" or "Kromstevens") had been imitated already from models of the French navy.

These vessels appeared in the XVIIth century as the result of the traffic with the city of Rouen (WITSEN, p. 164, 2<sup>nd</sup> col.).

From combinations of these types of vessels among each other or with smaller types have arisen certain kinds of boats called by the following names: the "Boot", which was nothing but a small flute having a "draai-over-boord" stern; the "Hekboot", derived from the pinnace and the Galliot; the "Katschip" (cat-boat), from the tender and flute; and finally the "Stokker", which had the bow of a "Spiegelship" with the stern of a howker.

Let it be remarked in passing that it is hard to separate clearly navigation over seas from navigation along shore, for even small kuffs ("koffen") have been chartered for the Indies in many cases.

The distinction made here between navigation over seas and navigation along shore bears especially on the original destination of the vessels.

#### B) *For navigation along shore.*

The largest types of vessels for navigation along shore were represented by the *galliot* ("Galjoot") and the *galeas* ("Galeas"); then by the *kuff* ("Kof") and the *smack* ("Smak").

The "Damloopers", the "Smalschepen" and the *Wijdschepen* as well as the "Friesche turfschepen" (the peat boats of Frisia) belonged to the family of the smacks.

These boats all came from a single type and differed only in some detail, of which local needs forced the adoption.

The family of the smacks gave rise to the *hoys* (= Tjalcken »).

The *hoys* were found especially in Friesland and in Groningen. In the province of Holland, where they underwent a few slight changes, they were called *Schuiten*.

In Zeeland, their deck was narrower and they were called « Poonen ».

In North Holland they were designated as « Jacht » (Yachts). Contrary to what was done for the « Poon », the bottoms of these boats were not so wide as those of the *hoys*. On the Belgian Scheldt, they were rather finer and known by the name of « Pleiten », or of « Otters » for the smallest ones.

Eastern Frisia had similar vessels; they were called « Motten » and bore some resemblance to the « Kuffs ».

There is still to be found a very old type of merchant vessel, descended from the old fishing boats and called « Ever » or « Bremerkahn ».

Independently of the family of the *hoys*, there has existed from the most distant times, in Overijssel, a distinct type of vessel which in the XVIIth century, and in Witsen's time, included the « Potten » and « Pujen ». Changes were made later in these vessels and they are still met with at the present time under the name of *Snijboon* (literally: Frensch or string bean) from which is descended the pram (« Praam »). The same shape, but with reduced dimensions, is also found in the « Somp » and the « Pegge ».

The type of these vessels is distinguished from that of the smacks by the shape of the bow and stern which are tapering while these parts are rounded in the smacks.

Many combinations have also been made in this class of vessels; they have given birth amongst others to the « Koftjalks », the « Praamaaks » and the « Aaktjalks ». The *Tenders* (« Boeiers ») should also be mentioned, but these vessels had scarce any resemblance to the old « Kromstevens ».

Finally, let the « Kraken » be again mentioned, from which all characteristics common to the Spanish caracks had disappeared. They were very strong *hoys* with quite straight lines, which gave them less sheer.

### III.

#### FERRIES.

The ferries properly so-called included the *Pontoons*, among which may be mentioned: the *Gierpont*, the *Kabelveerpont*, the *Jaagpont* (for ferrying horses), the *Halve Pont* (pontoon using a sail); the *Pijper* (small pontoon) and the *Overhaalpontje* (skiff).

Other kinds of boats were used as ferries, such as the *Veerhengsten*, which belonged to the family of the « Hoogaarsen » (see fishing boats), the *hoys*, the « *Schuiten* » and the « *Poonen* », all of them types of vessels already met in what precedes.

### IV.

#### BOATS FOR VARIOUS USES BUT NOT BELONGING TO THE PRECEDING GROUPS.

It is needless to say that the groups of boats I, II, III specified above include also a large number of small craft, intended for local use, which all come down from the same fundamental group; their destination only varies.

Among the more important of these are the « *Bokken* » found as much in Holland (1) as in Frisia. To this family also belong the *Groningeraardappelpramen* (prams used in Groningen for carrying potatoes), the Frisian *Snikken*, with a raking stem and similar in this respect to the *Haarlemmermeerplompertjes* (small boats on Haarlem Lake).

When the sternpost has a good deal of a rake the boat is called a *Westlander* and when vessels of this class have a strake less, like the dredging boats of the Hague, they form the « *Bokken* », which must not be confounded with those which have been already mentioned.

Near Vollenhove, to the north of Overijssel, there is still to be met a well known small boat, the *Punter*, descended probably from

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(1) Holland means here the two provinces of the Netherlands called North and South Holland.

the *Haaringschuitje* (a small boat used for the herring fishery) of the *Zuiderzee*. The *Groenteschuitje* from Hoorn (for transporting vegetables) is exactly like it. These vessels are narrow and have a great deal of rake in the stem and the sternpost.

The same origin must be attributed to the Utrecht pram and to the *Kromme Rijnaak*, but the length of these boats is proportionately greater when compared with the beam.

Outside of the preceding types, there are still found the « Snik » or the *Gondel* of North Holland, which very much resembles the « Oude Kinderdijksche Hoogars », as well as the « Oude Visch-schuit van Aalsmeer » (very old fishing boat from Aalsmeer).

Setting aside a very considerable number of small *Schouwen* which are nothing but covered and flat ferry boats, which already appear in the old engravings, there are still to be met in Holland the « Schiedamsche schouwen » or the « Melk en Spoelingschuiten » (boats used to carry milk and the residuum of fruits from which the juice has been pressed out). They are long flat-bottomed boats with flat bow and stern.

A special family of boats is made up of the « Barges » and « Trekschuitjen » (literally « boats hauled from the shore ») which exist all through the Netherlands. Almost all these boats are alike; they came originally from Holland and spread all through the rest of the country as fast as the canals were built.

The « Trekschuiten » are still particularly in vogue in the province of Drenthe, but the construction of railways and tram lines is slowly driving them out.

There are still other vessels, the *Baggeraken* (dredging lighters) which are very common in the Netherlands.

The special conformation of our rivers and arms of the sea required constant dredging to maintain the depth of the ports and navigable passes; but they were far from possessing such perfected machinery as have the modern dredges: the « Hand- » or « Hijsch-beugel » (hand dredge) was the only apparatus used for dredging in former times.

The boats used for this purpose went under the general name of « Baggeraken ». The best known type was the *flat* (« Vlet »), or the « Baggeraak » still called the *Sliedrechtsche Aak*.

Even now, the « Boeieraken » are still often used for dredging.

These vessels belong to the type of round bottomed craft. Other boats of a special kind used at Dordrecht for the same purpose were known by the names of: *Vreeswijksche Zandlichter* and *Dortsche Zandschuit* (boats used for dredging sand and having a great analogy with each other). They were used almost exclusively for dredging the ballast used by ships starting for sea. They have now almost wholly disappeared.

*Bokken* are used almost exclusively for dredging and for taking out sand from the downs in the West of the country and in the region of the Rhine. Their shape is almost identical with that of the « Westlanders » but there is no planking above the planksheer. In the province of Utrecht, the *Slijkpramen* are used for the same purpose. They correspond to the « Kromme Rijnaak », the general type of the Utrecht boat. In the province of Groningen, mud is carried by the « Groninger Slijkpraam », or « Vlotpraam », a narrow boat with a rounded bottom which has nothing in common with the « Overijselsche praam » and which does not resemble it in any way.

The forerunner of our dredges is the old *Moddermolen* (literally, mud mill) or *Moddermolenschip* used at Amsterdam since 1575.

The *Zolderschuiten* and the *Schouwen*, now called « Bakken », may be mentioned as very old boats. Vessels of this sort were supplied, in 1829, with trap doors in the bottom, whence come *Klepschouwen* or *Onderlossers* (literally: boats discharging through the bottom).

Finally, it is proper to mention also, in the class of vessels under consideration, the pleasure boats, or sailing *Yachts*, for which the *Boeierjacht* (in South Holland) and the *Tjotter* (in Friesland) are used as Dutch types.

It is important to note here that pleasure boats are most generally called « Yachts », even though these vessels have frequently no resemblance to the Yacht properly so called. Hence the name does not always mark the type.

## V.

### VESSELS FREQUENTING THE UPPER PARTS OF RIVERS (BOVENLANDERS).

All vessels which frequent the upper rivers are called generally « Bovenlanders » be their shape what it may.

These vessels, in spite of the interest which they offer, have rarely aroused attention; WITSEN devotes only a few words to them and calls them simply « Aaken » or « Samoreuzen » (p. 170, col. 2), and VAN YK also gives them this latter name (p. 318).

A) *Boats of the Lower Rhine.*

The Rhenish boats are of no uniform type. Those which frequent the lower part of the river (below Bonn) differ from those which circulate on the Upper Rhine and its tributaries, save for a small craft found on the Neckar which corresponds with the type below.

The fundamental type of the downstream section is represented by the *Dorstensche Aak*, and this latter has produced the *Stevenschip*.

These types, originating in the part of Western Germany of which Dorst is the centre, were imported into our country and have existed there for a very long time. This is why the « Geldersche Samoreuzen » are already mentioned in the XVIIth century. Although badly shown, they are to be seen also on old engravings. They are seen circulating on the Lower Rhine and the Waal where they are called *Hollandsche Aaken* and *Stevenscheepen*; even now, they are still built in North Brabant where they have been in existence for a very long time.

These types of vessels came from the West of Germany (Westphalia) and entered the Netherlands by way of the Lower Rhine and the Waal, and through the North-West of North Brabant. They are not met with on the Meuse, or on the Lower Waal below Tiel. Aaken have been built on a small scale along the Merwede, and at other points of Holland, where this same type was again found in the old clinker-built « Turfeiker » which seems now to have disappeared entirely. The hulls of all these craft were made in the beginning by overlapping planks, hence it was the old mode of construction used on the Baltic Sea. These vessels were all long, narrow and flat-bottomed, like the « Bovenlanders ».

B) *Boats of the Meuse.*

The Meuse boats, also long and narrow, form a special class of which the type differs completely from that of the Rhenish craft just mentioned.

The *Whalemajol*, the *Whalepont* and the *Maaspont*, as well as the smaller Spitsbek and the Herna, may be mentioned as fundamental types. All these types are found on the Belgian Meuse and in our country as far down as Roermond.

Small vessels called *Bovenmaasche Aaken* or *Hedelsche Aaken*, frequently used as dredging flats, are frequently found on the Lower Meuse in the Netherlands. The shape of these craft is different from that of the Meuse boats just mentioned from which, however, they are descended, but their rudder corresponds rather with that of the Rhenish craft which circulate above Bonn.

c) *Boats of the Upper Rhine* (above Bonn and inclusive of the regions West of the Rhine and East of the Meuse).

The fundamental type is here the *Keen*, and with it are found the *Keenaak* and a boat of more recent date, the *Slof*.

One of these types of boats was introduced at 's Gravenmoer, in the XIXth century, because it appeared suitable for exploiting the osier beds at Biesbosch, but since then many changes have been made in the stern and the rudder.

None of these types has its origin in the Netherlands.

The « Hagenaar », like the « Turfeiker », corresponds to the « Dorstensche Aak ».

There is also found on the Upper Rhine, as well as on the Meuse, a boat called the *Bunder* which dates only from the XIXth century.

Aside from the « Bunder », the hulls of the types of craft which have just been mentioned are clinker built. The vessels mentioned under letter B above must also have been clinker built formerly, judging by what old boatmen say and by what is seen on an old engraving of a Whalemajol, belonging to the collection of Mr. Van Gijn, as well as by what is shown on a stone, which dates from the end of the XVIIIth century, placed in the front of a house in Sint-Pieterstraat at Maastricht and representing a Herna. It is impossible to say whether carvel-built or clinker-built hulls existed at the same time, or whether the former are of more recent date. It may be assumed, however, that clinker-built hulls are older than the others.

It is interesting to note that a type which closely resembles the

Herna is still to be found on the Adriatic sea, especially the *Rascona* already described and represented in Paris's well known work (vol. II, n° 86); this vessel is still steered by means of the old "Slurriem" (steering oar).

## VI.

### FISHING BOATS.

#### a) For deep sea fishing.

The *Buys* (bush) and the *Hoeker* (howker), together with the *Scholschuit*, the *Basanschuit* and the *Zwartewaalsche Gaffelaar* should be mentioned as old types of Dutch boats intended for deep sea fishing.

The *Hoekerbuis* and the *Kwee* are descendants from the first two.

The "Sloep" (sloop), the "Logger" (Lugger) and the "Kotter" (cutter) come to us from France. It is important also to mention in connection with deep sea fishing the whale boats for which the *Noortsvaerders* were formerly used; these latter belong to the type of the "Fluitschepen" (flutes) already mentioned among the merchantmen.

The oldest vessel of the *Noortsvaerders* class is the *Egmonder Pink*, which gave birth to the *Bom* and to the smaller *Garnalen Schuit* (shrimp boat). These boats were so built that they could be grounded on the beach. After the fishing port of Scheveningen was finished, there appeared a new type of vessel descended from the "Logger" and the "Bom" and known by the name of "Loggerbom" or sometimes "Lelybom".

#### b) Near shore and river fishing.

The great majority of fishing vessels is devoted to ordinary or near shore fishing. The dimensions of these craft were formerly much smaller than those of the vessels of the preceding group

(at the present time, aside from the "Garnaalschuitjes", some are built even larger). Their names are innumerable and so different that they give no idea either of their form or kind.

The fundamental types of the group include :

a) The *Schokkers*, built on the model of the ordinary "Schokkers". To them also belong the "Wierschuitje", the "Steeckschuit", the "Henget" and the "Hoogaars".

The "Akes", which are met with in most of the types of boats (the "Aaktjalk", for example) are also found, under the name of *Tholensche Schouwen*, in the class of vessels considered.

These craft are much like the *Beyerlandsche Schuitjes* and form, in a way, a sort of transition to the *Vischboeieraakjes*.

b) The *Botters* as well as the *Vollendammer Kwakken*, the *Ronsen*, the *Pluten* and the *Platjes van Maassluis*.

A third group is formed by short round-bottomed little boats of which

c) The *Knotsen* of Antwerp are the prototypes. The "Bollen", and the "Lemmerjachten" or "Lemmeraaken" belong to the same group.

Finally, a fourth group is formed of vessels having a greatly raking stern and sternpost, called.

d) *Haaringschuiten* to which the widely scattered *Punters* also belong.

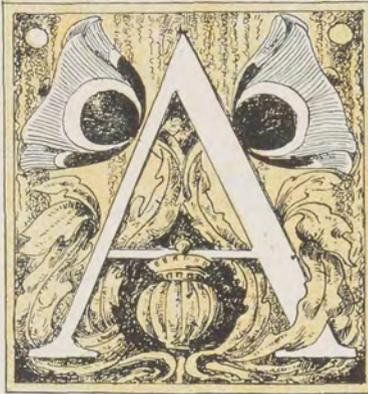
In conclusion, there may also be mentioned several types of small fishing boats, which frequent exclusively our inland rivers and canals, and present very often more or less marked resemblances to the types given under the letters a to d. They are the following :

The *Visscherschuitje van Aalsmeer*; the *Gondel*; the *Vischboeiertje*; the *Woudrichemsch Vischschuitje*; the *Prikschuit*; the *Steekschuit van de Biesbosch* and the *Strooperschuitje*.

Many rowboats of the most varied types, as well as old "botters" no longer fit for sea, and "schokkers" from the *Zuiderzee*, serve also for fishing on the inland navigable highways.



## DESCRIPTIONS OF TYPES OF VESSELS.



few sketches, taken from old engravings and descriptions, have been added to the plates of this work. They give an idea of the development of the ship from 1,200 to 1,600 inclusive. Reference is made, for more details in regard to them to the preceding chapters. As the drawings refer to the period subsequent to 1600, they are all made in accordance with the working drawings.

As has been repeated many times over, the old forms will have to be sought in the small types of vessels. Ships of war will, therefore, be set aside, while large merchant men will receive only a passing mention.

### THE PINNACE.

The *Pinasschip* (pinnace) is the oldest vessel of which we have any exact description extant. It dates from the first half of the XVIIth century and disappears at its close. This ship had a raking stem, a much developed beakhead and a square stern. The square stern and the beakhead come from the South; furthermore, this vessel is descended from the one of the XVIth century; its size however was greater and it carried cannons.

### THE FLYBOAT.

The *Vlieboot* (flyboat), which is found as far back as 1600, is very bulging and has a narrowed deck. From this type is derived

the "Fluit" (flute) which bulges still more in order to profit by the way in which boats used to be gauged in Denmark.

An ordinary "flute" was 130 feet long, 26 1/2 feet beam and 13 feet 5 inches deep. It had no beakhead at first, but the larger flutes, built later on, had one in imitation of the square sterned ships.

These vessels were used for various purposes and underwent many changes on this account. It is for this reason that the "East Indian flute" was more strongly built than the one which traded in the ports of the Baltic Sea. Let it be said, among other things, that the iron futtocks of the channels are doubled in order to reinforce the rigging, while their projections aft are made larger so as to obtain more spacious staterooms. In the matter of this enlargement, they were strengthened from the inside by means of iron ribs and bands (WITSEN, p. 159). In the beginning of the XVIIth century and until 1640, these vessels and generally all East Indian ships were built open forward and without quarters for the crew, whose bunks and hammocks were placed on either side of the ship.

The flutes were known as good sailers. Their slender construction gave little hold for the wind; they carried three masts and the well known rigging of the XVIIth century. Those which went for grain in the Baltic Sea, were rather smaller than the others; they were called "Oostvaerders" or "Oostervaerder". Their dimensions were: length, 125 feet; beam, 25 feet; depth, 12 feet; or else: 115,23 1/2 and 11 1/2 feet; or again 100,22 and 11 feet; and carried cargoes respectively of 200, 150 or 100 "lasts." (1 last = 2 metric tons). Most of them had no beakhead. Some idea of the importance of our traffic with the Baltic Sea can be formed when it is stated that, in 1604, 400 "Oostvaerders" were lying at the same time in front of Amsterdam. In less than a fortnight they were unloaded, reloaded and ready to retake the sea. (WITSEN, p. 448.)

The "Noordvaerders" or "Noortsvaerders" were also flutes, but two feet deeper than the "Oostvaerders", because more space was needed for loading the wood (WITSEN, p. 160) which they had gone to seek in Norway. Their beam was, as a rule, one-fifth of their length. They were massive and solid like the

« Oostvaerders » (WITSEN, p. 53.) but had no beakhead. When the continual wars are considered, the vessels trading with the Baltic Sea had smaller crews than those trading with the West. (WITSEN, p. 160.)

#### THE KATSCHIP.

The « Katschepen » are descended from the « boeier » and <sup>II 217</sup> the « fluit ». They are therefore vessels of marked curves. As they were often used in shoal water the bottom was very flat and, furthermore, it was very angular all around the edge. They were known as a poor sailers, but they carried a large cargo. WITSEN says (p. 163) that their slownets earned for them the name of « asses » rather than that of « kats ».

It had no beakhead; there were a forecastle, and a cabin. The tiller, which was manœuvred underneath the cabin, had no extension bar. These vessels were built most generally of pitch-pine.

All the types mentioned above have the stern of a flute, that is to say: they are square sterned, which is characteristic of the old Dutch naval construction.

#### THE OOST-INDISCH COMPAGNIESCHIP.

<sup>II 151</sup>  
<sup>III 11</sup> The pinnacle gave the « Oost-Indisch Compagnieschip » (ship of the East India Company). Its stern was rounded. As a merchant ship, it was heavily armed and was often used as a man-of-war in case of need. The plate of our album showing this vessel gives a good idea of the form and construction, hence, more detailed explanations are superfluous. Let it be mentioned only that the stern is very much ornamented, that there is a beakhead and that the length of the deck is greater than that of the « flutes. » It carried three masts and the ordinary sails and rigging.

<sup>II 159</sup> The vessel of the same kind, but smaller in size and with two masts only, was called « Snauwschip » (*rind*). It is met with frequently in Flanders. WITSEN counts the rinds as among inland vessels (p. 170).

#### THE BOEIER.

<sup>II 191</sup> The « Boeier » belongs to an isolated type of boats carrying on their traffic especially with Rouen. It was a flat-bottomed

vessel with keel and leeboards, as it frequented shallow rivers as much as the sea. The lee-boards reached two feet below the keel. The stem was much curved, whence their name of <sup>II 194</sup> « Kromsteven ».

Judging by the old engravings, the boats of this class had a very high « statie », which recalls rather the construction of the Mediterranean than that of Holland. Besides, the « Boyer » is not a purely Dutch type, and it is probably descended from a Mediterranean type, modified to suit the needs of our country.

Boeiers were built at Rotterdam as « draai-over-boord » with doubtless a raised deck astern, for WITSEN says that they had a small lodgment under the rudder (p. 164.) This author speaks wrongly of a « boeier » or of a « galliot », for this latter is an entirely different kind of vessel. The « boeiers » were about 86 feet long, 20 feet beam and 9 1/2 feet depth of hold.

#### THE HOEKER (*hoy*).

The « Hoeker » (*hoy*), originally a fishing boat, was already <sup>II 227</sup> a great deal used toward the middle of XVIIth century, as a <sup>II 228</sup> merchant ship with one, two or three masts. It was a sea-going <sup>II 230</sup> vessel, built very solidly, and later equipped for the East Indies, <sup>III 21</sup> in spite of its relatively small size. It was 80 feet long. The large hoys had a cabin on deck.

#### THE BUIS (*Bush*).

The « Buis » (*bush*) was also used as a merchant vessel, <sup>II 221</sup> which sometimes carried three masts, although originally it was <sup>III 113</sup> only a fishing boat.

The « hoy » and the « bush » will be spoken of again among the fishing vessels. It will be superfluous to say that neither « boeiers », « hoys » nor « bushes » carried a beakhead.

There should be mentioned also the following three types of vessels which are descendents of those which precede :

#### THE HEKBOOT.

The lower part of this vessel is that of a « flute » and the upper part that of a « pinnacle », that is to say : a vessel having a broad deck which increases its capacity.



### THE STRAETSVAERDER.

This vessel is a rather large « flute » which carries a beakhead (WITSEN, p. 168). (A large number of names referring to a same type of vessel arise in this way).

### THE STOKKER.

The Stokker is a massive ship with two decks. It has the bow of a « Spiegelschip » and the stern of a « hoy ».  
We have received from abroad :

### THE FRIGATE.

<sup>III 18</sup> The frigate occupies an important place especially at the end of the XVIIIth and beginning of the XIXth centuries. It has been seen in the preceding chapter how it came to us. This vessel, rigged in different ways, bore various names, such as: « Gaffelschoener », « Brigantijn », « Schoenerbrik », « Brik », « Bark ». Reference is made in this connection to the various plates of the collection relating to rig.

### THE GALLIOT.

When one reads that the King of Denmark stopped, in 1587, more than 600 Dutch ships in the Sound, ships which had all left the Vlie in a day as related by Hendrik Rantzou; see WITSEN, (p. 36), it must not be imagined that they were all large vessels. It is very probable, on the contrary, that most of them were no larger than the kuffs and hoys of the present time. It is easy to form an idea of the characteristic appearance of the Zuyder Zee, at this period, where the many fishing vessels then in use swarmed about all these ships. The Zuiderzee is well and rightly named therefore the cradle of our shipbuilding art. The little coast towns of the Zuiderzee, with their glorious past, are its witnesses.

Hence, there will be no cause for astonishment that, in the course of the many wars waged between Holland and Friesland

and Gelderland, innumerable battles should have been fought on the Zuiderzee. Thus, for example, a naval battle was fought in 1504 between Holland and Gelderland, which was described by Wilhelm Hermszoon, an Augustine monk (WITSEN, appendix, p. 19). This author relates that the Gelderlandiers came down the Zwarte Water with a large number of « Kochevers » to surprise the Hollanders, who had seven armed boats. He adds that the Hollanders understood war better than the Gelderlandiers, for the latter used only the bow, the cross bow and the sling, and that finally, the largest of the Holland ships having grounded, the Hollanders succeeded in frightening the Gelderlandiers so much by firing their arquebusses, that they made them give up the fight.

The same author relates, at another place, that, on the advice of the Spanish merchants, the inhabitants of Amsterdam caused a ship called « Galeoot » to be laid down and that a year was required to build it. This ship could be propelled by sail or with oars. It was handled by 32 rowers. It was called the « Terror of the Zuiderzee ».

These narratives are interesting in this that, in telling about the battle of the Zuiderzee, a « Kochever » is spoken of, which proves that the « Koch » or « Kogge » and the « Ever » are closely related. They also show that the « Galliot » came to us from abroad. The « Galliot », like the « Ever », is still met with to-day; but it is no longer handled by oars. <sup>II 241</sup> <sup>III 58</sup>

Our ships of the XVIth century were much smaller also than those of the states to the South; our navigation toward the Baltic was almost exclusively coasting and required smaller vessels.

The « Galjoot » (galliot) of the XVIth century was built still later in large numbers, and, besides, it is mentioned at all subsequent times. It is probable however that the « galliots » were built later with a more rounded hull like all our ships, for that matter. <sup>II 225</sup> <sup>II 226</sup> <sup>III 20</sup>  
It is to be noticed, in any event, that the « galliot » of the XVIIIth century displays great analogy with the ordinary « Kof-tjalk ».

The side of the galliot is more nearly straight and the castles fore and aft are higher. (LE COMTE, p. 18). The vessel is 85 feet long, 21 feet beam and 11 feet deep. The stern and the bow are more rounded than they are in the boeier (WITSEN, p. 165). The

vessel therefore, is one which may not be classed among the Dutch types. The main mast, in one- and two-masted galliots, was placed at one-third the length of the ship from the stem. The ship is a « draai-over-boord ». It had at times the stern of a « flute », in which case it was called a « Bootschip » or simply a « Boot ». At other times, the upper part was that of a pinnace with a *converso* (1) so as to increase its cargo capacity. Again it can be noted how most boats can be brought back to a fundamental type. It is in this way that « advies Jachten » are often spoken of in history. This was merely a generic name for all kinds of vessels employed for the same purpose and including, especially, the « galliots ». (WITSEN, p. 165.) These vessels were then built with finer lines and greater sail power so as to be able to move more quickly. The « galliots » had generally two masts of different heights and, exceptionally, they had three. They had no beakhead. They carried lee-boards at the beginning. Their capacity varied from 160 to 300 tons. There are still a few left, trading on the Baltic Sea, but they are smaller, having an average length of 19 metres, a mean width of 4.50 m., and a depth of 2.20 m. They too will soon disappear and give way to the steel « Kofs » and « Hoys ». (LE COMTE, p. 22.) The name « Galliot » is probably of Italian origin. (KOENEN, p. 140.)

#### THE GALEAS.

II 239 The « GALEAS » like the « galliot », belonged to the largest types of vessels used for navigation near shore. The name alone indicates a foreign origin for this kind of vessel, although they were frequently found in Holland. Their mode of construction also shows the same origin. Most of them were built at Königsberg, Stettin, Stralsund, etc. They gauged up to 100 and even 260 tons. (LE COMTE, p. 35.)

The galeas traded especially between Holland, England and France. They drew from 8 to 14 feet (2.26 to 3.96 m.) Like the « galliots », they had two masts, as a rule. Their build was very much like that of the « Kotter » (cutter) and the « Sloep » (sloop).

(1) A part of the deck where people gathered to talk.

Hence it was an exotic type of which, a few specimens are still met with on the Baltic Sea, and which made its appearance later, probably under the influence of the naval construction of the peoples of the South. (In the Mediterranean : the names of Galeazza, Galeona, Galeota, are still found).

#### THE KOFF.

The « Koff » (kuf) is a purely Dutch type mentioned neither<sup>II 218</sup> by WITSEN nor VAN YK. It seems to date from the end of the XVIIth century and later it replaced, in many cases, the « flutes » and the « cat boats ». (LE COMTE, p. 10.)<sup>III 22</sup>

The forms of the kuffs are very much rounded and show in this way their affinity to the « smacks » and the « hoys ». They are flat-bottomed with a square bow or, as VAN LOON says (p. 64), « stomp rond » (round and bluff). Later, some were built with finer lines.

They are solid ships and withstand storms very well, whence the saying : « Koffen en Smakken zijn waterbakken » (Kufs and Smacks are reservoirs of water). I cannot partake of the opinion of Mr. Koenen, who claims that « Kof » is descended from « Kog » because the « Kofs » made their appearance much later than the Kogs and are descendants from small inland boats. They are, as a rule, vessels of light draught, 72 feet long, 17 feet wide and 8 feet, 3 inches deep. Their capacity varied from 100 to 300 tons. They have ordinarily two masts, the larger being at one-third the length of the vessel from the bow. They are provided with a slightly raised deck aft without « statie ». The small « Kofs » have lee-boards, the large ones, none.

Making the bow of these vessels finer was begun in the XIXth century (VAN LOON, p. 65), and this caused their old characteristics to disappear. It was desired to give to them, in this way, greater steadiness in steering. These vessels are still built in the province of Groningen, where they originated. Now, they are made, however, as are the « hoys », with a more rounded bow. Formerly they were also met frequently in the province of Holland; they ran not only to the Baltic Sea, but also to Norway, England, Scotland, Ireland, France, Portugal and the Mediterranean and even to Rio de Janeiro. (LE COMTE, p. 11.)

### THE SMAK.

The "Smak" (smack) is as interesting a vessel as the "Kof" which it resembles a great deal. It is a pure Holland type, bluff and flat and very stable on the water. Le Comte calls it the sister of the "Kof". The shape of the "hoy" is found clearly again in this type. They are not fine either at bow or stern, and resemble exactly the old engravings of the "Smalschepen" and "Wijdschepen" and the "Turfschepen"! Furthermore, they belong to the same family with these last, but they are rather more strongly built as they are intended to make longer voyages. The "smack" is the type of Frisian vessels. It carries a "statie" and lee-boards. The main mast is at one-third of the boat's length from the bow and it carries also a small mast at the stern in the "statie". These vessels are generally 80 feet long, 22 feet wide and 9 feet deep. Their capacity varies from 70 to 140 tons. They traded with France, England, even with Lisbon, to say nothing of their traffic with the Baltic Sea. They were, however, especially built, as Le Comte says (p. 12), to sail across the "Wadden" to Groningen, Friesland and East Friesland. Witsen does not mention the "smack".

If the design of the "smack" be compared with that of the "Wijdschip" mentioned by Witsen (p. 171), it is seen at once that it is a question here of a mere change of name. Nor is there at bottom any essential difference between the "Smalschip" and the "Wijdschip". Van Yk says (p. 308) that the only difference between the two types was this: the "Smalschip" was so narrow that it could go through the city of Gouda, while the "Wijdschip" had to go around. Hence they are two like vessels which differ only in dimensions. If now, the designs of these boats be compared with those of the "Turfschepen", a perfect resemblance is again to be noted. It is at the end of the XVIIIth century that the generic name of "hoy" is given to all these vessels, thus imitating what was done in Friesland.

### THE SMALSCHIP AND THE WIJDSCHIP.

The "Smalschip" had the following dimensions: length, 60 feet; beam, 16 feet; depth, 14 feet: those of the "Wijdschip"

were respectively: 70 feet, 20 feet and 8 feet 2 inches. These vessels carried a "statie".

### THE DAMLOOPER,

The "Damlooper" was a vessel of the same type as the preceding but so built that it could pass through the lock of the "Leidschen Dam". Van Yk gives its dimensions as follows (p. 312):

" 'T Schip (de Damlooper) zal lang zijn 56 voeten, wijd dat de zwaarden afhangen, het rakende en echter gemaklijk door de Duikers van den Leidsen dam kan gebragt werde, zo sal dat schip op de bovebuitekant van de Kimmegang of wenselstrook, so wijd als op 't Barkhout wesen moeten en ten minsten van binnen tegen de zetwegers gemeeten zijnde elf voeten en een duym wijdte hebben. " (1)

The capacity of the vessel is given further on as 18 last (= 36 tonnes).

The lock of the "Leidschen Dam", which is in question here, was built under authority of the provincial Act of 1617 and reconstructed in 1648. This lock, like the one of the Gouwe, dating from the XIVth century (2), was only replaced in 1885, by a new lock of 7 metres clear width and with a depth of 2.20 m. on the mitre sills. The provincial States of South Holland had the following inscription placed on a stone in the lock keeper's dwelling of the "Leidschen Dam" in order to commemorate the event.

" In 1885 is de verbetering der vaart tusschen Rijn en Schie door de Staten van Holland ondernomen. Hier waar de naijver der steden tot 1648 slechts een overtoom en daarna een verlaat van 3.80 m. wijdte en doorvaarthoogte van 2.20 m. gedoogde,

(1) The ship will be 56 feet long and its width at the lee boards will be such that it can pass the lock of the *Leidschen Dam*, which gives 11 feet and 1 inch as the maximum breadth.

(2) See the *Gedenkboek van het Koninklijk Instituut van Ingenieurs*, p. 51, Van der Vegt, p. *De Binnenscheepvaart in Zuid-Holland*.

» hebben zij deze sluis wijd 7 meter met beweegbare bruggen » bevolen » (1).

Hence, the existing obstacles were only removed in 1885. It was therefore up to this time that the « Smalschepen » and « Wijdschepen » and the « Damloopers » had any reason to exist. They are no longer mentioned, however, in the XIXth century, the « hoys » being then almost exclusively spoken of. Hence, it is here again merely a change of name without any change of form in the vessels. All the same, the inland boats underwent an important modification in the course of the XIXth century. Indeed, VAN LOON tells us (p. 69): « The angular forms of the bow and stern » gave way to the more rounded forms of these parts of the vessel » and of the hull in general ». This gave the boat a generally regular and smooth shape. These angular shapes are no longer found save in a few old « Poonen » and « Schuiten ». The old engravings give a good idea of this angular construction which, on some of them, is so deep that it would be believed that the planking outside was clinker laid.

Hence it is seen that, in the XIXth century, a certain number of vessels, which had been known previously by different names, were all included under the generic name of « hoy ».

### THE TJALK

III<sub>26</sub> The « Tjalck » or « hoy » properly so called, is a native of  
III<sub>29</sub> Friesland and of the province of Groningen. Its capacity varies between 30 and 80 tons, but sea-going hoys, measuring up to 200 tons, are built, however, in the province of Groningen. The essential difference between a Groningen and a Friesland hoy is this : the former has a « draai-over-boord » and the second a « statie ». The Friesland vessel is sometimes called « Friesche Praam » if its lines be a little more nearly straight. (LE COMTE, p. 17).

(1) The Holland States undertook, in 1885, the improvement of the navigable highway between the Rhine and the Schie. Whereas, up to 1648, the rivalry of the cities tolerated navigation above the dam only, and later allowed at this point a lock only 3.80 m. wide and 2.20 m. depth of water, they caused this lock to be built at the same place with a breadth of 7 metres which is spanned by movable bridges.

Furthermore, the stem of the Frisian hoy has a greater rake. Like our inland boats, the « Tjalcken » were rigged formerly with sprit sails which, during the XIXth century, were replaced nearly everywhere by the ordinary fore and aft rig. They generally carry a single mast, but some large « hoys » have, at times, a second small mast on the « statie ».

### THE SCHUIT AND THE POON.

The « Schuit » is for South Holland what the « hoy » is for<sup>II 252</sup> Friesland and the province of Groningen, and the *Poon* for Zeeland<sup>II 254</sup> and the island of South Holland. There is very little difference between the « Poon » and the « Schuit »; each of them recalls the Dutch type of the « smack » of which the lower part is rather fuller. Hence the deck is rather less wide than the bottom, and the « Poon »<sup>II 236</sup> has a greater sheer than the « Schuit », of which the deck is more<sup>III 40</sup> nearly flat. Both of these vessels have a « statie » but the « Poon »<sup>III 43</sup> has often a « draai-over-boord » and a slightly raised deck in the stern. These characteristics are rarely found in the « Schuit ». <sup>II 211</sup>

They are very strong vessels and, above all, very steady in heavy weather. One peculiarity of these vessels lies in the fine point which terminates the stern. This point is thrown back a little and should point toward the hounds of the mast (upper part where the standing rigging is fastened to the mast). This same point is found among the boats which frequent the Belgian Scheldt, with the exception of the hoys.

### THE KAAG

Alongside of the Schuit, there is found in North and South<sup>III 24</sup> Holland, especially about Amsterdam, the *Kaag* which resembles the « Poon » closely. The hull of the kaag has sides which do not fall in as much as do those of the « Poon » and therefore, it forms a sort of transition between the hoy and the « Poon ». This vessel is much used as a light boat and is rigged with a sprit. Some are met with, however, carrying gaff sails; they are then called *Gaffelkaag* or *Gaffelschip*. The kaag is of about the same size as the « Poon » and the hoy. The « Schuit », the « Poon » and the

« Kaag » kept their angular shapes until the end. It is useless to dwell on the fact that the kaag also carries a « statie ».

The last three types of boats also kept longest the round hatchways which were formerly in general use.

#### THE STEIGERSCHUIT

The *Steigerschuit* (literally : landing boat) was often met with in the XVIIth century. The boats of this category were small Schuiten, Poonen or Kaag, used in ports and along rivers to carry passengers and freight back and forth between the landings on shore and the large vessels. The name shows the use and the type of boat.

#### THE YACHT

If boats with a narrow deck were built in South Holland and <sup>III 44</sup>Zeeland, narrow bottoms were preferred, on the contrary, in North Holland. This boat was then called « Yacht » a *Noord Hollandsche* <sup>III 45</sup>*Yacht*.

It is generally about the size of a small hoy. In order to classify the preceding vessels in accordance with their bottom width, it would be necessary to begin with the « Yacht », then to take the hoy and, finally, the « Poon ».

Its more narrow bottom and its more converging sides make the Yacht look more slender and more swift than the « Poon ».

The bends of the Yacht show a great deal of sheer with a straight element at the middle. The Yacht has a « draai-over-boord » with a slightly raised deck at the stern.

#### THE BOEIERSCHUIT

<sup>III 46</sup>The *Boeierschuit* belongs to the family of the « Boeiers » or « Kromstevens » above mentioned, but it is smaller and also somewhat like the ordinary « Schuiten », whence comes probably the name of « Boeierschuiten » given tho these vessels. The stern carries a « draai-over-boord », often with a poop deck. The Boeierschuiten have one characteristic and that is a sort of cockpit where the helmsman stands in order to handle easily the tiller. This

cockpit is often met with among the *Boeieraken*. The « Boeierschuiten » are found in South Holland, Zeeland and Flanders.

Shipbuilding was also early developed in Flanders. Let us mention only ancient Damme and Antwerp, and we shall not be surprised that the types of vessels found there resembled those of our country. Let us mention, in the first place, among them

The *Pleiten* and the *Otterschepen* which are also to be found in the North-West of Northern Brabant.

#### THE PLEIT

The « Pleit » is a very old boat, often spoken of in history. It <sup>III 51</sup>was seen trading with England. It had about the same capacity as our « hoy », of which it had the shape except that the length was proportionally a little greater as compared with the breadth. Hence this vessel appeared longer than the « hoy ». Its lines also were graceful. Its dimensions were: length, 23 to 27 metres; breadth, 4.80 m. to 5.00 m.; maximum draught of water, 1.90 m., capacity from 125 to 180 tons.

These vessels are now built larger; their length reaches 35 m.; their beam, 5.00 m.; their draught 0.40 m. light and 2.00 m. loaded; they carry 270 tons.

These boats are wrongly called *Bélandres Hollandais* in Belgium, from the newer inland boats called « bélandres » of which more will be said later.

These latter have no affinity with the « Pleit. » (See DEHEM, *Annales des Travaux Publics*, August 1901, p. 508).

The « Pleit » has a « statie ». It is curious to observe that the « Pleiten » of to-day are rigged very lightly considering their length. Formerly they had two masts.

#### THE OTTER

The *Otter* a small, narrowed « Pleit », from 16 to 30 metres <sup>II 253</sup>long (see DEHEM, p. 507); 4 metres beam; draught of water loaded from 1.70 m. to 2.20 m.; generally, 1.80 m. Its capacity varied <sup>III 52</sup>from 70 to 180 tons.

The « Otter » had a « statie » and carried the ordinary fore

and aft rig mast, and a small jigger mast set in the « statie » often completed the outfit.

« Schuiten » which correspond to the Dutch « Schuiten » are still met with on the Scheldt alongside of the « Pleiten » and the « Otter ». This type of vessels is just as different from the « Otter » as our « Schuit » is from the « Hoy ». DEHEM is, therefore, mistaken when he says, in his work mentioned above (p. 507) : « The Schuit is an « Otter » of smaller size... »

The « Pleiten » like the « Otters » are often met with in the Netherlands.

If the boats of the West of Belgium thus show the same characteristics as those of our own country, it will be the same for those of East Friesland.

#### THE MOT.

<sup>III 53</sup> The « Motten » replace the « Hoys » in East Friesland. They <sup>III 54</sup> are divided into : *Buiten Motten*, *Binnen Motten* and *Spitsche Motten*.

These boats have the same shape as those of the last two categories considered; they differ only in size.

They correspond to the hoys of Groningen, even in what concerns the shape of the bends and the rudder. Hence they belong to the family of the « Hoys ».

#### THE SPITSCHÉ MOT.

<sup>III 55</sup> The « Spitsche Mot » is a small boat which differs in shape from the ordinary boats of this class. It is sharper, less heavily built, and is 14.50 m. long; 3.90 m. wide, and 1.60 m. deep. The difference between a « Spitsche Mot » and a « Binnen Mot » is the same as that between an « Overijsselsche Praam » and a « Hoy ».

#### THE EVER.

<sup>II 241</sup> <sup>III 58</sup> The « Ever » and the « Bremerkahn » are met with all along East Friesland coasts as far as Denmark. They have kept some very old forms which recall the ancient « cogs ». They were built, especially, near Hamburg and were used originally as fishing boats.

The same thing has happened here as in our country where the « Howker » and the « Bush », which were fishing boats at first, became merchant vessels later.

The « Ever » will be treated of again among the fishing craft.

#### THE BREMERKAHN.

The « Bremerkahn » is a narrow « Ever ». Both have the <sup>III 57</sup> square stern which came to them from the South.

These last two boats have smooth hulls; formerly they were clinker built. The « Kahn », straighter and flatter than the « Ever », has a less sloping stem. They are fore and aft rigged and have often a small additional mast at the stern. Their capacity is very much the same as our « Hoys ».

The Hamburg « Ever » is 17 metres long; 6.40 m. beam and draws 0.70 m. of water when empty and 1.50 m. when loaded. The dimensions of the « Bremerkahn » are respectively : 15.50; 4.80; 0.70 and 1.50.

Save the Galliot and the Galeas, all the vessels belonging to group II-B, are found all the way from Denmark along East Friesland, Groningen, Friesland, North and South Holland, Zeeland, the West of North Brabant, Flanders, the West of Utrecht and also a very small part (West) of the Betuwe; in short, all along the coast and on our lower tidal rivers.

So soon as the Meuse, the Waal and the Lek are reached, the character changes. This applies also to the province of Overijssel and to a part of Drenthe. The greater part of the province of Drenthe only became accessible to navigation after the opening of the canals built in the XIXth century. The southern part of this province formed early, however, one with Overijssel, from the shipbuilding point of view, and the types now in use were developed in both at the same time.

#### THE POTTEN AND THE PUJEN.

The oldest vessels known in Overijssel are the *Potten* and <sup>II 201</sup> the *Pujen* (WITSEN, p. 170), of which few engravings are extant. The names are now no longer met with; the primitive « Potten »

and « Pujen » have, however, not entirely disappeared there. The old forms have been preserved there as everywhere else and, aside from a few changes, these vessels have merely changed their names.

Clinker built hulls gave way first to those carvel built, and later the forms of the boats became less angular. The old rig has changed and the old round hatchways have made place for more simple flat hatches. By these transformations, these vessels change their appearance somewhat although the hull remains the same, but the names of « Potten » and « Pujen » have give place to those of « Sompen », « Peggen » and « Snijboonen », more generally met with to-day.

Already, Witsen and other authors have noted that the « Potten » and « Pujen » are distinguished from the « Smalschepen » and « Wijdschepen » by their finer bow and stern; the same difference as is now found between the Hoys on the one side and the « Snijboonen » and « Sompen » on the other. Besides, the name « Snijboon » (string bean) shows that it is a question of a long and fine boat, that is : a flat bottomed boat with lengthened bow and stern.

#### THE SNIJBOON AND THE SOMP OR PEGGE.

<sup>III 34</sup> The « Snijboon » and the « Somp » have the same shape. <sup>III</sup> Both have a « draai-over-boord » and generally a poop deck. Their <sup>31-33</sup> characteristics are the fine bow and stern, the sudden fall of the bends near the sternpost and the stem; these bends being almost horizontal for the remainder of the length of the vessel; the sternpost and the stem are nearly vertical.

These characteristics distinguish them almost immediately from the boats of the other provinces. The « Somp » is 15.50 m. long, 3.70 m. beam and 1.80 m. deep.

When the « Somp » is smaller and draws less water it is called a « Pegge », of which the dimensions are respectively 12.00 m., 2.65 m. and 1.45 m.

The dimensions of the « Snijboon » are 17.50 m., 3.90 m. and 1.50 m.

#### THE HOOGEVEENSCH E PRAAM.

The *Hoogeveensche Praam* is an open vessel, of relatively <sup>III 53</sup> recent date, descended from the Somp but having a fuller bow and stern.

#### THE PRAAM (*Pram*).

The tendency, already noticed in the XVIIth and at the <sup>III 35</sup> beginning of the XVIIIth century, to build larger and fuller vessels (VAN YK, p. 348), became still more marked in the XIXth century. It is thus that the « Snijboonen » and « Sompen » are seen to increase in size and that birth is given to the *Praam* of which the size and load can be compared with those of the Hoy.

The « Pram » has retained, however, the slender bow and stern as also the characteristic line of the bends. (LE COMTE, p. 23.) <sup>III 36</sup> All of these vessels have the « draai-over-boord » often accompanied with a poop deck. Hence these « Pramen » are totally separated from the vessels of the « Semaque » (hoy) group met with in Friesland and Groningen. They have nothing to do with the *Groninger Aardappelpraam* or with the *Groninger Slijkpraam*, or with the *Friesche Praam* which belong to the « Hoy » group. The name of *Praam* which is met with in Overijssel only at the end of the XVIIIth or beginning of the XIXth century is not purely Dutch. The Marquis DE TOLIN says, for example (p. 175), that Napoleon caused to be built for his Boulogne fleet a few « prams », flat bottomed vessels, 37 m. long, 8 m. wide and drawing about 2.50 m. They were rigged with three masts and were armed with cannon. (DE BONNEFOUX and PARIS; *Dictionnaire de Marine à Voiles*, anno 1847, p. 59.) Twenty « Prams » of this kind are said to have been built. They had nothing in common, however, with our « Pramen » unless it were that both vessels were flat bottomed. The Marquis DE TOLIN describes the Dutch « Praam » in his book (p. 144); but this description lacks precision, because the « Overijsselsche » and « Friesche Pramen » are grouped together.

The « Friesche praam » (pram of Friesland) is merely a small hoy with rather slight sheer and provided with a « statie »; while

the other is a flat bottomed vessel with « draai-over-boord » and never with a « statie ».

LE COMTE (p. 29) says that the first of these vessels were built only in the province of Drenthe, at Meppel and Hoogeveen, and he too groups the hoy with the « Friesche praam ». So he writes (p. 14), for example, that the « hoys » sometimes have movable washboards when they load above the gunwales, whereas this is especially characteristic of the « Friesche pramen ».

Meanwhile, the Pram is often spoken of in Holland, although no vessel bearing that name, or one resembling the Overijsselsche Praam, is found there. This name is used then to designate vessels in general.

The big « Overijsselsche Praam », as it is known to day, dates only from the second half of the XIXth century and its increase in size is due solely to the improvement of existing canals and to the opening to traffic of new navigable highways, nearly all dating from the same period. In this way, the « Drentsche Hoofdvaart » was only connected with Groningen by the construction of the Noord Willemsvaart in 1858-1862; (see *Gedenkboek Koninklijk Instituut van Ingenieurs*, p. 31). The Hoogeveensche vaart, dug in 1623 as an « Echtens nieuwe grift », was only extended eastward and improved between 1850 and 1860 and the Meppelerdiep was improved only in 1860 and 1882.

The final junction of Friesland and Groningen by water is also of recent date; communication was had formerly only by sea. The inland communication between these provinces was still very primitive until the beginning of the XIXth century. It was only after 1851 that improvement was spoken of, and in 1864, the Gaarkeuken lock was rebuilt, at the boundary between the two provinces, with a width, of 6 metres and a neat length of 26 metres. The Stadskanaal, started in 1766 or 1767 was only finished in 1858.

It was also only in the XIXth century that the improvement of the junction between Overijssel and Friesland, accomplished by the removal of the high peat bogs, was begun, and the junction of the northern with the southern provinces of the Netherlands was brought about in 1820 by the opening of the « Willems-

vaart » (wich connects the Yssel with the Zwartewater). A water supply canal had really been built from Zwolle toward Yssel as far back as the XIVth century, and improvement of this canal, so as to make it navigable had really been begun in 1480, but the reciprocal jealousy of the cities of Yssel stopped these works. (Dr. H. BLINK, vol. II, p. 282.) Up to the first half of the XIXth century, water communications between the northern provinces were had under these conditions, by way of the Zuyder Zee, communications for which vessels of the hoy group were, at first used exclusively. The « Potten » and the « Pujen », like the « Sompen » and « Peggen », were unable to stand the high seas (WITSEN, p. 170.) and only the « Prams », which appeared later, were able by reason of their size and strength to take the open sea, and soon to spread over all our country.

It is interesting to inquire however, how the name « Praams » came to be admitted into a country where there existed so many other and more appropriate names. There is no doubt that the influence of the province of Groningen brought about this adoption. In fact, the city of Groningen decided, by the « Convenant van 1817 » (treaty of 1817, a time when the big Pramen of Overijssel were not yet built) that people coming to the market must pay, like every one else, the ordinary tolls at bridges, locks and gates of existing canals. There was to be paid for the canals to be built *thirty cents* at each lock for a « schip » (boat) and *ten cents* for a « pram ». The same distinction between boat and « pram » was already found in the old tariffs. For example: the « Stadsordonnantie » of January 28, 1773, lays down that a boat shall pay 15 sous at the locks of the city and a « pram » only 4 sous. It appears from all this that a distinction was made at Groningen between the « boat » and the « pram » and from the great difference in price it is clear that a « pram » was a small boat.

This is so evident that more ample explanations in regard to the nature of the « pram » have not been sought, and it is clear that the well known « Slijkpramen » of the province of Groningen are meant, the « Slijkpramen » being used just as well in the Dollard as in the peat bogs. They are small narrow boats, open above, with a straight longitudinal section, full bow and



stern (like the hoys of Groningen). They are found also, with a few changes, under the name of « Vlotpramen ».

When, after the completion of the Noord Willemsvaart in 1862, the direct connection between Overijssel and Groningen was accomplished and this latter province could be reached by the large Overijssel boats, which had also sides with no sheer, it was found evidently advantageous to call these vessels simply « Prams ». In this way, advantage was taken of the lower rate and, considering the resulting profits, good care was taken not to change the name « Pram » to that of « Schip ». It was only in 1903 that a judgment of the justice of the peace of Groningen decided that the vessels in question must be considered as « Schepen » and not as « Pramen », considered by the above mentioned covenant. (Provinciale Groninger Courant, Dinsdag, 24 Februari 1903, N° 46.) This judgment, which put an end to the advantages mentioned above, was given as the result of a report of experts dated December 24, 1902. Among the preambles of this report is pointed out the French translation of an article of the tariff sheet appended to the covenant of 1817, where the word « Praam » was translated officially by « bateau dit vlotpraam », meaning by that, and rightly, the small open « praam » of Groningen. The experts were mistaken, however, in saying that the present large « prams » were descended from the « vlotpraam » of Groningen. These prams are exactly like the Overijssel boats, but their dimensions are larger. Furthermore, they never belonged to the Groningen class of vessels. Their fine bow and stern are the most striking proof of this. In order to settle the type of the « prams », search should not have been made alone in Groningen, as was done by the experts, but a comparison should have been made between the types of this province and those of Overijssel.

To refer, as in the report of the experts, to a few earlier judgments where it is a question of « Praamschip » proves just as little, because there is no sense in considering the name of a boat, the type is what is required. The conclusion of the report is still more absurd, seeing that it says that the « praam » is a « boat » (schip), because the owner is called a « boatman » (schipper)!

The covenant of 1817 was not applicable to the « Overijsselsche pramen » because these did not exist when the agreement was concluded.

What precedes shows plainly that it is important to classify boats clearly and to determine beyond doubt the country to which the types belong.

It is perfectly natural that Overijssel should have found itself under the influence of the other provinces. So, the « Hoy » is found along the Zuyder-Zee and, in the XVIIth century, the « IJzeren Verken » (anglice : iron hog) is a boat which should also be classed among the hoys and which WITSEN calls a solid boat from Overijssel (p. 170). In the same way, the « statie » from Friesland is taken up in Overijssel, it being originally from the former province.

It will be useless to note that « Praamaken » and « Aaktjalken »<sup>III 37</sup> are met with, that is to say a few boats having the shape of the « Praam » and of the Hoy, but without a stem. The bottom ends in the nose and the planking is assembled on this front face.

Many « hoys » and « prams » have been built of iron during recent years. They still show characteristic differences among themselves, but it is to be expected that finally the forms will be confounded, when the « prams » will have taken fuller forms and the sheer of the hoys will have been reduced.

#### THE KOFTJALK.

Finally, the « Koftjalk » must be mentioned again; it being a boat which is intermediate between the « Kof » and the « Hoy ». <sup>III 25</sup> This kind of boat is originally from Groningen and resembles strongly the « Buitenmotten » of East Friesland. The « Koftjalk » is the precursor of the « Koffs » which later on replaced the « Cats » and the « Flutes ».

The « Koffs » therefore are not a spontaneous production, <sup>III 22</sup> but were developed gradually as trade and industry extended or as navigable highways reached further and became improved. Thus the dimensions of the « Koffs » increased at the beginning of the XIXth century as the result of the creation of the Damsterdiep in 1791.

If Hogendorp (Bijdrage tot de huishouding van den Staat, Vol. I, p. 183), still speaks, at the end of the XVIIIth century, of "Koffs" of 70 to 100 lasts, on the other hand, LE COMTE (p. 16) mentions, at the beginning of the XIXth, "Koffs" of 100 to 150 "lasts".

The name of "Koftjalk" shows, on the other hand, that there is only a slight difference existing between the "Koff" and the "Hoy".

### THE KRAAK.

The "Kraak" is a strongly built boat, with no sheer, with full and rounded bow and stern, belonging to the smack group. This vessel, of the size of a small "hoy", belongs to the region limited by the broken line Amsterdam, Naarden, Nigtevecht, Haarlem, Zaandam and Amsterdam, this last city being considered as its place of origin. This very old type of boats is already to be seen in the engravings of the beginning of the XVIIth century, but there they are called "Lichter".

It is for this reason that WITSEN speaks of the "Amsterdamsche binnenlichters", as being "een plomb gebouwd zonder zeil of mast overdekt met hooge ronde luiken" (a heavily built boat, without masts or sails, covered by high round hatches).

They were generally poled and had no masts; and carried a small deckhouse aft.

An engraving of a "lichter" of the XVIIth century, also bears this distich:

" Te lichten menich schip bequaem "  
" Daar af voert dit schip zijnen naem ".

(The name of this boat comes to it because it is able to raise many another).

Later, larger "Lichters" were built, known as "Lichter" of Nigtevecht, Brouwershaven, Wieringen, etc.

All have the same massive form raised a little forward and aft. A few carry a "statie". The waist of the boat is always straight. The larger size involved the necessity of a rig, and the "Lichters" so rigged were called "Kraken", a name which has nothing in common with that of the Spanish caracks.

An engraving which shows a ferry-boat running between Amsterdam and Haarlem, gives an idea of the precursor of the "Kraak". There must also be counted among the "Kraken", the "Ijker", with a smooth hull, of which the more recent name undoubtedly designates the same kind of vessel. It is well again to remark that the old "Turfijker" has nothing to do with this "Ijker", with a smooth hull, which it resembles only in name.

At Haarlem, the "Kraak" is called "Haarlemmerpont". This vessel is a little less bluff and the stern is less full.

The Netherlands, cut up by innumerable rivers and streams in every direction, have been, from the most distant times, the country "par excellence" of ferries and other vessels for carrying man and beast to and fro.

### THE "OVERHAALPONTJE" SKIFF.

The simplest form of these ferries is shown by the rectangular scow made to run back and forth by hauling on one or two ropes. Boats of this kind are very well known by the name of "Overhaalpontjes" (skiffs), of which large numbers exist still in Holland, especially in the neighborhoods of The Hague, Amsterdam and Utrecht.

### THE PONTON.

The "Ponton" is another kind of ferry boat.

The larger sized craft are raised forward and aft to facilitate the passage. The bow and stern, which are broad and flat, carry a movable part called the "Koebrug" (cow bridge) to facilitate taking horses, cattle and carts on board. These movable outside bridges are lowered and raised by two balanced levers, one on each side. By bearing down on them, the fore bridge is raised a little above the horizontal. The lever is then made fast. After crossing the river, the bridge is dropped and rests on the approach. The slope of the bridge must not be too great, nor should the movable part be too long, otherwise it would be unmanageable.

It follows from what precedes, that there exists, for a good approach, a certain relation between the slope of the ramp, the length of the movable bridge and the draught of the ferry-boat.

As a general rule and for ordinary pontoons, the most favorable slope for the ramp is 1 on 8.

An easier slope makes too sharp an inclination for the movable bridge; a steeper slope, which would make the bridge more nearly horizontal, would make, on the other hand, too difficult an approach for wheeled vehicles.

#### THE « HALVE PONT » OR « PIJPER ».

In order to send the pontoon across, oars or a sprit sail can be <sup>III</sup><sub>60-64</sub> used. The boat is then steered with an oar. Instead of using a pontoon with a movable bridge at each end, a « Halve Pont » (half pontoon) is the more generally in service. This is a boat with the bow of an ake and the stern of a pontoon. Sometimes this half pontoon is called a « Pijper ». Vehicles come on board the ferry over the stern and must leave in the same way. The vehicles must go ashore backward as they cannot turn end for end on the boat itself.

If the current of the river be strong enough, it is utilized to carry the ferry back and forth by means of a cable. It is needless to say that large pontoons with a movable part at each end are used for the purpose.

#### THE « GIERPONT ».

<sup>III</sup><sub>63</sub> The « Gierpont » (flying bridge) allows a stream to be crossed as follows :

The operating cable is attached at one end to an anchor put down upstream near the middle of the river and at the other end to the middle of the upstream side of the boat. The two ends of the pontoon are then fastened by special lines to the swinging cable. The pontoon can, in this way, be made to lie at an angle to the current. The component of the current normal to the side of the boat causes it to cross in describing an arc of a circle around the anchor as a centre and with the length of the cable as a radius. The speed is regulated by changing the angle which the axis of the pontoon makes with the direction of the current.

In order to assist the action of the current on the pontoon, two

or four lee-boards are fastened to the upstream side, that is : the side next to the cable, one or two of them serving to cross the stream to the right bank, the other one or two, to the left bank.

In order to diminish the resistance of the cable in the water, it is supported by a few small boats called « onderlegaakjes ».

A « Gierpont » of this kind works, among others on the Meuse, at the Gravenbicht-Rothem (Limbourg) and Grave crossings.

#### THE KABELVEERPONT.

The « Kabelveerpont » is another kind of boat for crossing <sup>III</sup><sub>62</sub> streams. The swinging cable is here replaced by one which crosses the stream, on the bottom of which it lies under the action of its own weight. The middle of the upstream side of the boat is attached to this cable, which passes over a sheave. In order to cross the stream, the boat is pushed off into the current, after having raised the movable bridges, then the cable is drawn up on the end of the boat pointing across the river and made to pass over a sheave placed, temporarily and for the crossing, at the middle of the bridge. The pontoon then occupies a position oblique to the cable and, as in the preceding case, at an angle to the direction of the current which causes the boat to move. The cable, which runs from one bank to the other, rests on the bed of the river from which only the part on the boat is raised.

The pontoons serving the crossings at Kessenich-Stevensweert and at Elsloo-Boorsheim (Limburg-an-Meuse) may be mentioned as examples of this kind of ferries.

The cable is not always raised, however, on the boat because when so raised it may interfere with navigation. Sometimes the cable is allowed to remain on the bed of the river and the ferry is attached to a rope which is connected with the cable by means of a roller. This rope, which is then stretched in the direction of the current, is fastened to the middle of the upstream side of the boat. If now the latter be inclined by means of a special cable, as explained in the case of the « Gierpont », it crosses the river, the roller running on the cable which lies on the bottom.

An example of such a boat is to be found at the crossing at Zalt-Bommel in Gelderland. The trouble with these cables

and of all transverse cables in general is that they are often displaced by the anchors of vessels which foul them in passing. Abroad, especially in Belgium, the cables for trail bridges (as they are called in the United States) are stretched above the river so that vessels can pass underneath. But this arrangement does not seem to be applicable to heavy boats and to the great widths of the crossings found in Holland without using expensive means for supporting the cable.

In Limburg, where the character of the Meuse is torrential, and were the steep slope of the bed causes much more violent currents than in the rest of our country, the barges have no lee boards.

A very wide approach ramp is necessary for all these ferries in general and for the « Kabelveerponten » in particular. A width of 16 metres at the level of mean low water and lessening upward has been found necessary, because of the slack of the cable which varies with the strength of the current and the force of the wind.

The more violent the current, the easier it is to go safely on the boat, and this allows the width of the approach ramp to be reduced near the top, because this upper part is only utilized during high water.

It is needless to say that not only pontoons, but also every <sup>171</sup> kind of boats, such as the « hoys » and « poonen » already men- <sup>175</sup> <sup>178</sup> <sup>181</sup> tioned, can be also utilized for crossing.

Use is also frequently made of the « Hengsten » (anglice: stallions, <sup>60</sup> used here to designate strength) and of the « Veerhengsten » which <sup>III</sup> <sup>65</sup> <sup>67</sup> belong to the type of the « Hoogaarsen », which they resemble greatly.

The « Hoogaarsen » are described among the fishing boats.

For ferrying pedestrians, rowboats and « vletten » are very frequently used.

One remark may still be added to what precedes :

Two cables are needed for tidal rivers, one above and one below, so as to be able to work during both the ebb and flood tides. The manœuvres then become difficult at times, because when the tide is at a stand there is no current or it is so weak that the crossing is not always possible. In these cases the cables are used merely as guides for the boats. The latter are run across by hand or by a motor which works a special cable for

crossing. A system of this sort is located on the Bergsche Meuse, below Heusden.

If the current become too strong at high water, so that there is danger of breaking the cables, the pontoon may be attached to a swinging cable which would then take up the greater part of the tension. This cable should be very long : 1° so that the pull on the anchor may be as nearly horizontal as possible and 2° so that the are described by the ferry boat may be as flat as possible.

The small inland boats are not less important than those just considered. Their size has gone on increasing as the navigable highways are improved and the clinker-built hulls give way to the carvel built. They differ, in the matter of form, from the types mentioned above, by their relatively small beam as compared with their length, as much as by their very much inclined bow and stern. If, as a general rule, the ratio between length and breadth which lay generally between 3.5 and 4.6 now reaches often 5 for the inland boats. Evidently, they are all flat-bottomed and, of late years, they have been built with a more rounded bilge.

#### THE BOK.

The *Bok* is one of the largest vessels of this group. It is <sup>III</sup> <sup>83</sup> <sup>84</sup> met with in Friesland, in the North-West of the province of Utrecht, below Ankeveen and 's Graveland, and in the North-East of South Holland to the North of the Old Rhine. It is a long, narrow boat, 16 metres long, only 3.35 m. beam and 1.75 m. depth. It narrows harply toward the bottom and has a very strong stern-post and stem. The stern-post is straight and leaning; the stern also slopes and is slightly curved. The bow of the boat is square which gives it a characteristic appearance.

#### THE SNIK.

Along with the « Bok » there is found in Friesland, the <sup>II</sup> <sup>240</sup> *Snik*, which is a « Bok » of less square build with a more <sup>III</sup> <sup>85</sup> sloping stern-post and stem.

In the province of Holland, the same difference from the "Bok" is noted in the "*Harlemmermeerlompertje*" which is smaller than the "Frisian Snik".

Neither the name of "Snik" nor that of "Bok" is known in Groningen, but there is in this region a boat of the same kind, with its bow and stern a little fuller than those of the "Bok". It is the *Groningen aardappelpraam* (Groningen potato pram) already met with. Like the three preceding boats, its bends have a slight sheer. Its full bow and stern differentiate it from the "Overijsselsche pramen".

If we leave the Haarlem lake, passing by Leiden, that is to say: if we cross the country of the downs going toward the West, we meet everywhere a type of boat which, while smaller, is still shaped like the "bokken". This type as the "Westlander" (boat of the West) as its representative.

#### THE "WESTLANDER"

This boat has a sharply raking and slightly curved stem. It rises but little above the water so as to be able to pass under the bridges. It can use sails but, most of the time, it is moved ahead by means of a boathook. The boat is decked over with flat and horizontal hatch covers. Considering the relatively low position of the tiller, these boats, like the preceding, have a "stuurbak" (a cockpit in the deck where the helmsman stands.) The top plank is strengthened so as to act as a bend. If this element be lacking, which is frequently the case with the small boats of this class, they are also called "Bok", but this must not be confounded with the big Frisian "Bok" mentioned above. "Westlanders" are often used for levelling off the downs; they are well known at the Hague.

#### THE KAAG

In the XVIIth century, there was met with, to the North of Leyden, along the Haarlem lake and in that part of North Holland lying North of the line Aalsmeer-Muiden, a boat then currently called "Kaag" (Kage or Kaghe), of which WITSEN gives

a good reproduction in his work (p. 174). This boat differed from the preceding types by the greater elevation of the bow and by the drawing together of the upper planking, which make it resemble the fishing boat, called the "Hoogaars". Like this last, it had a broad bow, but the stern, on the other hand, is more narrowed. The stem was straight but with a marked rake. The mast is at one-third the length from the bow; it is rigged with a sprit sail. This boat no longer exists now, but, on the other hand, a boat with a smooth hull is met with which resembles it and is now called the "Snik" or "Gondel". It is, however, less angular and has a square stern, which, as every where else, appeared later. It is probable that it is the old "Kaag" which is again found in this class of boats and which is often used to-day. The ratio of length to beam is the same for both vessels.

On the tidal rivers of Holland, there is found, as a small boat, the *Kinderdijksche Hoogaars* which resembles the old kaag perfectly. Then, there is met with among the islands of South Holland, a boat with a smooth hull, the "*Beyerlandsche Schuitje*" which is an "ake" if its bottom which rises right up to the extreme point of the bow be considered; it is probably not a very old type. Its affiliation with the preceding boats can still be easily observed. This boat is 9 m. long, 2.75 m. beam and 1.30 m. deep. The mast is from a quarter to a third of the length from the bow.

The "Beyerlandsche Schuit" corresponds fully to the fishing boat called the "Tholensche Schouw".

#### THE UTRECHT PRAM.

There is met with in the province of Utrecht another kind of boat which, while resembling the "Westlander" somewhat differs from it by its finer lines and more slender construction. The stern post, like the stem, is straight and rakes a great deal, which makes these boats very pointed. They are *Utrechtsche Pramen* (Utrecht Pram) and when they are entirely open they are called *Kromme Rijnaak* although they do not show the characteristic flat bottom rising toward the bow. They correspond to

1187 the " Vlotschuit " mentioned by WITSEN (p. 171, No 3) even though this latter boat is broader in proportion to its length.

The " Utrecht pram " sails along the " Kromme Rijn " and in the country still further North, along the Vecht. It greatly resembles a " punter " of the North of Overijssel (near Vollenhove, etc.) but it is longer and narrower. This class of boat is 11189 also met with in North Holland: the *Groenteschuitje van Hoorn*, called by WITSEN (p. 171-3) *Weyeschuitje* is an exemple.

#### THE " SCHOUW ".

The *Schouw* is a flat, open tub met everywhere. It is a very simple and very primitive boat which is seen already in the oldest engravings both in the countries along the Mediterranean and in the countries of the North of Europe.

The " Schouwen " are very much used in our country of canals and rivers. These more or less large tubs have gradually developed into the form of boats. Nearly all are pulled or pushed with a pole. The largest are the " Melkschouwen " of which large numbers can be seen every day at Rotterdam.

The hull of the " Schouwen " narrows a little forward and aft, while the bottom rises there regularly.

These boats are entirely open as a rule. When they have a hold covered with hatch covers and when they are a little higher and carry a cuddy forward and aft they are called *Schiedamsche Schouwen*, better known still by the name of *Spoelingschuiten* (small boats for carrying the refuse of fruit).

#### THE " TREKSCHUIT ".

It is hard for the present generation to imagine that, 60 years ago, the " Trekschuit " was still the only means of locomotion of the period. Who would now think of going in a " Trekschuit " from the Hague to Schevening or back where so many electric 11224 11227 trams cross each other everywhere? And yet, the " Trekschuiten " have played an important part in our " country of water " and there are still some regions where these boats are in use. The " Trekschuiten ", properly so called, could be divided into two classes,

those with a sloping but straight stem and those with a curved stem.

The first, which are almost entirely like the Westlanders, 11177 11179 11180 while being of a little more massive construction, are found particularly in North and South Holland and to the West of Utrecht. The old engravings show that these boats have changed little in the course of the centuries; the water tight cabin being the only serious modification which they have undergone.

They are still frequently met with as " Pakschuiten ", of which 11178 the vivid colors (green, white, red) immediately attract the eyes.

The second class of these boats, which have curved stems, are of more elegant shape. They are known by the name of " Barges " or " Trekjachten ", and are found especially in the North of our country, in North Holland, Groningen, Friesland. Their bows and sterns are quite full (like the " hoys ") and make one think rather of the old yachts, fined down a little, from which they are certainly descended.

#### THE " YACHT ".

The old " Yacht " was one of the most beautiful boats in 11156 11155 11184 11185 11186 use. At first a small reproduction of the pinnace, it was afterwards built of larger dimensions while offering, by reason of its lack of depth, (" Vlotgaanswille ", as it used to be said), pretty full forms. The decoration of the cabin and of the stern was particularly carefully wrought out. The " Yachts " carried sprit 11190 sails and had no lee boards. It is to be regretted that sundry pictures showing yachts should not have been preserved; in the second half of the XIXth century some of them were destroyed as firewood. A few superb photographs of " Yachts ", taken from drawings in the collection of Mr. van Gijn, of Dordrecht, accompany the collection and it will be seen how suggestive they are.

#### THE " BAGGERAAK ".

The " Baggeraak " (dredging ake) forms a special group. As has been said already, they can be classified in three groups. To the first group, belongs the " Vlet " (flat) or " Baggeraak "

which is met with in Southern Holland, the West of the Betuwe, the West of Northern Brabant (the Biesbosch and Donge) and also in Zeeland, in a word, on all our tidal rivers. The « Flette »<sup>III 68</sup> or « Baggeraak » (called also « Sliedrechtsche aak ») was a small stout boat which, save for a small cuddy in the bow, was wholly open. Its rig was the « Spritsail », it was provided with lee boards and movable wash boards so as to facilitate the casting of hand dredges. These wash boards were placed only when the boat was partially loaded, that is when it was appreciably down in the water. The mast was set at one-fifth to one-fourth of the length of the vessel from the bow. The ratio of beam to length was as 1:4. The planking was continuous to the nose against which a false stem was fitted.

In Zeeland, a great many « Hoogaarsen » are used for dredging, and « Boeieraakjes » are employed in Brabant and Holland, as at the Biesbosch and on the Amer and the Donge. They are also used a great deal on the Meuse, although there, as on other upper rivers, the « Bovenlandsche Baggeraakjes » were formerly employed.

<sup>III 70</sup> There belong to the *Bovenlandsche baggeraakjes* those vessels of the Meuse which stand midway between the « Keen » and the « Whalemajol ». They have a little sprit sail rig and a « Klaphekken » (a special kind of rudder). The largest, known especially by the name of « Hedelsche Aken » and which carry lee-boards, are used for all sorts of purposes. These boats belong neither to the true Meuse type nor to the Rhenish type above Bonn (The Keen, etc.). They form an isolated group, descended probably from the two types in question.

<sup>III 73</sup> The *Vreeswijksche zandschuit* (sand boat of Vreeswijck) alone remains of the Rhine boats. It has the bow of a « Dorstensch Aak » and the stern resembles that of the « Dortsche Zandschuit » (sand boat of Dordrecht). This « Dortsche Zandschuit » is alike at bow and stern and the hull is smooth. Although it is more pointed, this boat resembles the « Westerling » a little, the latter being known as a very old boat of the lepper Scheldt (see DEHEM, p. 505). The old « Dortsche Zandschuit » was especially used for dredging ballast intended for sea-going vessels.

<sup>III 72</sup> A large number of « Bokken », already mentioned among the

« Westlanders », are used for levelling down the dunes in the West and in the Rhine country.

The « Slijkpraam », which resembles the « Kromme Rijnaak »<sup>III 87</sup> already mentioned, is used in the province of Utrecht, while finally, the « Vlotpraam » or « Slijkpraam » is still met with in Groningen.

From a certain standpoint, the « Hoogeveensche Pramen »,<sup>II 246</sup> mentioned above, which are used in the peat bottoms, should be classified in this group.

#### THE « BAGGER- OR MODDERMOLEN » (*The Dredge*).

The « Moddermolen » (mud mill) or « Moddermolenschip »<sup>II 274</sup>  
<sup>II 277</sup> was already found in the first half of the XVIIth century, as the forerunner of the « Baggermolen » (bucket or ladder dredge). This dredge was worked by hand at first; later on horses were used for this purpose. (LE COMTE, p. 6, and WITSEN.) A horse-power and a stable were built on the deck. In the XVIIIth century, says LE COMTE, the old « Moddermolen » was already so perfected that it was imagined that these was nothing more to improve.

Navigation, however, kept calling for greater and greater depths, so that the Kater Brothers, dredge builders at Monnikendam, were led to build, in 1829, a boat which dredged down to a depth of 7 metres. From three to six horses were used, according to the depth and compactness of the materials to be dredged.

These same builders, says LE COMTE at another place, were the inventors of the « Klepschouwen », for which they asked the concession on May 1, 1830. LE COMTE gives an engraving of these dredges in plate 12 of his work.

J. C. KERKMEIJER relates, in an article of the *Eigenhaard* Review (1906), entitled « De Diep- of Baggermolen, een merkwaardige ontdekking », that he had found the model of the dredge built by its inventor in 1632, a model which is mentioned by C. A. ABBING, in his continuation of the *Chronicle of Hoorn*, by VELUIS (1841, p. 12), wherein it is stated :

« About this time (1632) Jan Jantz Nieng, a native-born citizen « of this town (Hoorn), invented the « diepmolens ». The first

» model, made by him, was 2 feet 6 1/2 inches long, 9 inches » broad and 6 1/2 inches high; the measurements being taken » over all. » This model was still to be seen at the city shops at Hoorn a few years ago. The model found by Mr. Kerkmeijer was carefully repaired by him and it is preserved at the city hall of the town.

Thanks to the kind assistance of this author, a few details can still be given in regard to the « Moddermolen » of Middelbourg, called « Dieplust ». These details were received from the chief of the Kool ship yard of this town.

The « Dieplust » extracted the mud by means of a trough with low straight sides, lined at its lower end with iron. When the boat was moved, by means of a cable attached to an anchor, the lower end of the trough entered into the mud as far as it could. The ladder of the dredge was suspended inside of the trough and to its endless chain were fastened pieces of plank of about the same width as that of the trough. These pieces of plank tumbling around a hexagonal or octagonal drum at the lower end worked down into the mud of which they brought up a certain quantity and discharged it through a hole at the top of the trough.

There was no question yet of buckets to bring up the dredged materials, these having only made their appearance with steam dredges.

The trough, with the ladder, could be lowered or raised by means of a windlass; it passed through an opening which was not in the axis of the boat. In the larger half of the vessel was placed the shaft which, by means of gearings, transmitted to the ladder the movement produced by the horses. These gearings were similar to those of the old wind mills. A horse power and a stable were constructed on the deck of the boat.

The Ghent paper *Het Volksbelang* published the *Eigenhaard* article in its issue of June 9, 1906. Some doubts are emitted, however, about 1632 being the authentic year of the invention, because the following annotation is found in the *Resolutie boek van de Staten van Vlaanderen* of 1628-1630, F<sup>o</sup> 16 (*Archives of the State*, at Ghent. — N<sup>o</sup> 553):

» Actum den XXII May 1628 wierd den Ingeniaris Adam

» Clippens, ghemaect hebbende den slijckmeulen, gelicentieert » en de gheordonneert hem te geven ordonnantie van betalijnghe » den dach van merghen mitghaders hondert guldenen voor eene » vereeringhe zoo ghedaen is geweest » (1).

From which it would appear that a mechanical dredge must have been built in Flanders in 1628. Hence the year given by Abbing cannot be correct, or else the same machine might have been invented at two different places at about the same period. The question is not yet settled, but, be that as it may, it must be granted that the first mechanical dredge was at work in the XVIIth century.

#### THE « TJOTTER ».

Pleasure boats or Yachts have been described so often and <sup>III 91</sup> so many different types have been used as such that they could be passed by in silence. Let it suffice to mention the *Tjotter*, which is spread throughout Friesland, and the *Friesch Bootje*. The « Tjotter » is a full, short and broad craft of elegant lines and <sup>II 247</sup> steady on the water. It has a great deal of sheer, is fore-and-aft <sup>II 248</sup> rigged (bazaantuig) and is generally very well finished.

#### THE « LAADBAK » AND THE « ZOLDERSCHUIT ».

The *Laadbak* and the *Zolderschuit* are so well known that <sup>III</sup> nothing more will be done than to refer to the drawings given <sup>74-76</sup> of these two vessels.

#### THE « ONDERLEGGER ».

It is worth while to point out still another very serviceable boat which has always been much in use. It is the *Onderlegger* of which an engraving is given by WITSEN (p. 175) and which was

(1) By act of May 22, 1628, it is ordered that there be paid to Adam Clippens, Engineer, who built the mud mill, a sum of 100 florins for the bid which he presented.



used for heaving vessels down for repairs, for pulling piles out of the ground, for hoisting in masts, etc. It was 60 feet long, 16 feet broad, and 6 1/2 feet deep and carried two capstans.

#### THE « BOVENLANDERS ».

The craft frequenting our upper rivers are called *Bovenlanders*. They are totally different from the types met with so far. They are all relatively long and narrow, flat-bottomed and draw but little water. It may be said, as a general rule, that the « Bovenlanders » appear where the tidal rivers end. They have been in existence since the most distant times although they are rarely ever seen in the engravings. If they were not often mentioned, it was doubtless because they were not considered as being worth a description, or, perhaps again, because they were not sufficiently known. WISEN mentions only the following vessels (p. 170-171) of which he says textually :

« A) The *Overlanders*, which come to us from the Upper Rhine, » are vessels with high sides, heavy and rather unfinished. Whole » families live on them.

11213  
11214 « B) The *Samoreuzen* are very long flat boats which bring » wood down the Rhine. They carry a very high mast, made » in two parts, and fastened by lines to the ends and sides of » the boat.

« c) The *Aeken*, which bring wine from Cologne, are long, » high and very full. Their rudder is very wide.

« D) The *Dortsche Koolhaelders* are very long, open boats, » flat-bottomed, so as to be better able to cross the shoals of » the river. They have near the middle a square deck house » which serves as a dwelling for the boatmen. They are square » at the corners and the rudder is long and broad. The sail » is square and is hoisted on a short mast, near the deck house, » by means of a curved yard. »

VAN YK speaks of « Geldersche Samoreusen » (p. 348) and LE COMTE, of a « Samoreus » or « Keulenaer » (p. 44) which are to be seen on the Groenewegen engraving. (Series F, No 3.)

The « Overlanders » mean the « Bovenlanders », and the « Samoreuzen » mean the boats coming from above Cologne, while

the « Aeken » are probably big « Keenaken ». Finally, the « Dortsche Koolhaelders » are undoubtedly the « Dorstensche Aken ». Neither engravings nor description give any exact idea. But the types of these craft have been very well preserved on the Rhine until the introduction of iron; the clinker built hulls have even remained intact, and this enables us to appreciate even now what these boats of by-gone days were and whence they came.

#### THE RHINE.

As was seen in the general classification, the Rhenisch boats may be divided into two groups :

a) Those navigating the Rhine below Bonn;

b) Those navigating the Rhine, above Bonn, and its tributaries, with the exception of the Neckar, where is found a boat belonging to group a.

Group a includes :

1. — The *Dorstensche Aak*, so called from the town of Dorsten where these boats were frequently built. It is a long and narrow « ake » of which the bottom was continued all the way to the tip of the bow; the length was 6 to 7 times the beam and the hull was clinker built. The bow was full, the stern slender at the water line. The after deck included a poop deck, with a much curved tiller resting on a solid « luierwagen » (prop). The rudder was large and heavy. These boats had two masts. The cabin on the small boats was by the after mast; on the larger, there was a free space between the cabin and the mast. A dwelling was placed aft of the main mast and in the bow was a cabin for the servant. The hold was decked over with plane inclined hatch covers, which, formerly, were round. The « Dorstensche Aak » with round hatch covers was a « Samoreus ». Alongside of these latter there used to be akes with open holds called « Dorstische Koolhaelders ». Although these boats were no fuller than the other akes they appeared, like all clinker built boats, more massive. They generally carried square sails on the main mast and fore-and-aft sails on the smaller. As a general rule, these boats reached us unfinished and it was only when the cargo (pots and other household utensils) was sold, that they were finished in our country.

<sup>III 94</sup> The *Neckaraak* (ake from the Neckar) was a small "Dorstensche Aak" of which the length was about 6 1/2 times the breadth. These vessels were long and narrow and worked well. They had a characteristic cabin which, compared with the height of the boat, rose a great deal above the deck. They had, in addition to a main mast, a small one near the rudder. They carried no lee boards, but their rudder was like that of "Dorstensche Aak".

#### THE "STEVENSCHIP".

<sup>III 95</sup> The *Stevenschip* resembled the "Dorstensche Aak". Like this latter, it was clinker built, carried the same rig and was built in the same way. It differed from it only in this that the planking did not end at the nose, but, on the contrary, was rabbetted into a strong and somewhat curved stem.

<sup>III 96</sup>  
<sup>III 98</sup> The preceding types were met with also in our country both clinker and carvel built. They were then called *Hollandsche Aaken* (Dutch akes) and *Stevenschepen*, whereas alongside of the latter there were found formerly a large number of smaller akes along the Rhine, the Waal and the Lek as far as the point where the tidal regimen begins, and along the Yssel and its tributaries. These "akes" were exact copies of the large akes but at the same time they had more elegant lines by reason of their less length. Those which are seen in our album are made from some old specimens which date, probably, from the XVIIIth century. The bow of the "Hollandsche aak" is rather flatter than that of the "Dorstensche aak".

<sup>III 100</sup> The "Bovenlanders" took on also rather fuller forms, as can be seen by comparing the drawing of a "Dorstensche aak" with that of a "Samoreus". A few small Dutch akes carry a discontinuous false stem, whence their name of "Hollandsche Schechtaak".

A few of the "Aakjes" (small akes) are met with also along the Merwede and the Yssel.

#### THE "TURFIJKER" AND THE "HAGENAAR".

In the region to the East of the line from Leiden to Delft, North of Rotterdam, South of the Old Rhine and West of Utrecht, there used to exist a very curious type of clinker-built boat of

small dimensions, constructed in the German way, called the *Turfijker*, which has disappeared but of which the characteristics <sup>III 101</sup> are found in the "Hagenaar".

The "Hagenaar" is a flat boat without sheer, which rises <sup>III 99</sup> very little above water on account of the small clear height of the bridges at The Hague, whence its name of "Hagenaar" (Boat of the Hague). Here then is found in the very heart of the province of Holland, a type of "Bovenlander".

It is curious to note that the same large Dutch "aaken" (Dorsten type) are still to be met with in the North-West of North Brabant (Langstraat) where they are still built while this kind of construction been abandoned on the Meuse and the Lower Waal.

The second group of boats under consideration and which circulate above Bonn is easily distinguished from the first by the long rudder, attached to the main-piece which traverses the stern. From the end of the rudder, called "klaphekken", starts above the main piece, a strong piece of timber solidly fastened to the tiller.

This rudder is called the *Klaphekken*. All the boats belonging to this group carry this characteristic rudder; they are, moreover, flatter than those of the first group. They are clinker built although many are now met with which are carvel built.

#### THE "KEEN".

The *Keen* may be considered as the fundamental type of this <sup>III 105</sup> second group. It was rigged formerly like the "Dorstensche Aak" <sup>III 106</sup> but it now carries, like all the boats, a fore and aft sail. The bottom rises both forward and aft to the level of the nose. Hence the "Keen" is an "ake". The planking is assembled on the bottom very nearly along a right line. The stern carries, as a rule, a poop deck.

#### THE "KEENAAK".

The *Keenaak* is broader as compared with its length and it is generally a little larger, it stands higher out of water, its ends are <sup>III 107</sup> fuller and the side planking ends in a point at the nose.

### THE « LAHNAAK » AND THE « SLOF ».

III 108 The « Keen » when entirely open is called a *Lahnaak* (ake of the Lahn); its size has been increased of late years. When vessels of this kind have nearly vertical sides, blunt bow and stern, and smooth planking they are known as a *Slof*.

One of the characteristics of the « Sloffen » is that they always carry at the bow a narrow cabin which rises a little above the deck of the boat. The « Sloffen » have been closed in of late years with hatch covers, and then they are called simply « Akes ». The III 103 boatmen even call the « Slof » sometimes the « Mulmsche Aak ». (Mülheim ake).

A very strongly built boat, which dates only from the second half of the XIXth century, must also be mentioned as belonging to III 110 the first group : the *Bunder*. This boat is shaped like a « Dorstensche Aak », but it is carvel built and is covered in with hatch covers.

Finally, these must still be mentioned among the boats of our III 102 III 104 country the « 's Gravenmoersche Aak » which made its appearance at 's Gravenmoer in the XIXth century and which came from the Upper Rhine to be used at the Biesbosch. Boats of this category were provided originally with « Klaphekken », a special rudder which later has been sometimes done away with, either because it was too long or because it was not sufficiently strong, and which has been replaced by an ordinary rudder. They resemble the « Lahnaak » and are used especially for carrying hay. The coming of iron and steel will cause these boats, like so many others to disappear.

In order to avoid confusion, it is necessary to dwell upon the fact that some Dutch Akes have been provided later with false stems, which gives them the appearance of « Stevenschepen » but which, does not make them so.

### THE MEUSE.

The long, narrow, light draught boats which frequent the Upper Meuse and its tributaries have an entirely different appearance from those which have just been considered. In the first place, their rudder differs entirely from that of the preceding types. It is

true that the long rudder attached to the stock has been kept, but the piece of bent wood has given place to a curved balance beam in two parts of which the after ends are fastened to the after upper corner of the rudder, one on each side. The two parts of the balance beam are made fast near their middle and by means of a chain to the head of the stock of the rudder. The forward end of the balance beam is connected with the end of the tiller by a rope drawn up taut so as to make the whole very solid. The balance beam is composed of two twin pieces. The rudder stock comes up through the stern, but the latter, instead of rising gently and regularly aft, bends sharply inboard.

### THE WHALEMAJOL

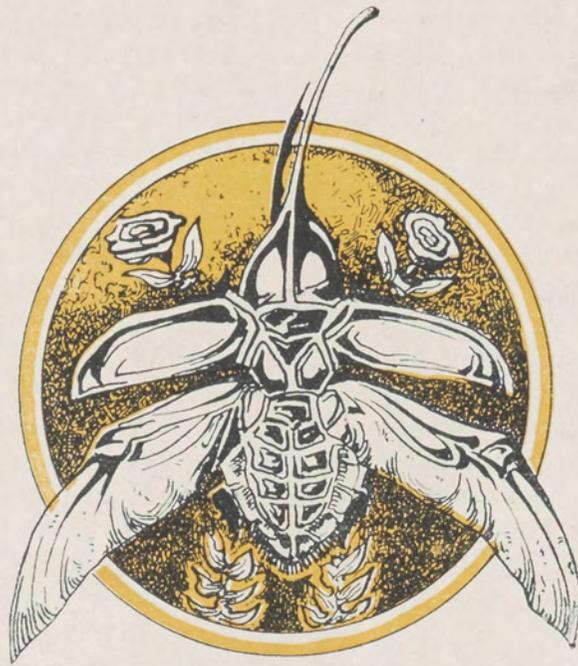
Originally, the bow of the Meuse boats had another form; of late years, these craft have been made fuller, and their bow has been bent back to reduce the length of the boat and increase its capacity. The oldest type of this category is the *Whalemajol* (or *Mijole*). Its bow and stern are pointed and its main frame is a trapezoid on which the three upper tiers of planking are clinker laid and the hull below is carvel built.

The *Herna* is of the same size as the preceding, is wider II 208 at bow and stern, and ends with a horizontal timber. Its main frame, formerly trapezoidal, as in the preceding case, is now III 111 rectangular like that of the Rhenish « Sloffen ».

The *Spitsbek* is a small « Herna » (old form) entirely covered over. It is made of all sizes and is called « Spitsbek » (pointed beak) on account of its slender shape.

The « Klaphekken » seems now to be preferred to the old rudder of the « Whalemajols » and it is gradually being adopted. A « Whalemajol with a klaphekken » is called a « Whalepont » or a « Maaspont ».

Boats of this kind are also found in the southern part of the Limbourg Meuse. Further down stream they are, however, the « Hedelsche Aken », which come between the « Keen » and the « Majols », which latter are the more numerous. These craft carry a « Klaphekken » and sometimes they also carry now an ordinary rudder.





## FISHING BOATS



III 112

MAN has been given to fishing from the most remote times, even though in primitive ways. Hence fishing boats will also be seen to have existed from the earliest times; furthermore, as man thinks of his own maintenance first before dreaming of trade, fishing boats are older than merchant ships and it is perfectly natural to conclude that the latter issue from the former. So, the "Koggenschip" (cog) is nothing but

a transformation of what will be called later an "Egmonder Pink" or better, a "Pink" of large size.

As fish were taken at the beginning only for local needs, the fishing boats were small. Distant expeditions were not undertaken, the preservation of fish being unknown in those days. Some old writers even maintain that the herring fishery only appeared at Zierikzee in the XIIIth century (in 1163 according to WITSEN, p. 431). Hence it may be said that the beginnings of our ocean fisheries date only from the century mentioned. No great revolution took place until 1384, when Willem Beukelsz of Biervliet invented the salting and barrelling of herrings. This invention caused such a stir that, a hundred years after the death of Willem Beukelszoon, the Emperor Charles V still visited his tomb at Biervliet (1556).

Distant voyages became possible from this moment because the herring could be preserved. The first great herring net was

made at Hoorn in 1416, and smooth planking for the boats made its appearance at Zierikzee, the centre of the herring fishery. A relation certainly exists between these two events. The packing of herring gave fishing such a start that a new commerce was the result which, in its turn, brought forth more and more numerous demands requiring a perfected plant.

## THE "EGMONDER PINK".

The old clinker built "Egmonder Pink", formerly the largest fishing boat (35 feet long, 12 feet wide and 3 feet deep) became too small, just as soon as herring nets, constantly increasing in size and weight, began to come into use.

III 112

## THE BUIS (Bush).

A new boat became necessary. It was built larger and with a smooth hull, thus giving the "Buis" (bush), 52 feet long, 13 feet wide and 8 feet deep. This boat had a much greater tonnage than did the "Pink". (WITSEN, p. 167.)

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III 113

At the end of the XVth century, there were already at Enkhuizen 400 to 500 "Haringbuizen", and there were also 40 of the so called *Grootschippers* (large fishing boats), which could carry from 20 to 120 lasts. (KOENEN, p. 78.) In 1590, 350 "bushes" started for the herring fishery, and, at the beginning of the XVIIth century, 1609, 3000 Dutch bushes were fishing in the North Sea, whereas in 1601 their number did not exceed 1500. (*Groen van Prinsterer Handboek*, § 100, KOENEN, p. 156.) These 3000 boats, said KOENEN, have a total of 50,000 men in their crews, and this fleet requires in its turn 9000 larger boats and 150,000 men on land and at sea to pack and transport the fish. It is estimated that 20 "Haringbuizen" give employment to 8000 persons.

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II 196  
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A fleet of 1500 bushes passed three times through the Texel passes at the beginning of the XVIIth century. Hence it is not astonishing that the departure of this fleet should produce a

great impression. Even in our day, the well known "Buisjesdag" (day of the bushes) is still spoken of.

When, at the time of the second war with England, the herring fishery was stopped on the North Sea and the fishermen continued their work on the "Zuyderzee", some of them still succeeded in taking, in a month, 800 last (1600 tonnes) of herrings valued at 15,620 florins. A large number of decrees appear in reference to fishing (1611, 1612, 1620 and 1629).

For example :

"Niemand vermag zijn roer onklaer houden zoodat daer netten aen zoude kunnen hechten." (No one may so hold his rudder as to foul any nets.)

"Die niet en vischt vermag niet onder de visschers te drijven." (He who is not fishing may not sail among the fishers.) While it is laid down, at the same time, that every one should place his name on his nets so that they can be recognized.

The size of the crew and the armament were also the object of regulation, which was all the more necessary in those times of war.

A "Noortsvaerder" of 70 to 80 lasts, and a "bush" of more than 24 lasts, ought to carry at least two "gotelingen" (small cannon). These guns are still to be seen in many old engravings. Nor was bravery lacking among the fishermen. M. DE JONGE (Vol. I, p. 182) gives an example of this in relating the meeting of an English craft with fishermen from Vlieland between the Skagerrack and the Doggersbank :

Scarcely had they come near each other when the English began throwing stones, for lack of other weapons. The Dutch answered by throwing fire wood, but this innocent fighting became a bore to the Hollanders. "They grappled the enemy's boat, jumped on board of it, carry their knives in their mouths and, headed by their valiant steersman, Jonge Kees, drove the English down into the hold, which they nailed up, and returned triumphantly with their little boat to Amsterdam where a gold medal was offered to the brave leader and where the crew received the captured boat and other rewards".

Our fishing fleet went very much to pieces toward the end of the XVIIIth and the beginning of the XIXth centuries. Matters became still worse toward the middle of the latter. If in 1843 there were still 126 fishing boats in existence, this number fell to 93 in 1852. (KOENEN, p. 156.) But a revival took place toward the end of the XIXth century and in 1905 there were again 724 vessels in our fleet. The upward start began in 1891, as shown in the table given further on. The great improvement in means of communication increased the demand for fish as a popular article of food, (See the Inaugural Address of Professor E. Vosnack at Delft; *Nieuwe Rotterdamsche Courant*. October 11, 1906, first sheet, A.) while more careful packing in ice now allows fish to be carried to much more distant points.

This is why the cod and haddock fisheries have been taken up here with renewed ardor (A. HOOGENDIJK, *de Grootvisscherij*, 1895, p. 47) and the trade has become more lucrative by combining it with the herring fishery.

The herring fishery requires rather a small boat, as the latter should not pull too hard on the nets. Winter fishing requires, on the other hand, a strong fast boat, as it has to be on duty in all weathers.

Hence it follows that, in order to combine both, a new type of boat, able to satisfy these discordant conditions, has become a necessity and the old types in use are doomed, naturally, to disappear. The faster the boat, the greater the number of trips and the fresher the fish brought back.

Countries which are rich in fish can be visited with fast vessels and it is not to be wondered at that steamboats should be put into use in our country, just as in England, after the "loggers" (luggers), "Kotters" (cutters) and "sloepen" (sloops) which had preceded them. The first steam fishing craft appeared in 1897, and since then the number of these vessels has steadily increased.

The English fishing fleet has now not less than 1600 steamboats for deep sea fishing.

Composition of the Dutch fishing Fleet, exclusive of the Bommen, from 1867 to 1905.

YEARS	HOWKERS	SLOOPS	STEAM BOATS	MOTOR BOATS	LOGGER CUTTERS AND LOGGER- BOMMEN	TOTAL	REMARKS
1867	85		—	—	4	89	The first French lugger was put into service in 1867.
1868	80		—	—	11	91	
1869	79		—	—	28	107	
1870	69		—	—	51	120	
1871	45	13	—	—	64	122	
1872	30	14	—	—	64	108	
1873	23	11	—	—	68	102	
1874	20	11	—	—	83	114	
1875	14	11	—	—	90	115	
1876	6	11	—	—	92	109	
1877	8	11	—	—	94	113	
1878	7	11	—	—	109	127	
1879	4	10	—	—	114	128	
1880	3	9	—	—	121	133	
1881	2	9	—	—	127	138	
1882	2	8	—	—	135	145	
1883	2	8	—	—	144	154	
1884	2	8	—	—	159	169	
1885	2	8	—	—	174	184	
1886	1	8	—	—	181	190	
1887	—	7	—	—	180	196	
1888	—	8	—	—	186	194	
1889	—	8	—	—	186	194	
1890	—	7	—	—	189	196	
1891	—	7	—	—	199	206	
1892	—	9	—	—	212	221	
1893	—	11	—	—	213	224	
1894	—	13	—	—	214	227	
1895	—	17	—	—	216	233	
1896	—	24	—	—	245	269	
1897	—	30	1	—	252	283	
1898	—	36	1	—	258	295	
1899	—	40	2	—	260	311	
1900	—	46	3	—	275	324	
1901	—	47	7	1	300	355	
1902	—	52	25	1	327	405	
1903	—	58	44	1	410	513	
1904	—	58	44	1	432	535	
1905	—	48	38	1	425	512	

The first steam-boat was put into service in 1897.

Summary of the different types of boats in use for the herring fishery from 1896 to 1905

YEARS	LUGGERS CUTTERS SLOOPS	STEAM- BOATS	MOTOR BOATS	LOGGER- BOMMEN	BOMMEN	TOTAL	REMARKS
1896	269	—	—	—	324	593	See report on maritime fisheries 1905 (p. 149)
1897	282	1	—	—	325	608	
1898	294	1	—	—	320	615	
1899	309	2	—	—	303	614	
1900	320	3	—	1	289	613	
1901	346	7	1	1	279	634	
1902	377	25	1	2	271	676	
1903	463	44	1	5	268	781	
1904	484	44	1	6	239	774	
1905	467	38	1	6	212	724	

Let the "Bush" be taken up again for a few moments before beginning on the description of the modern types of fishing boats.

The "Bush", which appeared in the XVth century, remained the boat for the herring fishery until the middle of the XIXth century, when it disappeared entirely. If, in 1832, there were still 120 "Buizen" (78 at Vlaardingen, 18 at Maassluis, 1 at Delfshaven, 3 at Zwaastewaal, 5 at Enkhuizen, 5 at De Rijp and 10 at Amsterdam, see LE COMTE, p. 46), they were, on the other hand, no longer mentioned in 1867, the year when the French lugger was brought into service. The bush was used exclusively in fishing for herring. When this latter failed, the vessels were stripped and laid up. Although their forms were full, they had a keel and sought safety in the different ports. These boats could not be grounded. Toward the last they were about 22 metres long, 6 metres wide and 3 metres deep. The dimensions of these boats had also increased gradually. (VAN YK gives, p. 310, 7 Rhine feet as their depth.)

The "Bushes" carried originally three masts, of which two could be lowered and each of which carried a large sail. Later, at the end of the XVIIth century, the rig was changed and made like that of the "Howkers". This change is shown on the old engravings. The "Bushes" carried a "statie".

### THE " KWEE " AND THE " HOEKERBUIS "

The dimensions of the " bushes " must have increased most at the end of the XVIIIth or beginning of the XIXth century; the " statie " was then suppressed and the fish tank appeared. The boats supplied with this tank were called *Kwee* according to HOOGENDIJK (p. 59). The " bush " proper which was used exclusively for the herring fishery, had no fish tank.

The " bush " which had a howker rig was also called a *Hoekerbuis*. What HOOGENDIJK tells about the origin of the *howker*, in his interesting book on the " Grootvisscherij ", does not seem to be wholly exact. According to him (p. 59) the " howker " is said to be descended from the " Hoekerbuis " by the suppression of the " statie ". But, according to WITSEN and VAN YK, the howkers have existed from the earliest times and, hence, long before the appearance of the " Hoekerbuis ".

The " howker " is met with as a contemporary of the " bush " from which it differs quite a good deal in shape; the placing of the " howker " rig on the " bush " proves that the former vessel was already in existence in the time of the latter.

### THE " HOEKER " (HOWKER)

II 228  
II 229  
II 234  
III 114 The " Hoeker " (howker) is a boat strongly rounded at the stern, showing a great deal of sheer and carrying a tank for fish. The name comes very probably from " hoek " an iron (hook) used in fishing for cod and haddock, but as the " bush " is spoken of before any mention is made of the " howker ", it must be concluded that the latter came later into use, that is to say, that cod fishing on a large scale was a much later occupation. The date of adoption of the fish tanks is not known. It is probable that this arrangement is very old, but it is possible that it was only applied much later to deep sea fishing.

### THE " HARINGJAGER " AND THE " BUISCONVOYER "

II 222  
II 232 The " howker " was used not only as a fishing boat but also as a *Haringjager* (herring hunter), a boat which is sent to get the first catch of the fleet.

The " howker " was also used as a *Buisconvoyer* (convoy

for bushes); it was then armed with several guns and intended to defend the " bushes " against the enemy. Various circumstances contributed to the complete disappearance of the " bushes " and the " howkers "; these are the more and more severe demands laid on this traffic, the combination of herring fishing with that for cod and haddock on one and the same boat, the use of cotton nets which are much lighter than the old ones so that casting the nets is less important on the boat itself. All these causes brought about the creation of boats with fine lines, so that there existed, in 1886, but one howker for 8 sloops and 181 luggers. The sloop and the lugger, which followed it came to us from France.

### THE " SLOEP " (SLOOP)

The " sloop ", having at first one mast with a large boom sail and square stern (HOOGENDIJK, p. 61), was put into use at Middelharnis, Zwarte Waal and Pernis and hence is known generally as a *Pernissersloep*.

The heavy and unhandy rigging of the single mast was soon replaced by the " lugger " rig, while the square stern disappeared from among the more recent sloops, thus doing away with the principal difference between the two types of vessels.

The sloop has a fish tank and is used for carrying live fish, but it can also be employed for the herring fishery if it have a fore-mast which can be unshipped.

The new types of sloops were not favorably received by the public, says HOOGENDIJK (p. 55), especially in regard to the deep sea herring fishery. Their enormous tonnage gave rise to the fear that they would be too heavy for this kind of work. This loading capacity reached 40 lasts while the ordinary load for a herring boat was but 25 to 30 lasts, to say nothing of the many boats which carried scarcely more than 16 to 20 lasts.

This fear, however, was found to be groundless. The more slender shape of the boat gave less hold for the wind than did the old types and so made it superior for purposes of navigation. No one would think now of preferring the old " bushes " and " howkers " to the modern " lugger " and " sloop ".



### THE LOGGER (LUGGER)

<sup>II 269</sup>  
<sup>II 270</sup>  
<sup>III 118</sup> The « lugger » is also a boat of slender form and of French origin.

The construction of the boat, which has no fish tank, is made sufficiently clear by the drawings. The rigging includes two masts. The main-mast, at one-third of the length from the bow, can be lowered. The nets are cast from the bow and are taken in over the side.

### THE « BOM »

<sup>II 270</sup>  
<sup>II 271</sup>  
<sup>III 115</sup> The vessels mentioned above are not, however, the only ones used for the herring fisheries. Another very remarkable type still in use is the « Bom », a descendent of the « Egmonder Pink ». The « Bom », built so that it can be allowed to ground, has, like the « Pink », a very strong bottom and clinker built sides. Its length is double its beam. It carries two masts (a large and a small); the rig is fore and aft and long, narrow lee boards (about 1/3 as long as the vessel). The high tide lands the « Bommen » on the beach whence, after they had been raised by jacks and wooden rollers had been placed under them, horses drew them up on a wooden floor laid on the strand.

The creation of the « Bommenhaven » (harbor for « Bommen ») at Scheveningen makes grounding these craft unnecessary and, consequently, will cause them to disappear, because it is more advantageous to use « luggers ». There will be, therefore, no further reason for the existence of the « Bommen » and the port built for their use will cause their extinction.

This port has also led, already, to the construction of a few « Bommen » with keels, called *Loggerbommen* or *Lelybommen* which are intermediate between the « lugger » and the « Bom ». The first of these « Bommen » was launched in 1900, but it has not been imitated often as it is scarcely better than a « lugger ». It is clinker built and has the bow of the « Bom » with the stern of the « lugger ». The old and interesting « Bom » is no longer built; it will belong soon to history, like the « bush »

and the « howker », and with it will disappear the last vestige of the « cog ». Since 1896, the number of these vessels has been already reduced from 324 to 212.

Strength of the « Bomschuiten » Fleet, 1899 to 1905.

	1899	1900	1901	1902	1903	1904	1905
Scheveningen	217	205	194	189	183	158	140
Katwijk	67	68	69	71	74	70	66
Noordwijk	15	15	15	10	10	10	5
Egmond	3	—	—	—	—	—	—
Haarlem(Ymuiden)	1	1	1	1	1	1	—
Maassluis	—	—	—	—	—	—	—
Report on ocean fishing, 1905 (p. 149).	303	289	279	271	268	239	211

### THE « GARNALENSCHUIT »

The *Garnalenschuit* (a boat used for shrimp fishing) resembles <sup>III 116</sup> somewhat the original « Bom » and its resemblance to the old « Egmonder Pink » is most striking. <sup>III 117</sup>

### THE « SCHOLSCHUIT » OR « BAZAANSCHUIT » THE ZWARTEWAALSCHIE GAFFELAAR.

There was met with formerly, alongside of the « bushes » <sup>II 219</sup> and « howkers », a fishing boat belonging to the « smack » <sup>II 220</sup> group : the *Scholschuiten* (boats used for the sole fishery) also called *Bazaanschuit*. At Zwartewaal, these vessels carried gaff sails (gaffeltuig) whence their name of *Zwartewaalsche Gaffelaar*.

The Scholschuiten were shorter than the « howkers »; but fairly broad and with a strong frame. They resembled greatly the « Visscherssnikken » of Paessens and Wierum (not to be confused with the « Binnensnikken ») and the « Palingschuiten » of Heeg and Gastneer which used to carry eels to London.

The « Scholschuit », met with at Pernis, Middelharnis and Zwartewaal, was replaced later by the « sloop ».

<sup>11 202</sup> The whale fishery, formerly so flourishing, had disappeared completely in the XIXth century. There were 186 boats still following this industry in 1756; but this number had fallen to 66 in 1785, this change being brought about especially by the large premiums granted by England.

As this industry gradually died away in our country, it became more flourishing, on the contrary, in England. In this latter country, only 26 whaling vessels were to be found in 1750; this number increased to 152 in 1785. Premiums of 3,000 to 8,000 florins, given in that country according to the size of the vessels brought about the result of causing our whaling ships to disappear and only two vessels put out to sea in 1854. (KOENEN, p. 164).

« Noortsvaerders » as well as the « Fluitschepen » already described, were used for this fishery.

The land of the « bushes » was at Vlaardingen and Enkhuizen; a few are found also at Maassluis and Delfshaven, that is : along the Meuse and in the North-West part of the Zuiderzee.

The country of the « Bom » was Scheveningen, Katwijk and Noordwijk, along the flat beach of the North Sea.

That of the « sloop » is Middelharnis, Zwartewaal and Pernis, while the « lugger » is met everywhere.

The old « howker » was found particularly at Maassluis and the « Loggerbom » or « Lelybom » at Scheveningen.

An erroneous idea of the Netherlands fishing fleet would be formed by supposing that only the 724 fishing vessels given in the above list belonged to it. Alongside of these boats, are still found many smaller boats used exclusively for this industry.

If a glance be cast over the Report on the Netherlands Ocean Fishery for 1905, it will be seen that, in this year (p. 342), the fleet contained in all 5334 vessels with a total tonnage of 234,766 tons and a total of 20,141 men in the crews. These figure for 1891 were, respectively : 4427, 164,357 and 15,482.

Situation of the Netherlands Fishing Fleet and of its Crews.

YEAR	NUMBER OF VESSELS	TOTAL TONNAGE	CREWS
1905	5334	234766	20141
1904	5781	215873	21228
1903	5922	218249	21467
1902	5938	215660	21225
1901	5851	199248	20164
1900	5719	195950	19498
1899	5661	191530	19232
1898	5385	186554	18709
1897	5318	184576	18387
1896	5211	181953	17895
1895	5189	179782	17643
1894	5151	176649	17286
1893	4902	172603	16700
1892	4647	167549	16142
1891	4427	164357	15482

The small fishing boats work on the North Sea, along the shores of Friesland and Groningen, on the maritime rivers of Zeeland and of the province of Holland as well as on the Zuiderzee.

All sorts of names of fishing boats are found among them, so that it is very difficult to determine from this point the places whence they come. Then too, these boats have become so numerous in our country during the last fifty years, that the presence of a given type at any place is no proof at all that it had its origin at that place. Thus, for example, « Schokkers » and « Bidders » are now to be found on the Upper Meuse where not one of them was ever built. Just so soon as fishing becomes flourishing, there are brought into use all sorts of boats which were never intended originally for any such purpose. In order to form an exact idea of *fishing boats* and their evolution, only such vessels as were built especially for this use should be considered.

As was said in the general classification, these boats can be divided into principal orders as follows : a) the group of the « Schokkers »; b) that of the « Bidders »; c) bluff bowed boats (« Knots », « Akes », etc).

#### THE « SCHOKKER ».

This boat has a long, fine bow; the stern, on the other hand, <sup>III 120</sup> is narrow. The hull above the bends falls in sharply. The

stem is straight and very much inclined. At the square upper end of the stem is a sheave, one side of which rests on the stem and the other side on a bracket (the « snoes ») which is made firm to the stem. The boat carries a fish tank and has near the bow a cuddy which serves as a lodging. Although the « Schokkers » were originally open at the middle, some are to be found at the present time of larger size and closed. The « Schokker » has at the bow a small deck, called « kootje ».

The « Schokker » carries lee boards and a mast placed at four fifths of the length of the vessel, at the position of the main frame. It is 26.10 m. long, 4.48 m. beam and draws 0.98 m. It is fore and aft rigged (« bazaantuig ») with a short, curved boom and a large fore stay-sail which is attached to the side abaft the mast, consequently without any travelling bar. This latter is sometimes to be found, however, in these latter times. A jib may be set on the bowsprit. The hull was clinker built formerly, now it is frequently carvel built. It is a very old type of vessel, but the large models only date, however, from the XIXth century. Neither WITSEN nor VAN YK speaks of them, although they were already in existence in their time, for drawings of them appear on the stretchers of the reformed church at Workum which dates from about 1600.

<sup>II 203</sup>  
<sup>III 125</sup> The « Schokker » comes originally from the Zuyderzee and especially from the shores of Overijssel (Vollenhoven), of Schokland (probably of Urk also) and of Enkhuizen.

According to common report, the island of Schokland is said to have obtained its name from that of the « Schokkers ».

Its straight, inclined stem separates this boat from the type of the other fishing vessels of the Zuyderzee, with the exception of the « Haringschuit ».

#### THE « HARINGSCHUIT »

The *Haringschuit* (boat used in the herring fishery) may be considered a large « Punter » or a small « Schokker » with less freeboard.

Hence there is no doubt that the old « Schokker », the « Haringschuit » and the « Punter » belong to the same family.

The « Schokker » is distinguished from the others by its higher and more bluff bow, given to it by reason of the more distant trips on the Zuyderzee and the North Sea for which it was intended.

#### THE « PUNTER » AND THE « GONDEL ».

The *Punter* is met with in the North of Overijssel as an <sup>III 141</sup> inland boat. When of large size, it is used as a fishing boat.

The « Haringschuit » is also met with along the shores of Gelderland, but on the coasts of North Holland is frequently found a small boat, the « Vischschuit van Aalsmeer » (fishing <sup>II 183</sup> boat from Aalsmeer) which resembles the « Punter » and sails <sup>II 185</sup> alongside of the *Snik* or the *Gondel* (the old cog) of more massive form, just as solid « Schokkers » are found elsewhere <sup>III 137</sup> alongside of the « Punter ».

The « Gondel », which carries a fish tank, is used however as an inland craft, on the lakes; it ventures very rarely out to sea. All the same, the stem which has a slight rake rises quite high.

The same characteristics appear in the « Wierschuitje » of <sup>III 130</sup> Wieringen where the « Haringschuit » is also met with.

#### THE « HOOGAARS ».

The same type is seen in the old « Kinderdijksche Hoogaars » of South Holland, in the « Steegschuit » of the Biesbosch and <sup>II 273</sup> in the « Steegschuit » and « Hoogaars » of Zeeland, while the <sup>III 132</sup> « Hengst » and « Veerhengst », met with in the same neighbourhoods, are also « Hoogaars » which have undergone slight changes. <sup>III 133</sup> There is also the « Tholensche Schouw » which is just like the « Beyerlandsche Schuitje » used among the islands of South <sup>III 134</sup> Holland. Both these latter vessels have a high, broad bow; they have no stem, the planking ending on the apron. Hence they are « Akes ».

The *Hoogaars* has, therefore, a straight stem with a slight rake, which is much smaller than that of the « Schokker ». The sides which were formerly clinker built are now carvel built. The

bow is rather finer than that of the « Schokker », the stern is rather fuller. The bow is covered while the waist is open and there is a raised deckhouse astern. The « Hoogaarsen » carry a narrow rudder and a lee board on either side; they are fore and aft rigged and show a fore staysail and jib. This vessel is flat-bottomed, like the « schokkers » and other boats already mentioned, but it has no fish tank. The new « Hoogaarsen » of large size have a fuller stern, after the manner of the « Boeiers », and this gave rise in the second half of the XIXth century to the « Hoogaars-Boeier » type. The tendency to make the stern fuller is found now in all fishing vessels and this is causing the characteristic differences between the various types to disappear.

<sup>III 136</sup> The ordinary « Hoogaars » is 15 metres long and 4.50 m. beam. The « Hoogaars » of Arnemuide is somewhat smaller, entirely open, has a small raised deckhouse in the stern and is rigged with spritsails.

#### THE « STEEKSCHUIT »

The *Steekschuit*, constructed like a « Hoogaars », is rather heavier in build and the bow falls in less. The sternpost is rounded at the upper end.

#### THE « HENGST »

The « Hengst » differs very little from the « Hoogaars ». It is used a great deal on the « Hollandsche Diep » (Willemstad.)

All the types before described carry long narrow lee boards, with the exception of the « Tolensche Schouw » and the « Kinderijksche Hoogaars » of which the lee boards are wider. Fishing for <sup>III 130</sup> oysters and mussels now employ a great many « Boeieraakjes ».

#### THE « BOTTER »

<sup>III 121</sup> Instead of types with a straight stem, there are types now to be <sup>III 127</sup> found, to the West of the Zuiderzee and the island of Urk, which have a curved stem. They bear a large number of names by reason of slight differences among themselves, but they all belong

to the same family, that of the *Botters*, of which the old « Tochtschuiten » and « Kubbooten » were the forerunners. Aside from the stem, every thing that has been said in regard to the « Schokkers » is applicable here. They are met with at Urk and along the North Holland shore of the Zuiderzee, South of Medemblik, as well <sup>II 123</sup> as in the provinces of Utrecht and of Gelderland as far as Harderwijk. Their names vary.

The oldest form is the « Kubboot », which is met with under the names of « Vollandammer Kwakken », « Bonse », « Plüte », and <sup>III 126</sup> at Maassluis under that of « Platje van Maassluis ». <sup>III 122</sup>

#### THE « BLAZER »

Since the end of the XIXth century, the « Botters » have been built bigger and more bluff, the result being the *Blazer* type, of which the curved stem falls in less and of which the stern is fuller than that of the « Botter ». This kind of boat is used for fishing in the North Sea and is found all along our shores.

« Blazers » are now built with a « Boeier » stern, giving a mixed type : the *Blazerboeier*. This boat, by reason of its great <sup>III 124</sup> stability, will soon take the place of the « Schokkers » and the « Botters ».

#### THE « LEMMERAAK »

« Akes » are more and more used for fishing in the Zuyderzee. <sup>III 128</sup> These vessels come from Friesland where they are called *Lemmeraak* or « Lemmerjacht. »

They are passably short but robust and bluff, thoroughly <sup>III 129</sup> suited for running in shallow water.

#### THE « BOLLE » AND THE « KNOTS »

The preceding type of boat is found at Urk under the name of *Bolle van Urk*, or else of « Bolletje van Urk ». It is derived from the « smack » group. It is curious to note that boats of the same kind have long frequented the port of Antwerp under the name of *Knots van Antwerpen*. (« Knots of Antwerp »). <sup>III 135</sup>

## THE « JOL »

At Stavoren, there still exists the *Stavorensche Jol* (Stavoren Yawl), a small, short, bluff boat with a keel; it is exceedingly steady on the water. It is also met with now at Enkhuizen and at Medenblik. It is a clinker built boat (sometimes carvel built at the present time) which is often compared to a « sabot » on account of its rounded forms. It carries a fish tank and, as it has a keel, the lee boards are lacking. It is spritsail rigged, and its tonnage is from 4 to 6 tons.

At the Helder, at Enkhuizen and at Medenblik a great deal of use is made of flats, of which the length may be as much as 10 metres. The stern has a sternframe; the quite long bow, on the contrary, rises high with a slight rake. The vessel is clinker built and carries two bilge keels and a bit of a false keel at the after end of the main keel. It gauges generally from 2 to 5 tons.

As a rule, the tonnage of the « Bidders » and « Schokkers » varies from 20 to 30 tons. The smaller types met with at Huizen run from 16 to 20 tons, and at Harderwijk and Elburg, from 13 to 18 tons.

The variations between the fundamental groups may be attributed to the different ideas of builders, just as there are differences in the costumes of various countries.

But the difference between the types of a same group is, on the contrary, the result of the use made of the boat and hence of the fishing apparatus employed on board.

In order to make this more easily understood, it will be well to give a short description of the fishing apparatus used on the Zuiderzee, this description being taken from the report published by the *Zuiderzeevereeniging* (1905, pp. 35 *et seq.*), as well from the annual reports on deep sea fishing.

The fishing outfit can be divided into movable apparatus and fixed apparatus, the latter being the less important for our study.

Belonging to the former, there are :

a) The *Wonderkuil* (*anglicé* : miraculous pocket) which, like the *Kwakkuil* and the *Dwarsskuil*, is composed of a net, in the

shape of a pocket which has its mouth kept open by a square frame (made of four pieces of wood called « juffers-oorstokken »). The net is moved ahead while holding the frame vertical, all the apparatus touching the bottom. The fish enters at the mouth and is captured in a convergent bag. The movement through the water distends the net. The « Wonderkuil » is hung between two « Bidders » which go ahead at the greatest possible speed so as to entrap the quick swimming fish, such as the herring. The large « Bidders », being good sailers, are very well suited to this work.

The « Wonderkuil » scarcely touches the bottom on account of the great speed, but every fish which comes in front of the opening is taken, necessarily. The narrowing of the meshes, caused by the great speed, prevents any from escaping.

b) The *Kwakkuil*, used at Vollandam, is a small « Wonderkuil » drawn by one boat which is generally a « Vollandammer Kwak ». The pocket is then attached to two beams fastened together crosswise at the stern of the boat. As the speed is less than that attained with the « Wonderkuil », the net drags along the bottom which enables eels, plaice and sole to be taken.

c) The *Dwarsskuil* (transverse pocket), smaller than the « Kwakkuil » but of the same shape, is fastened to the side of the boat by lines which lead to the bow and stern. In order to work it, the boat must move crossways and, naturally, its change of position is slow. The boat should not be flat bottomed, and while fishing is going on the lee boards should be raised.

The « Wonderkuil » is used in deep water and on hard sandy bottoms; in shoaler water and on soft bottoms the « Kwakkuil » is brought into play, and in the shallow waters of Utrecht and Gelderland it is the « Dwarsskuilen » which is employed.

The many complaints about the destruction of fish by the « Wonderkuil » were not born of yesterday; for already, in 1559, an ordinance fixed the size of the meshes of the « Aetkens of Steerten » (of the tails of the nets).

There should certainly be mentioned as part of the movable outfit, the drag nets used for catching herring, anchovy, sole and smelt. They are used in all the large fishing ports of the Zuiderzee. These nets are dragged between any two boats whatever.

Along the Frisian coast, fishing is carried on mainly with fixed apparatus; this is particularly the case to the North of Makkum. This way of fishing requires only small boats (24 to 30 traps per boat). Eel and herring traps are used for this purpose. It is probable also that the old *Kubboot* owes its name to a fishing instrument called "Kub", a wicker basket shaped like a funnel, nearly closed at the lower end where, however, a small opening is left. Following this opening is a small silk net in which an opening allows the eels to pass which are piled up in the basket.

Fishing in the Zuiderzee is of a special sort because a large number of Zuiderzee fishermen frequent the North Sea while others devote themselves to fishing in the rivers; those who spend the entire year on the Zuiderzee itself, are the fewest in number. The first use large "Blazers", "Schokkers" and "Botters"; the second take the "Gondels", "Lemmeraken", "Punters", etc., and the last use "Kwakken", "Kubbooten" and "Haringschuiten".

Besides those just mentioned, there are a whole series of chance fishermen using all sorts of boats. Hence it is very difficult to give the exact number of boats in use for fishing and the figures in the above tables are only round totals in so far, at least, as they relate to the Zuiderzee.

#### THE "WATERSCHIP".

<sup>11238</sup> The vessel called "Waterschip", used for towing the *Zee-kameelen* (a sort of floating dock) through the Pampus, has

long been known. The "Waterschip" was, at the beginning, a simple Marken "Botter". As has been seen already, the "Zeekameelen" date from 1651. They were built later with a stronger stem and sternpost and with a deckhouse abaft the mast. These vessels become thus still more separated from the old "Botters".

The towing of the ships of the East India Company, which belonged at first to two private societies (the Big and the Little Societies), was granted by contract, subsequently to 1741, to the more important society which gave to its "Waterscheepjes", as a distinguishing mark, a plate of tin fastened to the stem. This measure did not suffice, however, to keep off the competitors. It was ordered, in 1783, that the Admiralty arms should be painted on the sails of the accepted vessels, just as letters are painted on the sails of fishing boats at the present time.

Under the French domination, when navigation was reduced to a forced suspension, the "Waterscheepen" went so to pieces that, in 1824, of the 18 which were still in existence, 6 were broken up. The remainder were sold in 1827, after the opening of the North Holland Canal. (LE COMTE, p. 38.)

These "Waterscheepen" must not be confounded with those used for carrying sea water and of which a few engravings are reproduced in the collection. These boats, with scarcely an exception, belong to the group of "smacks".



THE number of the *Annales de Travaux Publics* of Belgium for August 1901 contains a detailed study of the Inland Navigation floating stock circulating in Belgium. This study is the work of Mr. DEHEM, Principal Engineer of the Ponts et Chaussées. It contains a description of the types of boats in use on the French and Belgian canals. These types of boats, built especially for these canals, are of no historic value. As

they are seen frequently, however, on the Zuid-Willemsvaart (the canal from Maastricht to Bois-le-Duc), a brief description of these boats, called "Ballanten" in Holland, will not be out of place.

They can be classified, as a rule, as follows (1):

- A) Baquets of Charleroi;
- B) Walloon boats or "péniches".

11 257 The boat of group A, called "Bak" in Flemish, is a parallelepipedon in shape. Its average length is 19.50 m.; its breadth, 11 265 2.60 to 2.65 m.; it draws from 0.35 m. to 0.40 m. when light and 1.80 m. when fully laden. With the latter draught its tonnage oscillates between 67 and 71 tons. This type of boat was introduced particularly for navigation on the Charleroi canal, of which the old small locks have a neat length of 19 metres and a breadth of 2.70 m. The clear height of the permanent bridges on this navigable highway varies from 2.65 m. to 3 metres.

(1) As the names of the boats which follow are almost strictly local, no attempt has been made to translate them. *Péniche*, however, is the general name in France and Belgium for the standard canal boat of about 300 tons.

These boats cost from 4,500 to 7,500 francs.

The boat of group B, called "Waal" in Flemish, is also a box having the shape of a parallelepipedon with a flat bottom and nearly plane sides. According to the differences in shape of the bow and stern, these boats are known by different names, such as: 1° Tournai boat; 2° chaland; 3° bélandre; 4° pointu.

It should be said, however, that the last two names should be assigned rather to old types and that the first two should be reserved for the large canal boats (*péniches*) generally built at present.

The Tournai boat has the forward and after faces rounded and a quite marked curve in the vertical plane, so that the boat shows a curved stem called the *nose*. The forward face carries a bend called the *moustache* and has on top a wooden rail to support the tow line which is made fast to the towing bitt back of the nose.

In the *chaland*, called also "Ballant", the forward and after faces are nearly plane, the nose and moustache are slightly marked and the towing bitt is placed at the extreme forward end of the boat.

As a rule, these boats are not very strongly built and their planking suffers a good deal through the sharp curves at bow and stern. Their shape is so determined that they shall exactly fill the locks and that they shall then have a maximum loading capacity, although it is altogether incomprehensible that, just in order to get a few more tons on board, the whole question of facility of towing should be entirely neglected. What is gained then in one way is doubly lost in another in high charges for towing.

The only explanation which can be given for this manner of building is, that most boatmen have their own tow horses, for which a stable is placed at the centre of the boat, so that they do not notice the additional costs of towing which they have to pay.

The dimensions of Tournai boats and of the chalands are the same; their length varies from 37.50 m. to 39 metres, not counting the rudder, and their breadth goes from 5.00 m. to 5.05 m.; they draw empty, on an average, 0.28 m., and when loaded from 1.80 m. to 2.30 m., with a tonnage of 300 to 370 tons.

By comparing the *bélandres* and *pointus* with these boats, it

can be seen that the latter can carry less than the former on account of their finer bow, whence their name of *Pointu* or *Spits*.

The essential difference between the « bélandre », called in Flemish *Bijlander*, and the « pointu » lies in this, that the bottom of the former connects with the forward face by means of a curved surface, whereas the bottom of the latter remains flat up to the nose. The two types differ little in other respects. They are rarely built now. It is true that new « pointus » are still met with, but they should be considered rather as bastard « péniches ». Here again is seen a fusion of different forms accompanying an increase in the size of the boats.

The « bélandres » are 28 to 34 metres long, 4.60 m. to 5 metres broad and draw 0.30 m. to 0.40 m. light and up to 2 metres loaded.

The « pointu » is 20 to 30 metres long and generally 3.50 m. broad (never reaching 5 metres); it draws light, on an average, 0.35 m., and 1.80 m. when loaded. Its tonnage is from 100 to 200 tons.

The largest *pointus* measure 32 metres in length and 4.90 m. in breadth; they gauge at most 250 tons on a draught of 2.15 m.

Many of the types just mentioned are now often built of steel.

The « Prij » should also be mentioned in the chapter relating to these boats; it is a « spits » made in two distinct parts, each of which can be loaded separately.







SHIPBUILDING in Europe developed around two centres which came into contact in the neighborhood of 1300. The fusion of the two zones took place only between 1450 and 1500.

The Northern centre, that of the Baltic Sea, which had its origin in Sweden and Norway, only reached its full expansion in the time of the Vikings. The types of boats of the various nations along the shores of the seas of the North of Europe

show undeniable analogies both in form and in mode of construction.

Going further into the continent, the same striking analogies still appear, so that the likeness of forms is further strengthened along the East-West line.

Map No 1 herewith shows in green the sphere of the Northern centre; the probable direction of the movement of the rounded Frisian types being given by a full line, the direction of the finer types by a dotted line and that of the types of the Lower Rhine by a broken and dotted line.

The Southern centre, situated in the Mediterranean, and originally from Phœnicia, is marked in red. There too, shipbuilding developed along an East-West line. Although it may not be certified, from the nautical standpoint or with the data at hand, that the Southern centre was under the influence of Asia, it can be observed, however, that many forms and processes of construction noted in old engravings are still found in the Arab, Indian and Chinese vessels.

Hence it follows that it is all the more necessary to carry on our investigations in that direction because the old methods of

propulsion and of steering have been relatively well preserved in Asia rather than in Europe.

There is no doubt that relations in connection with this subject will be found between the Southern centre and a part of Asia.

Shipbuilding, which came to us from the Baltic Sea, was first put to use for fishing, that undoubted cradle of every great maritime race. The gradual growth of this industry widened the field of action and favored trade as it did in the Flanders. Hence, there will be no cause for astonishment in finding that the oldest memories of Holland in reference to shipbuilding are those of the herring fishery.

The birth of the cog, for example, is due to the rise of this kind of fishing; then this type of vessel led to that of the "Egmonderpink", and afterward to that of the "Bom", which will very soon have disappeared and of which it may be said that it will have formed the last vestige of the "Cog".

The whole evolution of the ship is founded, furthermore, on *tradition*. This, however, did not lie alone in servile imitation of all that our oncestors had turned out, but in yielding to new demands which the special conditions of the period brought with them.

The evolution of the ship, like that of its size, has been gradual. So the ships of antiquity were smaller than those of the Middle Ages, and these in their turn were smaller than the vessels of modern times.

Neither the compass, the adoption of the rudder nor even the invention of gunpowder were able to bring about sudden changes in naval architecture. It was only gradually, and through improvements in artillery, that ships became heavier; so that at the beginning of our war for independence the distinction had begun to be made between war vessels and merchantmen, which until then had both been equally used for military purposes.

It was after the discovery of America and of the route to the East Indies, two events of the greatest importance for the evolution of the peoples of Europe, that the commerce of the world left the Mediterranean and moved toward the North Sea. Then it was that our country woke up and soon surpassed all others in shipbuilding. The Netherlands then carried naval construction back toward the Baltic.

France also borrowed from us the elements of shipbuilding. The province of Holland was at the head of this branch of construction from 1500 to 1700; France then took Holland's place and, from the middle of the XVIIIth century, had its own separate construction. It was the keen French mind which guided all countries in the systematic construction of ships.

England, always practical, has ever done her best to keep up with the country which turned out the largest ships. HOLMES'S work shows this tendency clearly. After 1800, England outstripped her rivals and set the pace for naval architecture. Numerous improvements were carried out under the influence of that country.

The continental blockade dealt our shipbuilding a mortal blow. It was only through the initiative and the energetic backing of King William I that the industry revived in the first half of the XIXth century and reached, in the second half, a new period of prosperity. Japan's first modern war vessels were built in Holland.

The coming of steel opened a new era for our naval architecture and our worthy shipbuilders have been able to do honor to the traditions of our race by proving themselves now, as formerly, economical architects with the ability to give a pleasing appearance and an irreproachable finish to a solid construction.

The distribution of the groups of the various types of boats is shown on map 3, while map 4 gives the subdivision of these groups in the Netherlands.

The Frisian types appear on both these maps in blue; the types of the Lower Rhine, which penetrated into the North-West of Brabant and into the heart of South Holland, are given in brown; the types of the Upper Rhine are in violet, those of the Lower Meuse in red and those of the Upper Meuse in green. The types with finer lines of Overijssel, surrounded by those from Friesland and the Lower Rhine, and which are also met with on the Ems, the Weser, the Elbe, the Havel and the Spree are shown with a paler shade.

Chart No 4 shows the zone of the fishing boats which frequent the North Sea. These last, except the "Lugger" and the "Sloop", belong to the Friesland type. It is curious to bring the boundaries of charts 5, 6 and 7 together, containing, as they do, the results of the patient researches of the late Professor Dr. Gallée, so well

known and esteemed for his vast learning as well as for his great kindness, when, some time ago, he was so good as to place copies of these charts at the author's disposal.

A mere glance is sufficient to show that the limits of costumes have been most changed; but, on the contrary, there is a striking resemblance from the point of view of the distribution of languages and, especially, from that of the kind of dwellings.

The Frisian and Saxon influences agree on the different charts, while the types of the Upper Meuse are found every where that the architecture of the Roman villas has been preserved. Hence it is not astonishing that these types of the Meuse resemble those found in the valley of the Po and on the Adriatic Sea.

These observations agree with the historical researches which have established the fact that the countries bordering on the North Sea were inhabited by the Celts who came from the East to Central and Western Europe several centuries before our era. The Celts drove out the Mongols, who were already settled there; but they, in their turn, were driven from the West by the Germans. This is what caused the Romans to say that, north of the Rhine, the Celts had already been driven out everywhere by the Germans. The Rhine was at that time the general boundary line between the two peoples. South of this river there only a few German out-lying positions, like those of the Eburones at Maestricht and Roermond, and of the Condrosii near Liège. The Germans and Celts are confounded along the Meuse. The Celts in North Brabant had already become very much germanized, while the Menapii, the Morini and the Nervii of Flanders and Zeeland also felt this influence. All these germanized Celts were called Gauls by the Romans. The Germans penetrated several times into Gaul, they even came as far as the Menapian country in the valley of the Scheldt; but Cæsar succeeded in driving them back, in the year 55 B. C. After the latter's conquests, the Rhine became the frontier of Roman domination and so remained until about the IXth century. The Gauls quickly became latinized. North of the Rhine, the Roman influence made itself felt on the Batavi, the Chamavi and the Frisians. Still, this influence was not very strong, especially on the last-named tribe. From the moment that the Roman power

began to weaken, the Germans reappeared, and it was especially the Franks who proved to be the stronger. These latter, who inhabited the region of the Lippe, the Ruhr and the Upper Ems, were probably being pushed out already at this time by the Saxons. The Franks were again driven beyond the Rhine by the Emperor Probus, in 280, but they advanced again toward the South after the death of Constantine the Great (337). Cologne fell into their hands and they appeared in front of Treves. Julian prevented, however, their entering Taxandria, the present North Brabant.

The Salians, the strongest of the Franks, remained in the country of the Batavi while the Chamavi, another their of tribes, settled on the North of the Rhine. The Salians and Batavi soon consolidated into a single tribe. Then when the Romans retired in 402, during the reign of the Emperor Honorius, the Franks started again on their route toward the South and invaded North Brabant.

The Saxons who, as already mentioned, had probably started the Franks, inhabited the country lying between the Ems and the Elbe, consequently the North of Germany. They settled in the East of our country and, later, extended their influence northwardly.

The Frisians, who are generally spoken of in connection with the Saxons, were able to hold their ground between the Weser and the Zwin (Zeelandisch Flanders). Their King, Radboud, carried their domination to the South of the Rhine and pushed on even so far as Cologne where he was defeated by Charles Martel.

If Holland was called Frisia (or Friesland) in the Middle Ages, only as far as the mouth of the Meuse, it is related, on the other hand, that Saint Amand preached the Gospel to the Frisians of Zeeland. This tradition is confirmed by Prof. FOCKEMA ANDREA, who has shown that the Frisian law of 800 was applied from the Weser to the Zwin and the Frank law as far as the Ems, that is to say : the Chamavi inhabited the Veluwe to the East of this river; consequently Utrecht belonged to Frisia.

It is also said, in connection with the struggle of the Frisians against the Franks, that Utrecht was situated on the frontier of Frisia.

In a word, the Netherlands were inhabited originally by Celts whom the Germans drove toward the South. Later, they were able, with the assistance of the Romans, to hold their ground to the South of the big rivers of the country. The first Germans in Holland were the Frisians. They occupied the coast from the Weser to the Zwin and, at a few points, established themselves among the Celts.

Thus it is that Frisian types of vessels are found from Denmark to Flanders and that they penetrated as far as Utrecht and along the tidal rivers.

The Chamavi, the first Franks, very probably occupied the Veluwe and the Betuwe as far as the Singe and the Ems.

Later, the Franks, settled North Brabant and penetrated into Zeeland, Utrecht and South Holland. As a matter of fact, we have already been impressed at meeting, in our country, with types of boats of the Lower Rhine not only along the Rhine and its tributaries, but even in the heart of South Holland and in the North-West of North-Brabant.

The Saxons, who were the last to arrive, settled in the East of the country and spread gradually into Groningen and Friesland. It is there that the slender Overijssel or Saxon types are met with.

Types of vessels, just like the styles of dwellings, languages and costumes, have certain relationships with the first inhabitants of countries.

This explains why types of different boats are found along the same river and the same country.

So, old forms and old customs last through the ages and our country can pride itself not only on a glorious past but also on its ability to maintain so enviable a place in the domain of naval architecture, for the words that WITSEN wrote in 1671 :

“ In 't overleg van een zuinig meester  
„ bestaet al 't geheim van  
„ goedkoop bouwen. „ (1)

can always be applied to our able builders of ships.

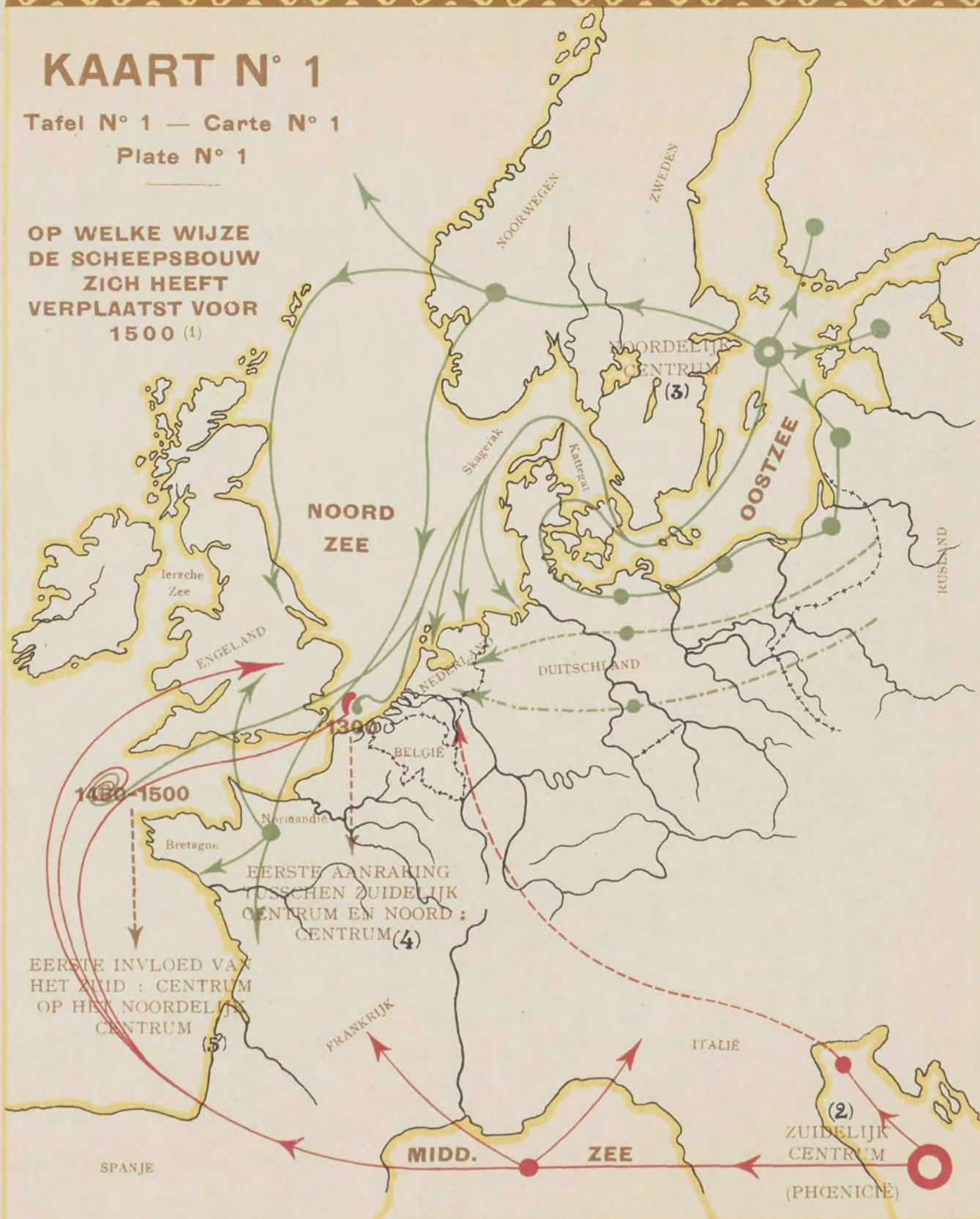
(1) The entire secret of economical construction lies in the reasoning of a careful builder.



# KAART N° 1

Tafel N° 1 — Carte N° 1  
Plate N° 1

OP WELKE WIJZE  
DE SCHEEPSBOUW  
ZICH HEEFT  
VERPLAATST VOOR  
1500 (1)



(1) Wie sich der Schiffbau vor 1500 bewegt hat.

(2) Südlicher Mittelpunkt.

(3) Nordlicher Mittelpunkt.

(4) Erste Berührung zwischen dem südlichen und nördlichen Mittelpunkt.

(5) Erster Einfluss des südlichen auf den nördlichen Mittelpunkt.

Evolution de l'architecture navale avant 1500.

Centre méridional.

Centre septentrional.

Premier contact entre le centre méridional et le centre septentrional.

Première influence du centre méridional sur le centre septentrional.

Way in which shipbuilding moved before 1500.

Southern Centre.

Northern Centre.

First contact between the Southern centre and the Northern centre.

First influence of the Southern centre on the Northern centre.

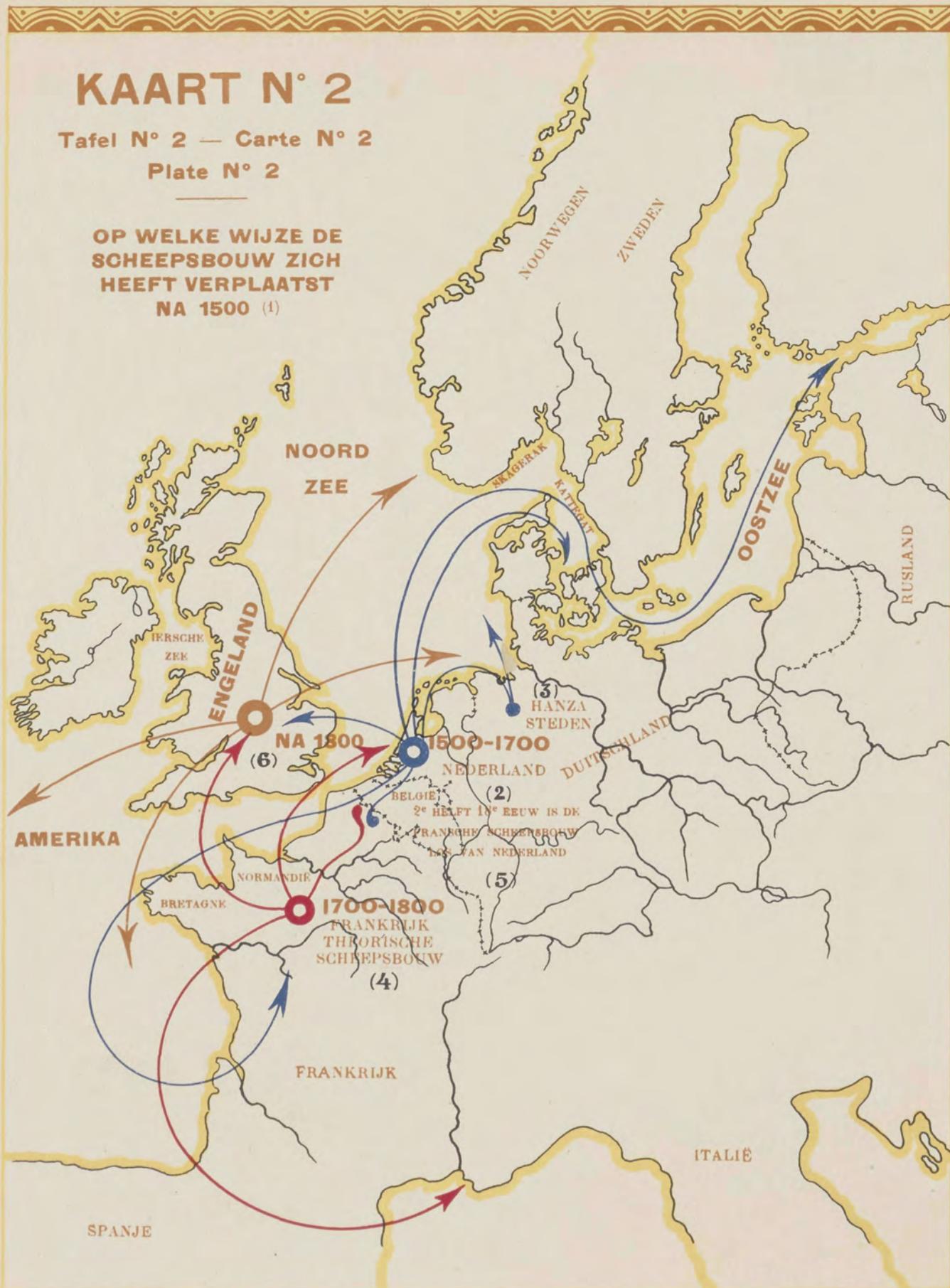


# KAART N° 2

Tafel N° 2 — Carte N° 2

Plate N° 2

OP WELKE WIJZE DE  
SCHEEPSBOUW ZICH  
HEEFT VERPLAATST  
NA 1500 (1)



(1). Wie sich der Schiffbau nach 1500 bewegt hat.

(2). 1500-1700. Niederlande.

(3). Städte des Hansabundes.

(4). 1700-1800. Frankreich. Der theoretische Schiffbau.

(5). Die französische Bauweise trennt sich von der Niederlande.

(6). Nach 1800. England.

Évolution de l'architecture navale après 1500.

1500-1700. Pays-Bas.

Villes de la ligue hanséatique.

1700-1800. La France. L'architecture navale théorique.

L'architecture navale française se sépare de celle des Pays-Bas.

Après 1800. l'Angleterre.

Way in which shipbuilding moved after 1500.

1500-1700. Netherlands.

Cities of the Hanseatic League.

1700-1800. France. Theoretical shipbuilding.

French shipbuilding withdraws from that of the Netherlands.

After 1800. England.



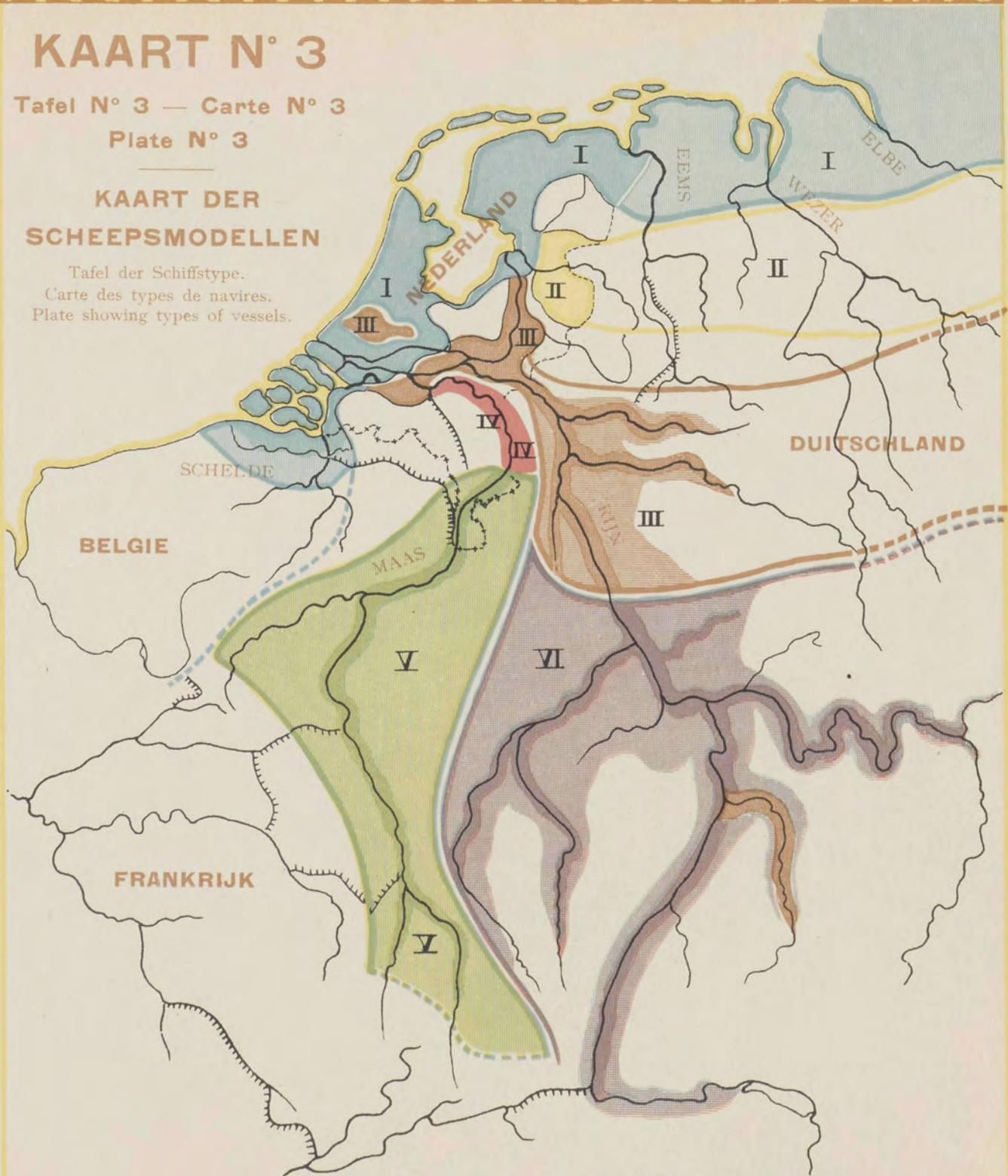


# KAART N° 3

Tafel N° 3 — Carte N° 3  
Plate N° 3

## KAART DER SCHEEPSMODELLEN

Tafel der Schiffstypen.  
Carte des types de navires.  
Plate showing types of vessels.



Friesche modellen.  
(Smak, enz.)

Friesische Type.  
(Smacken, u. s. w.)

Types Frisons.  
(Semaque, etc.)

Frisian types.  
(Smack, etc.)



Overijselsche modellen.  
(Somp, pegge, enz.)

Type von Overysel.  
(Somp, Pegge, u. s. w.)

Types de l'Overysel.  
(Somp, pegge, etc.)

Overysel types.  
(Somp, pegge, etc.)



**Rijn**  
(Dorstensche aak).

der **Rhein**  
(Aak von Dorsten).

**Le Rhin**  
(l'Aque de Dorsten).

The **Rhine**  
(Ake from Dorsten).



**Maas**  
(Hedelsche aak).

die **Maas**  
(Aak von Hedel).

**La Meuse**  
(l'Aque de Hedel).

The **Meuse**  
(Ake from Hedel).



**Maas**  
(Whale majol).

die **Maas**  
(Whale majol).

**La Meuse**  
(le Whale majol).

The **Meuse**  
(The Whale majol).



**Boven Rijn**  
(Keen).

der **Oberrhein**  
(der Keen).

**Le Rhin supérieur**  
(le Keen).

The **Upper Rhine**  
(Keen).



# KAART N° 4

Tafel N° 4 — Carte N° 4  
Plate N° 4



1)  
TAFEL DER SCHIFFSTYPEN  
CARTE DES TYPES DE  
NAVIRES  
PLATE SHOWING TYPES  
OF VESSELS

1		Schokker, Schocker	Smak, Schmaeke	25		Rijnmodel (Dorstenische aak)
2		Haringschuit, Heringsboot	Semaque, Smack	26		Rheinlyp (Aak von Dorsten)
3		Punter Gondel, etc.	Tjalk, Tialque, Hoy	27		Type rhéan (Aque de Dorsten)
4		Steekschuit, Steekschute, Hengst	Yacht, Yacht	28		Rhenish type (Ake from Dorsten)
5		Hoogaars	Schuit, Schute			
6		Thiolenische Schouw	Poon			
7		Thiolenische Schauwe	Piel			
8		Blazer, Blazer	Kraak, Gallion			
9		Slavorensche Jolle	Kof, Kof, Kofyalk			
10		Lemmerjacht, aak	Mot, Motte			
11		Lemmerjacht, aake	Bok, etc.			
12		Lemmerjacht, aake	Utrechtische Praam			
13		Lemmerjacht, aake	Praam von Utrecht			
14		Lemmerjacht, aake	Utrecht Praam			
15		Lemmerjacht, aake	Utrecht Praam			
16		Lemmerjacht, aake	Utrecht Praam			
17		Lemmerjacht, aake	Utrecht Praam			
18		Lemmerjacht, aake	Utrecht Praam			
19		Lemmerjacht, aake	Utrecht Praam			
20		Lemmerjacht, aake	Utrecht Praam			
21		Lemmerjacht, aake	Utrecht Praam			
22		Lemmerjacht, aake	Utrecht Praam			
23		Lemmerjacht, aake	Utrecht Praam			
24		Lemmerjacht, aake	Utrecht Praam			
25		Lemmerjacht, aake	Utrecht Praam			
26		Lemmerjacht, aake	Utrecht Praam			
27		Lemmerjacht, aake	Utrecht Praam			
28		Lemmerjacht, aake	Utrecht Praam			

Bovenlanders, Oberlander

De vaartuigen voor de grootvisserij zijn in de teekening aangegeven.  
Die Seefischereitype sind in der Tafel angegeben.  
Les types de la pêche maritime sont indiqués sur la carte.  
This plate also shows the types for deep sea fishing.



# KAART N° 5

Tafel N° 5 — Carte N° 5

Plate N° 5

## KAART DER DIALECTEN NEDERLAND.

Dialecttafel.  
Nederlands.

Carte des dialectes.  
Pays-Bas

Dialect Chart.  
Netherlands.



*Naar Prof. Dr Gallée*



Friesche dialecten.

Friesische Dialekte.

Dialectes frisons.

Frisian dialects.



Saksische dialecten.

Säksische Dialekte.

Dialectes saxons.

Saxon dialects.



Frankische dialecten.

Fränkische Dialekte.

Dialectes francs.

Frankish dialects.



# KAART N° 6

Tafel N° 6 — Carte N° 6

Plate N° 6

## VOLKSKLEEDER-DRACHTEN

Tafel der Volkstrachten  
 Carte des costumes nationaux  
 Plate of national costumes



<b>I</b>	Ooryzer en Friesch-Zeeuw- sche knoop en slot.	Ohringe und Schliesshaken, friesisch-niederländisch.	Boucle d'oreille et fermoir frison-zélandais.	Dutch-Frisian earring and clasp.
<b>II</b>	Idem.	Idem	Idem.	Idem.
<b>III</b>	Utrechtsche muts.	Haube von Utrecht.	Bonnet d'Utrecht	Utrecht cap.
<b>IV</b>	Kornet. Vroeger Twentsche muts.	Haube, früher Haube von Twente.	Cornette, jadis bonnet de Twenthe.	Hood, formerly Twenthe cap.
<b>V</b>	Vlaamsche muts	Flämische Haube	Bonnet flamand	Flemish cap
<b>VI</b>	Brabantsche muts	Brabanter Haube	Bonnet brabanton	Brabantine cap
<b>VII</b>	Limburg.	Limburg.	Limbourg.	Limbourg.





# KAART N° 7

Tafel N° 7 — Carte N° 7

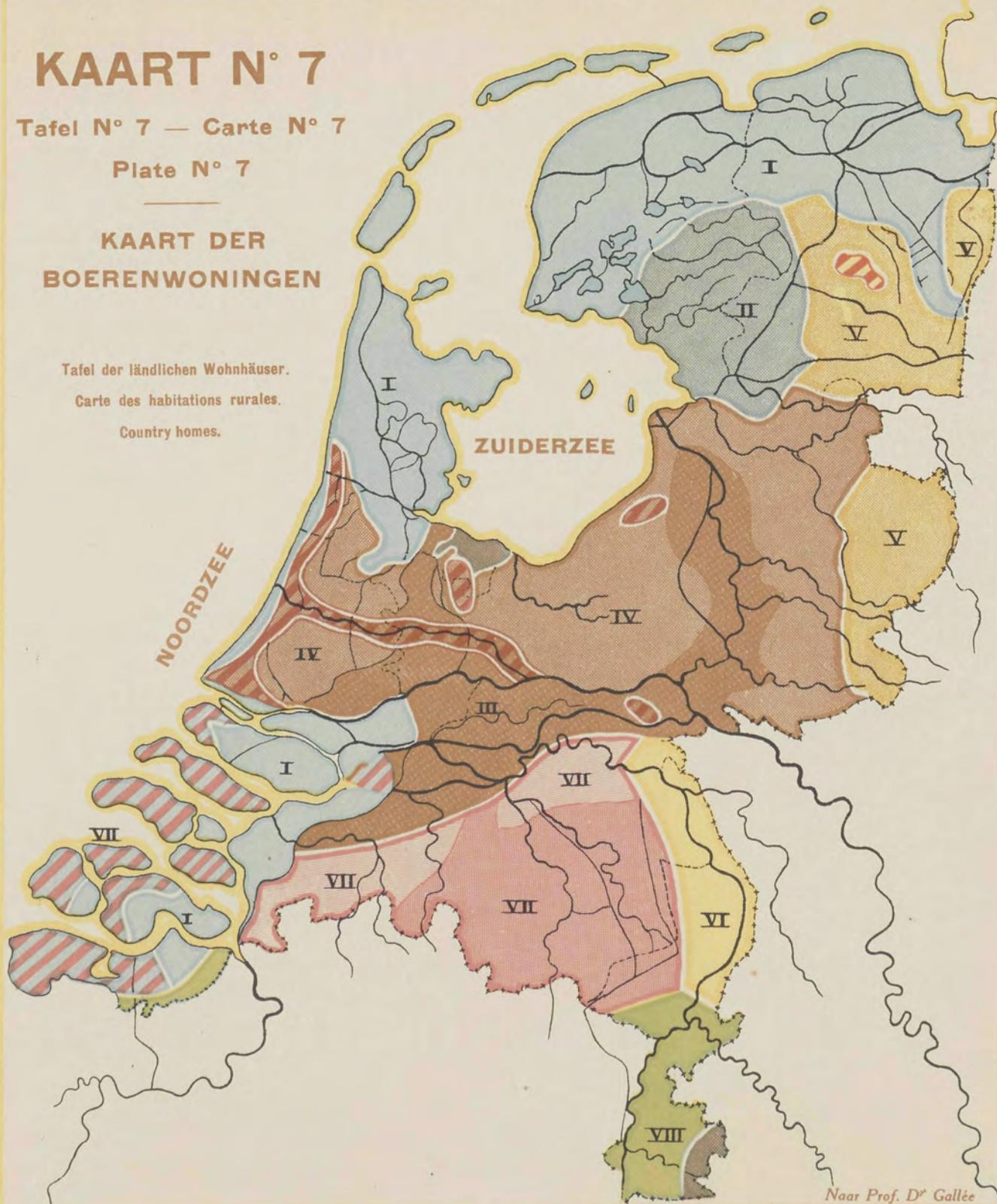
Plate N° 7

## KAART DER BOERENWONINGEN

Tafel der ländlichen Wohnhäuser.

Carte des habitations rurales.

Country homes.



Naar Prof. D<sup>r</sup> Gallée

<b>I</b> Friesch	Friesische.	Frisonnes.	Frisian.
<b>II</b> Langhuis met Fr. : hooiber- ging.	Langhaus mit friesischen Heuboden.	« Langhuis » avec grenier à foin frison.	« Langhuis » with Frisian hayloft.
<b>IV</b> } <b>III</b> } <b>Rijn en Yssel</b> } T. huis, ver- mengd met IV.	<b>Rhein-Yssel</b> } Haus in T form verbunden mit IV.	<b>Rhin - Yssel</b> } Maison en forme de T combinée avec IV.	<b>Rhenish-Yssel</b> } T. shaped house combin- ed with IV.
<b>V</b> Twentsch.	Haus von Twente.	Maison de Twente.	Twenthe house.
<b>VI</b> Langhuis } met hooiber- ging bo- ven in de schuur.	Langhaus } mit Heuboden über der Scheune.	« Langhuis » } avec grenier à foin au- dessus de la grange.	« Langhuis » } with hay loft above the barn.
<b>VII</b> Brabantsche huis.	Brabanter Haus.	Maison brabançonne.	Brabantine house.
<b>VIII</b> Romeinsche villabouw.	Typ der römischen Villa.	Type de la villa romaine.	Type of Roman villa.
<b>IX</b> Idem naast het duitse huis.	Idem neben dem deutschen Wohnhause.	Idem à côté de l'habitation allemande.	Idem along side of German dwelling.





