

# PREHISTORIC NAVAL ARCHITECTURE OF THE NORTH OF EUROPE.

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A tale of the times of old,  
The deeds of the days of other years. (OSSIAN.)

## INTRODUCTION.

In studying the art of shipbuilding, as performed in the North of Europe and illustrated by both Saga-accounts and actual remains, our attention is drawn toward numerous similarities with the ships of ancient Greece and Rome, which suggest a common origin. Although this is denied by many investigators, on the supposition that the ships of long-stretched build without sail, or only using it with favorable and constant winds, upon the comparatively quiet waters of the Ægean, Ionian and Thyrrenian seas, could not be an example to the people who navigated the northern seas, with their short, chopping waves, sudden changes of wind, tremendous storms, shoal shores, and sand bars, and that these people "had to be their own teachers,"<sup>1</sup> yet there lingers something in the naval structures of Scandinavia which seems to indicate that the maritime explorations of the people of the south, the Phœnicians, did have a tendency to influence the ancient inhabitants of the north in the construction of their vessels. It is true little is known in a direct way of the shipbuilding of the Phœnicians, yet the art taught them by the Egyptians and illustrated in some of the ancient relics of the seventeenth century B. C.<sup>2</sup> may be traced to the Greeks whose naval structures, at the height of their achievements, in many points show a remarkable resemblance to those one thousand years older,<sup>3</sup> and are reproduced in the Roman ships.

Of the naval structures of these two nations contemporaries have given accounts,<sup>4</sup> and while often written without technical knowledge their writings are not without value. Considerable attention has been given the subject during the last three and a half centuries, as shown by

<sup>1</sup> *Barthold*: Geschichte der Deutschen Seemacht. In Rammer's Hist. Taschenbuch, III Folge, Band I, 1850, p. 228.

<sup>2</sup> *Baummeister*: Denkmäler des Klassischen Alterthums, p. 1593, fig. 1656.

<sup>3</sup> *Græser*: Flotte einer ägyptischen Königin.

<sup>4</sup> Æschylus, Appian, Aristophanes, Cæsar, Diodor, Euripides, Hæschylus, Livius, Plutarch, Pollux, Sophocles, Thucydides, Xenophon.

Dr. Emil Luebeck, one of the most recent and thorough investigators, from whose work<sup>1</sup> I have borrowed the bibliography of authors since 1536,<sup>2</sup> given below, and which has greatly aided me in the following description of the construction of the ships of ancient Greece and Rome.

<sup>1</sup> *Luebeck, Dr. Emil*: Das Seewesen der Griechen und Römer. Hamburg, 1890.

<sup>2</sup> *Bäif, De* (Lazarus Bayfius): Annotationes in L. II. de captivis et postliminis reversis, in quibus tractatur de re navali. Paris, 1536. *Doletus*: De re navali liber. Leiden, 1537. *Gyraldus*: De re nautica libellus. Basel, 1540. *Calcagnius*: De re nautica commentatio ad Gyraldum. *Stewechius*: Comment. ad Vegetium IV. 37. Leid., 1592. *Henricus Sarilius*: De Militia Romana. Heidelberg, 1691. *Joseph Scaliger*: Animadv. in chron. Eusebii Thesaur. temp. Leid., 1606. *Willebrord Snellius*: Typhis Batavus sive histodromica de navium cursibus et re navali. Leid., 1624. *Thomas Rivinus*: Historia navalis antiqua. London, 1633. *Scheffer*: Dissertatio de varietate navium. 1613 (reproduced in Gronov. Thes. Græc. antiq. XI, p. 769). *Marci Meibomii*: Notæ in Vitruvium (Edit. Joane de Laet). Amsterdam, 1619. *Scheffer*: De militia navali. Upsala, 1654. *Jacob Palmerius* (Paulmier à Grentemesnil): Exercitatio ad optimos fere auctores Græcos. Leiden, 1668. *Meibom*: De fabrica triremium. Amsterdam, 1671. *Nicolaus Witsen*: Aelonde en hedendaegsche Schaeps-Bouw en Bestier. Amsterdam, 1671. *Scheffer* (pseudonym. Constantinus Opelius): De fabrica triremium Meibomiana. Amsterdam, 1672. *Rafael Fabretti*: De columna Traiana. Rome, 1683. *Isaac Vossius*: De triremium et liburnicarum constructione (reproduced in Grævius: Thes. antiq. Rom. XII, p. 709-734). Leid., 1699. *Père Languedoc*: Traité sur les trirèmes, ou les vaisseaux de guerre des anciens. Paris, 1721. *P. P. de Châles and Saundon*: In Journ. de Trévoux, Sep., 1722. *Admiral Théronard*: In Mém. de l'Acad. roy. de Brest. Tome I, 1733. *Père de la Mangeraye*: In Journ. de Trévoux, Oct., 1722. *Deslandes*: Essay sur la marine des anciens et particulièrement sur leur vaisseaux de guerre. Paris, 1748. *Le Roy*: Seconde Mémoire sur la marine des anciens (Hist. de l'Acad. roy. des inscrip. xxxviii. Paris, 1777. *General Melril* (by Pownall): A treatise on the study of antiquities. London, 1782. *Graf Carli*: Delle triremi. Milano, 1785. *Rondolet*: Mémoires de la marine des anciens. Paris, 1820. *Howell*: Essay on the war galleys of the ancients. Edinburgh, 1826. *H. v. Minutoli*: Ueber den Seeverkehr und das Schiffswesen der Alten. In Zeitschr. f. Kunst und Geschichte des Krieges, 1835. *Smith*: Ueber den Schiffbau der Griechen und Römer im Alterthum. Translated by H. Thiersch. Marburg, 1851. *Jal*: La flotte de César. Paris, 1861. *Keller*: Besprechung von Jal, La flotte de César. Philol. xix, 1863. *Grauser*: De veterum re navali. Berlin, 1861. Contin. in Philol. iii Supl. vol., pt. i; Philol. xliii. *Kirchhoff*: Ueber die Rede vom trierarchischen Kranze. In Verh. Berlin. Akad., 1865. *Angeliomotti*: Delle due navi Romane. Rome, 1866. *Lupi*: Il remeggio delle navi antiche, 1875. *Conze, Hauser und Beundorf*: Neue archäologische Untersuchungen auf Samothrake. 1880. *Joly de Maizeroy*: Conf. Du Sein, Hist. de la marine. Paris, 1863. *Fincati*: Le triremi. Roma, 1881. *Leopold Brunn*: In Verh. 35 Philol. Versamml. Leipzig, Treubner, 1881. *A. Cartault*: La trière athénique. Paris, 1881. *L. v. Henk*: Die Kriegsführung zur See. Berlin, 1881. *R. Werner*: Besprechung von Brunn "Axatos." Göttingen gel. Anz., 1882. *Roul Lemaître*: Disposition des rameurs sur la trière antique. Revue archéol., 1883. *Boeckh*: Staatshaushalt der Athener. *Boeckh*: Urkunden über das Seewesen des attischen Staates. *A. Baumstark*: Navigatio. In Pauly's Real Encyklop. v. *Das Ruderboot*. In Wassersport, 1883, No. 17. *Saefkow*: Konstruktionsplan einer Pentere. In Wassersport, 1881, No. 17. *Gilbert*: Handbuch d. griech. Staatsaltert. *Serre*: Les marines de guerre de l'antiquité et du moyen âge. Paris, 1885. *Breusing*: Die Nautik der Alten. Bremen, 1886. *Breusing*: In Iw. Müller's Handb. v. Klass. Alterth. Wiss. iv. Nachtrag. *Breusing*: Die Lösung des Trierenrätthsels. Bremen, 1889. *Helbig*: Das homerische Epos aus d. Denkmälern erklärt. Leipzig, 1887. *Bauer*: Griech. Kriegs-alterthümer. In Müller's Handb. v. Klass. Alterth. Wis., Bd. iv. *Blümner*: Tech-

The skeleton of the ship consists of the keel and the ribs. The keel is a strong, square beam corresponding to the length of the ship.<sup>1</sup> To this is secured a stout plank, the false keel, which serves in the two-fold capacity of strengthening the keel and protecting it from injury. In war vessels, oak was generally employed for the keel. Its ends, slightly elevated, served as a basis for the stem and stern posts; the almost perpendicular prow was strengthened by an apron, and carried a top-piece<sup>2</sup> with an ornament. The sternpost, too, was strengthened by an apron, and carried a top piece.<sup>3</sup> The U-shaped ribs, seldom consisting of one piece, were made of pieces exactly fitted and bolted together.<sup>4</sup> In order to secure firmness and prevent lateral displacement of the ribs, they were provided with notches into which the keel fitted; a longitudinal movement was prevented by the keelson, which fitted into the intervals between the ribs, and thus kept them in place and pressed them firmly against the keel.<sup>5</sup>

The aprons of the prows joining the keelson at an angle, it required here a knee, which, while supporting the former upon the inner side, connected them firmly with the keelson. These knees, made of stout, crooked timber, imparted the strength and power of resistance to the prows especially required by the stem for ramming.

The form of the hull is thus given by the ribs; the ship may be built sharp upon the keel or its bottom may exhibit a shallow curve. It is shown, however,<sup>6</sup> that the war-vessels of antiquity cannot have been built sharp upon the floor, but that even the largest of them must have had a flat bottom.

The frame having been made, the hull was formed by the planks, which, parallel with the keel, were nailed to the ribs. The planks were placed upon edge, forming a smooth surface (carvel), although the freight ships of the Egyptians were clinker-built.<sup>7</sup>

A beam covered the heads of the ribs (the gunwale) into which the tholes were inserted, which by means of leather straps offered a support to the oars that were fastened to them.

Many of the ships represented upon the Pompeian pictures and the

nologie. *C. Voigt*: Das System der Riemen-Ausleger im Klass. Alterth. In *Wassersport*, 1889. *Assmann*: Seewesen. In *Baumeister, Denkmäler*, iii. *Assmann, Ernst*: Zur Kenntniss der attischen Schiffe. In *Jahrb. d. Kais. Deut. Arch. Inst.*, 1889. *Haus Droysen*: Griechische Kriegsalterthümer. In *K. F. Hermanns Lehrbuch*, ii, 2. "Axatos": *Festschrift*, 35 *Philol. Versammlung zu Stettin*.

<sup>1</sup> *Breusing*: *Nautik der Alten*, p. 28.

<sup>2</sup> *Assmann*: *Seewesen*, p. 1602.

<sup>3</sup> *Pollux*, i, 90.

<sup>4</sup> *Breusing*: *Nautik der Alten*, p. 33; *Cartault*: *La trière Athén*, p. 49. *Assmann*: *Seewesen*, p. 1601; *Homer*: *Od.* xii, 229; xiii, 71.

<sup>5</sup> *Breusing*: *Nautik der Alten*, p. 30, 33.

<sup>6</sup> *Assmann*: *Seewesen*, p. 1601, 1626. *Berlin. philol. Wochenschrift*, 1888, No. 1, p. 28.

<sup>7</sup> *Röding*: *Allgem. Wörterb. d. Marine*. *Breusing*: *Nautik der Alten*, p. 35. *Herodot.* ii, 96.

Trajan column show an open grating upon the railing, the angle of which, apparently, served the purpose of thole pins and rendered their application necessary for the upper tier of oars;<sup>1</sup> generally, however, even the ships of several tiers of oars had for each tier holes cut into the planks and required thole pins.<sup>2</sup> As at present, one thole was used in antiquity on the Mediterranean.<sup>3</sup>

The walls of the ancient war-ship, pointed at both ends,<sup>4</sup> do not appear to have been absolutely parallel amidships, but slightly bulged out;<sup>5</sup> vertically they fell to the water-line almost perpendicularly.<sup>6</sup> A projection of the ship's wall of 45 degrees toward the water-line is suggested by some,<sup>7</sup> but rejected by others who do not concede that the ancient pictures justify such an assumption, since such a form would secure but indifferent stability in the water.

The prow was often ornamented with carvings which possibly corresponded to the name of the ship.<sup>8</sup> The eyes<sup>9</sup> upon both sides of the prow in men-of-war, often taken for hawse-holes, were either painted<sup>10</sup> or carved and fitted in the prow. Their object appears to have been symbolic and intended to show the watchfulness to prevent accident.<sup>11</sup>

External strengthening was had by nailing planks upon the external wall in a horizontal direction (*Wales*), which by means of perpendicular bolts were fastened to each other, forming a network which had a tendency materially to strengthen the structure.<sup>12</sup> Corresponding pieces (*Weger*) were fastened to the inside, possibly serving as a layer for the lower oar-rows in polyeres, in order to spare the thin outside planking.<sup>13</sup>

Metal covering was not applied to the ships of antiquity,<sup>14</sup> but they were caulked and covered with a coat of pitch and tar, and finally par-

<sup>1</sup> *Assmann*: Seewesen, p. 1608, 1628; *Baumcister*: Denkmäler, iii, p. 1627.

<sup>2</sup> *Boeckh*: Urkunden über das Seewesen des attischen Staates, p. 103.

<sup>3</sup> *Breusing*: Nautik der Alten, p. 33; *Assmann*: Seewesen, p. 1609.

<sup>4</sup> *Helbig*: Das homerische Epos aus den Denkmälern erläutert, p. 161, foot note 1.

<sup>5</sup> *Aristot*: De part. anim. 4, 10.

<sup>6</sup> *Brunn*: Verh. d. 35. Philol. Vers. p. 171; *Lemaitre*: Revue Archéol. 1883, i, p. 134; *Breusing*: Nautik der Alten, p. 39; *Assmann*: Seewesen, p. 1607.

<sup>7</sup> *Le Roy*: Sur la marine des anciens (Histoire de l'Acad. roy des inscript. et belles lettres, xxxviii, 1777, p. 542); *McNeill* (by Pownall) A treatise on the study of antiquities, London, 1782, p. 233; *Boeckh*: Urkunden, p. 115; *Smith*: Ueber den Schiffbau der Griechen und Römer, p. 40.

<sup>8</sup> *Assmann*: Seewesen, p. 1606.

<sup>9</sup> *Assmann*: Zur Kenntniss der antiken Schiffe. In Jahrbuch des Deutschen archäolog. Instit, 1889. Heft 2, p. 99; *Assmann*: Seewesen, p. 1597 and 1613; *Boeckh*: Urkunden, p. 103; *Jal*: La Flotte de César; *Baumcister*: Denkmäler, iii, p. 1617.

<sup>10</sup> *Blümner*: Technologie, iv, p. 455. Note 3.

<sup>11</sup> *Assmann*: Zur Kenntniss, &c. In Jahrbuch d. D. arch. Inst., 1889. Heft 2, p. 99; *Assmann*: Seewesen, p. 1597.

<sup>12</sup> *Assmann*: Zur Kenntniss, &c. In Jahrbuch d. D. arch. Inst., 1889. Heft 2, p. 102; *Assmann*: Seewesen, p. 1628.

<sup>13</sup> *Assmann*: Seewesen, p. 1602.

<sup>14</sup> Ueber die Alexandria des Hieron. v. Syrakus.

tially painted<sup>1</sup> in the bow, apparently to facilitate the recognition of the direction taken by a vessel in sight.<sup>2</sup>

The war vessels do not appear to have had full decks, from the fact that the mast had to be taken down before the battle; partial decks appear in the bow and in the stern; the midship was open, but some representations from the eighth century B. C.<sup>3</sup> show small bridges or gangways (plankways) on both sides of the mast, extending from the fore end to the aft end, partly covering the ship and forming a bridge upon which the fighting crew stood. A narrow plank fastened to the inside of the ship's wall also served a similar purpose. Even at *Cæsar's* time completely covered vessels were not in general use,<sup>4</sup> and even those called "decked" did not have what is now called "a deck."<sup>5</sup>

Before the battle the mast, which rested in a block upon the keel, had to be laid down,<sup>6</sup> and for this purpose a small longitudinal opening had to be left. It was the custom to penetrate the enemy's line in full force, in order to dislocate his oars. To thus render his ship defenseless to the spur thrusts, the oars of the attacking party had to be drawn in at the decisive moment so as to prevent their being broken. In order to accomplish this the small width of a decked ship would have been insufficient, while a broken deck afforded ready egress above.

The peculiar method of naval warfare, consisting principally in an effort to disable the enemy's ship by ramming, required a resistance scarcely to be found in the comparatively slight-built ships of antiquity, and special precautions had to be taken to secure, by means of additional devices and appliances, the longitudinal strengthening of the otherwise rather frail structure. Such appliances were the strut-frame and the girding. The former was first demonstrated<sup>7</sup> as consisting of two long beams, which, resting upon numerous supports, connected the two frames in such a manner as to leave a longitudinal opening for the raising and lowering of the mast. These beams, by covering them with planks, were converted into foot bridges for the fighting crew.<sup>8</sup>

One of the principal dangers to which the ship of antiquity was exposed, and which threatened collapse to the frail structure was from the breaking of the back,<sup>9</sup> which was apt to happen in a vessel crossing the waves, whereby the midship was lifted in the mass of water, while the prows, without any support, hanging over the trough, were apt to sink by their own weight and thus tend to break from the keel. In

<sup>1</sup> *Blümner*: *Technologie*, vol. IV, p. 453.

<sup>2</sup> *Helbig*: *Das homerische Epos aus den Denkmälern erläutert*, p. 161, note 1.

<sup>3</sup> *Monumenti dell' Inst.* IX., pl. 40, 3 and 4; *Annali* 1872, p. 153.

<sup>4</sup> *Cæsar*: *De bel. civ.* iii, 7; *Cicero*: *Ad Attic.* v, 12, 13.

<sup>5</sup> *Assmann*: *Seewesen*, p. 1607.

<sup>6</sup> *Assmann*: *Seewesen*, p. 1616; *Breusing*: *Nautik der Alten*, p. 48; *Droysen*: *Griech. Kriegsalterthümer*, p. 289; *Jal*: *Archæol. Nav.* 1, 288.

<sup>7</sup> *Assmann*: *Seewesen*, p. 1602.

<sup>8</sup> *Ibid.*, p. 1604.

<sup>9</sup> *Breusing*: *Nautik der Alten*, p. 183.

that event the walls, unsupported by connecting beams, were apt to become loosened from their holds and cause the whole structure to collapse.

In order to prevent this sinking of the prows the *girding* was applied, consisting in the tying of the ship by means of a stout cable, the *hypozome* (tormentum). Many views have been expressed as to the nature and the application of the hypozome.<sup>1</sup>

According to the theory which is most consistent with the accounts given in the ancient literature<sup>2</sup> the girding was performed by a single or double cable fastened to the heavy plaited rings surrounding stem and stern posts, often met with in ancient illustrations<sup>3</sup>, and running upon stout crutch-like supports, being probably tightened by pulleys as soon as the connections began to loosen from continued spur thrusts or by heavy seas.

The sticks forming the supports for the hypozome, and which according to ancient accounts were part of the articles of equipment of a ship, have heretofore been thought to be lateral supports of the mast.<sup>4</sup>

The most terrible weapon of the ancient war ship was the spur, a structure projecting from the bow, covered with iron or copper, probably an invention of the Phœnicians, whose vessels carried it 700 B. C. It was at first placed below the water line, but in the ancient Greek ships it was placed above the water<sup>5</sup> at a point where keel, stem-post, strutframes, and wales centered their combined force, in order to make the destructive thrust as effective as possible.

The effective application of the oar is dependent on the proportion of the inner to the outer lever, which has been found to be the most satisfactorily accomplished with a proportion of 1:2-3.<sup>6</sup>

For determination of size but very insufficient data exist, principally in the length and width of the ship sheds,<sup>7</sup> which, however, can be but relatively correct, since alongside of the ship articles belonging to it had to be stored. A scale is also found in a passage by Vitruvius,<sup>8</sup>

<sup>1</sup> *Scheffer*: De militia navali, i, 4, p. 48, Upsala, 1654; *Le Roy*: Troisième mémoire sur la marine des anciens, Histoire de l'Académie, xxxviii, p. 589, Paris, 1777; *Schneider*: Vitruv., x, 15, 6, Leipzig, 1808; *Boeckh*: Urkunden, p. 134; *Beger*: Thesaur. Brand., iii, 406; *Montfaucon*: L'antiquité expliquée, iv, 2, p. 214, pl. 134; *Smith*: Schiffbau der Griechen und Römer, p. 30; *Breusing*: Nautik der Alten, p. 171; *Assmann*: Jahrb. d. K. D. Inst., 1889, 2 Heft, p. 99, 100; *Graser* (Dumichen): Flotte einer ägyptischen Königin; *Assmann*: Seewesen, pp. 1594, 1604, 1614; *Baumeister*: Denkmäler d. Klass. Alterth., iii, p. 1593, 1604, fig. 1671; Musée de Marine du Louvre, p. 8; Berlin. Phil. Wochenschrift, 1889, Nos. 31, 32; *Droysen*: Griechische Kriegsalterth., p. 259; *Breusing*: Die Lösung der Priorenfrage, p. 26.

<sup>2</sup> *Assmann*: Seewesen, p. 1594, 1604, 1614.

<sup>3</sup> *Baumeister*: Denkmäler d. Klass. Alterth. iii, p. 1604.

<sup>4</sup> Berl. philol. Wochenschrift, 1889, No. 16, 31, 32.

<sup>5</sup> *Assmann*: Seewesen, p. 1613.

<sup>6</sup> *Assmann*: Seewesen, p. 1608.

<sup>7</sup> *Droysen*: Griechische Kriegsalterthümer, p. 279.

<sup>8</sup> *Vitruvius*: de architectura, i, 2, 4, "in navibus ex intersealmis, quod δπηχαίχη dicitur;" see *Marcus Meibomius*: De fabrica triremium. Amstelod., 1671, reprinted; *Graevius*: Thesaur. antiq. Rom., xii, 553, 573.

in which the laws of symmetry enter into architectural construction. A still more certain mode is found in the intersealmium; that is, the space between the oar ports, which by practical experience is accepted as most nearly correct at 2 ells = 3 feet. In computing the length, then, additional to the result obtained from intersealmium measurements the free space in the stem and stern will also have to be taken into account. For a 31-seater these are accepted as 12 feet aft<sup>1</sup> and 6 feet in the stem; we thus have the following formula:

$$x \times 3 + 12 + 6 = \text{length of ship.}$$

The space occupied by each rower is estimated by Lemaître at (1.60 meters) 5 $\frac{1}{3}$  feet in width, and allowing for the longitudinal middle spare (80 centimeters) 2 feet, we obtain an approximate width of that class of ship of about 17 feet.

A further estimate of the width of the ships is found in the size of the anchor cable,<sup>2</sup> of which each one-half inch thickness is computed as representing 1 foot width of ship at the water line; hence a 6-inch cable should correspond to a ship 12 feet wide at the water line.<sup>3</sup> It is, however, thought<sup>4</sup> that in view of the very sharp build of the ships a larger factor of width may be taken for each one-half inch of thickness of the cable.

The draft of the war-vessels of antiquity appears to have been very small, amounting in the largest of which we have information to a maximum of 1.5 meters.<sup>5</sup>

#### THE GERMANIC PEOPLE.

The first historic account of the ships of the people occupying the shores of the Northern Seas we find in Caesar's Naval Campaign against the Veneti, in the year 54 B. C.,<sup>6</sup> as follows:

"For their ships were built and equipped after this manner: The keels were somewhat flatter than those of our ships, whereby they could more easily encounter the shallows and the ebbing of the tide; the prows were raised very high, and in like manner the sterns were adapted to the force of the waves and storms which they were formed to sustain. The ships were built wholly of oak, and designed to endure any force and violence whatever; the benches, which were made of planks a foot in breadth, were fastened by iron spikes of the thickness of a man's thumb; the anchors were secured fast by iron chains instead of cables, and for sails they used skins and thin dressed leather. These were used either through their want of canvas and their ignorance of its application, or for this reason, which is more

<sup>1</sup> *Lemaître*: *Revue Archéolog.*, 1883, i, p. 149.

<sup>2</sup> *Boeckh*: *Seurkunden*, p. 163.

<sup>3</sup> *Cartault*: *La trière Athén.*, p. 246.

<sup>4</sup> *Graser*: *De vet. re nav.*, p. 20.

<sup>5</sup> *Assmann*: *Seewesen*, p. 1601. Berlin. philol. Wochenschrift, 1888, No. 1, p. 28.

<sup>6</sup> *Caesar*, *De Bello Gallico*, iii, cap. xiii.

probable, that they thought that such storms of the ocean and such violent gales of wind could not be resisted by sails, nor ships of such great burden be conveniently enough managed by them. The relative character of the two was of such nature that our fleet excelled in speed alone and the plying of the oars; other things, considering the nature of the place and the violence of the storms, were more suitable and better adapted on their side; for neither could our ships injure theirs with their beaks, so great was their strength, nor on account of their height was a weapon easily cast upon them; and for the same reason they were less readily locked in by rocks. To this was added that, whenever a storm began to rage and they ran before the wind, they both could weather the storm more readily and heave to securely in the shallows, and when left by the tide feared nothing from rocks and shelves; the risk of all which things was much to be dreaded by our ships."

The ships employed by Cæsar during his expedition to Brittany were the *nares actuarie*,<sup>1</sup> vessels of surpassing speed,<sup>2</sup> such as were employed by the pirates.<sup>3</sup> They were propelled by oars, and according to Isidorus<sup>4</sup> also employed sails. The designation *actuaria* appears to have been a multiplied and varied one<sup>5</sup> and embraces vessels of various sizes, number of oars,<sup>6</sup> and purposes. According to Dr. Luebeck<sup>7</sup> it may be assumed with a degree of certainty that they did not belong to the freight ships (*onerarie*),<sup>8</sup> nor are they to be considered as war-vessels proper of Cæsarian times.<sup>9</sup>

During the expedition to Brittany these *actuarie* took the place of the *onerarie* for the transport of troops, horses, and war paraphernalia, although it is stated explicitly that they were built as *actuarie*, and for that reason they were enabled to keep pace with the war-vessels

<sup>1</sup> Luebeck, Emil, Das Seewesen der Griechen und Römer. Hauburg, 1890.

<sup>2</sup> According to Nonius, xiii, 9, the *nares actuarie* were "*naviculae celeres, dicta quod cito agi possint.*"

<sup>3</sup> Sall. hist., lib. ii, "pauca piratica actuaria navigia."

<sup>4</sup> Isidor. Orig., xix 1; "*actuarie naves sunt, que velis simul aguntur et remis.*"

<sup>5</sup> Assmann, Seewesen, p. 1623.

<sup>6</sup> Cic. ad. Attic., xvi, 3, 6: "*hæc ego conscendus e Pompejano tribus actuariolis decemscalmis.*" And Livius, xxxviii, 38: "*Tradito et naves longas armamentaque earum, neque plures quam decem naves actuaris, quarum nulla plus quam triginta remis agatur, habeto.*"

<sup>7</sup> Dr. Emil Luebeck: Das Seewesen der Griechen und Römer. Hamburg, 1890. (The author has made a thorough study of ancient Greek and Roman naval affairs, and some of the references employed have been taken from his essay.)

<sup>8</sup> Sisenna: Histor., lib. iii (Nonius, xiii, 8): "*Quibus occisis actuaris ad viginti naris, item complures onerarias incendunt.*"

<sup>9</sup> Cæsar: De Bell. gall., v, 2, 1: "*Eo cum advenisset, circuitio omnibus hibernis, singulari militum studio, in summa omnium rerum inopia, circiter DC eius generis, cuius supra demonstrarimus, naves et longas xxviii invenit instructas, neque multum abesse ab eo, quin paucis diebus deduci possint.*" The words "*supra demonstrarimus*" referring to v., 1, 3: "*ad onera et ad multitudinem tumentorum transportandam paulo latiores, quam quibus in reliquis utimur maribus. Has omnes actuaris imperat fieri, quam ad rem multum humilitas adiuvat.*"

proper; they appear to have been connected with the war navy<sup>1</sup> without themselves being men-of-war; they were, however, like men-of-war, provided with a ram.<sup>2</sup>

Almost fifty years now pass, until in the year 9 B. C. Drusus Germanicus, the first Roman general who ascended as far as the North Sea, gave a victorious battle to the Bructers upon the Ems. Strabo, in his account, unfortunately does not minutely describe the vessels employed by the latter, yet they appear to have been rather unsubstantial structures.

A better account is given by Vellejus Paterculus, who about 5 A. D., under Tiberius, served as prefect of cavalry; he gives them<sup>3</sup> as "*caratum, ut illis mos est, ex materia,*" thus indicating them to have been dugout; and in such a vessel, capable of accommodating but one person, the chief of the Northalings, the people occupying the territory adjacent to the mouth of river Elbe, paid his respects to the conqueror.

Such a dugout, now in the museum at Kiel, was found in the Wolburgsan marsh in South Dithmarschen; it is 11 feet long, 2 feet wide, 1 foot deep, and is hollowed out of an oak tree.<sup>4</sup>

In 15 A. D. Germanicus<sup>5</sup> had built near the mouth of the river Rhine one thousand ships with sharp prows, but wide, to better resist the waves; some with flat bottoms, to enable them to run ashore with impunity; upon a number of them steering apparatus were provided at both ends, so as to permit propulsion in either direction. Many were decked, for the accommodation of throwing machines. Equally useful for sailing and rowing, they were imposing and serviceable and inspired the soldier with confidence. The fleet succeeded in reaching the mouth of the river Ems, but, after a victory over the Cheruskers it was shipwrecked in a storm, although the wind blew from the south.<sup>6</sup>

<sup>1</sup> *Cæsar: De Bell., civ. i, 34, 2: "profectum Domitium ad occupandum Massiliam navibus actuariis septem;" iii, 62, 2: "His paratis rebus, magnum numerum levis armature et sagittariorum aggeremque omnem noctu in scaphas et naves actuarias imponit;" iii, 102, 5: "(Pompejus) biduum tempestate retentus, navibusque aliis additis actuariis in Ciliciam atque inde Cyprum pervenit."*

<sup>2</sup> *De Bell. Alex., II: "navibus actuariis, quam numerus erat satis magnus, magnitudine quamquam non satis iusta ad proeliandum, rostra imposuit. Cæsar: de Bell. Goth., iii, c. xiii: "neque enim his nostræ rostra nocere poterant."* A similar remark is made in cap. xiv. The rostrum (*εὐβοῖον*) supplied a very formidable instrument of ancient naval warfare. It was a beam springing from a part just below the prow and topped with sharp iron points or an iron representation of a ram's head. Though formerly always above the water, they were in later times placed below it, and thus rendered more dangerous. *Lemaître: Revue archéologique, 1883, p. 112: "Armée d'un éperon, elle se jetait comme un jarelot sur ses adversaires pour les frapper d'un coup mortel."*

<sup>3</sup> *Vellejus Paterculus, ii, c. 107.*

<sup>4</sup> *Archiv der Schleswig-Holstein Lauenburg, Gesellsch. f. vaterl. Geschichte, Bd. XXIII, 4te Folge. Jahrbücher für die Landeskunde, Bd. XI. Zeitschrift d. Ges. f. d. Gesch. d. Herzogt. Schleswig-Holst. Lauenb., Bd. II, 1872.*

<sup>5</sup> *Tacitus, Ann., 6.*

<sup>6</sup> *Tacitus, Ann. ii, 23.*

The occurrence of a general wrecking of an entire fleet when the wind was offshore does not speak well for the construction of the ships; inexperience with the dangers and the coasts of the Northern seas and storms, however, may enter somewhat as an argument in favor of the construction, although it may here be mentioned that the warship of antiquity was of slight build, shallow upon the keel, and drew about 1 meter of water,<sup>1</sup> and that their construction was effected in a comparatively short time.<sup>2</sup>

A progressive ratio in the art of naval construction thus becomes apparent as we recede westward from the river Elbe, where at the time of the Roman invasion dugouts only, of small capacity, represented the vessels of the occupants of the north coast of continental Europe.

During the years 1885 to 1889, while excavating for a free port at Bremen, seven canoes were discovered in the alluvial land on the outside of the Weser dike at depths of from 2 meters (6½ feet) to 4 meters (13 feet) below the present surface level. They were dug out of the trunks of oaks—axes apparently having been employed for the purpose—flat-bottomed and without keel, but with the prow cut obliquely, and with anger holes provided for the insertion of the oars. Of the seven canoes four were entirely demolished; of the remaining three the dimensions were 10.5 meters (35 feet) long, 0.75 meter (2 feet 6 inches) wide; 10 meters (33 feet 4 inches) long, 1.25 meters (3 feet 6 inches) wide; 8 meters (26 feet 7 inches) long, 1.20 meters (3 feet 3 inches) wide, with a height of from 50 to 70 centimeters (1 foot 5 inches to 2 feet 2 inches).<sup>3</sup>

I am also informed that several other specimens of this type are preserved in the municipal museum at Bremen.

The most progressive of the coast tribes appear to have been the Chauci, Frisians, and Batavi. The elder Pliny<sup>4</sup> speaks of the piratical ships of the Chauci which visited the rich provinces of Gallia and carried retribution. They still were only dugouts, but able to carry thirty men. It was the first time that Tentons had ventured upon the open sea, and this venture formed the beginning of the naval enterprises of our ancestors of the northern coast of continental Europe; in fact they soon became dangerous to such a degree that Corbulo, the governor of Netherlandish Germania, in 47 A. D. was obliged to call out the entire fleet of the Rhine to keep the enemy in check.<sup>5</sup>

<sup>1</sup> *Lemaitre*, *Revue archéologique*, 1883, 1, p. 116; *Assmann*, *Zur Kenntniss der antiken Schiffe—Jahrbuch d. Kais. Deutsch. Archäolog. Inst.*, 1889, 1616, 1626. *Berliner philol. Wochenschr.* 1888, No. 1, p. 28; *Brunn*, *Verhand. d. 35 Philol. Vers.*, p. 177. *Luebeck*, *Das Seewesen der Griechen und Römer*, 1890, p. 10.

<sup>2</sup> *Plin.* *Nat. hist.*, xvi., 74; *Brosius*, iv, 7; *Polyb.*, i, 38, 5f.; *Cæs.* *Bell. civ.* i, 36; *Assmann*, *Antike Schiffe*, p. 1600.

<sup>3</sup> Communicated by Prof. Dr. F. Buchenau, through the courtesy of Dr. M. Lindemann, Bremen, April 25, 1892.

<sup>4</sup> *Pliny*: *Hist. Nat.* xvi, c. 76.

<sup>5</sup> *Tacit*: *Annal.* xi, c. 18.

In 70 A. D.,<sup>1</sup> on occasion of the Batavian and Frisian revolt under Claudius Civilis against the Roman Government, the Roman Brittanic fleet was attacked and the majority of the vessels sunk—the character of the aggressive force, however, is but approximately known—and after having taken the greater portion of the Roman fleet the enemy's admiral manned the biremen and other vessels, together with a large number of vessels holding from thirty to forty men.<sup>2</sup>

Although still only dug-outs, the art of ship-building appears to have progressed so as to include structures carrying forty men, and more-over to embody in their construction the observations made in the ships of more progressive nations, by allowing ribs to remain for the purpose of additionally strengthening the sides of the ship, or, in other cases, by inserting ribs after the excavation of the tree had been completed. This progressive idea was accompanied by the abandonment of a flat bottom, a rudimentary keel being worked out.

Of this type of naval structures a number of specimens are known to exist, of which one, now in the museum at Kiel, was, in 1878, discovered in the Valermoor, a marsh in Schleswig-Holstein.<sup>3</sup>

The *Valermoor boat* measures 12.288 meters (41 feet) in length, by 1.30 meters (4.33 feet) greatest width, 57 centimeters (19 inches) internal depth, and 62 centimeters (20½ inches) external height. The thickness of plank is 5 centimeters (1½ inches) at the bottom and 4 centimeters (1¼ inches) on top. The boat had eleven ribs of which nine still exist. Upon the gunwale, between the ribs, eleven holes were excavated for the insertion of the oars; stem and stern are sharp. A keel of (2 meters) 6½ feet in length is worked out of the wood at both ends of the boat, leaving the middle flat. A very interesting prehistoric repair is noticeable in the closing of a crack by means of dovetailed cleats or wedges ("securicula" Vitruvius).

The same form is met with in the British Islands.

*Ancient boat found at Brigg, Lincolnshire, England*<sup>4</sup> (Plate LXVIII). In May, 1886, workmen engaged in an excavation for a new gasometer in the town of Brigg, or more properly Glandford Bridge, Lincoln-

<sup>1</sup> *Tacit*: Hist. iv, 79.

<sup>2</sup> *Tacit*: Hist. v, 23.

<sup>3</sup> *H. Handelmann*, 35te Bericht zur Alterthumskunde Schleswig Holsteins. Kiel, 1878.

<sup>4</sup> *Stevenson, William*: Ancient boat recently discovered near Brigg, Lincolnshire; in *Illustrated London News*, May 8, 1886. *Brock, L. P. Loftus*: The discovery of an ancient ship at Brigg, Lincolnshire; in *Proceedings British Archaeolog. Assoc. Meeting*, May 19, 1886, p. 279. *Thropp, James*: The prehistoric boat discovered at Brigg; read before the Lincoln and Nottingham Archaeol. Soc., June, 1886. *Stevenson William*: The prehistoric boat; in *Grimsby News*, July 7, 1886. *The ancient boat at Brigg*; in "The Builder," London, July 17, 1886. *Stevenson, William*: Discovery of an ancient British vessel or ship of extraordinary size in Lincolnshire; in *The Times*, London, August 24, 1886. *Stevenson, William*, unpublished letters. *Atkinson, Alfred*: On the ancient Brigg boat; in Vol. 1, *Archaeologia* (Society of Antiquaries, London).

shire, England, upon the banks of River Ancholme and about 9 miles south of its juncture with the Humber, came upon a huge log which upon examination revealed itself to be an enormous boat, which had found a resting place upon what appears to be the clayey bottom of the sloping beach of an ancient lagoon, the clay, as it accumulated, creeping into every crevice and gradually covering up the entire boat to a depth of  $5\frac{1}{2}$  feet below the modern surface level at the bow, and 9 feet at the stern (Pl. LXIX).

The boat is made out of the trunk of an oak tree, perfectly straight, as if turned in a lathe; it is 48 feet 8 inches long, 5 feet wide, and 2 feet 9 inches deep. The stern end represents the butt end of the tree, with a diameter of 5 feet 3 inches; the dimensions, of course, slightly

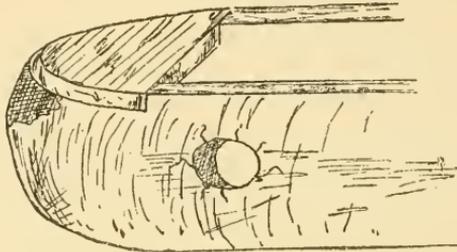


Fig. 25.

PROW OF BRIGG BOAT.

(Drawing furnished by Mr. William Stevenson, of Hull, England.)

diminish towards the prow, which is 4 feet 4 inches, the boat representing about 700 cubic feet contents. In a tree standing, from 4 to 6 inches should be added for bark and sapwood. This would indicate an enormous tree, with a height of about 50 feet to the first branches, that are noticeable on the sides of the prow, which is rounded off as if intended for a ram (Fig. 25).



Fig. 26.

CAVITY IN PROW.

(Drawing furnished by Mr. William Stevenson, of Hull, England.)

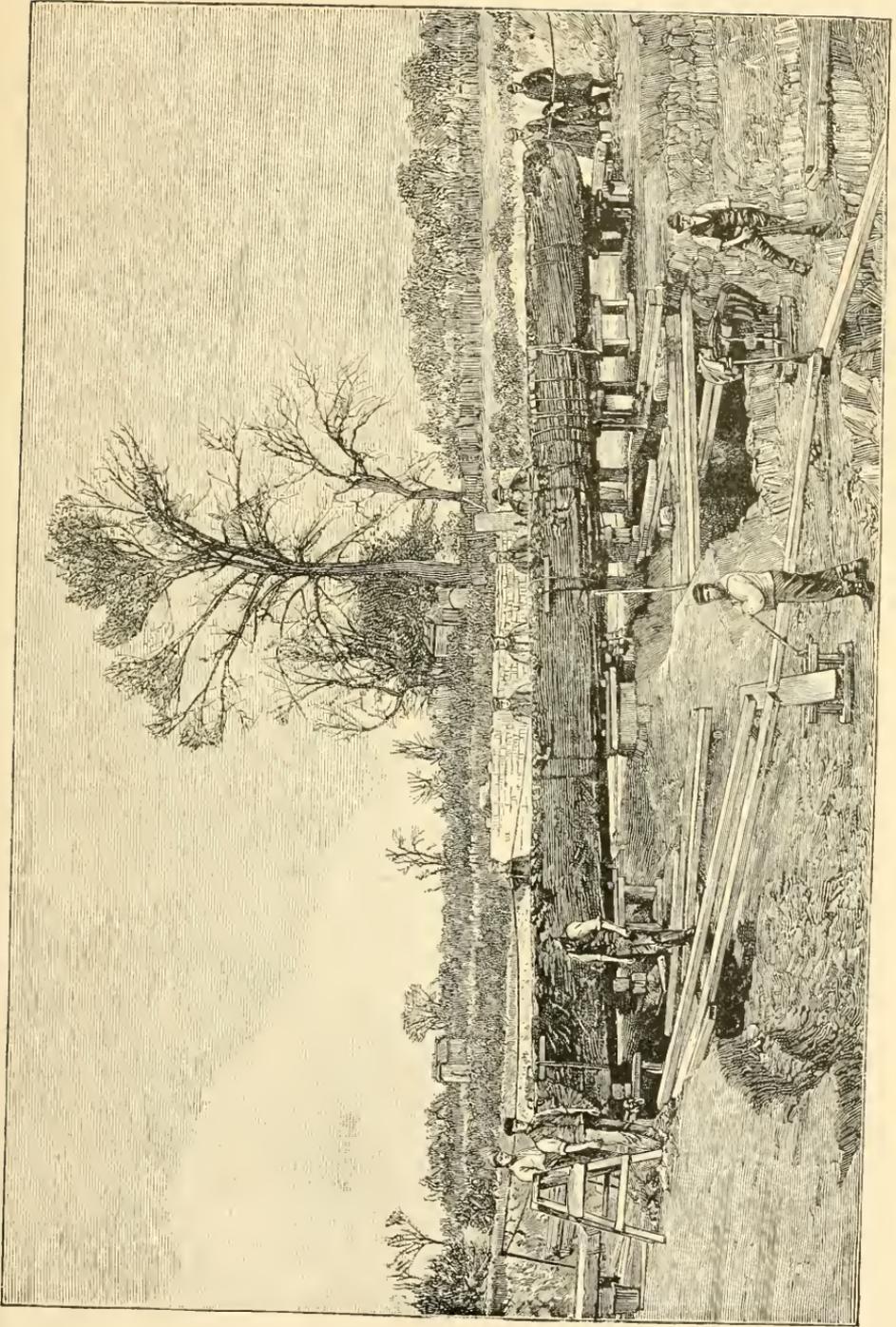


Fig. 27.

BOWSPRIT (?) OF BRIGG BOAT.

(From Mr. James Thropp's report.)

A cavity in the head of the prow (Fig. 26) is supposed to have been intended for the reception of the bowsprit (Fig. 27), for which a piece of crooked oak found near the prow has been taken. In the absence of a mast, or any arrangement which would point to the propulsion of the craft by means of sails, however, such a theory is untenable, notwithstanding the approximate correspondence in diameter of the curved piece of wood with that of the hole. This cavity (Fig. 26) rather appears to have been the result of the hollow of the tree running up there, *i. e.*, up the main stem. The adjoining parts of the prow are cut down on the top



BOAT FOUND AT BRIGG, LINCOLNSHIRE ENGLAND.  
(Copied from the "London Illustrated News," May 8, 1886.)







so as to form a ledge to receive a board, which may have been the parent of the later forecask, and which in part served to close the hole on its open side.

Upon the sides of the stem two round holes had existed, which were closed by means of large circular plugs rounded off on the outer face in the form of a boss driven in after the manner of bungs in barrels. The holes may have been designed to represent the eyes of the warship (*οφθαλμοί*), which, as *ἀποτρόπαια* in ancient Greek war-vessels, are supposed to be the symbolic significance of precaution against dangers threatening the ship. It is, however, probable that at that point the tree sent out two arms, which were dressed inside and closed up in the manner described, the holes showing the grain of the wood running in the direction of the branches, which of course could not possibly be the case had they been pierced artificially.

The bottom is flat throughout the entire length; the keel, if it may so be called, at the stern, is splitting, possibly owing to the great strain, to which it was subjected in the course of removal, or to shrinkage.

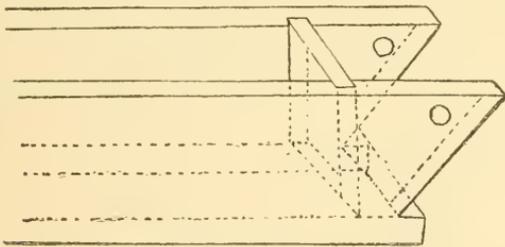


Fig. 28.

OVERHANGING COUNTER.

Drawing furnished by Mr. Stevenson.

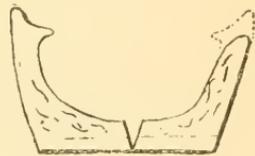


Fig. 29.

FACE OF STERN IN BRIGG BOAT.

(From report of James Thropp.)

The floor is perfectly flat, but in excavating transverse stays were allowed to stand at intervals at right angles to the sides, crossing the bottom athwart ship. Of these ribs, which take the place of floor-timbers in modern craft and are intended to stiffen the structure, three remain in perfect condition. Additional strength is given to stem and stern by allowing a greater thickness of solid wood to remain in shaping the inside of the boat.

The sides are hewn quite perpendicular; at the stern they are cut obliquely, so as to form an overhanging counter (Fig. 28).

As previously stated, the butt end of the tree formed the stern end of the boat, and here, probably on account of the decayed condition of the interior close to the roots, a natural stern could not be provided, and a plank end was adopted, which was fitted to a groove cut down on each side and across the bottom some distance from the end of the tree (Fig. 29). The sides projecting beyond the plank end were cut obliquely up from the bottom and a hole was pierced at each extremity through which probably ropes or thongs were tightly drawn, or sticks

were passed, which by means of wedges or pins held the sides taut against the plank end (Fig. 30).

The stern board (Fig. 31) is of oak planking  $1\frac{1}{2}$  inches thick and 4 feet in length, and consists of two boards, one of which is 17 inches wide and the other 10 inches, the sides and bottom having been shaped to

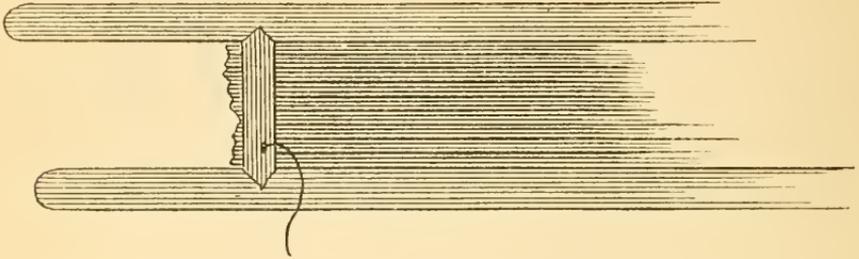


Fig. 30.

STERN OF BRIGG BOAT.

(Drawing furnished by Mr. William Stevenson, of Hull, England.)

fit the grooving. Some caulking found in the groove proved to be moss, which it is supposed was forced into the joint in a dry state, so as to swell and become tight when it got wet. The manner of fastening the stern board is shown in the accompanying figure 32.

Although no traces of deck were found, it is possible that the ledges

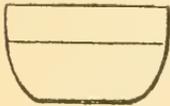


Fig. 31.

STERNBOARD.

(From report of James Thropp, Esq.)

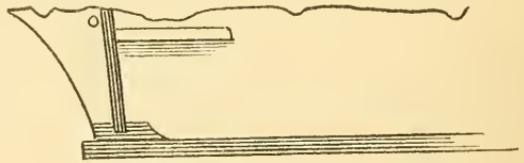


Fig. 32.

GROOVE FOR STERNBOARD.

(From report of James Thropp, Esq.)

cut out of the wood in the stem and forward of the stern-board groove formed the brackets for the support of seats or decks of small dimensions.

Along the sides of the vessel near the top edges are holes from 4 to 6 inches in diameter and chiefly elliptical in shape, which being in the middle portion of the ship and notwithstanding their apparent small dimen-



Fig. 33.

TRANSVERSE BARS IN BRIGG BOAT.

(Drawings furnished by Mr. William Stevenson, of Hull, England.)

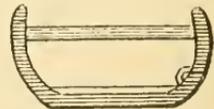


Fig. 34.

sions, may possibly have served for oars. It has been suggested that they were intended for a like purpose as the holes in the prolongations of the stern ends, that is, for lashing the sides together and keeping them firmly pressed against transverse stays (Figs. 33 and 34) or stretchers, of which one was found between the gunwales and near a

pair of holes. This stretcher or thwart was not made of oak, but of some softer wood which fell to pieces when removed. It is evident that by such process the sides of the boat would be better enabled to stand additional external pressure and would be prevented from closing in, while in the lashing the stretcher would find a firm and unyielding support against the sides; yet, in the absence of any mast or other indications that the craft was intended for sailing, it may not seem unreasonable to assume that the holes were intended for oar ports and that, judging from analogy with similar structures, the mode of propulsion was by means of oars plied from movable seats lashed to the sides of the ship.

In the angle of junction of the sides and the bottom a peculiar repair is noticeable which, in making good either a defect in the oak or a subsequent damage, indicates an advanced knowledge of carpentry (Figs. 35, 36, 37).

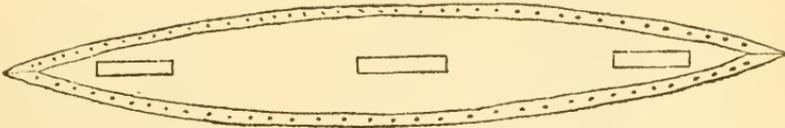


Fig. 35.

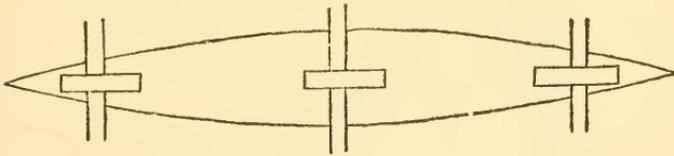


Fig. 36.

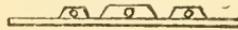


Fig. 37.

#### PREHISTORIC REPAIR IN BRIGG BOAT.

(Drawings furnished by Mr. William Stevenson, of Hull, England.)

This repair is shown by a cleat 6 feet long and 14 inches wide, tapered at the ends and fixed to the wound on the starboard side of the boat. The cleat is cut out of a solid piece of wood, the edges are beveled and bored through at distances of about  $1\frac{1}{2}$  inches and laced or stitched through the boat's side with thongs of hide or leather; three studs are left standing, which pass through the side of the craft and receive, through circular holes cut through them, wedges or pins to "bring the cleat home" and secure a perfectly water-tight joint.

With regard to the antiquity of the ship various factors will have to be taken into consideration.

The River Ancholme, in a tortuous course, drains a district of considerable extent, the "Ancholme Level," which forms a low-lying valley, and although not now of great importance for commercial purposes which are much better served by the "New Ancholme Navigation"

(Fig. 38), a navigable canal for the drainage and reclamation of the Ancholme Level, there are indications that at some early day the river was of much greater extent and importance, forming the drainage of a broad lagoon or swamp, which upon a drift bottom gradually accumulated alluvial deposit, interspersed with remains of fresh-water vegetation, the age of which may be roughly estimated from the existence of two well defined forest beds in the Ancholme Level, one just below the surface, and the other formed in the alluvial clay that collected upon and between the bowlders left at the close of the glacial period, both consisting of peat with large quantities of well preserved remains of oak, yew, hazel, etc.

The ancient lagoon was bordered on the east and west by two well-defined ranges of hills, which contracted in the vicinity of the present Brigg, and there afforded the people of remote antiquity the only

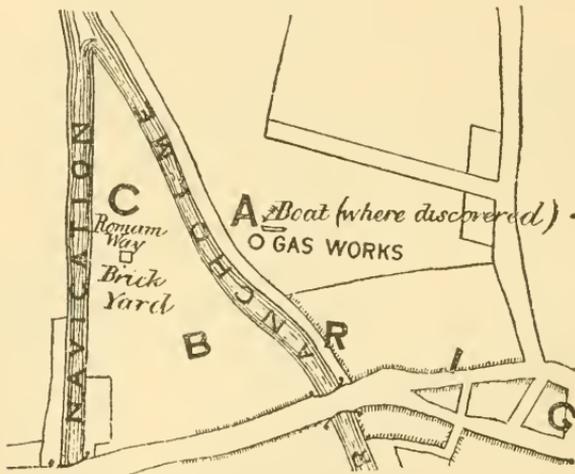
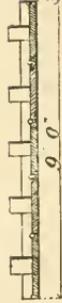
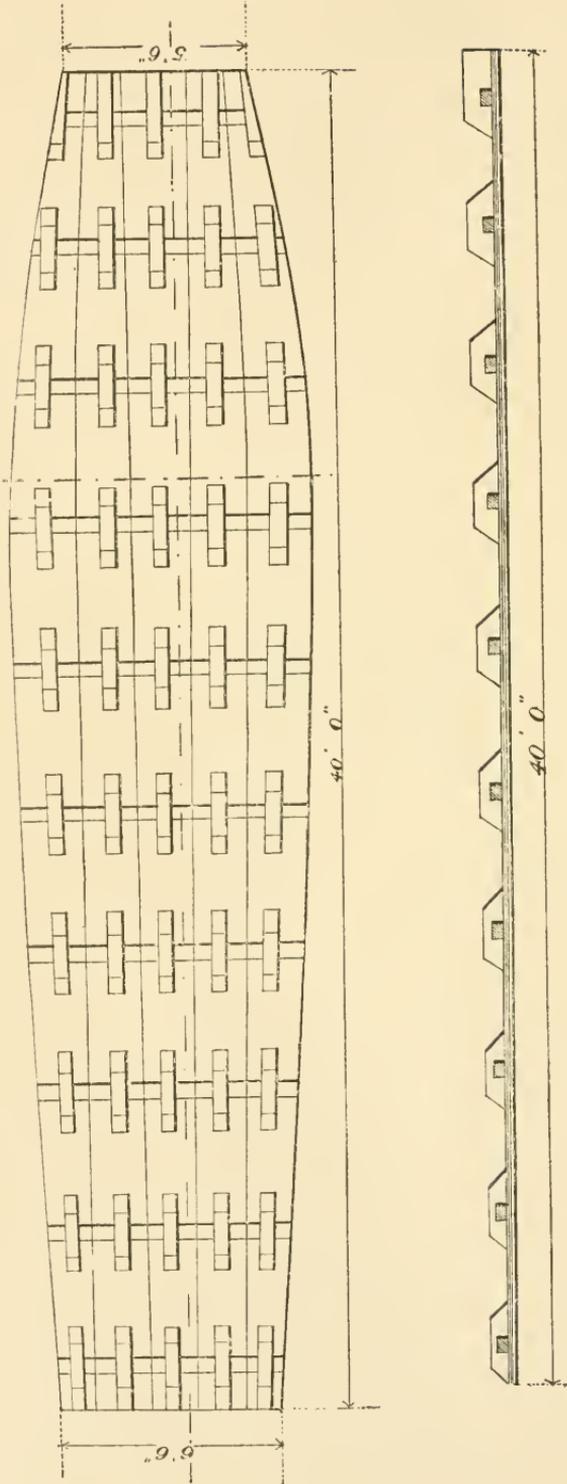


Fig. 38.  
LOCATION OF BOAT AND PLANK WAY.

means of crossing this otherwise impenetrable morass. The first record of any attempt to drain this marsh dates back to the reign of Edward I. It was reported to Edward II that "Man and Cattel passing over Glanford Bridge in the time of floods were seldom out of danger," and until the middle of the present century when the drainage of the district was improved, the level was under water for several months each year.

It was at this place then, that, in 1884, a most interesting discovery was made, consisting of a *Plank Road* situated 6 feet below the present level, and consisting of oaken planks riven from the tree, about 15 feet in length, and varying in width from 9 to 16 inches, fastened side by side and placed with the straight side up, upon small trees and branches laid at right angles to the planks. The latter were secured by means of stakes or round pieces of wood 3 or 4 inches in diameter, driven through rudely mortised square holes into a bed of stone rubble under-





RAFT FOUND NEAR BRIGG, LINCOLNSHIRE, ENGLAND.  
(Copied from Report of Mr. James Thropp.)

lying a stratum of clay of 6 inches thickness in which were found a human jaw bone, a ferule-shaped bone, (which, according to Dr. John Evans, much resembles some object from the Swiss lake dwellings) a stone celt, some rude pottery, and bones of deer, ox, sheep, and dog.

Above the road is 3 feet of dark gray alluvial clay, containing fragments and remains of sedges and fresh-water plants, and underlying 2 feet of brown alluvial clay and 1 foot of peat and surface soil.

About 120 yards north of this causeway, lying at an angle of 53 degrees and 90 yards south of the junction of the old Ancholme River with the New Ancholme Navigation (Fig. 39), a unique structure was found, consisting of a *Raft*<sup>1</sup> (Plate LXX) buried 2½ feet below the present level at the fore end, and 3½ feet at the aft end, having a length of 40 feet, by 6½ feet at the fore end and 5½ feet at the aft end.

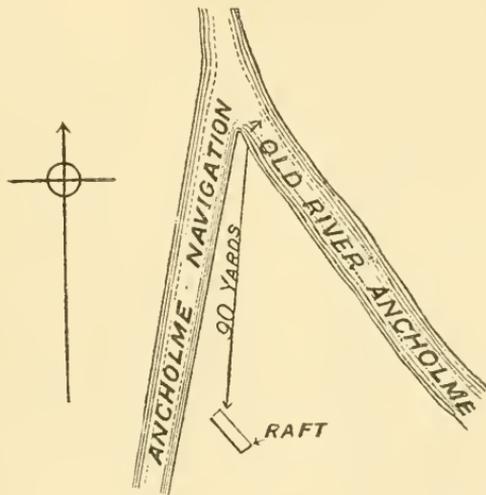


Fig. 39.  
LOCATION OF RAFT.

The level bottom consists of five boards tapering at the ends and representing the heart wood of trees split in the middle, with the remainder cut down but leaving the cleats in the solid at intervals in parallel rows. The cleats at the extreme ends were finished flush with the planks and all were provided with mortised holes to receive transverse or tie bars, consisting of rough branches of trees. Ten such tie-bars passing through the holes were secured by wedges driven in at the sides of the raft and also in the middle row of cleats to keep the framing taut.

The joints were caulked with moss and the sides of each plank were pierced with three-eighths-inch holes, 2 to 3 inches apart, and the

<sup>1</sup> A description of an ancient raft recently found by Messrs. Judge and Cole, in a field adjoining the brickyard, in their occupation, belonging to the Right Honorable the Earl of Yarborough, situate at Brigg, in the county of Lincoln, by J. Thropp, Assoc. M. Inst. C. E., county surveyor, Lincoln.

joints covered with straight pieces of wood 2 inches in diameter, fastened by lashing, which was passed through the holes and over these round packing pieces.

Owing to the peculiar manner of construction and method of tying the planking and framing together, and leaving solid cleats in the planks, speculation has connected this raft with the Viking ships of Tüne and Gokstad, in Norway. This method, however, is not confined to the naval structures of the eighth to the tenth century, but also occurs in the boat of the third century found in Nydam Moss, Denmark, from the description of which, by Engelhardt<sup>1</sup> we learn that "on all the planks there are perforated clamps of one and the same piece with the planks themselves, having been left projecting when the planks were cut out of the solid timber, and the ribs had perforations corresponding to the clamps, through which bast ropes were passed, tying planks and ribs together.

Nor does it stop here; but the same arrangement occurs in the repairs shown in the ancient boat found in the vicinity of the raft, and in a canoe of the identical type found at Valermoor, Denmark, and now in the museum at Kiel,<sup>2</sup> thus suggesting a common origin for those objects now under consideration.

In point of type these boats correspond to those ascribed by Tacitus in 70 A. D.<sup>3</sup> to the Batavians and Frisians, and although it is possible that the Romans would have employed such craft in crossing from Gaul to Great Britain, it is safe to assume that the same mode of construction may have been employed by the contemporaries in Britain. In point of antiquity, the position of the boat, raft, and planking, relatively to the geological formation does not necessarily connect them with the period expressed by the glacial drift upon or in the immediate vicinity of which they have found their last resting place, since even in historic times Glanford Brigg, now 9 miles from the Humber, was known as a fishing hamlet. This points to a more ready communication with the open water than at present, the intervening space having gradually filled up with deposits, the soft nature of which would cause the heavy objects, by their own weight, to find a lower level than the one corresponding to the period to which they properly belong, that of the Roman invasion, relics of which are found among the upper layer of forest land underlying the modern surface land.

A third specimen of this type is that known as the

*Loch Arthur Boat*<sup>4</sup> (Plate LXXI), found by Mr. Pittendjeon of Cargen, Dumfries, Scotland, in the summer of 1876 in Lotus Loch, or Loch Arthur, about 6 miles west of Dumfries.

<sup>1</sup> Engelhardt, C.: Denmark in the Early Iron Age, London, 1866.

<sup>2</sup> Handelmann H.: 35te Bericht zur Alterthumskunde Schleswig-Holsteins, Kiel, 1878.

<sup>3</sup> Tacitus. Hist. v, 23.

<sup>4</sup> Pittendjeon, Mr.: Unpublished letter of April 26, 1886, to Mr. Wm. Stevenson, and communicated by him to the author.



BOAT FOUND IN LOCH ARTHUR, SCOTLAND.

(Photographed from a sketch by Professor Geikie, Director of the Geological Survey of Scotland.)



The canoe was 42 feet long, dug out of oak; its width and breadth correspond to that of Brigg, with which it has great similarity. The grooves at the stern end were quite distinct where the board had been fitted in; the most remarkable feature in this canoe is the prow, which is shaped like the head of an animal.

About one-third of this boat, the front part, is now in the museum of the Antiquarian Society of Edinburgh; the aft end was so much broken after having been exposed to the air for some time that it was not worth preserving.

The photograph was made from a sketch made on the spot by Prof. James Geikie, of the Geological Survey.

This type finds numerous representatives in the British Isles. In and about Glasgow alone more than twenty canoes have been discovered and exhumed at various times.<sup>1</sup> They were met with at different depths, ranging from 10 to 20 feet below the present surface of the land, in strata of sand, gravel, and clay that indicate marine conditions for these deposits over the broad estuary of the Clyde, on which Glasgow is now built. Marine shells have been found in the strata surrounding the canoes as well as attached to their wood.<sup>2</sup>

Five of these boats lay buried in silt under the streets of Glasgow, one in a vertical position with the prow uppermost, as if it had sunk in a storm. Twelve other canoes were found about 100 yards back from the river at the average depth of about 19 feet from the surface of the soil, or 7 feet above high-water mark, but a few of them were only 4 or 5 feet deep, and consequently more than 20 feet above the sea level. One was sticking in the sand at an angle of 45 degrees, another had been capsized and lay bottom uppermost; all the rest were in horizontal positions, as if they had sunk in smooth water.<sup>3</sup>

Nearly all of these boats were formed out of a single oak stem, hollowed out by blunt tools; some were cut smooth, evidently with metallic tools. Hence a gradation could be traced from a pattern of extreme rudeness to one showing no small mechanical ingenuity. Two of them

<sup>1</sup> *Geikie, James*: The Great Ice Age; London, 1874, p. 212. *Bibliotheca Topog. Brit.*; No. 2, Part III, p. 242. *Beauties of Scotland*; Vol. III, p. 419. *Chapman, R.*: Picture of Glasgow; p. 152. *Chambers, R.*: Ancient Sea Margins; pp. 18, 158, 203-209. *Buchanan, John*: Glasgow Past and Present; 1856. *Geological Society of Glasgow*, Transactions; Vol. III, p. 370. *Nimmo*: History of Stirlingshire; 2d edition, p. 74. *New Statistical Account of Scotland*: Article Errol; also Vol. VI, p. 601. *Davis, J. W.*: Geology of Tremadoc, Carnarvonshire; in Quarterly Journal of Geological Society, May, 1846. *Gentleman's Magazine*. *Stuart Rob*: Views and Notices of Glasgow in Former Times. *Old England. Glasgow Delincated*; 1826. *Currie, Alex.*: In Proc. Geolog. Soc. Glasgow; Vol. III, pt. 2, p. 370. *British Assoc. Adv. Sci.*; Report 1858, p. 80. *Lyell, Sir Charles*: Antiq. of Man; 1st edition, p. 48. *Macgeorge, A.*: Old Glasgow; 1880, p. 250. *Buchanan, J.*: Ancient Canoes found at Glasgow; in Brit. Assoc. Rep., 1858. *Geikie, James*: Geol. Quart. Journ., Vol. XVIII, p. 224; 1862.

<sup>2</sup> *Chambers, R.*: Ancient Sea Margins; Jordan Hill: Mem. Wern. Soc., Vol. VIII, 1881.

<sup>3</sup> *Buchanan, J.*, in Brit. Assoc. Rep., 1858, p. 80; Glasgow, Past and Present. 1856.

were built of planks, one of which, dug up in 1853, was elaborately constructed.<sup>1</sup> Its prow resembled the beak of an ancient galley, the stern was formed of a triangular piece of oak, oak pins and metallic nails had been used in fastening the planks to the ribs, and for caulking wool dipped in tar had been employed.<sup>2</sup>

This boat was lying keel uppermost with the prow pointing straight up the river. In one of the canoes a beautifully polished celt of greenstone was found. In the bottom of another a hole had been closed by means of a plug of cork,<sup>3</sup> which, as Mr. Geikie remarks, "could only have come from the latitudes of Spain, southern France, or Italy."<sup>4</sup>

Judging, then, from their construction, these vessels represent various archaeological periods, namely, the most primitive ones the Stone age, the more finished the Bronze age, and the regularly built boats the Iron age, and their occurrence in one and the same marine formation must be considered as being due to the changes going on continually in the beds of all large bodies of water by the shifting of the channel, deposition, removal, and redeposition of sediments. In determining relative data attention should be paid to the stratification of the alluvium in which the objects occur.

The necessity of pursuing this course is pointed out by Prof. Geikie, as follows:<sup>5</sup>

"The relative position in the silt from which the canoes were exhumed could help us little in any attempt to ascertain their relative ages, unless they had been found vertically above each other. The varying depths of an estuary, its banks of silt and sand, the set of its currents, and the influence of its tides in scouring out alluvium from some parts of its bottom and redepositing it in others are circumstances which require to be taken into account in all such calculations. Mere coincidence of depth from the present surface of the ground, which is tolerably uniform in level, by no means necessarily proves contemporaneous deposition, nor would such an inference follow even from the occurrence of the remains in distant parts of the very same stratum. A canoe might be capsized and sent to the bottom just beneath low water mark; another might experience a similar fate on the following day, but in the middle of the channel. Both would become silted up on the floor of the estuary; but as that floor would be perhaps 20 feet deeper in the center than toward the margin of the river, the one canoe might actually be 20 feet deeper in the alluvium than the other, and on the upheaval of the alluvial deposit, if we were to argue merely from the depth at which the remains were imbedded, we should pronounce the canoe found at the one locality to be immensely older than the other,

<sup>1</sup> *Lyell, Charles, Antiq. of Man, 1st ed., p. 48.*

<sup>2</sup> *Chambers, R., Ancient Sea Margins, p. 205.*

<sup>3</sup> *Lyell, Charles, Antiq. of Man, 1st ed., p. 48.*

<sup>4</sup> *Geikie, James, Geol. Quart. Jour., vol. xviii, p. 224.*

<sup>5</sup> *Geikie, James, Geol. Quart. Jour., vol. xviii, p. 224.*

seeing that the fine mud of the estuary is deposited very slowly, and that it must therefore have taken a long period to form so great a thickness as 20 feet. Again, the tides and currents of the estuary, by changing their direction, might sweep away a considerable mass of alluvium from the bottom, laying bare a canoe that may have foundered many centuries before. After the lapse of so long an interval another vessel might go to the bottom in the same locality, and be there covered up with the older one on the same general plane. These two vessels, found in such a position, would naturally be classed together as of the same age, and yet it is demonstrable that a very long period may have elapsed between the date of the one and that of the other. Such an association of these canoes, therefore, can not be regarded as proving synchronous deposition; nor, on the other hand, can we affirm any difference of age from mere relative position, unless we see one canoe actually buried beneath another.”

The positions of these canoes in the ancient estuary of the Clyde, then, would seem to indicate that a rise of the land in Scotland of at least 25 feet above the present level of the sea must have taken place, and while it is generally conceded that this elevation has occurred since the peopling of the island, a much more remote period is assigned to the event than is warranted from the indications of a considerable change of level even in comparatively recent times.

Thus a recess in the face of the alluvium of Carron River, below Larbert Bridge, in Stirlingshire, is spoken of by tradition as an ancient harbor, and the remains of a boat and a broken anchor have been found imbedded in the spot.<sup>1</sup>

According to Nimmo<sup>2</sup>, the Carse of Stirling was cultivated and measured in the twelfth century, and it is quoted from Trevelius’<sup>3</sup> Chronicle that during the invasion of Scotland by Edward I, the English cavalry could not make their way through these “*Loca Palustria*” in the winter season.

An indirect support is given by Robert Chambers, from whose writing<sup>3</sup> I quote:

“The few remnants of a higher plateau throughout the Carse of Gowrie almost all bear names in which the Celtic word for island (*inch*) forms a part; as if a primitive people had originally recognized these as islands in the midst of a shallow firth. Perhaps there is little consequence to be attached to this fact since the extreme wetness which, even in recent times pertained to the lowlands of the Carse, may have appeared a sufficient reason for so distinguishing any snatch of more elevated and firmer ground. The minister of Errol reports, unfortunately not in a direct way, the finding of the remains of a small anchor, about fifty years ago, on a piece of low ground on the estate of Mag-

<sup>1</sup> Chambers, R., Ancient Sea Margins, p. 158.

<sup>2</sup> Nimmo’s History of Stirlingshire, 2d ed., p. 74.

<sup>3</sup> Chambers, R., Ancient Sea Margins, p. 18.

ginch. In the same district, which is fully a mile from the margin of the firth, a boat hook was discovered, 18 feet below the surface, 'sticking' among the gravel, as if left by the tide on the seashore.<sup>1</sup> (Here and for what follows, I quote a letter from a lady, the daughter of one of the chief proprietors of the Carse.) 'This relic has been preserved by the farmer who found it. I am also assured that what was considered as the remains of an anchor was found some years ago in casting a drain below Flaw Craig, a cliff which overlooks the Carse between Kinnaird and Fingask. Time out of mind, it has been a popular belief in this district that Flaw Craig rock bore the remains of a ring to which ships were fastened when the sea ran at the bottom of the hill.' A man living a few years ago alleged that he had seen the iron ring in his youth as he climbed along the face of the crag in bird nesting. So also it is told that the rock upon which Castle Huntly stands, in the center of the Carse, once had rings fixed to it for mooring the boats formerly used in sailing over the surrounding waters. A circumstance in the title deeds of at least one estate on the slopes descending to the Carse has given more force to these popular beliefs in the minds of the educated classes, namely, that they include a right of salmon fishing, though the lands are separated from the firth by the whole breadth of the Carse."

These particulars would perhaps not be deserving of notice if they were not in conformity with some others that are better authenticated. According to Mr. J. E. Davis,<sup>2</sup> "the sea is embanked out from an inlet called Traeth Mawr in Carnvonshire. There are a series of embankments higher up, which were made in the sixteenth century. It is evident that these embankments are not the sole or the principal cause of the sea no longer flowing within them, but that the natural recession of the sea (or elevation of the land) induced the inhabitants to anticipate, by the erection of earthen mounds, that which would have been produced in a few years by other causes. The sea marks may be traced upon the surface of the escarpments in several of the islands of the Tremadoc Valley, many feet above the present level of high water. Tradition also lends its aid. From the rocky ground of Inshir, Madoc, one of the princes of North Wales, leaving his country, sailed to unknown lands. And to descend to more recent times, I was informed that the parish register at Penmorfa contains entries showing that a place in the parish called Yevern was once a seaport, which, immediately before the erection of the great embankment, was several feet above high water."

In the great charter granted to the monastery of Holyrood (A. D. 1143) the King conveys to the monks at Renfrew "unum tostum in reinfry" with a right not only of nets "ad salmones," but, "et *ibi* piscari ad al-

<sup>1</sup> *Chambers, R.*, Ancient Sea Margins, p. 18.

<sup>2</sup> *Davis, J. E.* On Geology of Tremadoc, Carnarvonshire. In Quarterly Journal of Geological Society. May 1846.

lechia libere,"<sup>1</sup> and in the reign of Malcolm Ceanmor "Renfri" was entered with a large fleet.<sup>2</sup>

In 1683, while digging a water gate for a mill in the town of Stranrawer, the workmen came upon a ship *a considerable distance from the shore, into which the sea, at the highest spring tide, never comes.* "It was lying transversely under a little bourn, and wholly covered with earth a considerable depth; for there was a good yard, with kail growing in it, upon the one end of it. But that part of it which was gotten out, my informer, who saw it, conjecture that it had been pretty large; they also tell me that the boards were not joined together after the present fashion, but that it had nails of copper."<sup>3</sup> The remains were left *in situ*, and while the given account is rather meager, the use of copper nails would indicate considerable antiquity.

In reviewing the whole evidence, geological and archaeological, afforded by the Scottish coast line, Mr. Lyell<sup>4</sup> concludes that: "The last upheaval of 25 feet took place not only since the first human population settled in the island, but long after metallic implements had come into use; and there even seems a strong presumption in favor of the opinion that the date of the elevation may have been subsequent to the Roman invasion."

In some of the boats found at Glasgow,<sup>5</sup> and in one discovered in 1834 in the creek of river Arun, near North Stoke, Sussex,<sup>6</sup> the stern board arrangement, fully described and figured in a preceding chapter, on the boat found at Brigg, Lincolnshire, is noticeable, and other features in their construction connect them intimately with those of Loch Arthur, Scotland, Valermoor, Denmark, and with the crafts ascribed by Tacitus<sup>7</sup> to the Batavians and Frisians in their revolt, in A. D. 70, against the Roman Government.

#### THE SAXONS.

The next tribe assuming maritime supremacy in the Northern seas are the Saxons, who, according to their own lore,<sup>8</sup> claim vassalship under

<sup>1</sup> Liber Cartarum Sancte Crucis, p. 5.

<sup>2</sup> Chron. Mannie in Mr. Skene's Celtic Scotland, Vol. 1, p. 173; quoted by Macgeorge, Old Glasgow, 1880, p. 261.

<sup>3</sup> Kennedy, Alexander: Notice respecting an ancient ship discovered in a garden at Stranrawer, in Galloway. (In "Archeologia Scotica," Vol. III, Edinburgh, 1828.) The notice was copied from a manuscript account of the bishopric of Galloway in the possession of Thomas Goldie, esq., of Dumfries, supposed to be a copy of the "Description of Galloway," written by Andrew Symson, minister of Kirkiunes, in the year 1681, of which an elegant and correct edition has been recently printed for the first time from a manuscript copy revised and enlarged by the author in 1692.

<sup>4</sup> Lyell, Charles: Antiquity of Man.

<sup>5</sup> Chambers, R.: Ancient Sea Margins, p. 205.

<sup>6</sup> E. P. Loftus Brock in Proc. Brit. Arch. Assoc., May 19, 1886.

<sup>7</sup> Tacit. Hist., IV, c. 79.

<sup>8</sup> Grimm, deutsche Sagen, 1, 408. Dresser, Sachsenchronik, p. 7-8. Annolied (XII Cent), 21, 230. Sachsenpiegel, III, 44, 2, 3.

Alexander the Great. Upon his death they took to their ships, and finally effected a landing at the mouth of the river Elbe, where, on account of their long knives—by the Thuringians, whom they subjugated,<sup>1</sup> called “Sahs”—the name Saxe or Saxon was adopted. The term “sax” for a single-edged sword occurs in the Northern sagas,<sup>2</sup> in which also a Sax-land is mentioned, a country situated east of the peninsula of Jutland.

At the beginning of the Christian era they are reported to have occupied the land north of the river Elbe;<sup>3</sup> in A. D. 140 they are still found in the same location,<sup>4</sup> and near neighbors to the Angli; in the middle of the third century they are supposed to be coterminous with the Chauci;<sup>5</sup> in the middle of the fourth century with the Franks;<sup>6</sup> and about that time (363) they attempted settlement in Brittany.<sup>7</sup>

They are said to have possessed the art of sailing by the wind (tacking) and their small, apparently frail vessels, built of willow upon a keel of knotty oak and covered with skins,<sup>8</sup> the whole so light that, entering far into rivers, even with unfavorable wind, they would terrify the inhabitants of the Roman coast.<sup>9</sup> Notwithstanding their limited knowledge of the stars, without compass, without charts they found their way to the Orkneys.<sup>10</sup>

In the times of Diocletian and Maximian the Saxons harassed the coasts of Gallia and Brittany to such an extent that Maximian, in 286, was obliged to convert Gesoriacum, or Bononia (Boulogne), into a port for the Roman fleet.<sup>11</sup>

During the revolt of Carausius against the Roman Government, the confederate Saxons, etc., built ships after the Roman model, learned

<sup>1</sup>Curiosa Sax., 1768, pp. 210, 233, 342. *Witechinus* Corb., c. 3. *Horudorf*, Promt. exempl., p. 277.

<sup>2</sup>*Grettir Saga*. “When Grettir saw that the young man was within reach, he lifted his *sax* high in the air and struck Arnor's head with its back, so that his head was broken and he died. Thereupon he killed the father with his *sax*.”

<sup>3</sup>*Vellejus Patereulus*, 2, c. 107.

<sup>4</sup>*Ptolemy*—Geog. lib., ii, c. 2. “Ἐπι τὸν ἀρχὴν τῆς Κιμβρικῆς Χερσονήδου Σάξονες”

<sup>5</sup>*Pliny* Hist. Nat. XVI, c. 76. *Dr. Gustav Klemm*, Handbuch der Germanischen Alterthumskunde, 1836. *S. Barth*, Teutschland's Urgeschichte.

<sup>6</sup>*Eutrop.* Breviar. Hist. IX, c. 21. *Aurel. Viet.* in *Caes.* c. 32. *Enmenius* I, c. 12. *Ammianus Marcell.* *Rer. Gestar.* lib. XXVI, sec. 4; lib. XXVII, c. 8, sec. 5.

<sup>7</sup>*Claudius IV*; *Consul Honor* I. 31, 32.

<sup>8</sup>*S. Barth*, Teutschland's Urgeschichte II, 288. *Ziulae*, anglo saxon *Ceol*. *Isidor* origines LXIX, v. 1, *Celones*. *Icelandic Kiolor*, Low German, *Yell.* *Dr. G. Klemm*, Handb. d. Germ. Alterthk. 1836, p. 148. *Sidonius Appollinaris* *Carus VII*, v. 370.

“Quin et arenoriens pyratam Saxona tractus  
Sperabat, eni pelle salum sulcare Britannum  
Ludus, et assuto glaucum mare findere lembo.”

<sup>9</sup>In *Claudian*, *De laudibus Stilich* II, v. 254, *Britannia* says: “Illius effectum curis, ne litore tuto, Prospicerem dubiis venturum Saxona ventis.”

<sup>10</sup>*Claudian*, *De Cons. Hon.* IV, 31: “Madnerunt Saxone fuso Oreades; inebuit Pictorum sanguine Thule; Scotorum cumulus flevit glacialis Ierne.”

<sup>11</sup>*Eutropius*, *Breviar. Histor.* IX, c. 21. *Aurel. Viet.* in *Caes.* c. 32.

regular maritime warfare,<sup>1</sup> and occupied Batavian territory until Constantinus Chlorus retook Bononia, built a new fleet, and in 298 conquered the Brittanic Cæsar, and his German allies.<sup>2</sup>

In 363 the Saxon piratical craft again harassed the Gallic coast.<sup>3</sup> It is possible that the Saxons entered into a compact with the Piets, whom they afterwards so successfully fought for that possession, and around the coast of Scotland those naval battles may have been fought which are mentioned by Theodosius' orator,<sup>4</sup> and which freed the ocean from the Saxons.<sup>5</sup> But, notwithstanding, the terror they had spread down to the Garonne and Charente,<sup>6</sup> the destiny of the Saxons was fulfilled in the middle of the fifth century with the landing of Hengist and Horsa upon the southeast shores of Albion, with their three vessels, no longer canoes nor coracles of willow covered with skins, but long war-vessels, according to ancient tradition, each carrying three hundred men; not longer hollow trunks, but decked with high fore-castle and quarterdeck, proofs of the mighty progression.<sup>7</sup>

Nothing definite is known of the precise manner of shipbuilding among the Saxons unless the ship and boats found in the Nydam Moss, in the present Duchy of Sleswick, are accepted as a Saxon model. It has, by many writers, been ascribed to the Danes, near neighbors of the Saxons, and inhabitants of the peninsula of Jutland.<sup>8</sup> The Saxon claim on this ship is weakened by the fact that it presents exceedingly fine lines denoting greater knowledge of naval construction than can ordinarily be ascribed to a people who, like the Saxons, have occupied a short coast line, and have but for a comparatively brief space of time been engaged in maritime pursuits.

A further doubt as to the nationality of the ship in question arises from the exceedingly sparse and vague knowledge of the Romans, to whom we are indebted for any and all accounts of the North and its people. It will, for instance, be observed that Tacitus, in his *Germaniæ*, not even mentions the Saxons; a few years later they are reported to have occupied the country adjacent the mouth of the river

<sup>1</sup> *Eumenius* 1 c. 12.

<sup>2</sup> *Eumenius* 1 c. 17.

<sup>3</sup> *Claudian* IV, Consul Honor. 1, 31, 32.

<sup>4</sup> *Paculus Drepanius* in Panegyri. upon Theodor. M., c. 5.

<sup>5</sup> *Claudian* in Eutrop. 1, v. 392.

<sup>6</sup> *Sidon. Appolin.* Epist. viii, 6.

<sup>7</sup> *Nennii* *Histor. Briton.*, Ed. San Marte, § 31 "tres ciulæ." *Gildas*, de excidio Britan. Ibid. § 23, "tribus ut lingua (Saxorum) exprimitur, cyuli, nostra lingua longis navibus, secundis velis." *Beda*, *Ecclesiast. Histor. gentis Anglor*; 1, c. 15 (ed. Antwerp, 1550) "tribus longis navibus." *Sharon Turner*, *History of the Anglo-Saxons*, 1, 151 (edit. Paris) "the vessels carried three hundred men each." *Nennius*, etc., § 37, states that Hengist had a reinforcement sent consisting of sixteen additional ciuli.

<sup>8</sup> *Procopius*, de Bello Gothico, lib., 2 c. 15. *Ptolemy*, lib. 11, c. ii, speaks of the *Λαυχιοτες* or *Λαυχιορες* as the inhabitants of southern Scania. *Petersen*, *Danmarks Historie* i. Hedenold. *Worsæe*, *J. J. A.*, *Zur Alterthumskunde des Nordens.* *Keyser*, *R.*, *Om Normændens Herkomst og Folkesligtskab.*

Elbe. Probably it was the same people whose chief rowed across the river in a small dug-out<sup>1</sup> to pay his respects to the Roman conqueror.<sup>2</sup> One of the finest productions of prehistoric naval architecture of a few centuries later is to be ascribed to their skill. Neither its shape nor workmanship suggest the Ciula<sup>3</sup> mentioned by all the early writers in connection with the Saxon maritime power; its form is rather suggestive of the ships of the Suiones,<sup>4</sup> which will be fully described in a later chapter, and it will, I think, be safe to accept the opinion of the renowned archæologist Engelhardt,<sup>5</sup> and ascribe the structure to our Scandinavian neighbors rather than to the Germans<sup>6</sup> although the latter now occupy the territory upon which this interesting find has been made.

#### THE FRANKS.

The first mention in history of the name of Franks is made in a song, which the soldiers of Aurelian, in A. D. 214, just returned from the Northern German frontier, sang when leaving Rome for the Persian war.<sup>7</sup>

Neither Cæsar, Tacitus, nor Ptolemy mention the Franks, although they often speak of the people that occupied the very districts in which we afterwards find the Franks. It is, therefore, probable that Frank is the newest Old German name and represents somewhat vaguely a group of tribes bearing other names, although not much value is placed by some<sup>8</sup> upon this theory.

During the reign of Aurelian they make their first appearance upon the sea, discovering the entrance to the Mediterranean and ransacking Taragone.<sup>9</sup>

In earlier days they dwelt on the right banks of the Rhine, and, as once the Romans pressed on them, ere long they began to press on the Romans in return. The oldest Frankish band was then on the Rhine; southeast was a second group, including the Bructers and others, and beyond these the Chatti and Suevi, to which group<sup>10</sup> the name Franks was first given.

<sup>1</sup> "Caveatum ut illis mos est ex materia."

<sup>2</sup> *Vellejus Patereulus* II, c. 107.

<sup>3</sup> *S. Barth*, Teutschlands Urgeschichte II, 288. *Isidor origines* lxxix, 1. *Dr. G. Klemm*, Handb. d. Germ. Alterth. Kunde, p. 148. *Nennii Histor. Briton.*, ed. San Marte, § 31, 37. *Gildas*, de Excidio Britan., *ibid.*, § 23.

<sup>4</sup> *Tacitus*, De Germaniæ, c. xlv.

<sup>5</sup> *Engelhardt*, C., Denmark in the Early Iron Age, London, 1866.

<sup>6</sup> *Werner*, Admiral, Das Seewesen der Germanischen Vorzeit. *Handelmann*, II. Das älteste Germanische Seeschiff. 1871.

<sup>7</sup> *Vopiscus* in Aureliano, c. 7:

"Mille Sarmatas, Mille Francos, semel et semel occidimus,  
Mille, mille, mille, mille, mille Persas querimus."

<sup>8</sup> *Jacob Grimm*: Geschichte der Deutschen Sprache, p. 518.

<sup>9</sup> *Aurelius Victor* in Cæs., c. 33; *Entropius*, IX, 6; *Claudius* IV, Cons. Honor., 1 31, 32; *Orosius* VII, c. 2; *Nazar* Panegyry., Constant. Ang. diet., c. 17.

<sup>10</sup> *Watterich*: Die Germanen des Rheins, p. 166.

In the middle of the fourth century they are said to be coterminous with the Saxons.<sup>1</sup>

During the reign of Emperor Probus, transported to the Pontus, they seized the ships, and after many adventures returned to their northern homes.<sup>2</sup>

Nothing whatever is known of the character of the vessels employed by the Franks, and after a short existence they again disappear as a maritime power.<sup>3</sup>

#### THE SCANDINAVIANS.

The first mention of this people of the north is made by Tacitus. In describing the ships of the Suiones, he says: "*Suionem civitates ipsae in oceano praeter viros armaque classibus valent; forma navium et differt quod utrumque prora paratum semper appulsui frontem agit: nec velis ministrant, nec remos in ordinem lateribus adjugunt: solutum, in quibusdam fluminum et mutabile, ut res poscit, hinc vel illinc remigium.*"

In the absence of a specimen great difficulties presented themselves to the translators of Tacitus<sup>4</sup> in correctly interpreting the meaning to be conveyed of the structure of ships that so much differed from the Roman and other ships known as to require separate mention, although they really offered considerable similarity to the ships of the Veneti. Most translators therefore inform us that the equal prows were intended to facilitate landing in either direction and to enable the ship to effect an easy passage through shoals. With regard to the oars the general impression has been that they were not fixed to the sides of the ship in a regular manner (*nec remos in ordinem lateribus adjugunt*) but that they were loose (*solutum*) and could be used alternately (*mutabile*) on either side of the ship (*hinc vel illinc*).

Admiral Jal<sup>5</sup> explains the *mutabile* as implying a method similar to that employed by the Venetian gondoliers, who use a peg in the gunwale as point of resistance, and on either side of which the oar could be plied to produce a forward or backward motion. This interpretation, although a very good one considering the absence of any ship, however, does not seem to me to represent what Tacitus meant to describe. The *utrumque prora paratum semper appulsui frontem agit* would seem to imply a readiness to present in either prow a front to the enemy, either for aggressive or defensive purposes, and that this front could be

<sup>1</sup> *Ammian.* Marcell. rer. gestar. lib. xxvi, § 1; lib. xxvi, § 5.

<sup>2</sup> *Zosinus* I, c. 7; *Vopiscus* in Probo. IV, c. 18; *Eumenius* in Penegy. Constant. Cæs., xviii.

<sup>3</sup> The authorities on the Franks are: *Jacob Grimm*: Geschichte der Deutschen Sprache, Leipzig, 1848; *Waitz*: Des alte Recht der Salschen Franken, Beilage zur Deutschen Verfassungsgeschichte, Kiel, 1846; *Bohm*: Fränkische Reichs- und Gerichts Verfassungsgeschichte, Weimar, 1871; *Watterich*: Die Germanes des Rheines, Leipzig, 1872.

<sup>4</sup> *Tacitus*: De Germaniæ c. xlv.

<sup>5</sup> *A. Jal*: Archéologie Navale, 1810, 2d Mémoire.

much easier maintained by the position of the oars which were not fixed (*ne remos in ordinem lateribus adjudunt*), that is not permanently fixed to the sides of the ship, but were (*solutum*) loosely suspended (*et mutabile*) and capable of being changed in so far as to be employed in either direction (*hinc vel illinc remigium*); or, in other words, that, although in a measure fixtures to the sides of the ship, yet they were hanging loosely in loops or straps fastened to the rowlocks that, like the rowlocks for a forward motion, would act as points of resistance to permit a backward rowing without change of oar or of rowers.

The next mention of the people of the North we find in the middle of the second century, when the Danes are mentioned as inhabitants of Scania,<sup>1</sup> but it is not until the beginning of the sixth century that the Scandinavians (Danes) announce their coming to the West by entering the river Maas and pillaging the vicinity of Geldern.<sup>2</sup>

A navy of ships of the kind described by Tacitus must necessarily have been the growth of centuries, and must have been the result of active service upon the sea, in accordance with the historical truth that powerful nations do not remain idle; and it is, therefore, to be inferred that the Scandinavians (Suiones of Tacitus, Danes of Prokop) navigated the sea many centuries before the beginning of the Christian era.

The early history of a people finds its beginning in the traditions of the deeds and achievements of prominent men among them that were recounted upon festive occasions and thus handed down from generation to generation. Although based on facts, they soon assumed a mythical character and they do not now admit of being assigned a definite period of origin, while others, becoming more and more vague, were gradually forgotten, a circumstance much regretted by Cicero<sup>3</sup> as regards the loss to history of important facts.

*Rock-sculptures.*—The oldest form of the tradition of the people of the North has been discovered in the rock sculptures so abundantly found along the Scandinavian coast. They give, in an ideographic form, an account of the important events, a permanent record to be handed down to posterity. A second form, of much more recent date, is presented in the "Sagas."

The rock sculptures have received the name Hellristninger, (or Häll-

<sup>1</sup> Ptolemy, lib. ii, c. ii, speaks of the *Δακλιονες* or *Δαχτυλονες*. Procop. de bello goth. lib. 2, c. xi, xv. H. M. Petersen: Danmarks Historie i Hedenold, i, 24. Worsaae, J. J. A.: Zur Alterthumskunde des Nordens, p. 78. Keyser, R.: Om Normændens Herkomst og Folkeslægtskab.

<sup>2</sup> Greg. Turon, iii, c. 3. Barthold: Geschichte der Deutschen Seemacht (in Raumer's Histor. Taschenbuch, iii Folge, i Band, 1850, p. 304).

<sup>3</sup> "Gravissimus auctor in 'Originibus' dixit Cato, morem apud majores hunc specularum fuisse, ut deinceps, qui accubarent canerent ad tibiam elarorum vivorum laudes atque virtutes" (Cic. Tusc. Quæst. iv, 3). "Utinam existarent illa carmina quæ multio sæculis ante suam ætatem in spulis esse cantitata a singulis convivis declamatorum vivorum laudibus in 'Originibus' scriptum reliquit Cato" (Cic. Brut. xix).

ristningar,)<sup>1</sup> and among other objects they exhibit, in single outline, more or less equipped ships, sharp at the ends, with stem and stern curved and high. They occur along the coast from Trondhjem southward and around to and including Gotland. A few have been found in Denmark and upon the shores of Lake Ladoga in Russia.

With regard to their antiquity a variety of opinions prevail. Brunius<sup>2</sup> assigns them to the stone age and perhaps to the beginning of the bronze age; he thinks that they have been produced by rubbing or hammering, but that in either case they show the aid of stone utensils. Bruzelius,<sup>3</sup> Holmboe,<sup>4</sup> and Montelius<sup>5</sup> place them in the bronze age (about 1500 to 500 B. C.),<sup>6</sup> and a similar opinion is entertained by Nico-

<sup>1</sup> *Aberg, Dr. L.*: Hällristningar uti Bohuslän, 1839. *Annaler för Nordiske Oldkyndighed*, Kopenhagen, 183, p. 386; 1839, pl. x; 1842-43, p. 348. *Archiv f. Anthropologie*, x, p. 86. *Baltzer, L.*: Bohusläns Hällristningar, 1881. *Brunius*: Forsök till Förklaringer öfver Hällristningar, Lund, 1868. *Bruzelius*: Om Hällristningar i Järrestads Härad i Skåne (I Ant. Tidsk. f. Sverige, vi). *Bulletin histor. philol. de l'Acad. des Sci. de St.-Petersbourg*, xii, No. 7, 8. *Du Chailly*: Viking Age, i, p. 116. *Holmberg, A. E.*: Bohusläns Historie och Beskrifning, Udervalla, 1842, p. 15, 19, pl. i, ii. *Holmberg, A. E.*: Scandinaviens Hällristningar, Stockholm, 1846. *Holmboe*: Om Hällristningar (I Christ. Vidensk. Selsk. Forh., 1861). *Ferguson*: Rude Stone Monuments, fig. 106, p. 303. *Grewingk, C.*: Ueber die in Granit geritzten Bildergruppen am Onegasee. *Grewingk, C.*: Verh. d. estnischen Ges. zu Dorpat, vii, Heft 1, p. 25. *Kemble*: *Horae ferale*s, p. 228. *Montelius, O.*: Bohusläns Hällristningar, Stockholm. *Montelius, O.*: The Civilization of Sweden in Heathen Times (Transl. by F. H. Woods, London, 1888). *Montelius, O.*: Bohuslänske Fornsaker, Stockholm, 1874, p. 24-27. *Nilsson, S.*: Die Ureinwohner des Skandinavischen Nordens. *Nicolaysen, N.*: Langskibet fra Gokstad, Kristiania, 1882, p. 9. *Petersen, Dr. Henry*: Om Hällristningar i Danmark (Aarb. nord. Oldkynd. 1875, p. 42). *Petersen, Dr. Henry*: Notice sur les pierres sculptées du Danemark (Transl. by Abbé L. Morillet in *Mém. de la Soc. R. d. Antiq. du Nord*, Copenhagen, 1877, p. 330-342). *Petersen, L.*: Mere om Hällristningar ved Allinge (Meddelse til Bornholm Tid., 30 Sep. 1884). *Rau C.*: Cup-shaped and other lapidarian sculptures (in *Contributions to North American Ethnology*, vol. v. U. S. Department of the Interior), Washington. *Rygh, O.*: Om Hällristningar i Norge (Vidensk. Selsk. Krist. Forh., 1873, p. 455-470). *Schwede*: Nachr. Iswestija d. Geogr. Ges. St. Petersburg, 1850, p. 68. *Simpson*: *Archaic Sculptures*, p. 72. *Stevens, Geo.*: *Runic Monuments*, vol. i, p. 74. *Vedel, E.*: Bornholms Oldtidsminder og Oldsager, Kjöb., 1886. *Worsaae, J. J. A.*: Nordiske Oldsager i det K. Museum, Kjöbenhavn. *Worsaae, J. J. A.*: The primeval antiquities of Denmark (transl. by W. J. Thomas), London, 1849. *Worsaae, J. J. A.*: The Industrial Arts of Denmark, 1882, p. 113. *Worsaae, J. J. A.*: Zur Vorgeschichte des Nordens (German transl. by J. Mestorf, 1887, p. 67). *Worsaae, J. J. A.*: Zur Alterthumskunde des Nordens.

<sup>2</sup> *Brunius*: Forsök till Förklaringer öfver Hällristningar, Lund, 1868.

<sup>3</sup> *Bruzelius*: Om Hällristningar i Järrestads Härad i Skåne (I. Ant. Tids. f. Sverige, vi).

<sup>4</sup> *Holmboe*: Om Hällristningar (I, Christ. Vidensk. Selsk. Forh., 1861.)

<sup>5</sup> *Montelius, O.*: The Civilization of Sweden in Heathen Times, London, 1888.

<sup>6</sup> *Nilsson, S.*: Skandinaviske Nordens Urinvånarne, 1838-1843. *Nilsson, S.*: The Primitive Inhabitants of Scandinavia, 1868. *Montelius, O.*: The Civilization of Sweden in Heathen Times, London, 1888, p. 70. *Compte Rendu du Cong. Archéolog. de Stockholm*, ii, 450. *Montelius, O.*: Om tidsbestämning inou bronsåldern nal särskildt af seende på Skandinaavia, Stockholm, 1885, accept the bronze age as having occupied the period of from 1500 to 500 B. C.

laysen,<sup>1</sup> who gives approximately the year 1000 B. C. as the time of their origin. Boor Emil Hildebrand<sup>2</sup> places them in the bronze age from the form of weapons represented, while Holmberg<sup>3</sup> credits them to the Vikings; the sculptures of that period, however, distinguish themselves in a remarkable degree from those of the bronze age, as shown in the Höggeby stone, in Upland, Sweden, and in the Tjängvide



Fig. 40.

RUNIC STONE FOUND AT TJÄNGVIDE, GOTLAND, SWEDEN.

(Reproduced from Du Chailu: *Land of the Midnight Sun.*)

Stone, Alskog parish, Gotland (Fig. 40); similar stones of the Viking age occur in Hjerneris, Jutland, Bornholm,<sup>4</sup> etc. Viktor Rydberg<sup>5</sup> accepts the bronze age theory from a comparison of the shape of the ships de-

<sup>1</sup> *Nicolaysen, N.*: *Langskibet fra Gokstad, Kristiania, 1882.*

<sup>2</sup> *Hildebrand*: *Glyphs of Ostergötland.*

<sup>3</sup> *Holmberg, A. E.*: *Skandinaviens hällristningar, Stockholm, 1846.*

<sup>4</sup> *Thorsen, P. G.*: *De Danske Runemindesmerker. Stephens, Geo.*: *The Runic Hall in the Danish Old Northern Museum.*

<sup>5</sup> *Baltzer, L.*: *Bohusläns Hällristningar, 1881 (introduction by Viktor Rydberg).*

scribed by Tacitus,<sup>1</sup> from whose account it will be seen that the ships of the Suiones had stem and stern alike, both offering a front against attack from either side; furthermore, in both an inward curvature existed, while the boats of the bronze age, as illustrated by the rock sculptures, showed a marked difference between stem and stern.

According to Montelius no undisputable traces of mast and sails have been discovered in the rock sculptures of the bronze age, and the boats would seem to have been designed exclusively for rowing. Worsaae,<sup>2</sup> however, figures a boat (Pl. LXXII) that plainly shows the mast, which, however, may have been added at a subsequent period.

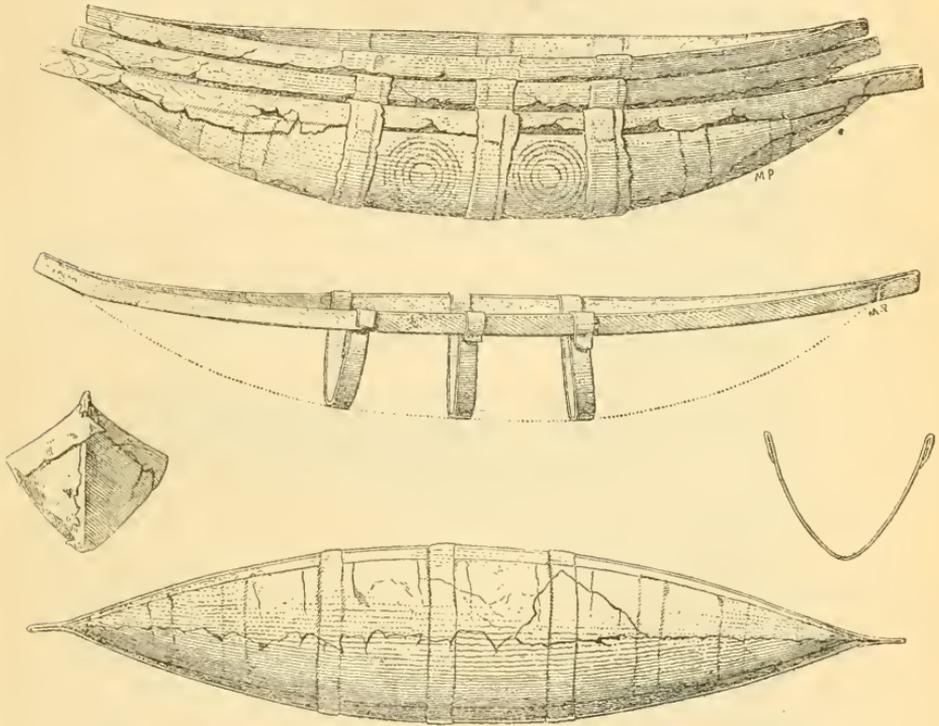


Fig. 41.

NEST OF GOLD BOATS FOUND AT NORS, DENMARK.

Reproduced from "Votiv-fund fra Sten-og-Bronzealderen" in *Aarbøger for Nordisk Oldkyndighed og Historie*, 1886.

*Gold Boats*<sup>3</sup> (Fig. 41).—A fuller illustration of form is furnished by the unique find, in a bank at Nors, district of Thisted, Denmark, around which are many small grave mounds, and among fragments of pottery, of a clay vessel covered with a flat stone, and containing about one hun-

<sup>1</sup> *Tacitus*: *De Germaniæ* xlv "forma navium eo differt quod utrumque prora paratum semper appulsui frontem agit."

<sup>2</sup> *Worsaae, J. J. A.*: *Zur Alterthumskunde des Nordens*, 1847, pp. 26, 27, Pl. xv.

<sup>3</sup> *Votiv fund fra Sten og Bronzealderen*. In *Meddelelser fra det Kgl. Museum for de Nord Oldsager* (*Aarbøger for Nordisk Oldkyndighed og Historie*, 1886, II Række, 1 Bind, Heft 3, p. 238).

dred small gold-plate boats laid within each other, as shown in the accompanying figure.

The railing and the ribs of these small boats are made of narrow and thin bronze bands that are bent around one another; in the middle of these lie sheets of thin plates of gold, whose corners overlap each other at the bottom of the boat and are bent around the bronze bands above, covering it. In the same manner the outside covering is effected.

The size of the boats and the number of ribs vary and some are ornamented with concentric circles.

*Boat-shaped Monuments.*—While the first appearance of the Northmen upon the western seas is shown to have taken place in the beginning of the sixth century,<sup>1</sup> there is strong and possibly conclusive evidence of their having entertained an active and intimate intercourse with the countries upon the eastern shores of the Baltic Sea; their traces are found in the Baltic provinces of Russia—in Estonia, Estnisch Livonia, attaining a maximum in Livonia, and diminishing again in Courland—and in northern Germany.

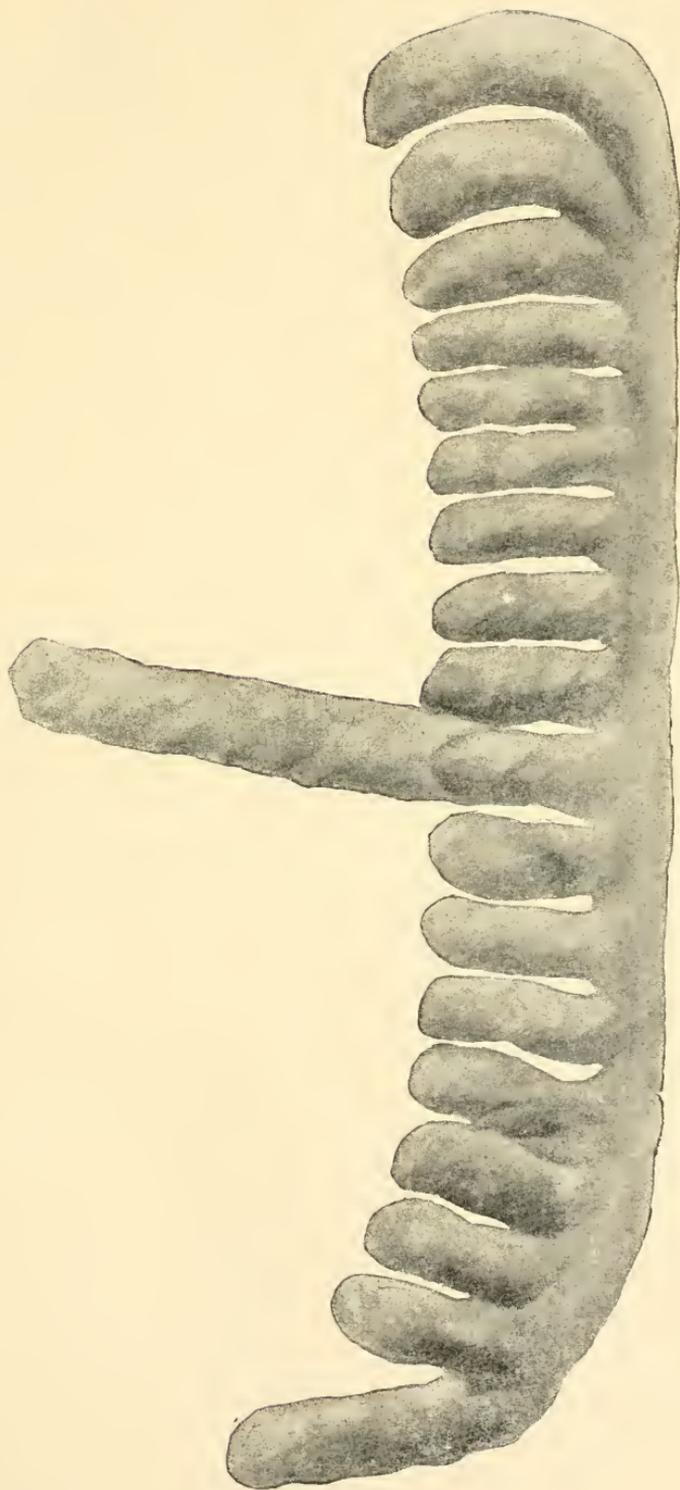
The monuments that give us an account of such intercourse are the burial places in the form of ships; the stone ship of the land supplanting the wooden ship of the sea, upon which, according to ancient custom,<sup>2</sup> the dead were cremated and their ashes, together with their personal property, buried.

These stone, boat-shaped burial places are known by the names of Skibssætningar, Stenskeppar, Skeppshögar, Skeppsformer, Steinschiffe, Schiffsetzungen, Teufelsboote, Wella Laiwe. Their home is in Sweden,<sup>3</sup>

<sup>1</sup>Greg. Turon. III, c. 3. Barthold: Geschichte der Deutschen Seemacht, 1850, Bd. 1, p. 304.

<sup>2</sup>Egils Saga, c. lxi (Heimskringla text). Gylfaginning, c. xlix (Heimskringla text). Hakon the Good Saga (Heimskringla text), c. xxvii. Landnama, ii. Laxdæla, c. viii. Vatnsdæla Saga, c. xxii. Ynglinga Saga, c. viii, xxvii.

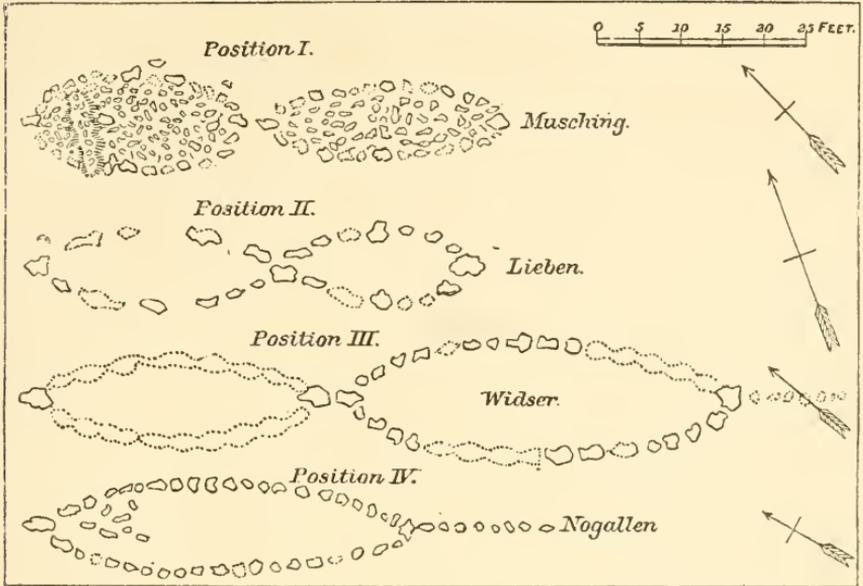
<sup>3</sup>BLEKINGEN, *Worsaae, J. J. A.*: Zur Alterthumskunde des Nordens, 1847, p. 16, and pl. III. *Sjöborg*, Samlingar för Nordens Fornälskare, I, p. 116, pl. XIV, fig. 46, and pl. XX, fig. 60. *Grewingk, C.*: Zur Archäologie des Baltiens (in Archiv. f. Anthropologie, x, p. 83. Aarbøger for Nordisk Oldkyndighed og Historie, 1881, p. 155. Antiquarisk Annaler, IV, p. 297. *Fedel, E.*: Bornholms Oldtidsminder og Oldsager, p. 27. BOHUSLÄN: Bidrag til Kännedom om Goteborgs och Bohusläns Fornminnen, 1874. *Grewingk, C.*: Z. Arch. d. Balt. (Arch. f. Anth., x, p. 83). *Holmberg*: Bohusläns Historie och Beskrifning, II, p. 192. GOTLAND, *Dr. Säre*: On Gotlands äldste Fornlemningar (I Ann. f. nord. Oldkynd, 1852, p. 130-170. *Fedel, E.*: Bornholms Oldtidsminder og Oldsager, p. 27. *Grewingk, C.*: Z. Arch. d. Balt. (in Arch. f. Anth., x). Bidrag til Kännedom om Goteborgs och Bohusläns Fornminnen, I, Stockholm, 1874. OELAND, *Algrist*: Oelands Historia, I, p. 31. *Holmberg*: Bohusläns Historia och Beskrifning, II, p. 192. SCANIA, *Grewingk, C.*: Z. Arch. d. Balt. (in Arch. f. Anth., x). SÖDERMANLAND: Yellow Book, Den yngre Jernalder, p. 356. *Peterson's and Söderström's Samlung. Worsaae, J. J. A.*: Z. Alterthumsk. d. Nordens, 1874, p. 16, 32, and pl. IV. SVEARICKE: K. Vitterhets, Historie och Antiq. Akad., Stockholm (monthly). *Hellier, Gosselin*, Sec. R. Arch. Soc. of Gr. Britain, manuscript letter. *Brown, Mary A.*: Manuscript letter. UPLAND, *Grewingk, C.*: Z. Arch. d. Baltie. (Arch. f. Anth., x).



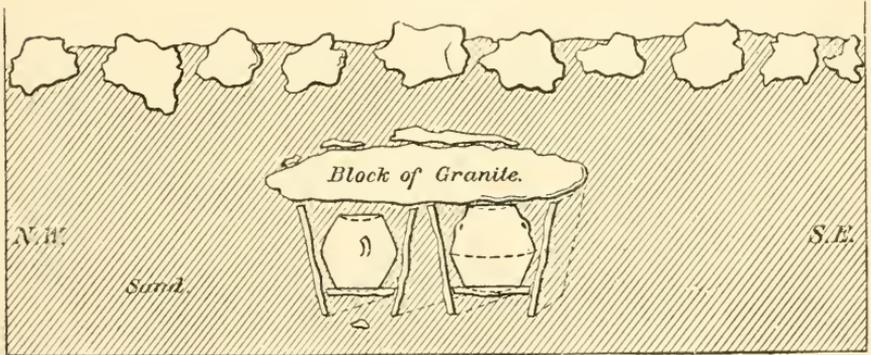
ROCK-CARVING AT MÖKLERYD, TORHAMN PARISH, BLEKINGE, SWEDEN.  
(Copy of Plate XV, J. J. A. Worsaae's "Zur Alterthumskunde des Nordens," Leipzig, 1847.)



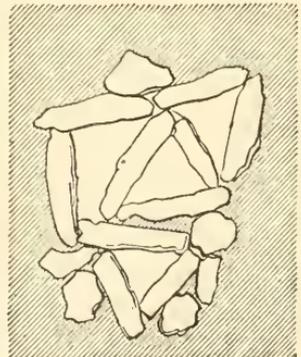
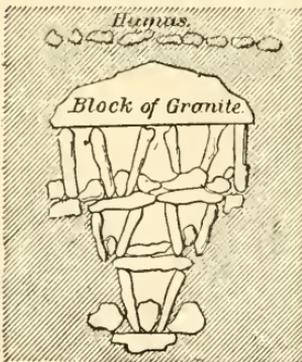
A.—Boat positions of Erwahlen, Courland.



B.—Sectional view.



C.—Stone chests in Boat-positions



BOAT-SHAPED GRAVES AT ERWAHLEN, COURLAND, RUSSIA.

(Copied from C. Grewingk's "Die Steinschiffe von Musching.")



where they represent the early iron age.<sup>1</sup> They occur in Denmark, upon Bornholm.<sup>2</sup> About twenty-four such positions are known, while in Jutland<sup>3</sup> only two have existed, of which one (at Højstrup, in Vester Van Herrel) is said to have been built upon graves from the earlier iron age. In Germany only two boat-shaped graves have been discovered, at Stralsund<sup>4</sup> and Köslin.<sup>5</sup>

In the Baltic provinces of Russia forty-two boat-shaped graves have been found and mostly examined; of these seven occur in Courland,<sup>6</sup> all being located in the diocese of Erwahlen, and with one exception they occur in pairs, situated behind each other. The outlines of long, narrow, and pointed vessels are represented by a single row of stones. (Pl. LXXIII).

The stem and stern posts are shown by large bowlders, thus indicating for these parts a considerable elevation above the bulwark of the boats; depressions in the board-stones indicate the rowlocks. The general direction of these ships is an easterly one, their dimensions: 31 by 8, 27 by 13, 25 by 10, 31 by 10, 50.9 by 14, 49 by 10, 47.10 by 10 feet.

<sup>1</sup> In the Lungersas (Goteland) ship runic stones of the later iron age occur. The skeppstorm of Lille Lundley, Södermanland, terminates at one end in a Banta stone, upon which are the following words in runes: "Spute and Halfdan raised this stone after Skarde, their brother." The ship form at Raftötungen, Blekingen, contained articles belonging to the later iron age.

<sup>2</sup> *Fedel, E.*: Bornholms Oldtidsminder og Oldsager, pp. 25-27. Petersen, L.: Manuscript letter of July 7, 1887.

<sup>3</sup> *Major John Daniel*, Spazierreise von Kiel aus nach Norden 1693 (mss.). *Arnkjøl*: Cimbrische Heydenbekehrung. Hamburg, 1702, p. 340. *Christiani*: Geschichte von Schleswig Holstein, I, p. 328. *Thiele*: Danmarks Folkesagen, I, pp. 31-32. *Kier*, Pastor: Handschriftl. Gemein. Annalen v. Osterlygum, 1812. *Handelmann, H.*: 28 Bericht der Schleswig Holstein Lanenburg'schen Gesellschaft für die Sammlung und Erhaltung vaterländischer Alterthümer. Kiel 1868, p. 31. *Antiq. Annaler* IV, p. 297. *Aarbøger f. Oldkynd.*, 1881, p. 155. *Fedel, E.*: Bornholms Oldtidsminder og Oldsager, p. 27.

<sup>4</sup> *Grewingk, C.*: Erläuterungen z. Archaeol. Karte, etc. In Verhandl. d., gelehrten Est. Ges., Dorpat, 1884; Bd., XII, p. 106. *Hagenow*: Baltische Studien d. Ges. f. pomm. Gesch., XV, 2, p. 49. *Grewingk, C.*: Z. Arch. d. Balt. (Arch. f. Anth. X).

<sup>5</sup> *Grewingk, C.*: Erläuterungen z. Arch. Karte, p. 106.

<sup>6</sup> *Döring, J.*: Die Teufelsboote von Kurland in Sitzungsber. d. Ges. f. Literat. und Kunst, 1860-1863. Mitau, 1864, p. 151. *Hagenow*: In Baltische Studien d. Ges. f. pomm. Geschichte, XV, 2, p. 49. *Grewingk, C.*: Das Steinalter der Ostseeprovinzen, Dorpat, 1865, p. 15. *Berg*: Notiz im Coresp. Blatt d. Naturf. Ges. z. Riga, XX, 1872, No. 7. *Sievers, Graf C.*: Verh. d. Berliner Ges. f. Anth. Oct. 1875. *Sievers, Graf C.*: Verh. d. Estnischen gel. Ges., Dorpat, 1876, VIII, Heft 3. *Grewingk, C.*: Zur Archaeol. d. Baltiens. (Arch. f. Anth., X). *Burchardt*: Baltische Monatschrift, XXIV, Riga 1875. Sitzungsberichte d. Estnischen gelehrten Gesellschaft, May, Nov., Dec., 1876. *Grewingk, C.*: Die Steinschiffe von Musching und die Wella Laiwo oder Teufelsboote Kurland's überhaupt. Dorpat, 1878. *Grewingk, C.*: Erläuterungen z. archaeol. Karte des Stein, Bronze, und Eisenalters in Liv-Est und Kurland. Dorpat, 1884 (Verh. d. Gel. Est. Ges. Dorpat. Bd., XII). *Grewingk, C.*: Die Neolithischen Bewohner von Kunda in Estland (Verh. d. gel. Est. Ges. Bd., XII). *Grewingk, C.*: Ostbaltische, dem heidnischen Todtenultus dienende, schifförmige und anders gestaltete Steinsetzungen. Dorpat, 1887.

At a depth of from 6 inches to a foot below the surface a large stone plate was found, serving as a cover to chests built of plates of either natural or artificial formation. The cells of these chests were occupied by urns (figs. 42, 43, 44, 45) composed of gravel mixed with clay but

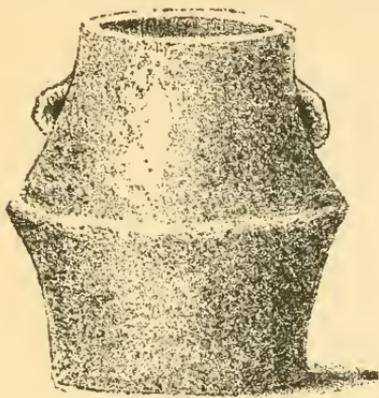


Fig. 42.

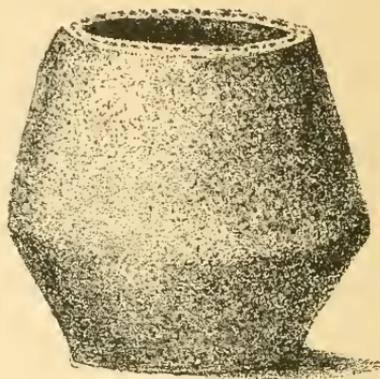


Fig. 45.

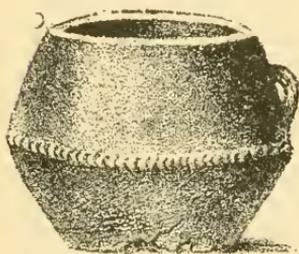


Fig. 43.



Fig. 44.

CINERARY URNS FROM BOAT-SHAPED GRAVE IN COURLAND, RUSSIA.

(Copied from C. Grewingk: "Die Steinschiffe von Musching, etc.," in Verh. Est. gel. Gesellschaft.)

little burnt, and containing more or less cremated human remains. The accompanying Pl. LXXIII, copied from "C. Grewingk, Die Steinschiffe von Musching" shows in *a* the arrangement and outlines of these boat positions; in *b* a sectional view of one of the Musching boats; in *c* the stone chests which have served for the reception of the cremated remains of the dead in the funeral urns shown in figures 42, 43, 44, 45.

Similar boat-shaped graves occur in Estland,<sup>1</sup> Estnish Livonia.<sup>2</sup>

<sup>1</sup> Kruse *Neerolivonica*, Generalbericht 10, Tafel 59, fig. 9. *Verhand. gel. Estn. Ges.*, i, 2, p. 9. Grewingk, C.: *Das Steinalter der Ostseeprovinzen*. Dorpat, 1865, pp. 56, 74. Grewingk, C.: *Ueber heidnische Gräber Russisch Litauens* (*Verh. gel. Est. Gesell.*, vi, 1870). Hansen: *Samml. inländ. Alterth. Russlands*, 1875, 1876. Grewingk, C.: *Die neolithischen Bewohner von Kunda*, 1884. Wiskowatow, P.: *Bericht über die Aufdeckung einer schifförmigen Steinsetzung bei Türsel in Estland* (*in Verh. d. gel. Est. Ges. zu Dorpat*, Bd. XIII, 1887). Grewingk, C.: *Der schifförmige Aschenfriedhof bei Türsel* (*Verh. d. gel. Est. Ges.*, XIII, p. 5-71, 1887). Grewingk, C.: *Ostbaltische, dem heidnischen Todtencultus dienende Steinsetzungen*, 1887.

<sup>2</sup> Kruse, *Neerolivonica*, Beilage e. p. 10. Grewingk, C.: *Das Steinalter der Ostseeprovinzen*, Dorpat, 1865. *Verh. gel. Estn. Ges.*, vi, 3, 4, pp. 266, 269. Tafel xix, fig. 10, 41. Hartmann, *Vaterländ. Museum*, Dorpat 1871. Taf. viii, fig. 6, 7, Taf. xi, fig. 11. *Sitzungsab. gel. Estn. Ges.*, 1873, p. 12; 1875, p. 159; May, Oct., Nov., Dec., 1876. Grewingk, C.: *Z. Archæologie des Baltieum* (*Archiv. f. Anthropol.*, x).

In Livonia<sup>1</sup> about thirty of such boat-shaped graves have been found (illustrated in Figs. 46, 47, 48).

The boat-shaped urn graves of Courland (Wella-Laiwe, figured on Pl. LXXIII) indicate but a comparatively short occupancy of the terri-

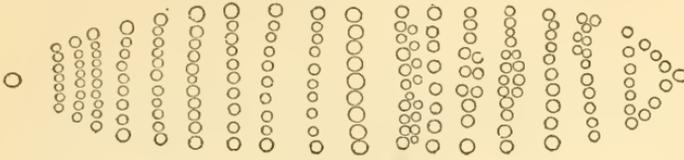


Fig. 46.

BOAT-SHAPED GRAVE NEU KARRISHOF, LIVONIA, RUSSIA.

(From J. X. Штида Раскопки, произведенныя въ Лифляндской губернии.)

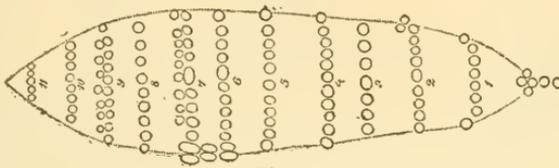


Fig. 47.

BOAT-SHAPED GRAVE AT MÄÄRO, LIVONIA, RUSSIA.

(From J. X. Штида Раскопки, произведенныя въ Лифляндской губернии.)

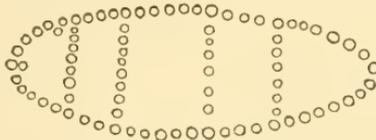


Fig. 48.

BOAT-SHAPED GRAVE AT WILLEMI, LIVONIA, RUSSIA.

(From J. X. Штида Раскопки, произведенныя въ Лифляндской губернии.)

tory, while the eineraria of Livonia and Estonia, by their arrangement and contents, must have served as cemeteries during a considerable period of time, extending, probably, over several centuries.

One of the finest structures of this kind is the Slaweck ship<sup>2</sup> (Fig. 49) upon the shores of Lake Strante; it shows a double row of stones

<sup>1</sup> Kruse: *Necrolivonica*. Dorpat, 1812. Bähr, J. K.: *Die Gräber der Liven*. Dresden, 1850. Verh. d. del. Est. Ges. zu Dorpat 1, 1860. Grewingk, C.: *Das Steinalter der Ostseeprovinzen*, 1865. Sievers-Raudenhopf, Jagor, von, Sitzungber. d. Est. Gel. Ges. Feb., 1872, March, 1876. Grewingk, C.: *Zur Archaeol. d. Baltie* (Arch. f. Anth. X). Sievers, Graf C.: *Verh. d. Berliner Ges. f. Anth.*, Oct., 1875. Sievers, Graf C.: *Verh. d. gel. Estn. Ges.* Bd. VIII, 3, p. 24, 1876. Sievers, Graf C.: *Briefliche Mittheilungen und noch nicht gedruckter Bericht*. Grewingk, C.: *Erläut.* 2, Arch. Karte. J. X. Штида Раскопки, произведенныя въ Лифляндской губернии. Jung, Herm, J.: *Die schifförmigen Steinsetzungen im Fellinschen Kreise des Gouvernment Livland*. (In 456 Sitzungsberichte d. gel. Estn. Gesellschaft, Dorpat 1s. 13 Nov., 1878.) Grewingk, C.: *Ueber ostbaltische, vorzugsweise dem heidnischen Totenkultus dienende schifförmige und anders gestaltete Steinsetzungen*. 1887.

<sup>2</sup> Sievers, Graf Karl: *Bericht über die im Jahre 1875 am Strantesee ausgeführten archäologischen Untersuchungen*. In *Verhandlungen der gelehrten Estnischen Gesellschaft zu Dorpat*. Band VIII, Heft 3.

laid perfectly straight, with fourteen cross rows or benches, between most of which the calcined fragments of human bones, especially of skulls, mixed with ashes, cinders, and bones, were found imbedded in black soil; pottery was found in some of them. One hundred and twenty-nine articles were found in the various portions of the structure, consisting of fibula, bracelets of bronze, rings, spirals, knife blades

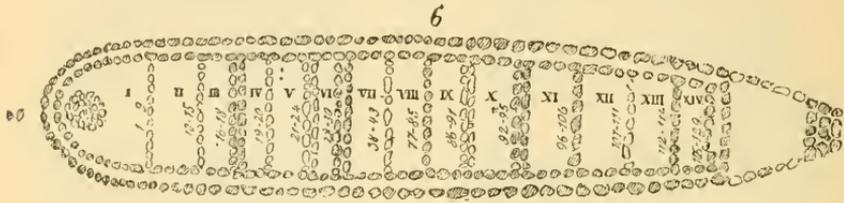


Fig. 49.

SLAWEEK SHIP, ESTONIA, RUSSIA.

Copied from Graf C. Stevers, "Archäologische Untersuchungen" in Verh. Est. gel. Gesellsch.)

of iron, ornaments of bronze, and gilded beads of glass, amber, and metal, etc. Some of the intervals show distinct traces of cremation, and exhibit thick layers of ashes and cinders; the calcined remains, however, were not left at these places, but were deposited in other intervals.

The boat-shaped cinerarium at Türsel, in Estonia,<sup>1</sup> recently explored, from its arrangement and tymbological contents, might serve as a fair representative of the numerous Livonian and Estonian cineraria without urn burial. While differing from most of them in point of material employed, consisting in calcareous slate plates against erratic bowlders, this difference is a mere local one, and results from the absence of the latter and occurrence of the former in the vicinity. Judging from its dimensions and comparatively small number of calcined human remains found, the ship appears to have served as burial place of a small family, which, however, distinguished itself by the wealth and beauty of articles and ornaments offered to the dead.

This cinerarium has been made the subject of a thorough study by the late Prof. C. Grewingk, of Dorpat, from whose report<sup>2</sup> I have borrowed the accompanying illustrations and notes:

"Fibula (Fig. 50) of Roman, or provincial Roman form is of frequent occurrence in the Balticum. It was found in the boat-shaped graves at Unnipicht and Langensee in North Livonia,<sup>3</sup> near the Strante Lake in southern Livonia, together with Roman coins from the years 69 to 79, and 161 to 180 A. D.,<sup>4</sup> in the stone ships of Abschekippe and Sla-

<sup>1</sup>Wiskowator, P.: Bericht über die Aufdeckung einer schifförmigen Steinsetzung bei Türsel, in Estland. In Verhandlungen der gelehrten Estnischen Gesellschaft zu Dorpat, 1888. Band XIII.

<sup>2</sup>Grewingk, C.: Der schifförmige Aschenfriedhof bei Türsel in Estland. In Verhandlungen der gelehrten Estnischen Gesellschaft. Band XIII. 1888.

<sup>3</sup>Archiv für Anthrop. x, p. 95. Tf. ii, fig. 11. and 12 *Aspelin*: Antiquités du Nord Finno-Ougrien. Helsingfors 1877-1884. fig. 1760

<sup>4</sup>*Aspelin*: Antiq, fig. 1788.

week,<sup>1</sup> in Courland in the deposits of arms of Dohbesberg, in the skeleton graves of Ringen, and in cinerary urns in the graves of Capselthen,<sup>2</sup> in Prussia, in cineraria with and without urns, together with Roman coins of the second and third century<sup>3</sup> in Rosenau, near Königsberg,<sup>4</sup> at Marienburg,<sup>5</sup> in Poland,<sup>6</sup> in Meckleburg, Nydam Moss, etc.

“Fibula (Fig. 51) of bronze with iron axis. Corresponding ones were found near Odsen, Livonia,<sup>7</sup> in the stone ships of Ahschekippe and

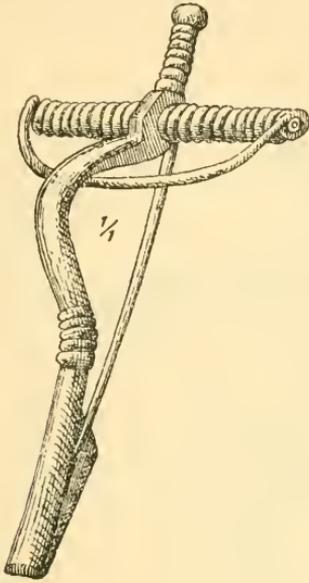


Fig. 50.

FIBULE FROM CINERARIUM AT TÜRSEL, RUSSIA.

Copied from C. Grewingk in Verh. gel. Est. Ges. 1888. Bd. XIII.

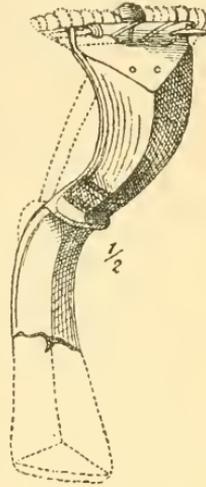


Fig. 51.

Slaweek,<sup>8</sup> in the Polish District Augustowo.<sup>9</sup> Similar forms occur in the cineraria of Elbing and Olivia, Prussia, upon Bornholm, and in Norway.<sup>10</sup>

<sup>1</sup> *Sievers, Graf C.*: Bericht über arch. Untersuchungen. In Verhandl. d. gel. Est. Gesellschaft zu Dorpat. Bd. VIII, 1876. Heft 3 mit Tafel i-iii. *Sievers, Graf. C.*: Ueber ein normänn. Schiffsgrab bei Ronneburg. In Verhandl. d. Berliner Gesellsch. f. Anthropol. Jahrg. 1874-1875. Sitzung vom 16 October. p. 14-17 und Tafel viii. *Aspelin*: Antiq., Fig. 1819.

<sup>2</sup> *Grewingk, C.*: Erläuterung z. arch. Karte, p. 12.

<sup>3</sup> *Tischler*: Ostpreussische Gräberfelder iii. In Schriften der physik-ökonom. Gesellsch. zu Königsberg XIX, 1879, p. 205. Taf. ix, Figs. 6 und 11. *Tischler*: Ueber die Formen der Gewandnadeln. Zeitschr. f. Anth. u. Urgeschichte Baierns IV. Heft 1 und 2. München, 1881. Mit 4 Tf. p. 31.

<sup>4</sup> *Berendt*: Zwei Gräberfelder in Natangen. Königsberg 1874. Tf. viii fig. 3 and 37-40.

<sup>5</sup> *Lissauer und Couwenz*: Das Weichsel-Nogat Delta. Schriften d. Naturf. Ges. zu Danzig. 1886, p. 228. Tf. ii, fig. 31.

<sup>6</sup> Sammlung des Collegium Jagellonicum zu Krakau. *Aspelin*: Antiq. fig. 1904.

<sup>7</sup> Sammlung der gelehrten Estnischen Gesellschaft zu Dorpat.

<sup>8</sup> *Aspelin*: Antiq. fig. 1815.

<sup>9</sup> Archiv f. Anthropol. x, 94 and 300. Also remark 139. *Aspelin*: Antiq. figs. 1902.

<sup>10</sup> *Undset*: Das erste Auftreten des Eisens in Nord Europa. Hamburg 1882, p. 481, fig. 193.

“Fibula of iron (Fig. 52) of gigantic dimensions. The eye-shaped holes upon the axis correspond to those from Türsel, Kauger, and Odsen and appear as the trade-mark from which to conclude on similar source and age. It resembles a specimen found at Ascheraden upon the Duna,<sup>1</sup> which, however, is of much more recent make; similar forms have been observed in the stone positions of Rippoka, and Lake Strante in central Livonia.<sup>2</sup>

“Figs. 53 and 54 are fibulae with reversed bodies; they are the first of their kind found in the Baltic provinces.

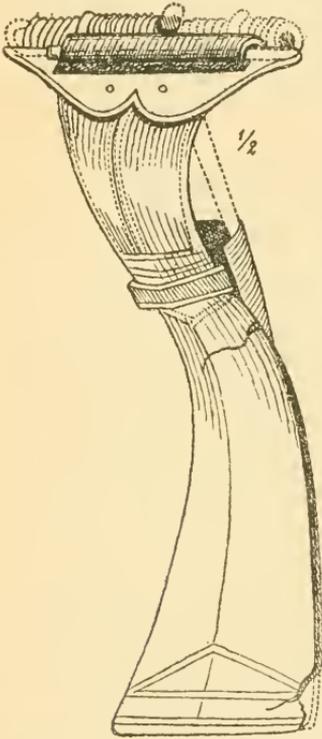


Fig. 52.

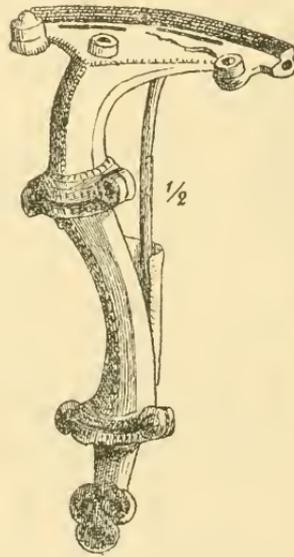


Fig. 53.

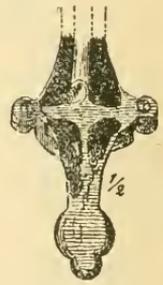


Fig. 54.

FIBULÆ FROM CINERARIUM AT TÜRSEL, RUSSIA.  
(Copied from C. Grewingk, in Verh. gel. Est. Ges. 1888. Bd. XIII.)

“Fibulae similar to those figured in numbers 55, 56, 57 are known from the boat grave of Määro.<sup>3</sup>

“Fig. 58 had been subjected to the action of fire and was found upon the second phalanx of the little finger of an apparently female hand. This form is characteristic of the cineraria of the first Iron age in Livonia, Estonia, and Finland. They have been found in the Ostrobotnien district of Finland<sup>4</sup> in several cineraria of Estonia (Uxom) and Livonia

<sup>1</sup>Sitzungsber. d. gel. Estn. Ges. zu Dorpat, 1871, p. 78, with cuts.

<sup>2</sup>Archiv f. Anthrop. x, pl. ii, fig 5<sup>b</sup>. *Undset*: Erstes Auftreten des Eisens in Nord Europa. Hamburg, 1882, pl. xvii, fig. 4.

<sup>3</sup>Archiv f. Anthrop. x, pl. ii, fig. 5, p. 94. *Hartmann*: Vaterländ. Museum zu Dorpat, 1871, p. 79, pl. viii.

<sup>4</sup>*Aspelin*: Antiq. fig. 1280, 1281.

at Kosse, Neu-Camby, Umnipicht, Willefer,<sup>1</sup> near Lake Strante, in the boat positions of Ahschekippe and Slaweek.<sup>2</sup> Very similar forms have been found in skeleton graves in the district of Kowno,<sup>3</sup> in graves at

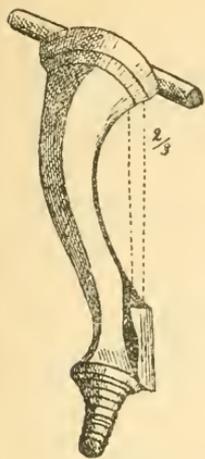


Fig. 55.

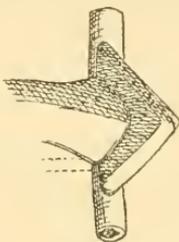


Fig. 56.



Fig. 57.

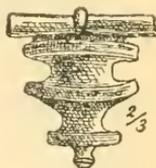


Fig. 58.

FIBULÆ FROM CINERARIUM AT TÜRSEL, RUSSIA.

(Copied from C. Grewingk, in Verh. gel. Est. Ges. 1888. Bd. XIII.)

Brandenburg,<sup>4</sup> and Olivia, near Danzig, Prussia;<sup>5</sup> resemblance to this form is shown in fibulæ from Bornholm,<sup>6</sup> Gotland, and Oeland,<sup>7</sup> and from Rhenish Prussia.<sup>8</sup>

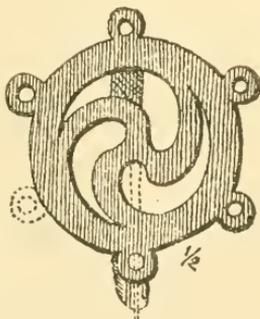


Fig. 59.

BREASTPIN FROM CINERARIUM AT TÜRSEL, RUSSIA.

(Copied from C. Grewingk, in Verh. gel. Est. Ges. 1888. Bd. XIII.)

“Breastpin or perforated fibula (Fig. 59) occurs in similar form in the Slaweek boat,<sup>9</sup> in the district of Kowno, in the Prussian urn cemeteries

<sup>1</sup>Hansen: Sammlungen inländ. Alterthümer. Reval, 1875, p. 40, No. 8, pl. viii, fig. 20. Jung: Sitzungsberichte d. Est. Ges. 1878, p. 191.

<sup>2</sup>Aspelin: Antiq. figs. 1789, 1801, 1780, 1803, 1813, 1811.

<sup>3</sup>Archiv f. Anthrop. x. 94, pl. ii, fig. 2. Aspelin: Antiq. 1896.

<sup>4</sup>Tischler: Gräberfelder iii, pp. 197 and 256, pl. ix, fig. 23 and 15, pl. xi, fig. 4.

<sup>5</sup>Lissauer: Schriften d. Naturf. Ges. zu Danzig iii, 1874. Pl. iv, fig. 13.

<sup>6</sup>Kasisky: Baltische Studien. Jhrg. 27. Stettin 1877, pp. 168-202, fig. 25.

<sup>7</sup>Montelius: Antiq. Suédois. Stockholm, 1873. Fig. 323, 328, 317.

<sup>8</sup>Emele: Beschreibung der Alterthümer. Mainz, 1833, pl. xv, fig. 5.

<sup>9</sup>Aspelin: Antiq. Fig. 1809.

of the district of Rastenburg,<sup>1</sup> and in the Roman colonies upon the Rhine and in Hanover.

“Ornamented disk of bronze plate, rim turned down, with iron knob in the middle with iron pin, is figured in 60 and 61. It recalls the *phalera* of a Roman soldier,<sup>2</sup> or the ornament of a warrior as found in Nydam Moss.<sup>3</sup> Similar forms have been found in the Baltic provinces, in Pomerania.<sup>4</sup> Their form is also approached in specimens from the urn graves in Courland,<sup>5</sup> in the districts of Wilna and Wilkomirz,<sup>6</sup> and in East Prussia.<sup>7</sup>

“Horseshoe-shaped ornament (Fig. 62) resembles the *armilla* of a Roman soldier.<sup>8</sup> The circular or disk ornamentation recurs upon the

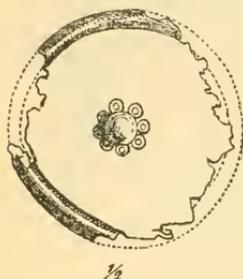


Fig. 60.



Fig. 61.

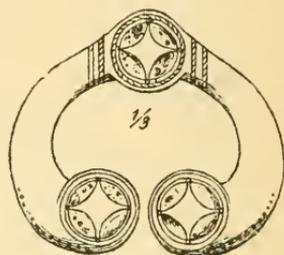


Fig. 62.

ORNAMENTS FROM CINERARIUM AT TÜRSEL, RUSSIA.

(Copied from C. Grewingk in Verh. gel. Est. Ges. 1888. Bd. XIII.)

handle of a Roman treasury box,<sup>9</sup> while the four-pointed star in the interior of the disk ornamentation has been found upon articles from Livonia and Courland.<sup>10</sup>

“Fig. 63 is a bronze pin, apparently belonging to a buckle, nor is the possibility excluded that it may have formed part of the horseshoe-shaped ornament just described.

“Another horseshoe-shaped ornament is found in Fig. 64, the ends being wound in spirals. The spiral is one of the oldest forms of metal decoration of the earliest Baltic bronze age.

“Fig. 65 is a bronze ring; has been injured by action of fire. Similar rings, although somewhat smaller, occurred in the Slawek boat.<sup>11</sup>

<sup>1</sup> *Aspelin*: Antiq. Fig. 1884. Verh. d. Berl. Ges. f. Anthrop. 1885, p. 247. Sitzungsber. d. Alterthumsgesellschaft “Prussia” in Königsberg. Nov. 1885-'86, pp. 9, 116, 143.

<sup>2</sup> *Lindenschmit*: Alterthümer heid. Vorzeit. I. Heft 4, Pl. 6.

<sup>3</sup> *Montelius*: Die Cultur Schwedens in vorchristlicher Zeit. Berlin 1885, p. 105, ent.

<sup>4</sup> Photogr. Album d. Berliner Ausstellung, 1880, Sect. ii, Pl. 23 and 24. Catal. s. 324 No. 99, Sect. iii, Pl. 4.

<sup>5</sup> *Aspelin*: Antiq. Fig. 1845.

<sup>6</sup> Sammlung Prodezaecynski in Krakau.

<sup>7</sup> *Undset*: Erstes Auftreten des Eisens, p. 222.

<sup>8</sup> *Lindenschmit*: Alterthümer Bd. I, Heft 6, Pl. 5. Emele: Alterthümer Rheinhesens. Mainz 1833, Pl. 29, Fig. 2.

<sup>9</sup> *Wagner*: Handbuch d. Alterthumskunde, 1812, Fig. 297.

<sup>10</sup> *Aspelin*: Antiq. Fig. 1776, 1778, 1784, 1785.

<sup>11</sup> *Sierers, Graf K*: Bericht über archäologische Untersuchungen, 1875. Verhandl. d. Estn. Gesellsch. Bd. VIII, Heft 3. Dorpat 1876, Pl. I, Fig. 13, p. 8, No. 22, and p. 17, No. 32.

“Fig. 66 is a necklace; the form recurs in stone positions in Courland,<sup>1</sup> in the district of Kowno and Wilna, Russia,<sup>2</sup> and near Marienburg, in Prussia.<sup>3</sup>



Fig. 63.  
BRONZE PIN.

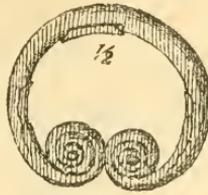


Fig. 64.  
ORNAMENT.

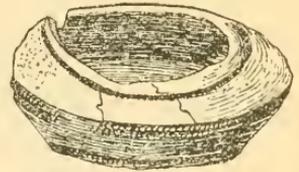


Fig. 65.  
BRONZE RING.



Fig. 66.  
NECKLACE.



Fig. 67.  
NECKLACE.



Fig. 68.  
ORNAMENT.



Fig. 69.  
ORNAMENT.

FROM CINERARIUM AT TÜRSEL, RUSSIA.

Copied from C. Grewingk, in Verh. geol. Est. Ges. 1888. Bd. XIII

“A necklace is also shown in Fig. 67. This form is known from the stone boat at Fellin and other places in Estonia,<sup>4</sup> from skeleton graves in Courland,<sup>5</sup> in the Russian district of Kowno,<sup>6</sup> and from cineraria, at the mouth of the river Memel, in Prussia.<sup>7</sup>

“Figs. 68 and 69 are the fragments of an ornament. They have thus far not been known to have been found in graves.

<sup>1</sup> *Aspelin*: Antiq. Figs. 1826, 1875, 1880.

<sup>2</sup> *Aspelin*: Antiq. Figs. 1892, 1900.

<sup>3</sup> *Undset*: Erstes Auftreten des Eisens, p. 139, Pl. xv, Fig. 13.

<sup>4</sup> *Aspelin*: Antiq. Figs. 1761 and 1786.

<sup>5</sup> *Aspelin*: Antiq. Fig. 1879.

<sup>6</sup> *Hartmann*: Vaterländ. Museum, p. 35. Pl. ii, Figs. 20, 21. *Aspelin*: Antiq. Fig. 1885.

<sup>7</sup> Photogr. Album d. Berliner Ausstellung 1880; Sect. i, Pl. 13; Cat. 118, Nos. 520-542. *Tischler*: Gräberfelder iii, Pl. e, i, Fig. 16.

“In Fig. 70, a necklace or bracelet is shown of a form found upon Usedom, in Pomerania,<sup>1</sup> and in larger dimensions in a skeleton grave in Mecklenburg,<sup>2</sup> and near Thale, in the Harz Mountains.<sup>3</sup>

“Necklaces or arm rings are shown in Figs. 71, 72, 73, 74. They have been found in Courland and Kowno district.<sup>4</sup>

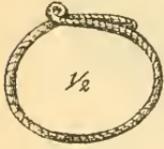


Fig. 70.

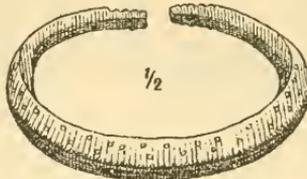


Fig. 71.



Fig. 72.



Fig. 73.



Fig. 74.

ARMINGS OR NECKLACES FROM CINERARIUM, AT TÜRSEL, RUSSIA.

(Copied from C. Grewingk, in Verh. gel. Est. Ges. 1888, Bd. XIII.)

“Bracelet or fragment of belt hook (Fig. 75). Similar forms have been recovered from the cemetery at Elbing and cinerarium at Olivia, near Danzig;<sup>5</sup> they have been found in Pomerania<sup>6</sup> and in Schwarzburg Rudolstadt.<sup>7</sup> Worth mentioning is the girdle hook from an urn in Brandenburg, Prussia, and a peculiarly jointed bracelet from Oeland.<sup>8</sup>

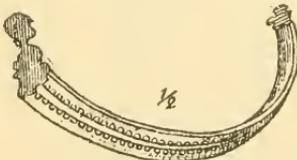


Fig. 75.



Fig. 76.

CLASPS FROM CINERARIUM AT TÜRSEL, RUSSIA.

(Copied from C. Grewingk, in Verh. gel. Est. Ges. 1888, Bd. XIII.)

“The clasp (Fig. 76) has suffered from high temperature; a similar form is known from Courland.<sup>9</sup>

“The spiral spring of bronze (Fig. 77) occurs in the *φελιον* of the Persians, as described by Herodotus, and also in the armament of Scandi-

<sup>1</sup> Berliner Photogr. Album 1880; Sect. ii, Pl. 20; Cat. 322, No. 56.

<sup>2</sup> Lisch: Friederico-Franciscanum. Leipzig 1837, Pl. x, Fig. 2.

<sup>3</sup> Berliner Album, 1880. Sect. vi, Pl. 14, Cat. 527.

<sup>4</sup> Aspelin: Antiq. Figs. 1769 (Langensee), 1835 (Kandan), 1838 (Passeksten), 1866 (Wistn-Kappi), 1877 (Herbergen).

<sup>5</sup> Undset: Erstes Auftreten des Eisens, pp. 147 and 110, Pl. xv, Figs. 10 and 14. Tischler: Gräberfelder III, Pl. c, 1, Fig. 11.

<sup>6</sup> Berliner photogr. Album, Sect. iii, Pl. 19, Cat., p. 324.

<sup>7</sup> Berliner photogr. Album, Sect. vi, Pl. 22, Cat. 590, Nos. 39 and 40.

<sup>8</sup> Undset: Erstes Auftreten des Eisens, p. 200, Pl. xxi, Fig. 1, and p. 386, Fig. 63.

<sup>9</sup> Aspelin: Antiq. Fig. 1797.

navian warriors of the early bronze age; it has been described as a German protective armor and appears to be very frequent during the younger heathenish iron period in the Baltic lands. A corresponding specimen was found in the Strante ship.

“Figs. 78 and 79 are finger-rings of bronze wire; their chemical composition places them nearest to the bronze fibulae from Herbergen, in Courland, whose form corresponds to one from the Ailschekippe stone position.<sup>1</sup> These rings are of frequent occurrence in the graves of the first East Baltic iron period.

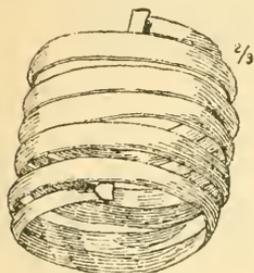


Fig. 77.

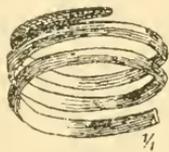


Fig. 78.

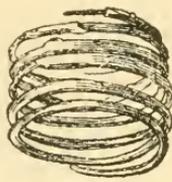


Fig. 79.

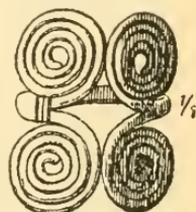


Fig. 80.

SPIRALS FROM CINERARIUM AT TÜRSEL, RUSSIA.

Copied from C. Grewingk, in Verh. gel. Est. Ges. 1888, Bd. XIII. 1

“Fig. 80 is a finger ring corresponding in form to rings found in the Estonian district Harrien,<sup>2</sup> in the stone heap of Rippoka, in Livonia.<sup>3</sup> The same form, but in silver, together with silver nippers, was found in a cinerarium in the East Prussian district of Gumbinnen.<sup>4</sup> These forms may be traced to the younger iron period, as, for instance, in the graves upon Oesel and as cast imitations in the Wotish skeleton graves near Gatchina.<sup>5</sup> A like ornamentation is noticeable in Mecklenburg,<sup>6</sup> and one specimen was taken from a Roman grave in the Upper Palatinate.<sup>7</sup>

“Fig. 81 represents a pair of bronze nippers; similar ones were taken from the Strante ship, from the urn graves near Liban, Russia,<sup>8</sup> and from a cemetery in the province of Prussia.<sup>9</sup>

“Nippers of iron are shown in Fig. 82, and the same form occurred in the Strante see Krawand, and in graves in Prussia.<sup>10</sup>

“Fig. 83 shows a buckle of bronze of the same form as were found in the urn graves at Liban and in East Prussian grave fields.<sup>11</sup>

<sup>1</sup>Archiv f. Anthrop. x, 301. Analysis No. 5, Pl. ii, Fig. 9.

<sup>2</sup>Hansen: Alterthümer. Reval 1875, p. 41, Pl. v, Fig. 21.

<sup>3</sup>Hartmann: Vaterländ. Museum, Pl. xi, Fig. 11.

<sup>4</sup>Tischler: Gräberfelder iii, Pl. x, Fig. 13, p. 261, grave No. 31.

<sup>5</sup>Aspelin: Antiq. Fig. 1162; also Figs. 803, 1046, 1951, 1970, 1992, 2084.

<sup>6</sup>Lisch: Friderico-Franciscanum, Pl. xxii, Fig. 1.

<sup>7</sup>Lindenschmit: Alterthümer heidn. Vorzeit. Bd. 1, Heft 5, Pl. 4, Fig. 5.

<sup>8</sup>Aspelin: Antiq. Fig. 1841.

<sup>9</sup>Tischler: Gräberfelder III, Pl. x, Figs. 6 and 7.

<sup>10</sup>Undset: Erstes Auftreten des Eisens, Pl. x, 19; xiii, 14; xiv, 8 and 9.

<sup>11</sup>Berliner photogr. album, 1880. Sect. i, Pl. 2.

“Figs. 84, 85, 86 represent belt fastenings of bronze; corresponding forms occur in the stone heaps of Stranteseec; they are often met with in the first Baltic iron period, and in the younger Scandinavian bronze age.



Fig. 81.

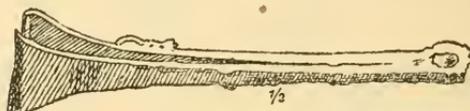


Fig. 82.

NIPPERS FROM CINERARIUM AT TÜRSEL, RUSSIA.  
(Copied from C. Grewingk, in Verh. gel. Est. Ges., 1888. Bd. XIII.)

“A lance point is shown in Figs. 87 and 88: similar point was found in the Kaugerkrawand in Livonia, together with Roman coins of the years 161 to 180.

“Figs. 89, 90, 91, and 92 are single-edged iron knives, of a form not otherwise known in the East Baltic Lands. Some knives from the

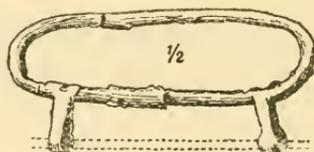


Fig. 83.

BUCKLE FROM CINERARIUM AT TÜRSEL, RUSSIA.  
(Copied from C. Grewingk, in Verh. gel. Est. Ges., 1888. Bd. XIII.)

Slaveek ship<sup>1</sup> approach the form, as also some from the Finnish District Wasa.<sup>2</sup> Knives corresponding to those found at Türsel have been taken from graves of the first iron period in the province of East Prussia,<sup>3</sup> and they have also occurred at Ascheraden, in skeleton graves of the younger iron period.”<sup>4</sup>



Fig. 84.

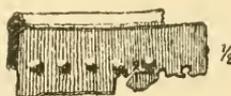


Fig. 85.

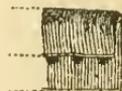


Fig. 86.

BELT FASTENINGS FROM CINERARIUM AT TÜRSEL, RUSSIA.  
(Copied from C. Grewingk, in Verh. gel. Est. Ges., 1888. Bd. XIII.)

From the large number of imported bronze articles found Grewingk concludes that the foreign intercourse with Türsel appears to have been more extended than with any other portion of Estonia and Livonia;

<sup>1</sup> *Sievers, Graf K.*, Bericht in Verhandl. d. Estn. Ges. VIII Heft 3, Pl. i, Fig. 31. 43-45.

<sup>2</sup> *Archiv f. Anthrop.* x, p. 81, 310.

<sup>3</sup> *Berendt*: Zwei Gräberfelder in Natangen. Königsberg, 1874, Pl. i, Fig. 26; Pl. vii, Figs. 26, 30. Sitzungsber. d. Alterthumsges. “Prussia.” Nov. 1885-86, p. 9, Pl. iv.

<sup>4</sup> *Aspelin*: Antq. Fig. 1921 and 2085.

and in view of the fact that the neolithic inhabitants of that section obtained their flint supplies from the West Baltic lands and that such intercourse had continued during the Scandinavian bronze age (500 B. C.) the helleristinger of which show rowboats, he connects the boat graves of Estonia and Livonia with the typical form of Suionian ships as shown in the Nydam boat belonging to the identical period (the third century), and suggests that the stone ship-burials served as the forerunners of the wooden funeral ships of the Vikings.



Fig. 87.



Fig. 88.



Fig. 89.



Fig. 90.



Fig. 91.



Fig. 92.

LANCE POINT AND KNIVES FROM CINERARIUM AT TÜRSEL, RUSSIA.

(Copied from C. Grewingk, in Verh. geol. Est. Ges. 1888. Bd. XIII.)

Another fact to be considered in this connection is the age of the Roman coins found in the various cineraria of Estonia and Livonia; they represent the period of from 30 B. C. to 244 A. D. Among them are: denars of Augustus, Vespasian, Faustina, Antoninus Pius, a Gordian, etc., thus representing almost the identical coins found in the Nydam boat, the consideration of which will form the next chronological step.

Before taking up the Nydam boat, however, the following table, showing the dimensions of a number of boat-shaped stone positions, may not be out of place here.

*In the following table the dimensions are given of a number of these boat-shaped stone positions.*

Locality.	Length.		Width.
	Fect.	Fect.	Fect.
Kåseberg, Scania, Sweden .....	212		60
Nen Karrishof, Livonia, Russia .....	189		57
Eds, Upland, Sweden .....	182		50
Rumsa, Stockholm, Sweden .....	182		50
Villefer, Livonia, Russia .....	139		52
Vestermarie, Bornholm, Denmark .....	157		63
Braidflor, Gotland, Sweden .....	144		16

*Dimensions of boat-shaped positions—Continued.*

Locality.	Length.	Width.
	Feet.	Feet.
Straute, Livonia, Russia.....	142	27
Blonsholm, Bohuslan, Sweden.....	141	31½
Gotland, Sweden.....	140	33
Slaweck, Livonia, Russia.....	140	40
Stralsund, Germany.....	130	16
Kawershof, Livonia, Russia.....	126	42
Määro, Livonia, Russia.....	120	37
Vestermarie, Bornholm, Denmark.....	103	40
Do.....	103	25
Hortehammer, Bleking, Sweden.....	100	29
Vestermarie, Bornholm, Denmark.....	97	14½
Kronoberg, Sweden.....	92	32
Willemi, Livonia, Russia.....	89	29
Vestermarie, Bornholm, Denmark.....	85	14½
Kawershof, Livonia, Russia.....	70	24
Vestermarie, Bornholm, Denmark.....	62½	12½
Do.....	53	25
Do.....	52½	14½
Lieben, Courland.....	50¾	14
Eista, Gotland, Sweden.....	50	16
Farö, Gotland, Sweden.....	50	8
Türsel, Estonia, Russia.....	50	20
Vestermarie, Bornholm, Denmark.....	50	8½
Widser, Courland, Russia.....	49	10
Nogallen, Courland, Russia.....	47. 10	10
Vestermarie, Bornholm, Denmark.....	42	10
Do.....	37½	8½
Do.....	34½	7½
Little Lundley, Södermanland, Sweden.....	34	10
Lieben, Courland, Russia.....	31	10
Straute, Livonia, Russia.....	31	8
Vestermarie, Bornholm, Denmark.....	31	6
Mushing, Courland, Russia.....	27	13
Do.....	25	10
Archua, Livonia, Russia.....	22	9

*The Nydam Boat.*<sup>1</sup>—The oldest Scandinavian naval relic, part of an oar, was found in the Nydam Moss, northeast of Flensburg, in the Duchy of Schleswig, in the year 1859, and the remaining part of the same oar in 1862. On August 7, 1863, the remains of a boat were excavated; on October 18, 1863, a large and magnificent oak-built boat

<sup>1</sup> *Engelhardt, C.*: Denmark in the Early Iron Age. London, 1866. *Handelmann, H.*: 35 Bericht z. Alterthumskunde Schleswig-Holsteins, 1878. *Handelmann, H.*: Das älteste germanische Seeschiff. In *Corr. Bl. d. D. Ges. f. Anth.*, No. 12, Dec., 1871, p. 95; No. 1, Jan. 1872, p. 8. *Stephens, Geo.*: Nydam Moss. In *Gentleman's Mag.*, Oct. 1863, New Ser., vol. xx, p. 681. *Werner, R.*: Das Seewesen der Germanischen Vorzeit. In *Illust. Monatsh.*, 1882, Oct. *Bochmer, Geo. H.*: Norsk Naval Architecture. In *Proc. U. S. Nat. Mus.*, Vol. IX.

was discovered lying in the direction of the valley, from southeast to northwest, and on October 29, 1863, a third boat, built of fir, was found at the side of the second boat and parallel with it.

The first of these boats was in a very poor state of preservation, having evidently been intentionally destroyed; nevertheless the fragments found and taken up displayed sufficient resemblance to the corresponding parts of the second and third boats to indicate the same construction for all three. The second and best preserved was placed in the hands of Mr. Stephenson, restorer of antiquities, at Copenhagen, and of the restored boat the accompanying Figures 93 and 94 are



Fig. 93.

NYDAM MOSS BOAT.

(Copied from C. Engelhardt, "Denmark in the Early Iron Age.")



Fig. 94.

NYDAM MOSS BOAT.

(Copied from C. Engelhardt, "Denmark in the Early Iron Age.")

representations as figured by Prof. C. Engelhardt \*, under whose direction the excavation of Nydam Moss had been conducted and from whose work the following description has been taken:

"When first discovered the boat was, of course, no longer in its original state. In course of time the washers of the bolts by which the planks were fastened together had corroded, the ropes joining the outer parts of the boat to the inner framework had been destroyed, the planks in consequence had separated and resumed their original shape, the rowlocks had fallen from the gunwale, the ribs had sunk out of their proper places and lay in different directions, whilst the stem and stern posts had detached themselves from the bottom plank. By degrees, as

\* Engelhardt, C.: Denmark in the Early Iron Age. London 1886.

the boat fell to pieces, these sank to the bottom to about the same depth, while the peat, at the same time, grew up around them, covering and protecting them from destruction. The shape of the boat could not therefore be directly ascertained from the pieces found, and the sketches of it were not made until, after the lapse of so many centuries, it had been restored to its original form in the Museum of Northern Antiquities at Flensburg. No drawing, however, can fully convey the striking impression produced by the large, sharp, and well-built boat itself.

"The boat is 77 feet long, measured from stem to stern, and proportionally rather broad in the middle, namely, 10 feet 10 inches, flat at the bottom, but higher and sharper at each end (Pl. LXXIV).

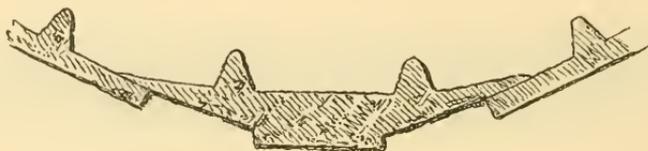


Fig. 95.

## KEEL PLANK OF NYDAM BOAT.

(Copied from C. Engelhardt, "Denmark in the Early Iron Age.")

"It is clinker-built, and consists of eleven oak planks, viz., five on either side, besides the bottom plank (Fig. 95), of which the keel form part, the latter being only a little more than 1 inch deep and fully 8 inches broad at the middle of the boat, gradually diminishing and at last vanishing entirely toward the sternpost.

"The planks are held together by large iron nails (Fig. 96), at intervals of  $5\frac{1}{2}$  inches, with large, rounded heads outside, and square burrs.

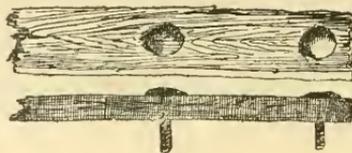


Fig. 96.

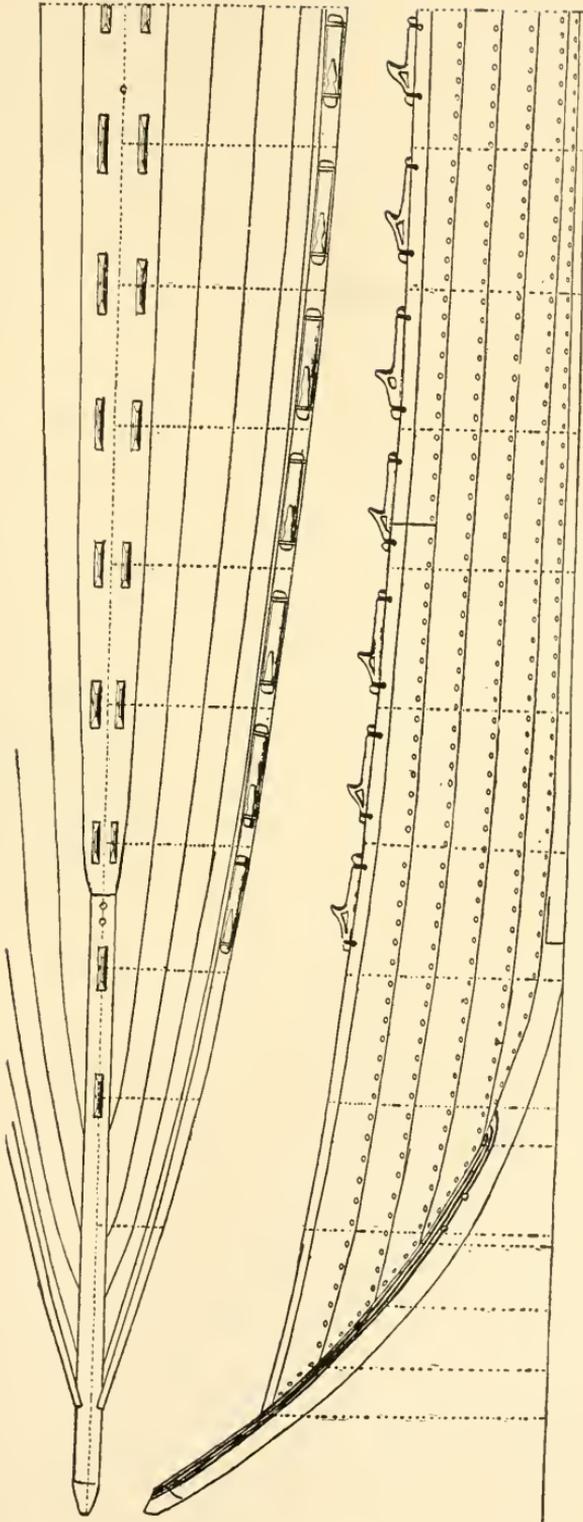
## RIVETS OF NYDAM BOAT.

(Copied from C. Engelhardt, "Denmark in the Early Iron Age.")

or washers, inside. The spaces between the planks where they overlap each other were filled up—caulked—with woolen stuff and a pitchy, sticky substance.

"The planks are cut from very fine pieces of timber, the bottom plank being 46 feet 8 inches long, and all of one piece. On both stems, which are fixed to the bottom plank by means of wooden pegs (Fig. 97), there are ornamental grooves, and each of them shows two large holes, which, to judge from the marks of wear, most likely have served to pass the ropes through when the boat was hauled ashore.

"On all the planks there are perforated clamps of one and the same piece with the planks (Fig. 98) themselves, having been left projecting when the planks were cut out of the solid timber, a most surprising



BOAT FOUND IN NYDAM MOSS, SCHLESWIG, GERMANY.  
(Copied from C. Engelhardt's "Denmark in the Early Iron Age.")



fact, considering the high development to which the smith's art had been carried, a fact, too, which proves that they must have possessed a great abundance of timber, as they would not otherwise have wasted it to that degree only in order to save a few nails or to secure the clamps so much better.

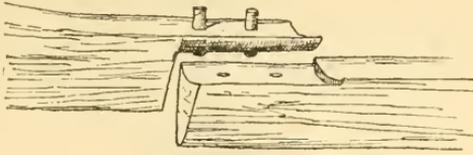


Fig. 97.

CONNECTION OF PROWS WITH KEEL.

Copied from C. Englehardt, "Denmark in the Early Iron Age."

"The ribs, which give the boat its shape (Fig. 99), are mostly in their natural crooked and irregularly bent shape, and rest on the clamps projecting from the planks which form regular rows across the boat, those on one plank exactly corresponding to those on the next. The ribs have perforations corresponding to the clamps, through which bast ropes were passed, tying planks and ribs together (Fig. 100). This is again highly surprising in a nation familiar with the use of iron and

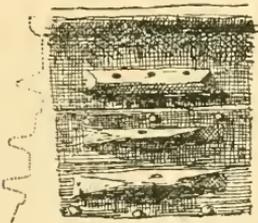


Fig. 98.

CLAMPS ON PLANKS.

Copied from C. Englehardt, "Denmark in the Early Iron Age.")

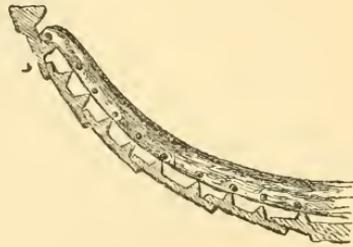


Fig. 99.

CONNECTION BETWEEN RIBS AND PLANKS.

able to work it so well. At the same time it is possible that a loose connection between the framework and the planking of the boat served to give it more elasticity to the sides, and that boats built in this manner went through the surf and great waves easier than those more strongly built.

"Upon the gunwale were fixed the rowlocks which, although made of the same general model, yet all differed from one another in size or in the details of the work. Fig. 101 represents one of the best preserved. They were tied to the gunwale by means of bast ropes; and in this case, too, it might seem surprising that for the fixing of such important pieces as the rowlocks recourse should have been had to such weak fastenings, which must so often have required to be renewed. But this method had at the same time the advantage of rendering it possible to turn them when necessary and row the boat in the opposite direction, particularly as both ends of the boat were so exactly alike that it is difficult to say

which is the prow and which the stern. It is true that the width of the boat at the fourth rib is a few inches greater than at the fifteenth, which corresponds to it at the other end; but this difference is so small that it was probably not intentional, and the boat has, no doubt, been designed to shoot through the waves with equal speed, whichever way it was rowed. The oars were passed through loops of rope tied to the rowlocks, on which the marks of wear by the oars are still quite visible.

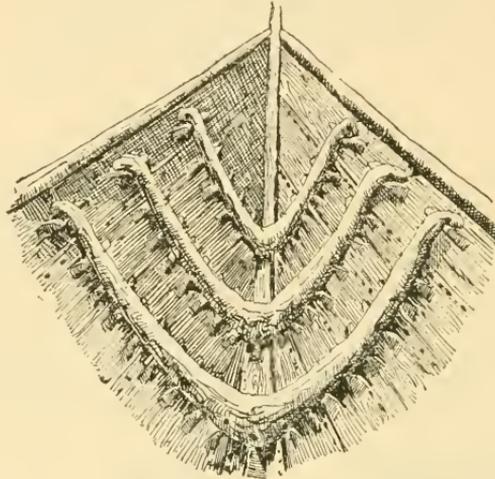


Fig. 100.

INTERNAL VIEW OF STEM.

(Copied from C. Englehardt "Denmark in the Early Iron Age.")

"At the sides, about 10 feet distant from the stern, the rudder (Fig. 102) was discovered. Its length is 9 feet 7 inches, and near the middle it has a hole through which a rope may have been passed for the purpose of tying it to the side of the boat. Just below this hole there is

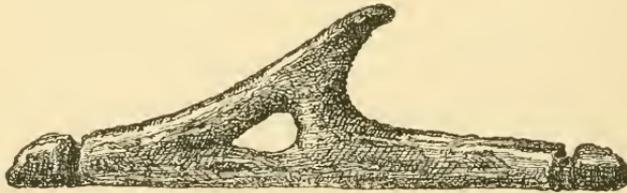


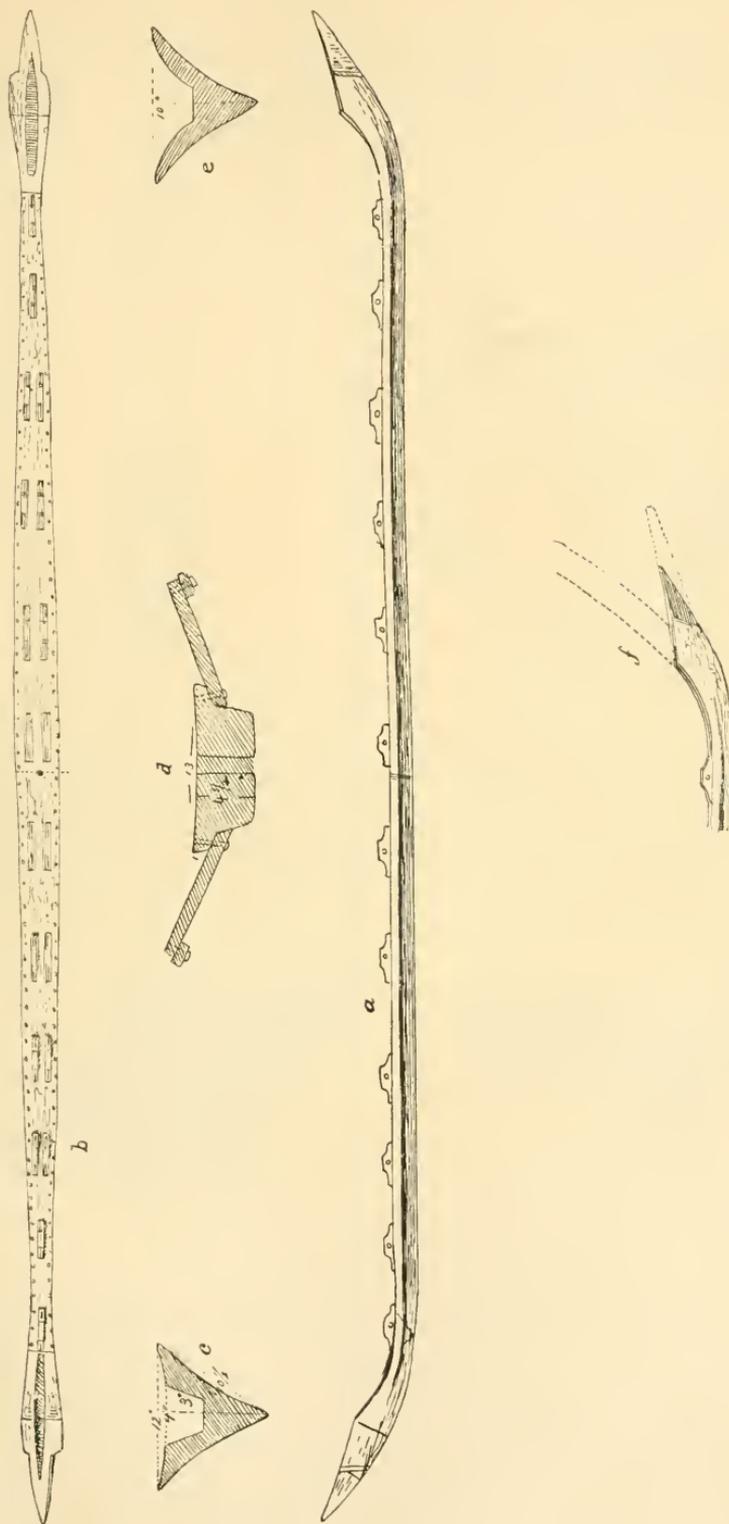
Fig. 101.

ROWLOCK OF NYDAM BOAT.

(Copied from C. Englehardt, "Denmark in the Early Iron Age.")

a little cushion of wood fixed with three wooden pegs, intended to protect the rudder from injury by knocking or getting against the side of the boat, and at the top there is a loose piece with two handles.

"The thwarts (Fig. 103) were strengthened by two angular boards underneath (Figs. 104, 105) and supported by three perpendicular pieces of wood. Only in one place, by the middle thwart, these boards were tolerably well preserved, but even there the ends were so soft as not to admit of any very complete examination, and it remains uncertain in



FIR-BEAT FOUND IN NYDAM MOSS, SCHLESWIG, GERMANY.  
*a*, Side view of bottom plank; *b*, same seen from above; *c*, *d*, *e*, transverse sections; *f*, supposed outline of spur.  
(Copied from C. Engelhardt's "Denmark in the Early Iron Age," p. 36.)



what way they were fixed to the sides of the boat. A wickerwork mat covered the bottom of the boat.

“The fir boat (Pl. LXXV) was tolerably complete when first discovered, and its different parts were brought on shore during the next following day after it had been laid bare and the contents taken out on the 27th



Fig. 102.

RUDDER OF NYDAM BOAT.

(Copied from C. Englehardt, "Denmark in the Early Iron Age.")

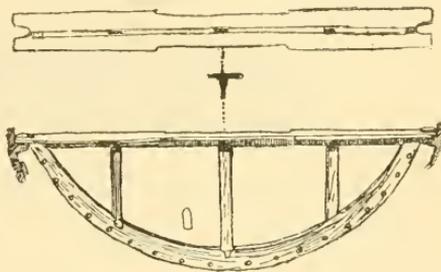


Fig. 103.

THWARTS IN NYDAM BOAT.

October, 1863. In order to protect the timber of this boat until the restoration of the oak boat could be finished, it was covered over with peat, but before anything could be done to save it, the country was occupied by hostile armies. Since then parts of it have been carried away, and the last remnant will probably soon be destroyed and disappear. Sketches of the most remarkable parts of this boat are shown in plate LXXV.

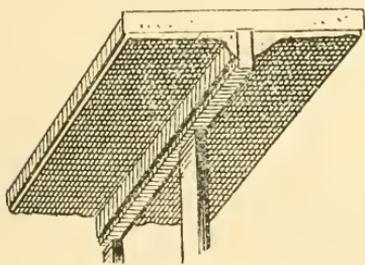


Fig. 104.

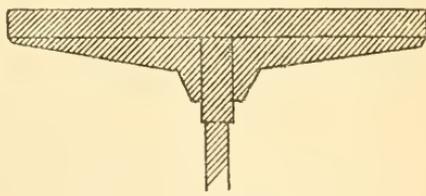


Fig. 105.

THWART SUPPORTS.

(Copied from C. Englehardt, "Denmark in the Early Iron Age.")

“The bottom plank was about 51 feet, 4 inches long and ended in two points which probably carried long and pointed iron spurs; if so, these spurs must have been *under water*.

“The side planks have clamps ornamented with mouldings, and cut out of the same piece of timber as the planks, just as in the two oak boats. The shape of the rowlocks is somewhat different, and they have formed a continuous row along the gunwale (Fig. 106).

“In this boat, as in the oaken boat, the planking was tied to the ribs by ropes passing through the holes in the clamps, and the principle of construction was the same; the great peculiarity of the fir boat being the terminal prolongations of the bottom plank, which probably have carried iron points—a dangerous weapon of attack, equally fit for sinking an enemy’s vessel or holding it firm while being boarded.

“As in the oaken boat the bottom was covered by a mat of wicker-work. In several places the timber had cracked, and been repaired by patches of wood. On the inner surface there are vestiges of the calking material, consisting of woven stuff, and a pitchy kind of substance similar to that used for fixing the feathers on arrows.



Fig. 106.

FIXED OAR CLAMP IN NYDAM BOAT.

(Copied from C. Englehardt, "Denmark in the Early Iron Age.")

“The boats here described I consider to have been mere rowing boats, not destined to carry sails, and in forming this opinion I rely principally on the fact that neither masts nor any signs of rigging have been discovered, nor any arrangements in the boat for fixing the necessary ropes. It is true that in the middle of the bottom plank of the oak boat, as well as of the fir boat, there is a hole of about 1½ inches diameter; but these holes are too small to have carried masts, and may have served for letting out water when the boats were hauled on shore, as was probably the case at the beginning of the winter.

“As I have stated before, the oak boat had been intentionally sunk by means of large holes cut in one of its sides below watermark; at the same time it had been caused to lean over on that side which was nearest the shore, that is, on the northeastern side. Beside this, the stemposts had in course of time detached themselves from the bottom plank leaving a large opening at each end. All these circumstances had necessarily caused a great part of the contents of the boat to float or drift out of it. But a part remained, and showed in several respects an intentional arrangement, objects of the same kind being accumulated into heaps at particular places.”

In Nydam Roman denari were discovered, embracing the period of from 69 to 217 of our era, and of the following emperors and empresses: Nitellius (1), Hadrian (1), Antoninus Pius (10), Faustina the Elder (4), Marcus Aurelius (7), Faustina the Younger (1), Lucius Verus (2), Lucilla (2), Commodus (5), and Macrinus (1). The latest of these coins was minted in A. D. 217.\*

\* Obs: Laureate head, Imp[erator] C[aius] M[arcus] Op[er]at[us] Sev[er]us, Maerinus Aug[ustus], Rev. Pont[ifex], Max[imus] Tr[ibun]itia. P[ro]t[est]ate. Co[n]s[ul], P[ater] P[atri]æ. Jupiter standing, a spear in his left hand, and the thunderbolt in his right.

They give us an approximate date for the object with which they were found. Allowing some time for their transport from southern countries, the deposit in the peat bogs can not have taken place before about the middle of the third century.

All the known coins from discoveries of this age—from mosses, graves, and chance finds—are of the first three centuries of the Christian era; the latest known is of Macrinus (A. D. 217). Among them the Antonines are of most frequent occurrence.

An analysis of the Nydam boat would give us the following interesting table:

Length between stems .....	feet and inches..	69	6
Length of keel .....	do.....	48	0
Width above gunwale amidships .....	do.....	10	8
Perpendicular depth from gunwale to bottom .....	do.....	3	10
Draft at middle of keel .....	do.....	2	3
Draft at ends of keel .....	do.....	2	3
Gunwale above water in the middle .....	do.....	1	10
Gunwale above water at the stems .....	do.....	4	8
Length of uppermost water line .....	feet and inches..	58	0
Width of uppermost water line .....	do.....	8	6
Area of uppermost water line .....	square feet..	333	
Area of middle rib .....	do.....	12	
Displacement in cubic feet .....	cubic feet..	443	
Displacement center before the middle .....	tons..	14	
Number of oars on each side .....		14	
Distance between oars .....	feet and inches..	3	6
Middle oar above surface of water .....	do.....	2	1
Length of middle oar .....	do.....	11	0
Entire crew .....		40	
Weight of crew, weapons, and provisions .....	tons..	7	
Weight of ship and equipment .....	do.....	7	

Prof. Handelmann<sup>1</sup> and Admiral Werner<sup>2</sup> recognize in this boat the only well-preserved specimen of the oldest German ship, basing their claim on the traditions that during the third and fourth centuries Saxon pirates had repeatedly harassed the coasts of the Roman provinces of Gallia and Brittainy, and that the coins found in the boats point to about that period.

Admitting the piratical excursions of the Saxons, our knowledge of their naval architecture (as shown on page 549) does not justify the acceptance of such hypothesis, most especially since the boats of the Nydam type in general appearance point to the ship of the Scandinavians (Suiones), explicitly described by Tacitus as being so entirely different from the Roman ships, which, in comparison with the primitive ships of the coast inhabitants of Germania, had attained a high degree of perfection. A navy that produced ships of the Nydam pattern must

<sup>1</sup> *Handelmann, H.*: Nydam boat; Das älteste germanische Seeschiff. In *Correspondenzblatt d. Deutsch. Ges. f. Anth.* No. 12, Decbr. 1871, p. 95.

<sup>2</sup> *R. Werner*: Die Seewesen der Germanischen Vorzeit. In *Westermann's Illustrirte Monatshefte*, October, 1882.

have been the growth of centuries before the times of Tacitus; it is also an historical fact that the fleets of powerful nations do not remain idle, and we thus may infer that the Suiones navigated the sea long before the time of Tacitus; it is not at all improbable that in following the coast they extended their journeys to Brittany and Gallia.

The Roman writers after Tacitus mention the naval expeditions of the Saxons and Franks, whose names do not occur in Tacitus, hence, summing up all the preceding considerations, it is not improbable that they are the identical people whom Tacitus described as the Suiones and who included all the tribes of the North beyond the line of Roman conquests.

*Sagas.*—The second and more recent record of the people of the North is found in the sagas. With reference to these Laing<sup>1</sup> says: "It does not appear that any saga manuscript now existing has been written before the fourteenth century, however old the saga itself may be. It is known that in the twelfth century Are, Frode, Sæmund, and others began to take the sagas out of the traditionary state and fix them in writing, but none of the original skins appear to have come down to our time, but only some of the numerous copies of them." It is also stated that Saxo Grammaticus has depended on many leelandic sagas which had then not existed in writing.

Extensive bibliographies of the saga literature are given in the *Heimskringla* and in other works.<sup>2</sup>

The extent of the Northern saga literature being comparatively little known I reproduce here a bibliographical list as given by Rasmus B. Anderson in his latest revision of the *Heimskringla*. As stated by him "the list is taken from that given by Thormod Torfeus in his 'Series Dynastarum et Regum Danie,' from that given by Müller in his 'Sagabibliothek,' and from that of Biorn Haldorson. The notes on the date and contents are extracted chiefly from Müller's work. The

<sup>1</sup> *Heimskringla*, translation by Laing 1, 23.

<sup>2</sup> *Snorre Sturlason*: *Heimskringla* (Laing's translation) 1, 17. *Burton*: *Ultima Thule* 1, 237. *Baring-Gould*: *Iceland, its scenes and sagas*. London, 1863. Appendix D. *Karl Maurer*: *Ueber die Ausdrücke altnordische, altnorwegische und isländische Sprache*. München, 1867 (also in *Abh. K. B. Akad. d. Wiss.*). *G. P. Marsh*: *Translation of P. E. Müller's 'Origin, progress, and decline of Icelandic historical literature'* (in the *Amer. Eclectic*, N. Y., 1841, vols. 1, 11). *Lindblom*: *Translation of Bishop Troll's Letters sur l'Islande*. Paris, 1781 (cf. *Pinkerton's Voyages*, vol. 1). *Charavanc*: *Bibliography of the Polar Region*, p. 95. *Geo. H. Boehmer*: *Bibliography of the volcanoes, earthquakes, and geysers of Iceland*, p. 513. *Solberg's* list of illustrative works appended to *Anderson's* version of *Horn's* list of the Scandinavian North. *Poolé's Index*, p. 622, and supplement p. 214. *A Compendious History of the Goths, Swedes, and Vandals, and other northern people*. London, 1650 and 1658 (translated from the Latin of Olaus Magnus). *Svearikes Historia*: Stockholm, 1746-'62. *Mallett's Northern Antiquities*. London edition, 1847. *Wheaton*: *Northmen*. *Xavier Marmier*: *Histoire de l'Islande*. *Dahlmann, F. C.*: *Geschichte von Dänemark*, 1840-'43. *Geijer, E. J.*: *History of Sweden*, English translation, London, 1845; German translation, Hamburg and Gotha, 1832-'57.

words *historical* or *fabulous* indicate only that the work is founded on facts apparently or is a work of fiction. The editor has consulted in this connection 'Catalogus Librorum' and the 'Verzeichniss,' by the learned Prof. Theodor Möbius of Kiel, and Gudbrand Vigfusson's edition of Cleasby's Icelandic-English Dictionary and his edition of *Sturlunga Saga*.

*Adonius Saga* (of a king and duke in Syria). Fabulous.

*Alafteks Saga* (of a son of a King Richard of England). Fabulous.

*Alexander Mikla Saga* (of Alexander the Great, translated by Bishop Brand Jonson, by order of Hakon Hakonson). Historical.

*Amicus Saga ok Amilius* (of Amicus and Amilius, belongs to the story of the Seven Wise Men). Fabulous.

*Amloda Saga* (of Hamlet, freely translated from Saxo). Fabulous.

*Andra Rimur* (rhymes of or concerning Andreas).

*Ans Saga* (of an Buesvinger). Mythologico-historical.

*Arna Biskups Saga* (of Bishop Arne, flourished 1260). Historical.

*Arons Saga Hiorleifssonar* (of Aron, son of Hiorleif). Historical.

*Asmundas Saga vikiings ins Irska*.

*Bærings Saga fagra* (of the beautiful Bæring, a Saxon king). Fabulous.

*Bandamanna Saga* (of the confederates—account of an Icelandic law-process in the eleventh century). Local history.

*Bardur Saga Snafelsass* (of Bard, son of King Duma, a giant). Fabulous.

*Barlaams Saga ok Josaphats*.

*Bevis Saga* (of Bevis, son of an English Count Ginar). Fabulous.

*Biskupa Sögur* (Sagas of the Bishops). Of these two large volumes have been published by the Icelandic Literary Society.

*Bjarnar Saga Hitdalakappa* (of Bjorn of Hitdale, a contemporary of Olaf the Saint). Historical.

*Blomstrvalla Saga* (a translation from the German by Biorn, in Hakon Hakonson's time). The name Blomstrvalla is from a place near Alexandria, where the scene is laid.

*Bodvars Biarka Saga*. Historical.

*Bose ok Herauts Saga* (of Bose and Heraut). Fabulous.

*Bragda-Magus Saga*. Mythical.

*Brandkrossa Thattr* (Traits of Helge Asbiornson of Helge Droplangson). Fabulous.

*Breta Sögur* (Saga of Wales, called Bretland; the parts of England occupied by the Anglo-Saxons were called Saxland by the Northmen). This is from Geoffrey of Monmouth's work.

*Brodhelga Saga* (of a chief who died about 974). Historical.

*Bua Saga* (of Bue Andredson). Fabulous.

*Damusta Saga* (of a Damusta who killed Ion, king of a country south of France, and became King of Greece). Fabulous.

*Dinus Saga Dromblata* (of Dionysius the Proud, son of King Ptolemy, in Egypt).

*Draplaugarsona Saga* (of the sons, Helge and Grim, of Draplaug). History and fable mixed; the period, the tenth century.

*Drauma Jous Saga* (of John, the dreamer and Earl Henry). Fabulous.

*Edda, Samnuds* (the older Edda). Mythological; English translation by Benjamin Thorpe, London, 1866.

*Edda, Snorres* (the younger Edda). Mythological; translated into English by R. B. Anderson, Chicago, 1880.

*Edwardar Saga hins helga* (of Saint Edward of England).

*Egils Saga Einhenda ok Asmundar* (of Egil the one-handed and Asmund). Fabulous.

*Egils Saga Skallagrimssonar* (of Egil, son of Skallagrim). Historical; period, from the middle of the ninth to the end of the tenth century. Translated into English by Daniel Kilham Dodge, PH. D.

- Eiriks Saga Randa* (of Eirik Red, who discovered Greenland and Vinland or America). Historical; period, from near the end of the ninth to the beginning of the tenth century.
- Eiriks Saga Vidforla* (of Eirik, the wanderer, who goes in search of the land of immortality). Mythological.
- Elis Saga* (of Elis or Julius and Rosamund). Translated from the French, 1226, by Monk Robert, by order of Hakon Hakonson.
- Eyrbyggja Saga* (of Thorgrim, whose forefather, Rolf, came from the Isle of Moster in the west of Norway, and first planted Iceland with people from his island (eyrbyggja, isle-settlers) to escape Harald Harfager). Historical; period, from the first colonizing of Iceland to the middle of the eleventh century.
- Farcynga Saga* (of the Farcys). Historical.
- Fertrams Saga ok Plato* (of Fertrams and Plata, sons of King Arthur). Fabulous.
- Finboya Saga hins ramma* (of Finboge the Strong). Fable and history; from the middle of the tenth to the eleventh century.
- Flateyar-bók* (the Flatey Codex, so called from the Isle of Flatey in Breidafjord in Iceland, in which the manuscript was discovered in 1650. The annals end in 1395. It contains many sagas transcribed into it, and is considered a most important historical collection).
- Flotamanna Saga* (of a Thorgil and his ancestors, original settlers in Iceland, and of his adventures in Greenland. Thorgil died in 1033). Historical.
- Flores Saga ok Blankiflur*.
- Floreuts Saga* (of Flovent, King of the Franks, inscribed by Master Simon in Lyons).
- Fostbraedra Saga*. Historical.
- Fridthiofs Saga* (of Fridthiof the Bold.) This beautiful story has been the groundwork of several poetic and dramatic imitations, of which Bishop Tegner's in Swedish, has been translated into English. [See Anderson's "Viking Tales of the North," which contains Tegner's poem in English and a translation of the original sagas.]
- Gautreks Saga*. Mythical.
- Gibbons Saga* (of Gibbon, son of the French King William).
- Gisla Saga Surssonar* (of Gisle, the son of Sur. Events, of the tenth century in Iceland). Historical. Translated into English by G. W. Dasent. Edinburgh, 1866.
- Gonger-Hrolfs Saga* (of Rolf Ganger, the conqueror of Normandy). Historical.
- Gravelndinga Thattr* (events in Greenland from 1122, and a list of nine bishops and fifteen churches). Historical.
- Grugas* (Gray Goose). A collection of the laws of Iceland. Edited and translated into Danish by V. Finsen.
- Grettis Saga* (of Gretter the Strong). Adventures, fabulous and historical, mixed, of Gretter and his forefathers in the ninth, tenth, and eleventh centuries. Translated into English by Magnússon and Morris. London, 1869.
- Grimsa Saga Iodinkinna* (the Saga of Grim Shaggy-Clin).
- Gudmundar Biskups Saga* (of Bishop Gudmund) being part of the third book of the Sturlunga Saga, or account of the Sturlung family, which ends 1261, and of which the first books are supposed to have been written in 1201.
- Guimars Saga* (of Guimar, an English knight).
- Gullthoris Saga* (of Gold Thorer, or Torsktindinga Saga). Fabulous.
- Gunlaugs Saga Ormstunga* (of Gunlang the Serpent-tongued). Historical; the period about 1006. Translated by Eirikr Magnússon and William Morris, in "Three Northern Love Stories." London, 1875.
- Gunnars Saga Keldagnups ffls* (of Gunnar the Idiot). Fabulous.
- Gunnars Saga Thidrandabaua* (of Gunnar, who killed Thidrande). Historical; supposed to be written about the end of the twelfth century.
- Hvansa Thoris Saga* (of Thorer, the hen merchant). Historical.
- Hakouar Konungs Saga Hakonasonar* (of King Hakon Hakonson) who was born 1203 and died 1261. Historical; by Starke Thordson, a contemporary.

- Hakonar Saga Ivarssonar* (of Hakon Ivarsson). Historical.
- Halfdanar Saga Bronufostra* (of Halldan, foster-son of Bran). Fabulous.
- Halfdanar Saga Eysteinnssonar* (of Halldan, son of Eystein). Fabulous.
- Halfs Saga* (of Half, who, if not altogether a fabulous personage, lived about the eighth century, or in the sixth according to others).
- Hallfredar Saga Vandradaskalds* (of Halfred "the Skald, desperate or difficult to deal with," who lived in King Olaf the Saint's time). Historical.
- Haralds Rimur Hringsbana* of Harald, who slew Hring).
- Haralds Rimur Kringiarna* (Rhymes of or concerning Harald the Woman-lover).
- Hararrar Saga Isfirðings* (a tragic tale). Historical.
- Hemings Thattr* (of Heming, a fabulous personage of Olaf the Saint's time).
- Hervarar Saga* (of Hervar). Mythological.
- Hialmters ok Olvis Saga* (of Hialmther and Olver). Fabulous.
- Hogne ok Hedins Saga*. Mythological.
- Holavrerja Saga*. Mixed fable and historical facts regarding Iceland.
- Hrafkets Saga Freysgötu*. Historical; of Harald Harfanger's time.
- Hrafn's Saga Sveinbjarnarssonar* (of Hrafn, son of Sveinbjörn).
- Heidarriga Saga*.
- Hvims ok Tryggva Rimur*.
- Heimskringla* (the work by Snorre Sturlason.) Historical. This work has been translated into many languages.
- Hrolfs Saga Kraka* (a collection of Sagas, some historical, some fabulous).
- Hrolfs Saga Gautrekssonar* (of Hrolf, son of Gautrek). Mythological.
- Hrolfs Saga Skuggafjfs* (of Hrolf, son of Skugge the Idiot).
- Hrolfs Saga Kraka ok Kappa hans* the Saga of Hrolf Kraka and his heroes).
- Hromundar Saga Greipssonar*. Fabulous.
- Hungreaka* (the Hunger-waking; is the name of a saga of the Bishops of Skalholt down to 1178; the author supposing it would raise an appetite for more).
- Illuga Saga Gridarfostra* (of Illugo, foster-son of Grid). Fabulous.
- Isfirðinga Saga* (of a division of Iceland called Isfirðing). Historical.
- Islendingabók Ara Froða* (Book of Iceland, concerning the first colonization of Iceland, the introduction of Christianity, etc., usually called Ara Frode Schedæ; written about 1120). Historical.
- Trents Saga Artuskappa*. Fabulous; translated from the French by order of Hakon Hakonson.
- Jarlmanns Saga ok Hermanns* (of Jarlman and Herman). Fabulous.
- Jarnsida* (the law of Iceland from A. D. 1172-1280).
- Jökuls Thattr Buasonar* (of Jökul, son of Bue). Fabulous.
- Jomsrikinga Saga* (of the Vikings of Jomsburg, in the Island of Wollin or Jom). Historical.
- Jonales Rimur* (Rhymes of Jonales).
- Jons Biskups Saga* (of John the Bishop, viz. Jon Ogmundson, who died 1121, Bishop of Skalholt). Historical.
- Jons Saga Leiksveins* (of John the Juggler). Fabulous.
- Jons Saga Baptista* (of John the Baptist).
- Jonsbok* (the Icelandic code of laws of A. D. 1280, and still in use in Iceland).
- Kallinius Rimur* (Rhymes of Callinius).
- Karlsmagnus Saga* (of Charlemagne).
- Ketils Saga Haungs* (of Ketil Haeng). Fable and history.
- Kirialax Saga* (of the Emperor Alexis, viz. Kurios Alexis; but this is a fabulous emperor).
- Klarus Saga Keysarasonar* (of Clarus, son of the Emperor). Fabulous.
- Knytlunga Saga* (of the Danish Kings of the Canute Dynasty, from Herold Gormson to the Canute VII, supposed to be Olaf Thordson, who died 1259). Historical.
- Konrads Saga Keysarasonar* (of Konrad, son of the Emperor).

- Koung-skuggsja* (the King's Mirror). A didactic scholastic work.
- Kormaks Saga* (of Kormak the Skald). Fable and history.
- Kraks Spa* (Prophecy of Krak).
- Kristurættir* (Ecclesiastic Laws, of which there are several collections).
- Kristni Saga* (of the introduction of Christianity into Iceland, from 981-1000). Historical.
- Kroka Refs Saga* (of Ref the Cunning). Fabulous.
- Lauduámbók* (events in Iceland from the original settlement in the ninth to the end of the tenth century; with names of the first settlers, and of their lands, to the number of about 3,000 names of persons, and 1,400 of places; supposed to be written in the last half of the thirteenth century). Historical.
- Langfædgal* (series of dynasties and kings in the North). Historical.
- Laurentius Biskups Saga* (of Bishop Laurence, who was born 1267). Historical, by a contemporary.
- Laxdala Saga* (of the descendants of Aud, who settled in Laxdale). Historical.
- Liosretninga Saga* (lives of the descendants of Thorgeir and Gudmund, and their own lives, between the middle of the tenth and end of the twelfth century). Historical; written about the end of the twelfth century.
- Magnus Saga Orkneya Jarls* (of Saint Magnus, Earl of Orkney, who was killed 1110). Historical.
- Margretar Saga* (of Margaret and Sigurd, in Magnus the Good's time).
- Maria Saga* (of Mary, viz, the Virgin).
- Mirmaus Saga* (of Mirman, a king in Sicily). Fabulous.
- Mottuls Saga* (of the magic cloak at the court of King Arthur).
- Nikolaus Saga Erkibiskups* (of Nicholas, Archbishop of Lunca).
- Njals Saga* (of Njal). Historical; and supposed to be written by Sæmund Trove, in the eleventh century. The Saga of Burnt Njal is translated into English by G. W. Dasent. The title is 'The Story of Burnt Njal; or Life in Iceland.'
- Nornagests Thattr*. A mythical story.
- Elkofra-Thattr* (A comical tale-telling how Thorkel, nicknamed Alchood, brewed the beer at the althing). Historical.
- Errevodds Saga* (of Od the Archer; literally, Arrow-Od). Fabulous.
- Orkneyinga Saga* (Saga of the Orkney Isles). Translated into English by Jon Hjal-talm and Gilbert Goudie, and edited, with notes and introduction, by Joseph Anderson. Edinburgh, 1873.
- Pals Byskups Saga* (of Bishop Paul, the seventh bishop of Skalholt, who died in 1211; probably by a contemporary). Historical.
- Parcerals Saga* (of Parceval, one of King Arthur's worthies). Fabulous.
- Partalopa Saga*.
- Petrar Saga Postola* (of Peter, the Apostle).
- Ragnars Saga Lodbrokar* (of Ragnar Lodbrok). History with fable.
- Reinalds Rimur* (rhymes of Reinald and Rosa).
- Reykdale Saga* (a story of the feud between the good chief Axel and the evil Vemund Koger). Historical.
- Salusar Saga ok Nikanors* (of Saul and Nicanor, two foster brothers, one of Galatia and one of Italy). Fabulous.
- Samsons Saga Fagra* (of Samson the Fair). Fabulous.
- Sigurdar Saga snarfara*.
- Sigurdar Saga Thegla* (of Sigurd the Silent, son of King Lodver, in Saxland). Fabulous.
- Skaldhelga Rimur* (rhymes of the Skald Helge).
- Skida Rimur* (Rhyme of Skide).
- Stjornu Odda Draumr* (Star Odde, viz, the Astrologer Odde's Dream).
- Stafs Thattr* (Traits of Staf, the Skald, who lived in the time of Harald Sigurdson, about 1050). Historical.

- Sturlunga Saga* (of the family of Sturla, of which Snorre Sturlason was a descendant, from the beginning of the twelfth century to 1284). Historical. Edited with prolegomena, appendices, tables, indices, and maps, by Dr. G. Vigfusson. Oxford, 1878. A superb edition.
- Svarfdala Saga* (of Thorstein, who first settled in Svarfdal, in Iceland; and fabulous adventures of his successors). History and fable.
- Sveins Thattr ok Finns*.
- Sverris Saga* (of King Sverre, from 1177, when Snorre Sturlason's *Heimskringla* ends, to King Sverre's death). Historical.
- Svinfellinga Saga* (the story of the sons of Orm, the noted chief of the Svinfell family). Biographical.
- Thidreks Saga* (of Dietrick of Bern). The same of the German story.
- Thomas Saga Erkebiskups* (of Archbishop Thomas of Canterbury). Edited, with English translation, by Eirikr Magnusson. London, 1875.
- Thordar Saga Hredu* (of Thord the Terrible, who, in 975, left Norway and settled in Iceland). Historical.
- Thorleifs Thattr Jarlaskalds* (of Thorleif the Skald of the Earls of Orkney). Historical.
- Thormodar Saga Kolbrunarskalds* (of Thormod Kolbrunarskald). Historical.
- Thorsteins Saga Sidu-Hallssonar* (of Thorstein, son of Hal o' Side). Historical.
- Thorsteins Saga Vikingssonar* (of Thorstein, son of Viking). Fabulous. Translated into English by R. B. Anderson, in his "Viking Tales of the North." Chicago, 1877.
- Thorvalds Saga Vidforla* (tells how Thorvald Kodranson, the far-traveled fellow-missionary and companion of the Saxon Bishop Frederick, preached the new faith to the Icelanders for four years, but in vain). Historical.
- Ulfhams Rimur* (Rhymes of Ulfham).
- Valdimars Saga Konungs* (of Valdemar, son of King Philip of Saxland).
- Vallalots Saga* (of Ljot o' Vall, an Icelander, the story of the twelfth century.) Historical.
- Valvers Thattr* (traits of the life of Valver).
- Vapnfirdinga Saga* (tells of the feuds between the men of Hof and the men of Crosswick). Historical.
- Vatnsdala Saga* (of Ketil Thrumr, his son Thorstein, Ingemund and Sæmund, his grandsons, who settled in Vatnsdal, in Iceland.) Historical.
- Vigaglums Saga* (of Glum, son of Eyjalf, who went to settle in Iceland, 922). Historical. Translated, with notes and an introduction, by Edmund Head. London, 1866.
- Viktors Saga ok Blaus* (of Victor and Blaus). Fabulous.
- Vilhiabms Sago Siods* (of William of the Treasure, a son of King Richard, in England). Fabulous.
- Vilkina Saga* (History of the Vilkins). Mythological, and belonging to the Niblung literature.
- Vilmundar Saga* (of Vilmund and Hierande, a son of a king in Frankland). Fabulous.
- Volsunga Saga*. Mythological. Translated into English by E. Magnússon and W. Morris. London, 1870.

The lives of saints (*Heilagra Manna Sögur*) many of which are mentioned in the above list, constitute two large volumes, published by C. R. Unger, in Christiania. The *Postula Sögur*, legendary accounts of the lives of the Apostles, have appeared in a large volume edited by Prof. C. R. Unger. A large number of the *Riddara Sögur*, that is, Romantic Sagas, have been published by Dr. Eugen Kölbing, Stras-

burg, and by Dr. E. Cederschiöld, of Lund, Sweden. The old Icelandic literature also abounds in so-called *Rímur*, or ballads, founded on written stories. Many of these *rímurs* have not yet been published. The most of the mythical sagas are published, collected in three volumes, by Prof. C. C. Rafn, Copenhagen."

In 1891 William Morris and Eiríkr Magnússon commenced in London, under the name "The Saga Library," the publication of a collection of sagas. At present two volumes have been issued, containing the following sagas: Vol. I. The Story of Howard the Halt; The Story of the Banded Man; The Story of Hen Thorir. Vol. II. The Story of the Ere-Dwellers (*Eyrbyggja Saga*) with the story of the Heath-Slayings (*Heiðarvíga Saga*). Of these the Sagas of the first volume are not mentioned in the foregoing list.

Of the story of Howard the Halt a fragment has been preserved in its older and purer state in pages 145-147 of the Landnámabók.

The story of the Banded Man (*Bandamanna Saga*) is the latest of the independent Icelandic Sagas. According to the editors of the Saga Library (Vol. I, preface p. xxiii) "it has come down in two versions, one evidently written in the north and the other in the west or south of Iceland. The northern text is preserved in the Arnarnagmæan vellum 132 fol., which paleographers variously refer to the end of the thirteenth down to the middle of the fourteenth century, and was edited by H. Fridriksson, at Copenhagen, in 1850. The western text is contained in 2845.4<sup>o</sup>, in the old collection of the Royal Library at Copenhagen, dating from the beginning of the fifteenth century and was edited by Gustav J. Chr. Cederschiöld, Lund, 1874."

The Story of the Heath-Slaying (*Heiðarvíga Saga*), published in the second volume of the Saga Library is pronounced the oldest of all Icelandic sagas. It is stated<sup>1</sup> that it was purchased by the Royal Academy of Antiquities in Sweden in 1682, through the agency of the Icelander Jón Eggertsson in an incomplete state,<sup>2</sup> and that it now forms part of the Royal Library at Stockholm. In 1722 Arni Magnússon obtained the loan of the first twelve leaves. He had a copy made of them but both original and copy were destroyed, in 1728, in the Copenhagen conflagration; but his copyist, Jón Olafsson, reproduced them from memory. The best edition of the saga is that of Jón Sigurdsson, in the volume of the *Íslendinga Sögur*.

These then are the records from which we obtain the knowledge of the Northmen and of their naval architecture.

*Ships*.—The name ship (*skip*) appears to have been given to any vessel propelled by oars from benches or short seats<sup>3</sup> that did not extend from board to board, but having a gangway between them<sup>4</sup> through the

<sup>1</sup>Morris and Magnússon: The Saga Library, Vol. II. London, 1892. Preface p. xxv.

<sup>2</sup>Cf. Sturlunga I prolog. cxlvii.

<sup>3</sup>Flateyrbók, I, 396.

<sup>4</sup>Heimskringla, p. 400.

entire length of the ship. According to the older Gula law, benches were not employed upon vessels of less than thirteen oars on each side, and it was from the number of benches on each side (*sess*), not from the number of oars, that the ship received the appellation of a 13, 14, 20, 30, etc., seater and were classed as *karve* (*karfi*) or longships (*langskibet*).

The *Karve* (*Karfi*) appears to have been propelled exclusively by oars,<sup>1</sup> although occasional mention is made of carvels with masts;<sup>2</sup> its name occurs in various sagas.<sup>3</sup> An ordinance of 1315<sup>4</sup> mentions the *karves* as vessels of defense. The *karve* of Bishop Haakon of Bergen<sup>5</sup> and one built in Nidaros in 1381<sup>6</sup> are the last two of this class of which mention is made.

The *Longship* (*langskibet*—*navis longæ* of the Romans) was the war-vessel of the North. In building war ships two classes of workmen were employed, namely, the carpenters who prepared and framed the skeleton, and the boarders who prepared the boards and fitted them to the frames. After the keel had been laid upon the stocks the stem and stern posts were placed in position, together with the knees, ribs, and crossbeams, of which the one by the mast was called *siglubite*, and that aft by the well, *austribiti*. The planks were then fixed to the frames, but the exact manner in which this was done is not known. They were, however, fastened to each other by iron bolts that were riveted on the inner side. The planks, each tier of which had a distinctive name, overlapped each other, and the tightening was done by the insertion of a layer of oakum, probably of cattle hair. It is thus evident that the vessels were clinker-built, although exceptions may be admitted.<sup>7</sup> Mr. Nicolaysen<sup>8</sup> thinks that all vessels were clinker built, and supports his theory by citing the following well-known ships:

Olaf's *Kathrinar*, *Sunifu*, *Postula*, *Reimar's Sažine*, whose name, derived from *suž*, suggests the clinker structure, and also by the *Mariasužen*, built by King Sverre at Nidaros,<sup>9</sup> a ship upon a door pillar at the church of Nesland;<sup>10</sup> the seal of Elif, the Lawyer;<sup>11</sup> the seal of the municipality of Bergen;<sup>12</sup> the seal of Gunnar Raasvein,<sup>13</sup> and a ship mentioned in a testament made in 1430.<sup>14</sup> He also claims<sup>15</sup> that the

<sup>1</sup> *Jal. A: Archéol. Navale* i, 411, 461.

<sup>2</sup> *Konungssögur*—ed. Unger, p. 190. D. Norv. II, 366.

<sup>3</sup> *St. Olaf Saga*, c. L. *Gretti Saga*, c. xx. *Egils Saga*, c. xxxvi.

<sup>4</sup> *Norg. gamle Love*, 112.

<sup>5</sup> D. Norv. VIII, No. 131.

<sup>6</sup> D. Norv. II, 366.

<sup>7</sup> *H. Miller: Søkrigshistoriens vigtigste Begivenheder*, p. 4.

<sup>8</sup> *Langskibet fra Gokstad*, p. 15.

<sup>9</sup> *Norske byggn fra fortiden*, 3 rækkje pl. v. (cited by Nicolaysen.)

<sup>10</sup> *Konungssögur*, ed. Unger, pp. 83, 85, 166 (cited by Nicolaysen.)

<sup>11</sup> D. Norv. III, No. 47 (cited by Nicolaysen.)

<sup>12</sup> D. Norv. II, No. 46 (cited by Nicolaysen.)

<sup>13</sup> D. Norv. II, No. 172 (cited by Nicolaysen.)

<sup>14</sup> D. Norv. V, No. 419 (cited by Nicolaysen.)

<sup>15</sup> Nicolaysen, *Langskibet, fra Gokstad*, p. 15.

first carvel ship in the north was the renowned galley built at Bergen in 1566,<sup>1</sup> but two Sagas indicate the carvel built. One of them states<sup>2</sup> that the beautiful planks of oak were fitted so tight as to represent an appearance as though they were grown together, and the second recounts the building, in 999, by Olaf Trygvason, at Ladehammer, near Drontheim, of a ship "which was larger than any ship in the country, and of which the beam knees are still to be seen." This is the celebrated Long Serpent (*Ormen-hin-Lange*) and an account of it, as given in the Saga, may be of interest.<sup>3</sup>

"The length of keel that rested upon the grass was 74 ells. Thorberg Shafting was the man's name who was the master builder of the ship; but there were many others besides—some to fell wood, some to shape it, some to make nails, some to carry timber [this division of labor and trades in the building of a vessel equal in length to a frigate of forty guns gives us a very interesting insight into the civilization of the Pagans of the tenth century and of the state of the useful arts among them], and all that was used was of the best. The ship was both long and broad and high-sided, and strongly timbered. While they were planking the ship it happened that Thorberg had to go to his farm upon some urgent business, and as he remained there a long time, the ship was planked up on both sides when he came back. In the evening the King went out and Thorberg with him to see how the vessel looked, and everybody said that never was seen so large and so beautiful a ship-of-war. Then the King returned to the town. Early next morning the King again returned to the ship and Thorberg with him. The carpenters were there before them, but all were standing idle with their arms across. The King asked what was the matter? They said the ship was destroyed, for somebody had gone from stem to stern and cut one deep notch after the other down the one side of the planking. When the King came nearer he saw it was so, and said, with an oath: 'The man shall die who has thus destroyed the vessel out of envy, if he can be discovered, and I shall bestow a great reward on who ever finds him out.' 'I can tell you, King,' said Thorberg, 'who has done this piece of work.' 'I don't think,' replied the King, 'that any one is so likely to find it out as thou art.' Thorberg said, 'I will tell you, King, who did it; I did it myself.' The King said, 'Thou must restore it to all the same conditions as before, or thy life shall pay for it.' Then Thorberg went and chipped the planks until the deep notches were all smoothed and made even with the rest; and the King and all present declared that the ship was much handsomer on the side of the hull which Thorberg had chipped, and bade him shape the other side in the same way, and

<sup>1</sup> Norske Magas. I, 331, II, 70.

<sup>2</sup> Saga of Fridthjof the Bold, c. 1.

<sup>3</sup> King Olaf Trygvason Saga, Heimskringla text, c. xev.

gave him great thanks for the improvement. Afterwards Thorberg was the master builder of the ship until she was finished. The ship was a dragon, built after the one the King had captured at Halogaland; but the ship was far larger and more carefully put together in all her parts. The King named her Serpent the Long, and the other Serpent the Short. The long Serpent had thirty-four benches for rowers. The head and the arched tail were both gilt, and the bulwarks were as high as in seagoing ships. The ship was the best and most costly ship ever made in Norway."

The long ships were subdivided into *snekka* (*snekkja*), *skude* (*skúta*), dragon (*dreki*), *skeid* (*skeið*), and *busse* (*buza*).

The descriptions of these varieties are somewhat indistinct and do not permit of a definite opinion as to the real difference existing between a dragon, *skeid*, or *buza*. The ship that Harald Hardradi had built at Nidaros, in 1160, is called *skeið* and *bussi*, and it is further told<sup>1</sup> that after the king had placed a dragon's head upon its prow it might be called a *skeid* or a dragon.

The Sagas have preserved accounts of celebrated ships, of which we mention:

(a) *Long ships*.—Thorolf Kveldulfsson's ship built in 872–873.<sup>2</sup>

King Olaf's ship "Karlhöfði"; on her prow was a king's head, which he himself had carved. That head was for a long time afterwards used on ships steered by chiefs.<sup>3</sup>

King Sverre's ship "Hárknifrin" (the razor), of twenty-three divisions,<sup>4</sup> and the "Olafsuðe," wherein six men were placed in each division.<sup>5</sup>

The "Mariasuðe," built by King Sverre in 1182; she had thirty-two divisions and was proportionately large; she was larger than any other ship in Norway at that time.<sup>6</sup>

King Sverre's ship "Ognarbrand," of thirty divisions, built in 1199, and which had a high free board.<sup>7</sup>

Ship "Gullbringen," belonging to Vidkunn Erlingsson, who died in 1183; she had twenty divisions and was proportionately large.<sup>8</sup>

In 1206 Urling Steinvæg, Reider the Messenger, and Earl Philippus, of Tunsberg, built a ship which was "much larger than any ship previously constructed in Norway." She had, what neither before nor

<sup>1</sup>G. Strom: Snorre Sturlason Historiekrivn, p. 252.

<sup>2</sup>Egil's Saga, c. ix; Olaf Trygvason Saga, Heimskringla text, c. lxxix.

<sup>3</sup>St. Olaf Saga, c. xix.

<sup>4</sup>A division, or *rúm*, was the distance between the rowers' benches; the intervening gangway divided the *rúm* into half *rúms*, which were occupied by from 2 to 8 men.

<sup>5</sup>Konungssögur, ed Unger (cit. by Nicolaysen), p. 66.

<sup>6</sup>Ibid., p. 77; Norske bygn fra fortiden. 3 rækkje, pl. v.

<sup>7</sup>Ibid., p. 165.

<sup>8</sup>Flateyrbók, II, 600.

since has been known here, two tiers of holes for the oars; the oars of the upper tier were 9.41 millimeters (31½ feet) long, and "a man must be one of the tallest who, standing on the frames, could, with his battle-ax, touch the ceiling of the deck." Each half division accommodated eight men.<sup>1</sup>

In 1239 Duke Skule built a ship with thirty-six divisions; he called it "Good Friday."<sup>2</sup>

In 1247 King Haakon set out from Bergen in his ship "Dragon," of twenty-five rúms, to meet Cardinal William, of Sabine.<sup>3</sup>

In 1253 Gunnar had the "Korsstuven" built at Raynsholt in Bohuslen, which was "one of the biggest ships that had been constructed in Norway;" her gunwale was 4.23 meters (14 feet) above the water line.<sup>4</sup>

The ship of Bishop Haakon, of Bergen (1339), had forty-five divisions and was 1.88 meters (6¼ feet) high.<sup>5</sup>

(b) *Snekkja*.—In 997 King Olaf built on the sands by Nidely a long ship, of the snekke kind, high stemmed, with thirty rúms, which he called "Trane."<sup>6</sup>

In 1020 St. Olaf built snekkjas.<sup>7</sup>

Aasbjorn Selsbane, of Thronhjem, owned a snekkja with twenty rúms and accommodating ninety-nine men.<sup>8</sup>

In 1026 St. Olaf built a snekke which he called "Visund."<sup>9</sup>

In 1027 Harald, of Thjøto, in the battle of Helgeaa, had a ship of twenty divisions, gilded pennant, and white sails ornamented with blue and red stripes.<sup>10</sup>

Eindrid the Young had a snekka of twenty rúm.<sup>11</sup>

In 1247 Cardinal William, of Sabina, used a snekkja while meeting King Haakon.<sup>12</sup>

In 1247 King Haakon used a beautiful snekkja in sending his daughter to Spain to be married.<sup>13</sup>

Erling Skjalgsson had a twenty-seated snekkja.<sup>14</sup>

(c) *Skuta*.—The skuta appears to have been a fast-sailing war ship of smaller dimensions, probably of fifteen rowers' benches, built for speed, as is indicated by the appellations *lettiskuta* (light skuta) and

<sup>1</sup> Konungssögur (cit. by Nicolaysen), p. 223.

<sup>2</sup> Flateyrbók, iii, 41.

<sup>3</sup> *Ibid.*, iii, 166.

<sup>4</sup> Konungssögur, pp. 425, 426.

<sup>5</sup> D. Norv. viii, No. 119.

<sup>6</sup> Olaf Trygvason Saga, Heimskringla text, c. lxxix.

<sup>7</sup> Heimskringla, ed. Unger (cit. by Nicolaysen), p. 251.

<sup>8</sup> *Ibid.*, p. 355; St. Olafs Saga, c. xxiv.

<sup>9</sup> *Ibid.*, pp. 114, 529.

<sup>10</sup> *Ibid.*, pp. 402, 428.

<sup>11</sup> *Ibid.*, p. 784.

<sup>12</sup> Flateyrbók, iii, 161.

<sup>13</sup> Konungssögur (cit. by Nicolaysen), p. 438.

<sup>14</sup> Magnús Erlingsson Saga, c. xxv; Olaf Trygvason Saga, c. cii; St. Olaf Saga, c. lx, cl.

*hleyþiskuta* (running ship),<sup>1</sup> and employed principally for boarding, which was facilitated by the build of their bulwark.<sup>2</sup>

Some of the leading skutas mentioned in the Sagas are:

A fifteen-seated skuta belonging to Eindrid the Young.<sup>3</sup>

A fifteen-seated skuta belonging to Erling Skjálǫgsson.<sup>4</sup>

A fifteen-seater given by Thorleif to his son Eirik.<sup>5</sup>

(d) *Dragon*.—The dragon (*dreki*) received its name from the decorations of the prows, representing the head and tail of some fabulous animal.

The most celebrated dragons handed down in the Sagas are:

That of Thorolf Kveldulfsson, of Sandness, in Nordland, built in 872–873.<sup>6</sup>

Harald Haarfager's dragon, built in 900. Of this it is said that "the King had fitted it out in the most splendid way and brought his house troops and his berserkers on board; the forecastle men were picked men, for they had the King's banner."<sup>7</sup>

The dragon of Chief Rand the Strong, in Sallen, which was "the most beautiful ship in Norway."<sup>8</sup> Her captor, King Olaf, called it "The Serpent" because the sail when filled by the wind would represent the dragon's wings. "It had thirty divisions, but was large in proportion thereto (*mikit at þri*). The prow bore a dragon's head and the stern was curved outward in a crook (*krókr*) like a tail (*sporör*); the figure-head, and both curves were gilt."<sup>9</sup>

The ship which King Harald Hardrada had built at Nidaros was of the same size as the Long Serpent, and every part of her was finished with the greatest care. On the stem was a dragon head and on the stern a dragon tail and the sides of the bows of the ship were of gilt. The vessel was of thirty-five benches, and was large for her size and was remarkably handsome, "for the King had everything belonging to the ship's equipment of the best, both sails and riggings, anchors and cables."<sup>10</sup>

The ship which King Eysteinn had built at Nidaros in 1103 in size and shape was like the Long Serpent which Olaf Trygvason had built.<sup>11</sup> "At the head there was a dragon's head and at the stern a crooked tail,

<sup>1</sup>Olaf Trygvason Saga, c. lxxxiii. xli. Ingi's Saga, c. i.

<sup>2</sup>Olaf Trygvason Saga, c. xx. Egil's Saga, c. Iviii. St. Olaf's Saga, c. cxxxii, cxlix. Magnus Blind's Saga c. v. xvi. Magnus Erlingsson's Saga, c. xxx.

<sup>3</sup>Heimskringla, ed. Unger (cit. by Nicolaysen), p. 799.

<sup>4</sup>Magnus Erlingsson's Saga, c. xxv. Olaf Trygvason Saga, c. eii. St. Olaf Saga, c. ix. cl.

<sup>5</sup>Olaf Trygvason Saga, c. xx.

<sup>6</sup>Heimskringla (ed. Unger cit. by Nicolaysen) p. 192.

<sup>7</sup>Egil's Saga, c. ix.

<sup>8</sup>Harald Haarfager Saga, Heimskringla text, c. ix.

<sup>9</sup>Olaf Trygvason Saga, c. lxxxv; Magnus the Good's Saga, c. xx.

<sup>10</sup>Harald Hardrada Saga, Heimskringla text, c. lxi.

<sup>11</sup>Sigurd the Crusader's Saga, Heimskringla text, c. xxvi.

and both were gilded over. The ship was high-sided, but the fore and aft parts appeared less than they should be."<sup>1</sup>

King Haakon's dragon, used by him in 1247.<sup>2</sup>

The "Mariasußen," built by King Haakon in 1257, was "the most beautiful ship hitherto built in Norway," and had thirty half divisions.<sup>3</sup>

King Haakon's dragon, used by him in 1263 in his expedition to Scotland, was built entirely of oak, had twenty-seven divisions, and the dragon's head, prows, and stern were all gilded.<sup>4</sup>

The largest dragon ever mentioned is that of Knut the Great; it had sixty pairs of oars, and from the descriptions given it must have been 300 feet long.

(e) *Skeid*, which was a fast sailer and occasionally as large as a dragon; the largest one of this kind is that of Erling Skjálgrsson, which had sixty-four oars and carried two hundred and forty men.<sup>5</sup>

(f) *Busse*, which appears to have been somewhat similar in size to a dragon; a buza ship is mentioned as having been built on the model of the Long Serpent.<sup>6</sup>

The most prominent busse mentioned in the Sagas is that of Thore Hund of Bjørkø, which was of such height between flooring that it gave room for "barrels of ale of astonishing size."<sup>7</sup>

Harald Hardrada's ship of the same size as the Long Serpent, but with a dragon head fore and aft. It had thirty-five divisions.<sup>8</sup>

King Eystein's busse, built in 1103, of the size and construction as the Long Serpent.<sup>9</sup>

Eindrid the Young's bussa, called the "Draglaun."<sup>10</sup>

In calm weather the ships were propelled by *oars* manned by two, three, or four men, according to their length and the size of the ship, and exceptionally strong men only could handle an oar unaided.<sup>11</sup> In two instances only does the Saga give us an account of the length of the oars, the one<sup>12</sup> being stated at 26 feet, and in the other instance 31½ feet is given.<sup>13</sup> Actual finds show the length of oars at 18½ to 19½ feet in length,<sup>14</sup> while oars of small boats<sup>15</sup> exhibit a length of 10 feet.

<sup>1</sup>Heimskringla, ed. Unger, pp. 591, 592.

<sup>2</sup>Flateyjarbok, III, p. 161.

<sup>3</sup>Ibid., III, pp. 196, 197.

<sup>4</sup>Konungssögur, ed. Unger (cit. by Nicolaysen), p. 464.

<sup>5</sup>Olaf Trygvason Saga, c. cv.; St. Olaf Saga, c. clxxxiv; Heimskringla, ed. Unger (cit. by Nicolaysen), pp. 231, 414.

<sup>6</sup>St. Olaf Saga, c. cxliii.

<sup>7</sup>Heimskringla, ed. Unger (cit. by Nicolaysen), pp. 591, 592.

<sup>8</sup>Harald Hardradi Saga, c. lxi.

<sup>9</sup>Heimskringla, ed. Unger (cit. by Nicolaysen), p. 684.

<sup>10</sup>Ibid., p. 774.

<sup>11</sup>Magnus Erlingsson Saga, c. vi.

<sup>12</sup>Frithjof Saga (ed. Tegner).

<sup>13</sup>Konungssögur, p. 223 (cit. by Nicolaysen.)

<sup>14</sup>Nicolaysen: Langskibet fra Goksted, p. 38, Pl. iv, Fig 18; v. Fig. 1; vii, Fig. 13.

<sup>15</sup>Engelhardt, C.: Denmark in the Early Iron Age, p. 38, Pl. iii, Figs. 19, 20.

In addition to the oars, mast and sails were used in the propulsion of the ship.

The *mast* was set in an opening made in a large block fixed above the middle part of the vessel, the aperture extending considerably sternward, so as to facilitate its raising and lowering.

The mast was of moderate height and was lowered upon all occasions, such as headwinds, when preparing for battle, or in making harbor, rendering the sail superfluous.<sup>1</sup>

The mast was steadied by ropes passing around the top and lashed to the forepost and by a few shrouds on each side. The hoisting rope passed through a hole below the place where the shrouds met. A wooden parral was used to hold the yard or prevent its being swung outward, while a brace rope was placed at each end of the yard and fastened behind the mast or held by the helmsman.<sup>2</sup>

*The sails* were square, but their form rendered tacking difficult, and the sailors often preferred waiting for a favorable wind. This is mentioned in the Sagas, especially on occasions where thereby an opportunity was offered to show to advantage an exceptionally handsome sail. It is said of Harald Sigurdson that, wishing to visit Constantinople on his return from Jerusalem, he waited with his fleet one month and a half for a side wind to enable him to display the sails covered with velvet.<sup>3</sup>

They were sewed together with thread and strengthened at their edges by a leech, to which hooks were attached and rings so placed as to receive the sheets when the vessel was to shorten sail.<sup>4</sup> They also had small ropes or reefing points to be used in reefing or shortening the sails.

The material used for sails was frieze, but ships best equipped for active service employed canvas. For show, beautiful sails were highly prized and often presented to chieftains;<sup>5</sup> designs were painted or embroidered upon them.<sup>6</sup> The dragon "Mariasuðen," built by King Haakon in 1257, had sails embroidered with historic designs.<sup>7</sup> They were often lined with velvet<sup>8</sup> and again double velvet, beautifully woven with red, purple, and gold.<sup>9</sup> White sails are mentioned, striped with blue and red.<sup>10</sup>

*Ornamentations* seem to have played a very important part in ships and carvings appear upon many trifling objects. The prow was gen-

<sup>1</sup> Konungssögur, pp. 165, 230 (cit. by Nicolaysen); Flateyrbok, III, 41.

<sup>2</sup> Laxdæla, I, c. xviii.

<sup>3</sup> Sigurd Jorsalafari Saga, c. ii.

<sup>4</sup> Ancient Gula law.

<sup>5</sup> Harald Hardradi; Fornmana Sögur, VI, c. 100.

<sup>6</sup> A. Schultz: Das höfische Leben zur Zeit der Minnesinger, II, 290 (cit. by Nicolaysen).

<sup>7</sup> Flateyrbok, III, pp. 196, 197.

<sup>8</sup> Sigurd Jorsalafari Saga, c. ii.

<sup>9</sup> Flateyrbok, III.

<sup>10</sup> St. Olaf Saga, clxviii.

erally ornamented with the gilded head of some fabulous animal. Ornaments are mentioned in many of the Sagas.<sup>1</sup>

The accompanying figures<sup>2</sup> show a number of carvings exhibited upon objects from funeral ships. Fig. 107 is a tiller, Fig. 108 part of a



Fig. 107.  
CARVED TILLER.

(Copied from N. Nicolaysen, "Langskibet fra Gokstad.")

wooden dish, Fig. 109 the top part of an oar, Fig. 110 wooden fragment of uncertain use, Fig. 111 the carved heads on the end of the verge board from the vessel's tent.

Of *rudders* only one form is known from the Sagas. It was placed on the right side of the ship, which, consequently, bore the name *stjørnboard*, while the opposite side, back of the helmsman, was called *bakboard*. In the rear of the helmsman and standing across was an upright wooden bulkhead.

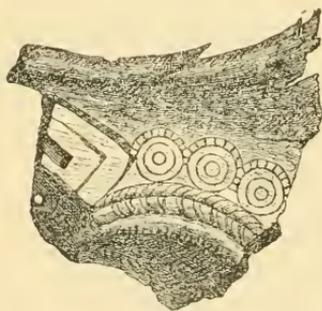


Fig. 108.  
CARVED DISH.

(Copied from N. Nicolaysen, "Langskibet fra Gokstad.")

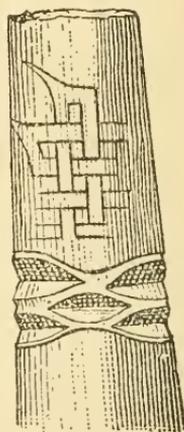


Fig. 109.  
CARVED OAR HANDLE.

The rudder, slightly mounted with iron, consisted of a broad oar,<sup>3</sup> the lower part of which was fastened to the side of the ship by means of a bast rope, while the round neck ran in a hollow cylinder. A square hole in the head admitted the tiller, which was generally taken in charge by the commander of the ship, whose position was a little below the rudder head, so as to secure some protection from the enemy's missiles.<sup>4</sup>

<sup>1</sup>St. Olaf Saga, cc. xlv, eliv; Olaf Trygvason Saga, c. lxxxv; Magnus the Good's Saga, c. xx; Sigurd Jorsalafari Saga, c. xiv; Fornmanna Saga, vii, 98; Recueil de chroniques de Flandre, 1837-1841, vol. 1; Schiern, Nyere historiske Studier, I, 1875.

<sup>2</sup>Copied from N. Nicolaysen: Langskibet fra Gokstad, Pl. vii, Fig. 7; Pl. ix, Figs. 2, 10a; Pl. x, Fig. 20; Pl. xi, Figs. 1, 4.

<sup>3</sup>Bergens Bylov, ix, 18.

<sup>4</sup>Magnus Barefoot Saga, c. ii; Harald Hardradi Saga, c. xxxii; Olaf Trygvason Saga, c. lxxxvii.

The side helm appears to have been the prevailing form of rudder until the fourteenth century<sup>1</sup> (Figs. 112–117), and even at the present time in the Nordland boats, while the rudder itself is hung astern, the steering is done from the side by means of a peculiarly constructed tiller.

“But round their ship’s side hung their shields.”<sup>2</sup>

From these words of Guttorm Sindre, in singing of Hakon’s pursuit of Erie’s sons, we learn that the shields, all of one size, were hung around

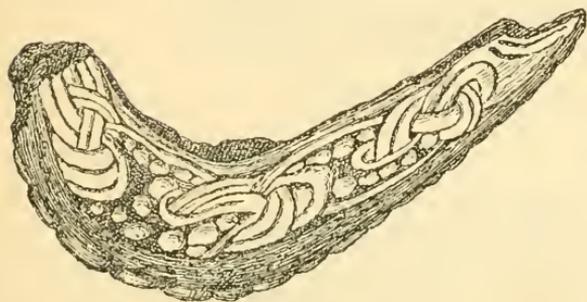


Fig. 110.  
CARVED IMPLEMENT.

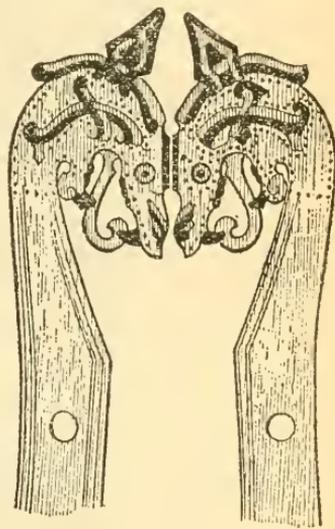


Fig. 111.  
CARVED HEADS ON TENT POSTS.

Copied from N. Nicolaysen, "Langskibet fra Gokstad.")

the sides of the war ship when not in use.<sup>3</sup> They were placed from a little ahead of the first oar to a little behind the last, and overlapping each other they served the double purpose of rendering the ship’s sides higher and being out of the way when not needed. They formed a distinctive mark of war ships and were not found upon merchantmen.<sup>4</sup>

In battle a circle or burgh of shields was formed around the leader and the standard-bearer, and in land battles the shield burgh appears to have been at the apex of the triangular form of attack.<sup>5</sup>

The *standards* and *weather vanes* are mentioned frequently. The

<sup>1</sup> Norske bygn. fra fortiden, 3 rækkje, Pl. v; Urkundenbuch der Stadt Luebeck I, 759. *Viollet Le Duc*: Diction. d. mobil. franç, IX, 34; Bergens Bylov, IX, 18 *Schultz, A.*: Das höfische Leben zur Zeit der Minnesinger, II, 290; D. Norv., II, No. 169, 172.

<sup>2</sup> Hakon the Good Saga, c. xx.

<sup>3</sup> Fornmana Sögur, I, p. 100; Landuama, xi, 3; Grettis Saga, c. xix; Njala, c. lxxxiv; Ynglinga Saga, c. xxv.

<sup>4</sup> St. Olaf Saga, c. clxviii.

<sup>5</sup> Ynglinga Saga, c. xxv. Flateyrbok, I, p. 140; III, pp. 196, 197. Konungs Skuggsjá, p. 85; St. Olafs Saga, cc. cexii, cexxxii. Harald Hadradi Saga, c. ix; Sögubrot, c. ix. Olaf Trygvason Saga, c. cxv, cxx.

standard-bearer stood in the prow of the ship and "the pennant, spun by women, played at the masthead of the reindeer of the waters."<sup>1</sup>

In battle the standard-bearer stood by the leader, both surrounded by a shield burgh.<sup>2</sup>

The standards were often very elaborately worked<sup>3</sup> and the weather vanes were often adorned with gold.<sup>4</sup>

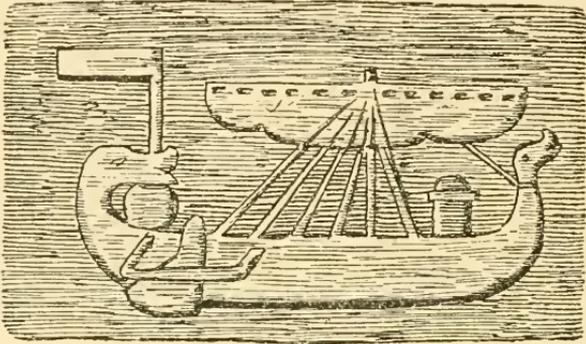


Fig. 112.

SIDE HELM ON BAPTISMAL FONT IN CHURCH OF LÖDERUP, SCANIA, SWEDEN.  
(From Du Chaillu, "The Viking Age," vol. II, p. 157, Fig. 936.)

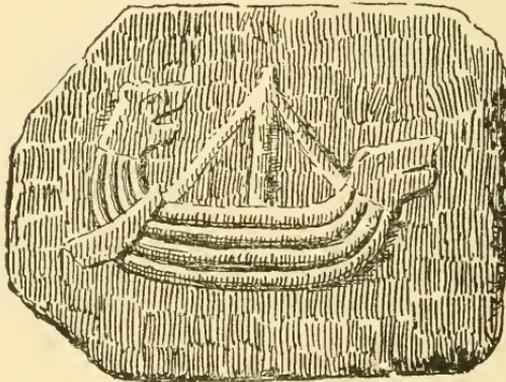


Fig. 113.

SIDE HELM ON SHIP IN STONE WALL AT CHURCH OF SKRÖBELEF, DENMARK.  
(From Du Chaillu, "The Viking Age," vol. II, p. 151, Fig. 914.)

For offensive purposes some of the vessels appear to have been provided with iron spikes or regular spurs. The former is mentioned in the description of the battle between Hakon the Jarl and the Jomsvikings in which it is stated that Eiríkr Jarl had a vessel the upper part of which was provided with a *skeg* (beard) apparently consisting of iron spikes.<sup>5</sup>

<sup>1</sup>Knut's Drapa; Orver Odd's Saga, c. viii. Egil's Saga, c. xxxvii; Helgi Hundingsbani, ii.

<sup>2</sup>St. Olaf Saga, cc. 48, 212, 233; Flateyrbok, vol. I. Hakon the Good's Saga, c. xxiii; Harald Fairhair Saga, c. IX. Olaf Trygvason Saga, c. CXV.

<sup>3</sup>Helgi Hundingsbani, c. II.

<sup>4</sup>Orver Odd's Saga, c. 8; Flateyrbok, III, pp. 196, 197.

<sup>5</sup>Svarfdæla, c. 4.

The *spur* occurs in a boat found in Nydam Moss, Sleswig (Pl. LXXV), and described in the early part of this book. In this boat the ends of the keel plank continued beyond the stem and stern and tapered into points, and it is supposed that these points were covered with iron for use on either side of the ship.

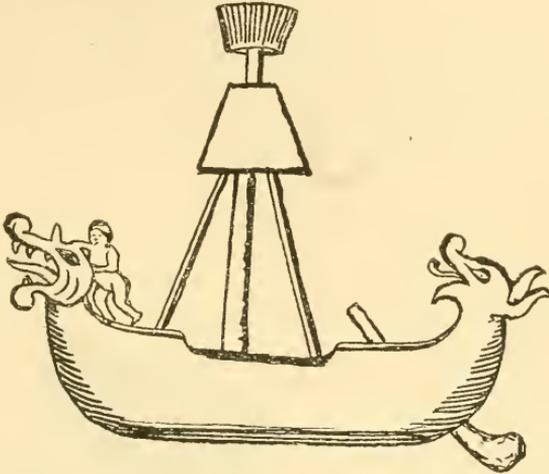


Fig. 114.

SIDE HELM IN A SHIP ON A STONE IN ALSNÖ PARISH, UPLAND, SWEDEN.  
(From Du Chaillu, "The Viking Age," II, p. 142, Fig. 915.)

For defensive purposes a war girdle (*viggýrdil*) or war hurdle (*vigkleki*) was placed upon the ship. Their application is not quite intelligible from the few meager accounts given.<sup>1</sup>

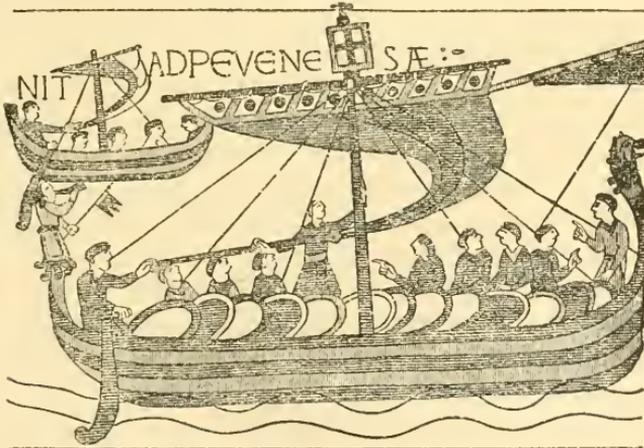


Fig. 115.

SIDE HELM IN SHIP ON BAYEUX TAPESTRY.

(From Edward J. Lowell, "The Bayeux Tapestry," in Scribner's Magazine, March, 1887.)

All the ships of the Northmen of which accounts have been handed down or of which the remains have been found show that they were

<sup>1</sup> "King Sverri had all his ships ready and *war-girdled* at the gangways" (Sverri's Saga, c. 52) and King Harald, pursued by King Svein, of Denmark, ordered the *viggýrdiles* and other things to be thrown into the sea.—Harald Hardradi Saga, c. 35.

provided with a single row of rowers on each side of the ship. One exception, however, is to be noted to this. It is stated<sup>1</sup> that in 1206 "Erling Steinvag, Reidar the Messenger, and Earl Philippus, of Tunsberg, built a ship which was much larger than any previously constructed in Norway. The ship had, what neither before or since has been known here, two tiers of holes (*háborá*) for the oars between both wells; the oars of the upper rank were 20 (now 15) ells long (9.41 meters=31.37 feet) and a man must be one of the tallest who, standing on the frames could, with his broadax, touch the under side of the flooring." Each half division was reckoned to accommodate eight men.

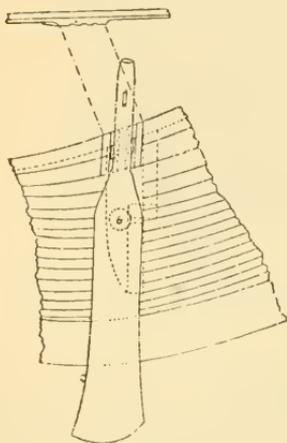


Fig. 116.

RUDDER OF GOKSTAD SHIP.

(Reproduced from N. Nicolaysen, "Langskibet fra Gokstad.")

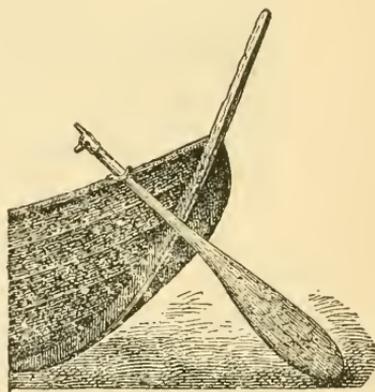


Fig. 117.

RUDDER OF NYDAM BOAT.

(Reproduced from C. Engelhardt, "Denmark in the Early Iron Age.")

*Launching.*—In getting the ship ready for the sea it was launched by means of rollers,<sup>2</sup> which appear to have formed part of the equipment and which also were used in dragging the ship ashore as was generally done at night if satisfactory landing could be had;<sup>3</sup> if not, the ship would remain close to shore and be connected with it by means of a gangway.<sup>4</sup> The sail was then lowered and formed a tent under which the men slept.<sup>5</sup>

It has been suggested that the ship received a name when being launched; there appears, however, to be no positive proof of such act in earlier days unless an exception is made in favor of the "Long Serpent."<sup>6</sup> Subsequent to the introduction of Christianity in the North, frequent mention is made of naming a ship at launching.<sup>7</sup>

*Burials in ships.*—With the exception of the boat found in Nydam

<sup>1</sup> *Konungssögur*, p. 223.

<sup>2</sup> *Ragnar Lodobroks Saga*, c. ix; *Harald Hadradi Saga*, c. lxii; *Olaf Trygvason Saga*, c. xvii; *St. Olaf's Saga*, c. 24, 115, 148; *Egil's Saga*, c. 19, 52, 72; *Fagrskinna Saga*, c. 42.

<sup>3</sup> *Olaf Trygvason Saga*, c. 17.

<sup>4</sup> *Ynglinga Saga*, c. 53; *Harald Haarfager Saga*, c. 37; *Egil's Saga*, c. 27.

<sup>5</sup> *Svarfdele Saga*, c. 4; *St. Olaf Saga*, c. 29, 143; *Egil's Saga*, c. 22, 27; *Harald Hadradi Saga*, c. 4, 35; *Ynglinga Saga*, c. 53; *Olaf Trygvason Saga*, c. 20; *Flateyrbok*, I.

<sup>6</sup> *Nicolaysen: Langskibet fra Gokstad*, p. 17.

<sup>7</sup> *Harald Hadradi Saga*, c. 62; *Flateyrbok*, iii, p. 196, 197; *Konungssögur* (cit. by Nicolaysen), p. 425, 426.

Moss and described on p. 572 our knowledge of northern ships would be very limited, and rest entirely in the Saga accounts, but for the fortunate circumstance connected with the burial customs in ancient times, in accordance with which the bodies of the more prominent dead were taken to the ship that had been their home during life and surrounded by their wealth became their last resting place. Two methods of burial existed, that of cremating the ship together with its sepulchral inhabitant and a like one in which a mound was erected over the ship and the dead. It is to the latter method that we are indebted for some well-preserved ships, which not alone serve to confirm the Saga accounts, but also extend our knowledge of prehistoric shipbuilding.

The *Voluspa* tells us that "the Asastook the body of Baldr and carried it down to the sea. *Stringhorni* was the name of Baldr's ship: it was larger than any other ship. The gods wanted to launch it for the *burning voyage* of Baldr, but it did not move. Then the *gyg* (Jötun-woman)—in Jötunheim named Hyrrokkin—was sent for. She went to the stern of the ship and pushed it forward at the first attempt, so that fire issued from the rollers."<sup>1</sup> The house of the living thus became the last dwelling of the dead.

In accordance with this law Odin ordered that all dead men should be burned and upon their pyre should be placed their property,<sup>2</sup> and Saga accounts<sup>3</sup> indicate obedience with this order.

The pyre indicated by Odin's law, then, was the ship of the deceased, which, after the body had been consumed, was covered up with earth.

A second form of burial took place in ships without the burning of the body, the ship being covered with a mound. This method was adopted after Fry had been mound-laid (*i haug lagdr*) at Uppsilir, although it is now shown<sup>4</sup> that this tradition can not extend to the erection of the mound, traces and remains of an enormous fire having been found there. The cremation custom, however, was not altogether abandoned, and both methods continued together, as is shown by the occurrence, upon the outer coast of the Trondhjem-Fjord, of the unburned remains found in ship mounds, while upon the inner coast cremation of both bodies and ships has continued. Dr. Sophus Müller places the age of cremation at the beginning of the iron period, and that of inhumation contemporaneous with the Roman invasion of the North, while Engelhardt ascribes the different methods to local customs.

*The ship grave of Mökklebyst, Eids Parish, Norway*,<sup>5</sup> explored by Mr. Lorange, who beautifully described the ceremony of cremation, offers an illustration of crematories.

<sup>1</sup> Gylfaginning Saga, c. 49.

<sup>2</sup> Ynglinga Saga, c. 8.

<sup>3</sup> Egil's Saga, c. 61. Hakon the Good's Saga, c. 27. Ynglinga Saga, c. 27.

<sup>4</sup> *Mestorf, J.*: In D. archäolog. Congress in Copenhagen. Hamburg, 1874.

<sup>5</sup> *Lorange, A.*: In *Samlingen of Norske Oldsager i Bergens Museum*. Bergen, 1876, pp. 153-161. *Lorange, A.*: In *Norske Aarsberetning, f. 1874, Taf. VIII*, p. 93. *Mestorf, J.*: Ein Grabdenkmal eines altnordischen Seekönigs, in *Globus*, xxix, p. 297. *Du Chaillu*: Viking Age, Vol. II, p. 339.

The mound is located in a plain, gently rising from the beach and permitting a full view of the sea, from which it is separated by a terraced formation. It measures 120 by 192 feet. All around it is a ditch, now 12 feet wide and 3 feet deep, which to the south and west is traversed by a bridge-like dam.

The interior of the mound, an oval of 24 by 40 feet, presents two layers, one of bone splinters, intermixed with soil and cinders, and one 8 inches deep, consisting of cinders and burnt remains. Over this a number of objects were strewn, plainly indicating that here a ship had been hauled ashore and gayly decorated with shields around its bulwark, and with arms and utensils of war piled up, had served as the funeral pyre of its commander.

The ship having been consumed, the remains were collected in a flat bronze vessel, together with some personal property of the owner, consisting of two combs, three dices, six chessmen of bone, a disk-shaped bead of dark glass with white wavy lines, a number of broken iron utensils, and an iron arrowhead. The vessel was then covered with twelve shield bosses which, at the time of excavation, had, by incrustation, gradually solidified into one mass and had become attached to the iron so firmly that in order to examine the contents without destroying this unique cover, it became necessary to remove the bottom of the vessel.

The ossuary was placed in an excavation at the bottom of the mound. Above it were piled a horse's bit, spears, swords, shields, and bucklers, all rusted together; eight arrowheads and other iron utensils, possibly coming from the ship's chest, and, wrapped in an untanned goatskin, unburnt animal bones, possibly the portion assigned the dead for his long journey from the funeral feast. The bottom of the mound was strewn with hundreds of ship's nails, mountings, mast rings, anchor hooks, forty-two shield bosses, and other things.

The vessel of enameled bronze appears to be of foreign make. Its ornamentation consists of ring ornaments inserted in and fastened to the bottom by three rivets. The inside of the bottom furthermore shows a three-leaved enameled star and the rim two four-cornered shields. Lorange places it in the younger iron age and sees in it a captured piece of northern French or Belgian make; but Mestorf, in view of the fact that this enamel was not introduced in France until the twelfth century, thinks that it might be considered the product of Rhenish post-Roman manufacture. In point of make and color the enamel resembles that of the Roman enamelled ornaments<sup>1</sup> and also called "Barbarian Grubenschmelz."<sup>2</sup> Enameled ornaments appear in the north at an early date. They are represented in the museums at Kiel and Copenhagen.<sup>3</sup> They have been found north as far as the Stavanger district,

<sup>1</sup> *Von Cohausen* in Bd. 12 Schriften des Nassau'schen Alterthums Vereins.

<sup>2</sup> *Buchner*: Geschichte der Technischen Kunst.

<sup>3</sup> *Engelhardt, C.*: Aarb. f. Nord. Oldk. 1853.

and they serve as proof of an early communication with foreign lands and people.

It may be here stated that the four-cornered shield with "Grubenschmelz" occurs upon fibule from the boat-shaped cineraria at Neu Camby and Langensee, in the Slawek ship, and upon silvered fibula from the Wella Kappene (devil's grave) and Wella Krawand (devil's stone heap) near Lake Strante, in Baltic Russia. They are figured by Aspelin in *Antiq.* fig. 1776, 1778, 1784, 1785, and belong to the first five centuries of the Christian era.

A modified form of these ship burials, in which cremation of the dead alone took place, after which the ashes and bones were collected, placed in a suitable vessel and deposited with other articles in the ship, over which then a mound was raised, is illustrated in

*The Borre Ship.*<sup>1</sup>—On the road from Horten to Jarlesberg and about one-half a mile from Borre-Prestegaard, Norway, is seen to the right the southern end of Borre Lake, whose banks are so flat at this place that their rise is almost imperceptible. On the ridge toward the north and northeast from the lake lies Horten Gaardene, and on the left side, toward the lake, upon a level, almost barren slope, are about twenty-four mounds of various sizes. There has long been a tradition that the Kings Eystein and Halfdan lie buried in two of the most northerly mounds.

Upon excavating one of the mounds and removing a quantity of sand the workmen, early in 1852, struck some rivets and nails, which led to the belief that it was a ship mound. Several articles were destroyed by the eagerness of the workmen, and the work was temporarily suspended during the winter. The results of the excavation were a lump of bent iron, 2 to 4 feet long and 2 feet broad, much eaten by rust, and of unknown use; next, fragments of an ash kettle of riveted iron plates, and of quite common form, with two ears as handles; a quantity of rivets, often with adherent wood fragments of ship's planks and some even with appended oakum; bones of three horses and one dog, and finally a twisted iron chain with the pieces belonging to it; fragments of a black glass jug with white enameled strips; an iron ax of the oldest type; two bits of iron; fragments of three stirrups, and a pair entire, all of iron, the one covered with thin silver plates and of very ancient form, the other more like those now in use; several fragments of saddles; part of a leather bridle with bits, head gear covered with ornamented plates, and with knobs on the end of the straps, spans, and a small bell. These things were lying somewhat aft of the ship's center, and in such a position that one horse with saddle and bridle (in whose vicinity the ash bucket and glass jug were found) was close

<sup>1</sup>N. Nicolaysen: Om Borrefundet, 1, 1852. In Foreningen til Norske Fortidsmindermaerkers Bevaring Aarsberetning for 1852, p. 25. The description given has been utilized in the above account. *Annaler for Nordiske Oldkyndighed og Historie*, 1858, p. 186.

to the starboard side, the second horse and dog near the port side, the third horse also on this side, but outside of the boat.

A second excavation was then undertaken with a view of learning particulars of the shape and size of the ship, a point of so much more interest, as little was known of the size of ancient ships.

Attention having been called to a layer of coal, about one-half of an inch thick and extending across the mound, and that former finds had first been made at that depth, everything above this layer was removed. Just under the coal layer ship nails were found in both directions, horizontally and vertically; but it was soon discovered that the mound had been so disordered by the first excavation that the present object could not be attained, since the whole aft end, and with exception of about 2 feet distance from the prow, the entire port side, was torn away. It could only be ascertained that the ship stood toward west-southwest and with the prow up toward the land; that by its sharp-built fore part it much resembled the present *Sogne* or northern coasting vessels, and that it, like those latter, was riveted, four boards in height, each board 8 inches wide. As a tolerably large piece of wood with a nail had before been found, with which also the tar on the outer side and a piece of the oakum between the planks was preserved, the thickness of the latter could be estimated. It came to about 1 inch between the inner side of the nail's head and the riveting plate, but as the head of the nail is driven somewhat within the outer side of the plank, each of them must have been half an inch thick. It was hardly possible to determine the ship's breadth. Its length, from the prow to the hindermost nail, measured 38 feet, and judging from the piece of mound which lay behind this nail, the length of the whole ship can hardly have been more than 50 to 54 feet.

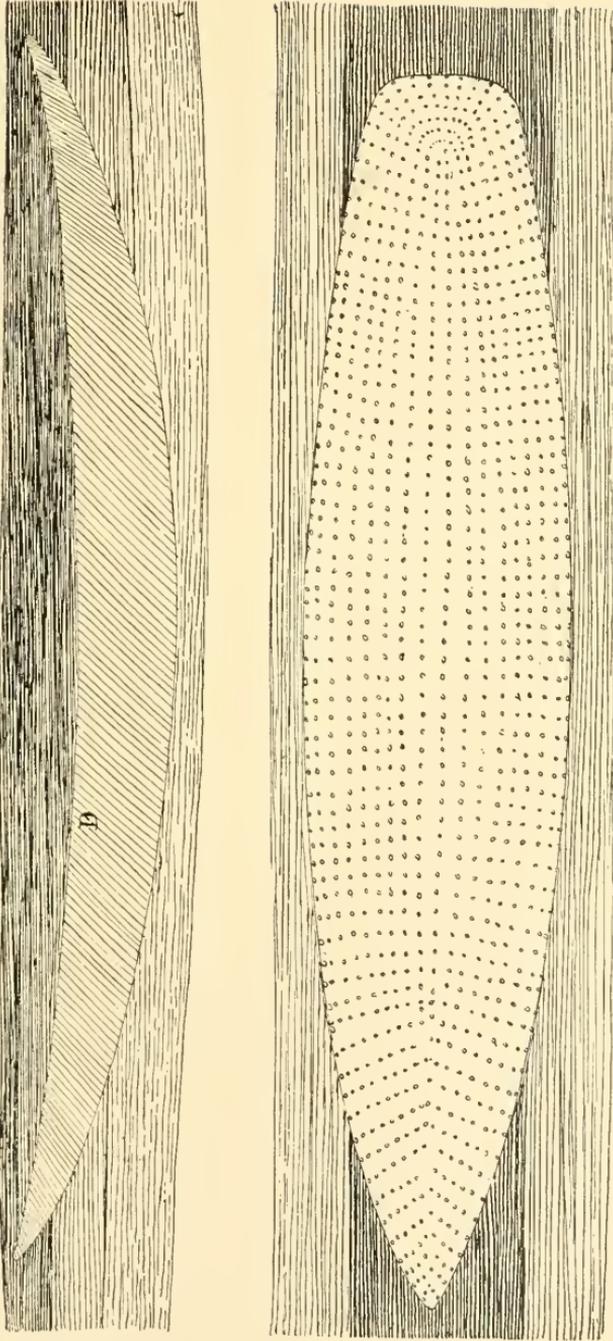
Of other things were found only a fragment of the forementioned glass jug, one of the usual beads of white crystal, probably belonging to a feminine neck ornament, together with a soapstone knob, presumably of a spindle or distaff.

Considering all these circumstances, this funeral seems to have taken place in the following manner: After the place had been determined and the upper layer of earth to the gravel carried away, the ship was dragged up there placed in position, and sand thrown up around it. The interior of the ship was then filled with a finer kind of sand, especially in the vicinity of the articles and animals deposited in it, but so as to leave open a space for the kettle. The litter with the dead bodies was then placed on the flat side of the pile, and after they were burned the ashes and bones were collected, placed in the kettle, and deposited with the other articles in the ship; thereupon the hole was filled with sand and a layer of the remnants of the pyre spread over the whole mound, which was next given its complete form to the top.

According to the *Saga*,<sup>1</sup> as related by Snorre and his informant,

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<sup>1</sup> *Ynglinga Saga*, c. li.



BOAT FOUND AT SNAPE, ENGLAND.

(Copied from "Proceedings of Society of Antiquaries of London," second series, vol. 2, p. 177.)



Thjodolf,<sup>1</sup> the graves of Kings Halfdan Hoitbein and his son Eystein must be sought for in this locality,<sup>2</sup> and it is therefore not improbable that the mound just described is the one which was raised over the remains of King Eystein, who died about the year 780.

*Lackalunga Boat.*<sup>3</sup>—While excavating a mound near the river Lackalunga, 1 mile from Lund, Torna district, Scania, the remains of a ship were found, consisting of some pieces of iron and about one hundred iron rivets, which varied in length from  $2\frac{1}{4}$  to 4 inches, all having large heads. Wood was found attached to a few of these nails, but not sufficient to allow of any reliable estimate as to form or dimensions of the ship, which had evidently served as the sepulchre of some important persons, whose bones were found in an urn around which had been deposited the following articles: a sword and belt, bridle, and other parts of a horse's equipment, stirrups, and the jawbone of a dog. The implements much resemble those found in a grave mound near Borre, Norway.

*The boat found at Snape, England*<sup>4</sup> (Plate LXXVI).—In the vicinity of the village of Snape, Suffolk, England, are located several tumuli of various sizes, and during the months of August, September, and October, 1862, one of these mounds, about 60 by 70 feet in diameter and about  $4\frac{1}{2}$  feet in height, was selected for excavation.

Among the objects found therein were several vases containing calcined bones, of which that given in Fig. 118 resembles in form and color the Anglo-Saxon urns described in the plates of Neville's "Obsequies;" the urn in Fig. 119 is considered to be British.

Upon increasing the depth of excavation a few pieces of metal and wood of doubtful character were discovered, but in such poor state of preservation that in scraping the dirt from them they broke. They appeared to have originally been of the thickness and length of a finger, with diameter of head of about the size of a florin, some knobbed rather than flat, and others with a short projecting point. An examination of the broken ones indicated their composition to be laminae of metal and wood with a bolt through them. Owing to the state of preservation it was decided not to disturb them any more, but to trace them out in the soil, removing the superincumbent earth.

In continuing the excavation what seemed to be a floor of considerable size was uncovered with rows of these knobs projecting at reg-

<sup>1</sup>Ynglinatal.

<sup>2</sup>Norsk Tidsskr. f. Vidensk. og liter., iv, 101. Norske Folks Hist., i, 377.

<sup>3</sup>*Bruzelius, Niles G.*: Lackalunga Fyndet-Beskrifning om ett i Skåne anträffadt fynd från jernaldern. In *Annaler for Nordisk Oldkyndighed og Historie*. Kjöbenhavn, 1858, p. 179. *Bruzelius, Niles G.*: Några fynd af fornsaker från Bronz-och Jernperioden. In *Forhandlingar ved de Skandinaviske Naturforskars. Syvende Möde*, 1856, p. 643.

<sup>4</sup>Condensed from *Septimus Davidson's* description in *Proceedings of Society of Antiquaries of London*, 2d series, vol. II, p. 177. See, also, *Francis Francis* in "The Field," an abstract of which was printed in the *Archaeological Journal*, vol. 20, p. 188.

ular intervals of a few inches. Carefully scraping or sweeping with the hands between the rows, it became apparent that the intervals were of wood, but so disintegrated and crumbling as to be almost of the color of the soil. Further search revealed continuations of these rows at an obtuse angle from the floor upward; and finally the shape of a boat was uncovered, and it appeared that the pieces of metal and wood above alluded to were the rivets used in joining the planks, laid clinker-wise, and that the boat was flat bottomed.



Fig. 118.

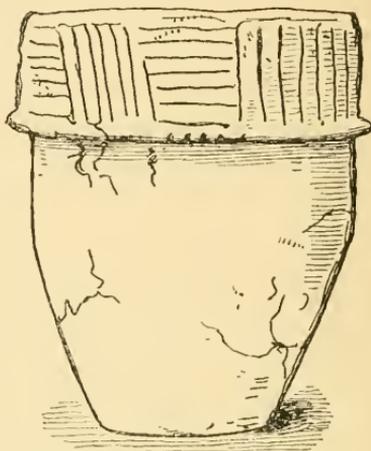


Fig. 119.

URNS FROM BOAT FOUND AT SNAPE, ENGLAND.

(Reproduced from paper by S. Davidson, in Proc. Soc. Antiq. London, Vol. II.)

The boat was 48 feet in length, 9 feet 9 inches in width, and 4 feet high. There were 6 rows of rivets on either side and 4 or 5 at the bottom of the boat, and in each row 7 rivets occupied the space of 3 feet. All the rows terminated in 2 rivets, laying one at the stem and the other in the stern. This will be better understood from the accompanying plate of the boat with longitudinal and transverse sections.

Among the articles found in the boat were some human hair of auburn color, a couple of pieces of cloth, a ring, and some pieces of glass. The ring was a thick band of gold with raised center, the sides ornamented with filagree of the later Roman type; and the setting, apparently Anglo-Saxon, held an onyx of dark color, the intaglio being evidently of Roman origin. The general form may be compared to the Saxon rings found at Bossington, Hants,<sup>1</sup> Warkworth.<sup>2</sup>

The glass, of light orange tint, was in minute pieces, and obviously of Anglo-Saxon origin. In its unbroken state it must have resembled the vases found at Fairford, Gloucestershire;<sup>3</sup> at Castle Durham;<sup>4</sup> at

<sup>1</sup>Journal of the British Archaeological Association, Vol. I, p. 241.

<sup>2</sup>Archaeological Journal, Vol. VII, p. 191.

<sup>3</sup>"Archaeologia," Vol. XXXIV, p. 82; Wylie's Fairford Groves, Pl. 1.

<sup>4</sup>Ibid, Vol. XV, Pl. 37.

Reculver, Kent;<sup>1</sup> in Kent;<sup>2</sup> at Chatteris, Isle of Ely;<sup>3</sup> at Selzen, near the Rhine,<sup>4</sup> and at Douvrend, in Normandy.<sup>5</sup>

The most interesting circumstance connected with this find, according to Mr. Davidson, is that a body was deposited in the boat. He says that this has received special mention from Mr. Worsaae, who remarks<sup>6</sup> that no instance of such burial has been brought to light in Denmark, although in Sweden and Norway fragments of wood have been occasionally found in barrows which have been presumed to be portions of boats.<sup>7</sup>

Among the ship graves in which cremation of the dead formed part of the ceremony, Montelius<sup>8</sup> mentions that discovered in 1884 by S. Söderberg and C. Follin upon the island of Oeland;<sup>9</sup> further, one excavated at Ekrem, Romsdale district,<sup>10</sup> and the ship found near Roald's church, in Söndmöre,<sup>11</sup> of which the keel and part of the bottom were well preserved, while of the sides the rivets only were left; aft of the mast a heap of burned bones and two iron axes were discovered. The boat of Björnes, North Thronhjelm district,<sup>12</sup> can be traced in outline by the rivets lying in rows as they had fallen out of the sides of the boat; bones, nails, coal ashes, an iron arrowhead, scales of bronze, and glass pearls constituted its inventory.

*Of ship burials in mounds without cremation* mention is made in the Sagas,<sup>13</sup> and it is to these graves that we must look for confirmation of the various accounts given us of the ships of the people of the north.

A large number of tombs have been brought to light,<sup>14</sup> but in almost every case the woodwork had, for the greater part, decayed by its long rest in the earth, so that but insufficient information would be collected as to the precise form and dimensions of the sepulchral ships or their position relative to the sea.

Only in two cases have the ships, together with their boats, been sufficiently preserved to permit of restoration, and these ships will be

<sup>1</sup> *Ackermann's Pagan Saxondom.*

<sup>2</sup> Now in the British Museum.

<sup>3</sup> *Gent. Mag.*, 1766, pt. L.

<sup>4</sup> *Lindenschmit: Todtenligger bei Selzen*; in *Coll. Ant.*, Vol. II, p. 51.

<sup>5</sup> *Cochet: Normandie Souveraine*, p. 399.

<sup>6</sup> *Worsaae: Primeval Antiquities of Denmark*, p. 102.

<sup>7</sup> *Guide to North. Antiq.*, p. 30; *Worsaae: Zur Alterthumskunde des Nordens.*

<sup>8</sup> *Montelius, O.: Om högsättning i skepp under vikinga tiden.*

<sup>9</sup> *Söderberg, S.: Beskrifning öfver den undersökningsresa som han 1884 med anslag af Vitterhets Akademien företog på Öland.*

<sup>10</sup> *Aarsber. for 1880 af Foren. til Norske Fortidsm. Bev.*, p. 45.

<sup>11</sup> *Lorange, A.: I Aarsber for 1874 af Foren. til Norske Fortidsm. Bev.*, pp. 37, 38, 88.

<sup>12</sup> *Aarsber. for 1874 af Foren. til Norske Fortidsm. Bev.*, pp. 47, 48.

<sup>13</sup> *An Bogoveigi Saga*, c. vi; *Hakon the Good Saga*, c. xxvii, xxxiii. *Laxdæla*, c. viii; *Landnanna*, 11; *Vatnsdæla*, c. xxii; *Harold Haarfager*, c. 42, 45, 46; *Olaf Trygvason*, *Saga* c. lxxix; *Ynglinga*, c. lli.

<sup>14</sup> *N. Fornlevn*, pp. 20, 179, 245, 551; *Aarsber. f. Norske Fortidsmindesm. Bev.*, 1869, p. 94; 1879, p. 292; 1880, p. 45; *O. Rygh: faste fornlevn og Oldsager i nordre og søndre Thronhjelm's Amt*, p. 241.

fully discussed later on; they are the Tune ship and the Gokstad ship, both found in Norway.

*The Vendel (Upland) boats.*<sup>1</sup>—In 1882 Mr. Hjalmar Stolpe, of the Archaeological Museum at Stockholm, in excavating a number of graves at Vendel, in Upland, about 40 kilometers north of Upsala, discovered the remains of several boats, of which he published a preliminary report in 1883.<sup>2</sup> The boats were found below the level of the ground, without any mound having been erected over them. Of the boats nothing but the rivets remained, but, as they were lying in regular rows, it was possible to reconstruct the shape of the boats. They were found at different depths, from 2 to 6 feet, one boat in each grave. They were filled up with skeletons of domestic animals, kitchen utensils, etc., in the stem, and amidships the skeleton of a warrior surrounded by his weapons was found; that is, such was originally the arrangement in all the graves, but, unfortunately, most of them had been plundered of their valuables. Only one of the eleven graves was intact; in most cases, however, the rivets were left in their places, the plundering of the graves being confined only to the spot where the warrior and the more valuable pieces of his equipment were to be found. On such spots the rivets were found without any order, from the surface down to the bottom. In all other parts of the boats the rivets were lying in parallel rows, showing very distinctly the shape of a boat or small vessel, sharp at both ends. In most cases nine or ten rows of rivets are to be seen, indicating that the boats were constructed of at least four planks on every side. The rivets are generally about 2 inches in length; only in two boats three larger rivets (about 4 inches) were found close to the stems; in some instances they were connected with pieces of iron bands, but as they were found in the places destroyed by the treasure hunters their use can not now be stated. They may have served in connecting the keel with the sternpost.

In boat 1 the stern was destroyed by laborers in 1881, when the grave was discovered, and the other parts of the vessel were so covered up with skeletons (three horses, one bull, one ram, two dogs, one sheep, two big pigs, etc.) that it was impossible to construct a plan from the rivets *in situ*. From the length of the grave it is concluded that the vessel measured about 30 or 35 feet in length and perhaps 8 feet in width.

No. 2, plundered and destroyed, to conclude from certain facts, by the laborers who built a church close by in A. D. 1300; the boat can not have exceeded 24 feet in length.

No. 3 may have been 25 feet long, but the part left uninjured by the grave-robbers was too much covered with skeletons of animals (the rule is three to four horses on the starboard side, the bull in the stern, and the smaller animals on the port side) to permit the surveying of the rivets; and when the skeletons were broken up the rivets were dislocated.

<sup>1</sup> Communicated by Mr. Hjalmar Stolpe, in a letter of 24th of May, 1892.

<sup>2</sup> Antiquarisk Tidskrift, Vol. VIII, 1883.

The length of No. 4 was about 26.5 feet by 7 feet wide amidships. Four planks to every side.

No. 5, no rivets.

In No. 6 the grave measured 24 feet in length. Severely damaged. Rivets found only along the south side of the grave, over a space 16 feet in length, 3½ feet in width; apparently disturbed.

In No. 7 the boat was very distinct. Length, 29.8 feet; breadth, 8 feet. In the stern 3 large rivets.

In No. 8 the grave is 25.5 long; boat uncertain.

No. 9, the only grave found intact. The boat, 29 feet 8 inches long by 6 feet 5 inches wide. In the middle the skeleton of a man, with two swords, two shields, one adze, one spear, arrows, comb, knife, several chessmen, and half a Kufic coin from A. D. 914 to 943.

In No. 10 the boat was 35 feet 5 inches long, 5 feet 9 inches broad.

In No. 11 the boat was 31 feet long by 6 to 7 feet broad.

As to their age the graves differ very considerably. From the most ancient one, dating from the beginning of the seventh century, there is a coherent chain down to the end of the tenth century, perhaps indicating generation after generation of a chief's family.

Not far from the old burial-place is a lake formerly communicating with other lakes and rivers in the province.

*The Björkö boats.*<sup>1</sup>—On the island Björkö, in Lake Mälär, the ancient city of Birea, mentioned by Adamus Bremensis as the place where Ansgarius, in the ninth century, preached the Gospel to the heathenish Swedes, and supposed to be identical with old Sigtuna, the remains of two large flat-bottomed boats were found within the wall surrounding the place where the old city once stood. The rivets indicate a size of about 19 feet in length and 5 to 6 feet in breadth. Of their construction nothing could be learned.

In the *Orkneys*<sup>2</sup> the sites of three ship burials have been located as follows:

In 1841, by Mr. George Petrie, in a sandhill in Westray;<sup>3</sup> in 1855 in a mound situated in the bay of Pierowall, and explored by Mr. Farrer;<sup>4</sup> in July, 1863, in a mound in the bay of Pierowall explored by Messrs. Farrer and George Petrie.<sup>5</sup>

The contents of these burial places, however, owing to the nature of the soil did not permit of any details and simply established the fact of having contained ships.

In the *Faroe Islands* no traces of ancient ships have been found.<sup>6</sup>

<sup>1</sup> Communicated by Mr. Hjalmar Stolpe, of Stockholm, by letter of May 24, 1892.

<sup>2</sup> Proceedings, Society of Antiquaries of Scotland, 1879-'80, p. 79.

<sup>3</sup> *Ibid.*, vol. v, p. 16.

<sup>4</sup> *Ibid.*, vol. II, p. 158.

<sup>5</sup> *Ibid.*, vol. v, p. 300.

<sup>6</sup> Communicated by Mr. Louis Bergh, of Thorshavn, March 23, 1892.

*Ultuna ship.*<sup>1</sup>—In excavating a sandhill at Ultuna, three-fourths of a mile from Upsala, Sweden, two layers of a dark substance were met which were soon discovered to be the remains of the rotten sides, or boards, of an ancient ship. In these layers were found a large number of iron nails from 1½ to 2 inches long, with a round head at the one end, and a square, riveted footpiece on the other, undoubtedly used for holding together the side planks of the ship. The width between the layers was about 8½ feet; their length could be followed 19 feet, but as a part of the hill's edge was formerly dug away, the entire length of the ship can not now be determined. Since the ship's bottom lay about 8 feet below the natural surface level, it must be supposed that a depression was dug in the hill, in which the ship was placed and the hill erected over it. Just on the bottom layer there were found remains of a human skeleton with bones of two horses, buried in the stern of the ship; further forward there were also bones of some domestic animals; a double-edged sword of iron and a large number of articles and ornaments of bronze, iron, and bone were found under a covering of loose stones which had probably formed a tube in the interior of the mound, which had fallen to ruin when the deck, where such was found, had rotted and fallen to the bottom of the ship.

Of mound-settings in ships in which the human remains were buried unburnt, descriptions are given by Montelius,<sup>2</sup> Nicolaysen,<sup>3</sup> and others,<sup>4</sup> and although in most cases the wood has molded away, the outlines of the ship are shown by the numerous rivets deposited in rows, sharply contrasting with the light sand in which the ships have been buried. Among these finds may be mentioned the remains of a boat found in 1853 near Hof, in Dønne's parish, Nordland District, which contained two human skeletons, skeleton of a dog, shield bosses of iron, and near one of the skeletons ornaments of bronze, pins, rings, implements of bone, an iron kettle, glass, pearl, and scissors.<sup>5</sup>

In *Northern Norway* (Trondhjem district) traces of boats have been found in grave mounds, but they were so much decayed that but very few important details have been observed; in fact, the wood was almost everywhere completely rotted, leaving only a couple of brown-colored lines in the gravel. Fragments of frame timbers, knees, etc., have occasionally been found in bogs in a tolerably uncorrupted state, but these seem to belong to more modern times and are of no particular interest as to construction.

<sup>1</sup> *Hildebrand, B. E.*: Några fynd af fornsaker från Bronz—och Jernperioden. In *Forhandlingar ved de Skandinaviske Naturforskere. Syvende Møde. Christiania, 1856*, p. 613. *Annaler for Nordiske Oldkyndighed og Historie, 1858*, p. 188.

<sup>2</sup> *Montelius, O.*: Om högsättning i skepp under vikingatiden.

<sup>3</sup> *Nicolaysen, N.*: Norske fornlevninger, p. 20, 245, 588.

<sup>4</sup> *Aarsber, af Foren. til norske Fortidsmind, Bev. 1871*, p. 13.

<sup>5</sup> *Nicolaysen, N.*: Norske fornlevn., p. 681, 682; *Lorange, A.*: Samlinger af Norske Oldsager i Bergens Museum, p. 192, 193.

The following traces of prehistoric boats have been discovered in Trondhjem Amt.<sup>1</sup>

In *Valnesset, Bjuvu parish*<sup>2</sup> (63° 50' N.) a boat was deposited over the dead body, bottom up, 20 to 22 feet long, 6 to 8 feet broad, 7½ inches between the nails which were partly 1¼ and partly 2½ inches long—the latter most likely through the keel and the ribs; was placed in an east to west direction, parallel to the near shore-line, the bow most likely pointing to the west.<sup>3</sup>

In a mound at *Tuunol, Bjuvu parish*, were found two rows of nails 6 feet distant from each other. A part of the stem, probably of oak, could be seen in the east end of the mound, with a large iron loop fastened to it. The head of the body eastward. Together with it were here found more objects than in any of the other interments, namely, a silver bracelet, bronze scales, some implements of bone, etc.<sup>4</sup>

On the *Isle of Snotra, Aaffjord parish* (63° 54' N.), four boats, apparently of fir, have been found in four different mounds, 22 to 24 feet long. The iron nails were of the same dimensions and with the same distance between them as above. In one of these the nails were of three different sizes. In one of the mounds the body was deposited with the head towards the east, in the others towards west and northeast.<sup>5</sup>

At *Grarrok, Melhus parish*, about 20 kilometers south of Trondhjem and consequently as far from the coast (while the above-mentioned finds have been made along the coast) a similar boat seems to have been deposited in a mound.<sup>6</sup>

*Storhaugen ship*.<sup>7</sup>—Upon a small plateau formed by Karmisland (Karmøyen), about 160 miles from the shore in Avaldsnes Bay, Bergens Stift, Norway, stands a mound in which, in 1887, the remains of a ship were discovered, the antiquity of which appears to date back to the days of the strife in the North between paganism and Christianity.

Oaken boards and other worked pieces of wood found occasionally seemed to indicate the existence of a boat, but as the excavations were carried on unsystematically and the finds represented little, if any, antiquarian value, special attention was not given to the matter until in 1887, when, upon proper representation, systematic excavation was begun under the skillful management of the late Dr. A. Lorange, of the Bergen Museum.

<sup>1</sup> Kongelige Norske Videnskabernes Selskabs Skrifter f. 1878 and 1879; Aarsberetning fra foreningen til norske fortidsmindesmaerkers bevaring.

<sup>2</sup> Aarsberetning, etc., 1873, pp. 8, 9.

<sup>3</sup> For this information I am indebted to Mr. K. Lossius, deputy manager of the Archaeological Museum of Trondhjem.

<sup>4</sup> Aarsberetning fra foreningen til norske fortidsmindesmaerkers bevaring, 1872, p. 36.

<sup>5</sup> Aarsberetning, etc., 1864 and 1874, pp. 16, 17.

<sup>6</sup> Communicated by Mr. K. Lossius, deputy manager of the Archaeological Museum of Trondhjem.

<sup>7</sup> *Lorange, A.*: Storhaugen paa Karmøyen, Nyt Skibsfund fra Vikingetiden. In Bergen's Museum Aarsberetning. 1887. *Du Chailou*: Gunnarhaug ship discovered in Bergen Stift in 1887. In Viking Age, vol. II, p. 335.

In the central line of the mound a depression from north to south was observed which continued throughout all the layers and gave evidence of a general caving in in that line of the original structure; and in that line, directly under the depression, the oaken keel of a ship was found in a space formed by two stone walls  $3\frac{1}{2}$  feet (1 meter) high and broad, set 20 feet (6 meters) apart and running parallel with the keel, which was supported by three pair of stone pillars. At this place too several pieces of pressed and tarred seaweed were found which had served as caulking.

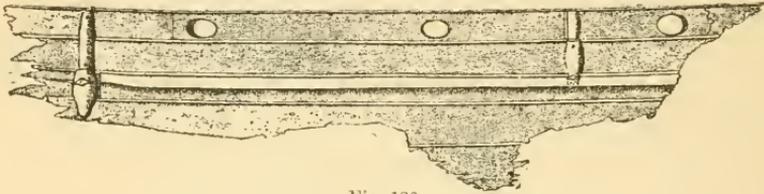


Fig. 120.

## STARBOARD GUNWALE OF STORHAUGEN SHIP.

(Reproduced from A. Lorange "Storhaugen fra Karmøen," in Bergens Museum, Aarsker, 1887.)

About 4 feet from the center the two parallel walls were intersected by a third wall, on the south side of which was found the starboard gunwale of the ship in a good state of preservation, two planks, and three short timbers (Fig. 120). On the inner side were the top pieces of two ribs connected by short timbers which appear to have given support to the gunwale; they were fastened with iron nails and also with a rivet of the type found in the Mökklebyst ship. The boards were tongued and grooved and riveted together; the other planks were nailed from the outside. Owing to the absence of floor timbers the ground plan can not now be shown; the finding of a piece of board with a clamp (Fig. 121) suggests a construction similar to that of the other known ships. In the fragment of the top plank are three oval holes about 3 feet apart and evidently intended for the oars. The upper part of a pine oar

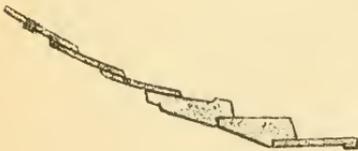


Fig. 121.

## FASTENING OF PLANKS.

(From A. Lorange, "Nyt Skibsfund fra Vikingetiden," 1888.)

was found near the ship's side, standing perpendicular, with the handle downward. Another finely smoothed fragment shows two patches fastened with trenails and so carefully joined that it requires an experienced eye to discover them.

In the southern part of the ship, near the keel, were found the scattered remains of a nimbly built boat, the boards of which, a little more than one-third of an inch in thickness and finely smoothed were joined to each other with clinched nails and tied to the ribs by means of carved clamps (Fig. 122). Along the inner side of the top plank runs a strong

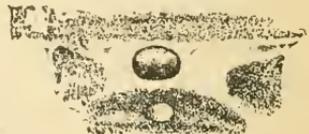


Fig. 122.

## CARVED CLAMP.

(From A. Lorange, "Nyt Skibsfund fra Vikingetiden," 1888.)

Along the inner side of the top plank runs a strong

edging. Over the well-preserved fragments was placed a gangway of fir (Fig. 123).<sup>1</sup>

The inside of the ship was lined with a layer of moss as if to prevent direct contact with the soil of the mound which was to be erected over it; the prow was filled with large lumps of iron rust.

The ship appears to have had a length of keel of 66 feet (20 meters); the width, from the space between the parallel walls, may be estimated at 16½ feet (5 meters). No traces of mast or sailing arrangement having been discovered, it is surmised that the ship was used exclusively for rowing, with a distance between oars of 3 feet, as suggested by the holes in the top plank.



Fig. 123.  
GANGWAY.

(From A. Lorange, "Nyt Skibsfund fra Vikingetiden," 1888.)

During the progress of excavation the following articles were discovered:

- (1) A shovel formed tool (Fig. 124).
- (2) Tool of fir (Fig. 125).
- (3) Tool of oak (Fig. 127).
- (4) An oaken board 6 feet (1.8 meters) long and 4 inches (0.11 meter) wide, with two notches in the middle and two on one end; this piece is roughly hewn and not planed.



Fig. 124.

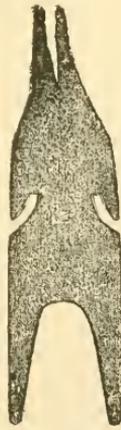


Fig. 125.



Fig. 126.



Fig. 127.

TOOLS FOUND IN STORHAUGEN SHIP.

(From A. Lorange, "Nyt Skibsfund fra Vikingetiden," 1888.)

- (5) A bat of oak (Fig. 126).
- (6) Oar-shaped tool 40 inches long with a short, broad blade.
- (7) Club formed tool cut off at both ends.
- (8) Two round poles 17 feet and 10 feet long and a little over 4 inches diameter.

<sup>1</sup>Åarbog, Bergens Museum. 1886, p. 72.

(9) Three profiled fragments of oak with ornamented edge.

(10) Several pieces of bast rope.

The observations made would indicate that the vessel had served as the last resting place of a chieftain whose remains were placed in a sepulchral chamber erected over the ship formed of rafters which found a support upon the stone walls beyond the board and erected for that purpose, while the intersecting cross wall gave support to the gable end of the roof. In the chamber thus formed and covered with plenty of birch bark, as shown by the shavings left in the place, the dead was deposited in a sitting or lying position, near the south end of the wall upon which were found two swords, one spear, several blacksmith tools, whetstones, a little box, fire steel and flint, etc.

At the foot of the wall stood an iron pot with a round edge bent over but sadly rusted away; near by two beautiful cheekers, a sinker, a waxen tablet bearing the mark of a cross, and a gold buckle.

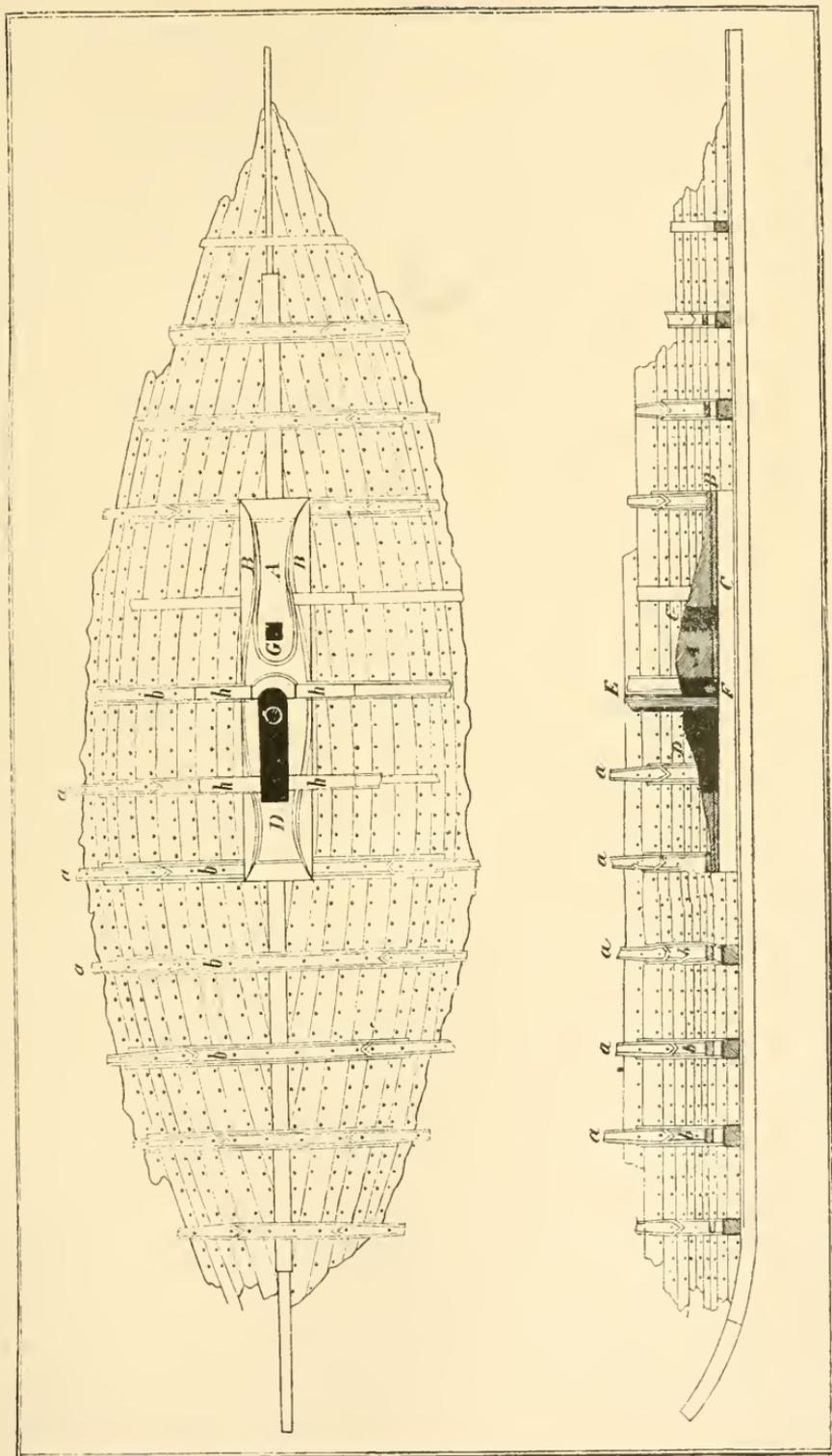
While of animal remains only the accidentally preserved jaw of a horse was found, its occurrence suggests the usual funeral customs observed in other ship graves of that kind, after the completion of which the mound was erected over the entire structure.

The gradual settling of the earth and the enormous pressure exerted thereby upon the funeral chamber resulted in the crushing in of the comparatively frail structure, the earth filling the entire vessel, tearing it asunder and distributing its contents throughout the soil; the absence of human and animal remains may, therefore, be ascribed to the direct contact with the soil into which they, in the course of centuries, became absorbed without leaving any distinguishable traces.

With regard to the antiquity of the ship, tradition connects the place upon which it was found with the battle of Rastarkalv, in which Hakon the Good defended Norway's independency against the Danish king. The saga tells us that after the battle was over the king had some of the ships of Eriksson drawn ashore, placed Egil Ullsaerk and other slain men into it and built them an honorable grave; he had the mound raised over the funeral ship and erected bauta-stones upon the same; and it is, therefore, not impossible that the ship found at Storhangen is the ship which Hakon "mounded" in memory of the fallen heroes in the year 953.

*The Tune Ship*<sup>1</sup> (Plate LXXVII).—According to old reports, a ship was said to be buried in a mound located on the farm of Hangen on the Rolfsisland, about three-quarters of a mile above the town of Frederiks-

<sup>1</sup> Skillings Magazine, 1867, pp. 717-719, 724, 738-739. Polyteknisk Tidsskrift, 1867. Gade, G.: the ancient vessel found in the parish of Tune, Norway; Christiania, 1872 [employed in the description here given]. Müller, H.: Søkrigshistoriens vigtigste Begivenheder, p. 1. *Tuxen, N. E.*: De nordiske Langskibe. In Aarb. f. nord. Oldk. og Hist. Copenhagen, 1886. Parker, Foxhall A.: The Fleets of the World, New York, 1876, p. 151. Nicolaysen, N.: Langskibet fra Gokstad Kristiania, 1882, p. 12. Montelius O.: The Civilization of Sweden in Heathen Times; translation by F. H. Woods, London, 1878, p. 185. Bochner, Geo. H.: Norsk Naval Architecture; in Proceedings U. S. National Museum, vol. ix, p. 454.



ANCIENT SHIP FOUND IN PARISH OF TUNE, NORWAY.  
(Copied from G. Gade's "The Ancient Vessel found at Tune," 1872.)



stad, and about 600 meters from Visterflo, one of the branches of the Glommen River, in the parish of Tune, which has preserved the most remarkable and probably the oldest of Norwegian Runic stones. Over a century ago excavations had been made in the progress of which the existence of the ship appears to have been determined. Acting on these reports, the owner of the farm, in about 1865, began a search for the ship, and after several ineffectual attempts succeeded in uncovering a part of its inner side. The discovery being reported to the Society for the Preservation of Norwegian Antiquities, the proprietor of the farm desisted from further search and allowed the excavation to be made by Prof. O. Rygh, under the direction of the society.

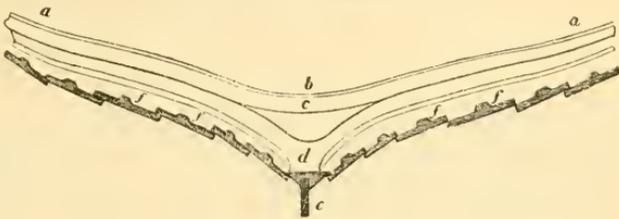


Fig. 128.

## CONSTRUCTION OF TUNE SHIP.

(From G. Gade, "The ancient vessel found at Tune," 1872.)

Owing to the circumstance that the ground covered by the mound had been under cultivation for many years, its original shape had been modified, and its former size could not be correctly estimated; it appears, however, to have been round, about 13 feet high, with a circumference of between 450 and 550 feet. It is situated on the slope of a hill facing the river.

The lowest layer of the mound consisted of a stiff clay, and to this is due the fair state of preservation of those portions of the ship imbedded therein; the upper layers consisted of other kinds of earth, and all portions of the vessel surrounded by them had been destroyed, not even a trace remaining. It was best preserved in the middle, where the clay had been thickest; the extremities had suffered considerably, and only the very lowest portions of the prows have been preserved. The pressure of the heavy mass of earth appears to have resulted in the breaking of several of the ribs and in the bending of some of the boards, but the principal parts are fairly well preserved and most of the nails undamaged.

In the mound the vessel stood on a level with the surrounding surface of ground. Both of its ends being almost alike and very pointed, it would have been a very difficult matter to determine which is fore and which aft but for the mast, whereby it became apparent that the northern end is the stern. Its position relatively to the sea, therefore, confirms the many references made in ancient writings that the burial ship was placed seaward or Glommenward, to be ready, under the command of its master, to be launched upon the element that had been its home.

The ship is of oak, clinker built, and is composed of keel, stem and stern posts, frame-timbers, beams, knees, and planking. (Fig. 128.)

The keel, with a length of  $45\frac{1}{2}$  feet, is made of a solid piece of oak and is fitted directly to the stem and stern (Fig. 129); the width amidships, owing to the absence of some of the upper planks, can not now be determined accurately, but may be estimated at  $14\frac{1}{2}$  feet, with a perpendicular height from keel to bulwark of somewhat over 4 feet.

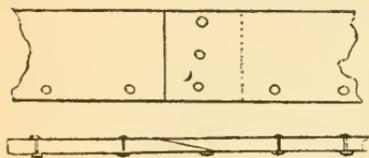


Fig. 129.

CONNECTION BETWEEN KEEL AND STEMS.  
(From G. Gade, "The ancient vessel found at Tune,"  
1872.)

The frames, thirteen in number, are united by crossbeams, and are not fixed to the keel, but lie free above it. On the top of the frames, fitted onto the overlying limbs of the knees and their continuations, rest the ends of the beams, thus forming a ledge for the ends of the bottom boards to rest in. The knees are attached to the beams.

The ribs (Fig. 130) are built of three different layers of wood, of which the upper and lower ones are of oak, the upper one exhibiting molding and carved ornamentations, and a middle layer of fir, which is wider than the others and projects on either side. The relative distance of the ribs

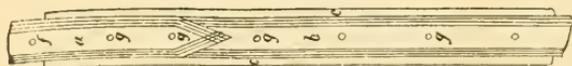


Fig. 130.

TRIB OF TUNE SHIP.

(From G. Gade, "The ancient vessel found at Tune," 1872.)

is rather regular, namely, 2 feet 7 inches. The under side of the ribs have been provided with holes, through which the ropes were passed that connected the planks to the ribs.

The ends of the beams rest on the top of the frames, where they are fitted on the overlying lower limb of the knees and its continuations, and as both these are somewhat narrower than the beam, a ledge is formed on which the ends of the bottom boards rest.

The planks (Fig. 131), twelve in height, all ornamented with molding on the edges, are laid in the ordinary manner of clinker-built ships, each upper plank projecting a little over the edge of the lower one. Their width is from 6 to 12 inches and their thickness 1 inch, with the exception of the eighth plank from the bottom, which is more than 2 inches thick.

Where the boards are joined they are cut off obliquely and held together by three rivets having round heads on the outside and square ones inside; they are placed at intervals of from 6 to 9 inches.

Only the bottom plank and the two top planks are fastened to the timbers; iron spikes had been used to fasten the garboard to the keel, and trenails to fix the two upper planks to the knees; all the intervening planks,

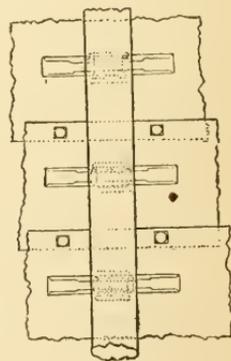


Fig. 131.

FASTENING OF PLANKS TO  
RIBS.

(From G. Gade, "The ancient vessel found at Tune," 1872.)

although fastened to each other by bolts of iron, riveted together, have been tied to the frames by means of apertures placed at regular intervals, partly in ledges on the frame timbers and partly in cleats projecting from the planks themselves; or, in other words, on the inside of the boards, at every rib, a long clamp had been carved out of the wood; two holes had been made in the clamps and in the under side of the rib a similar one, through which the rope had been run.

It seems surprising that a people so far advanced in the application of the useful arts should have bestowed so much labor on the shaping of the plank without some definite purpose; it would appear to us that this peculiar method of joining had rendered the ship rather weak, although it may, at the same time, have given it more elasticity and increase in speed.

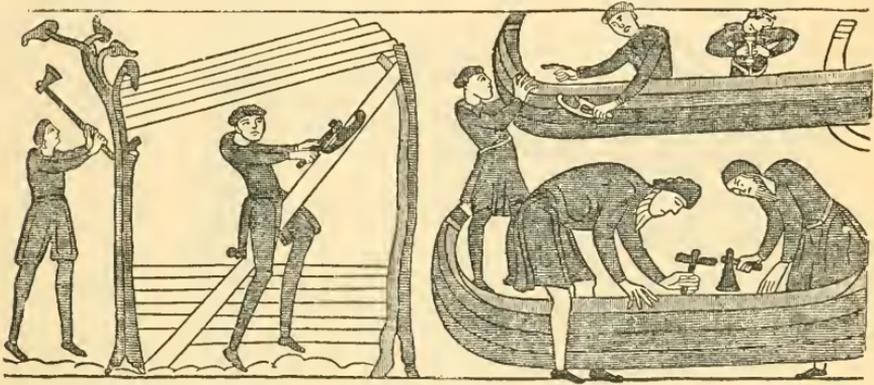


Fig. 132.

## BUILDING OF A SHIP.

(Reproduced from Edward J. Lowell, "The Bayeux Tapestry," in Scribner's Magazine, March, 1887.)

As previously stated, the ancient Gula law specified two classes of workmen engaged in the construction of war vessels which the district had to furnish—the carpenters who prepared and framed the skeleton, and the workers on thin boards, who whittled the boards and put them on, and the latter class appears to have been charged with the laborious task of preparing the planks, which, in addition to the cleats, were provided with beaded edges within and without. Figure 132, taken from Edward J. Lowell's paper on *The Bayeux Tapestry*,<sup>1</sup> illustrates the method employed in shaping the planks.

The tightening of the joints was effected by means of a thin layer of oakum made of cow's hair.

The gunwale being entirely destroyed, the form of tholes can not be ascertained; it may, however, be assumed that they have been of the same pattern as is still in use in the boats on the north and west coast of Norway. The rowlocks of all the Northland boats, from the most ancient to the present Norwegian fishing craft, exhibit the same general model, although they differ from one another in size and details of

<sup>1</sup> In Scribner's Magazine, March, 1887.

work. In every case they are cut out of one piece of timber. The representation given (Fig. 133) is from a boat built at Rannefjord, in the Nordlands Amt, about latitude  $66^{\circ}$  north.

They are called "keiper," and the same term "keiper" is found in old Icelandic Sagas.<sup>1</sup> The keiper consists of a piece of wood fastened to the gunwale by wooden pegs, bearing an oblique prolongation at one end, and furnished with a loop of wickerwork rope or leather

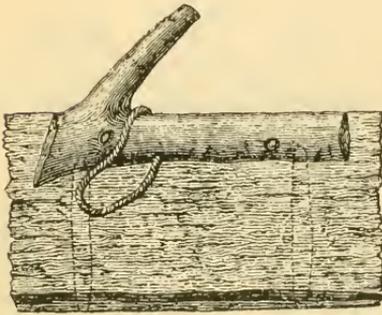


Fig. 133.  
OARLOCK.

(Drawing from model in U. S. National Museum.)

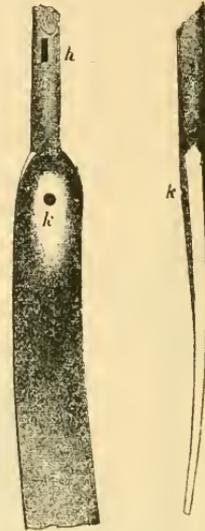


Fig. 134.  
RUDDER OF TUNE SHIP.

(From G. Gade, "The ancient vessel found at Tune," 1872.)

through which the oar is passed, and which prevents its slipping out of the keiper while rowing.

Of thwarts no trace was found and their number can therefore only be estimated from the number of ribs.

The rudder (Fig. 134), which was found lying across the vessel, is of fir; its original position had been somewhere before the sternpost on the right side of the ship. It consisted of a plank in the shape of a broad oar 4 feet 7 inches long and  $10\frac{1}{2}$  inches wide, the lower portion of which, in the middle and 7 inches from the upper edge, was provided with a round hole through which it was fastened to the side of the ship by means of a rope, while its short, round upper neck was caught by a grummet. A small aperture in the opposite direction of the blade was made in the upper part of the neck for the tiller, which stood perpendicularly on the flat side of the blade. The rudder was mounted with iron,<sup>2</sup> to which one or more cramps were added down toward the heel of the rudder.

One of the points of especial interest is the peculiar manner in which the mast was secured. A large, square hewn oaken block (Fig. 135), extending in uniform length over five frame timbers and five beams, is

<sup>1</sup> Fornmanna Sögur: Snorre's Edda.

<sup>2</sup> Bergens Bylow, ix, p. 18.

laid amidships along the keel, notched to admit the frames, and above it rests another still larger oaken block (about  $12\frac{1}{2}$  feet long, a little over 2 feet wide, and  $1\frac{3}{4}$  feet thick in the middle, but decreasing toward the ends, which are shaped like a fish-tail) grooved to admit the beams; and it is further fixed to the beams by knees or crooked timberheads. A little below the center rib a square hole, 3 feet 9 inches long and 11 inches wide is made in the upper block for the mast, which rests upon the surface of the lower block. A stump of the mast, about 2 feet long, was found standing in the hole, together with a stump supporting it, which is formed by a projecting thick knot of wood, leaving a space between the mast and the side of the slot in the mast-block. The intervening space was probably filled with plugs. A little in front of the mast there is a smaller hole, which probably accommodated some additional support for the mast.



Fig. 135.

## MAST-BLOCK OF TUNE SHIP.

(From G. Gade, "The ancient vessel found at Tune," 1872.)

Just behind the mast the unburnt bones of a man and of a horse were found; there were also some colored glass beads, some pieces of carved wood, some cloth and the fragments of a saddle, and a portion of a snow skate. The inside of the vessel had been covered with a layer of moss before the mound was thrown up over it.

According to Mr. Gade, United States consul at Christiania,<sup>1</sup> "in the southern end of the mound at the height of the gunwale and still higher, traces of iron utensils were seen at many places, but they were so rusted away that there was hardly anything left but some stripes of rust in the earth. Nothing of it could be preserved and it was only in a few instances possible to make out what it had been. For instance, near the prow, at the eastern gunwale of the vessel, the handle of a sword of the form used in the Viking period was clearly distinguished; nearly opposite on the western side the point of a spear and the boss of a shield seem to have laid. Just where the prow must have been lay a long, heavy lump of iron rust, apparently a fragment of a rolled up coat of mail. On the western side of the gunwale about opposite the mast there was a heap of horse bones, but so decayed that only the teeth could be exhumed in any way whole. They were examined by a veterinary surgeon, who declared that there must have been the skeletons of at least two horses, viz, of an older and a younger animal. In that part of the mound was also found a little round bung of oak, such as might be used for a barrel, and also several oaken

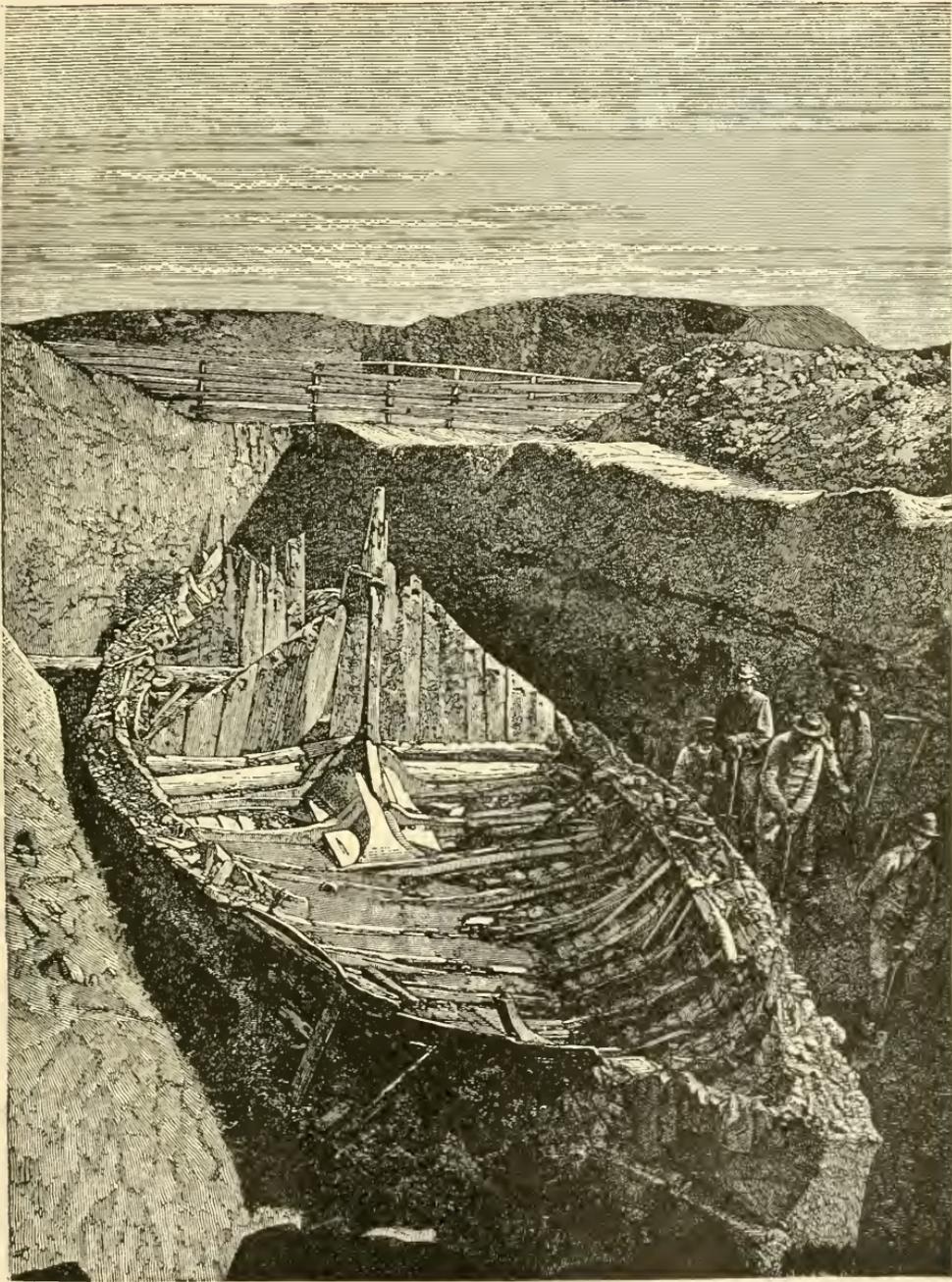
<sup>1</sup>The ancient vessel found in the Parish of Tune, Norway. Dedicated by the translator to Commander Stephen B. Luce, U. S. Navy, in remembrance of the United States corvette *Juniata's* visit to Norway in 1871. Kristiania, 1872.

sticks, 2 to 4 feet long, somewhat pointed at one end, scattered here and there in the vessel. At many places inside the vessel, but not equally distributed throughout it, juniper branches which had been pulled up with the root were lying in the clay and still so well preserved that the needles could be distinctly seen. Finally, under the vessel, on its eastern side were found an oaken spade or shovel and a hand-spike made of a young oak trunk, of which the bark was partially preserved. The articles found in and near the vessel completely established what might also have been supposed without their testimony, viz, that one had come on a ship-tomb from the younger iron age. The ship was carefully drawn out of the river not far distant; it was placed on the ground, the turf and earth having been previously removed. The situation chosen was such as was generally preferred for interments in heathen times, as the mound could be seen a great distance on all sides and the deceased could thus enjoy from his last resting place a fine view over the country where he had lived and toiled. After the space under the ship had been filled with earth the body of the deceased was placed in its aft part where, as its captain, he had sat when alive. The beads and the piece of cloth indicate that the body was buried with the clothes on. By its side a horse and a saddle, harness, and snow skate were laid. Thus he had ship, saddle, horse, and snow skates with him in the sepulchral tumulus. One involuntarily calls to mind the ancient account of Harold Hildebrand, who fell at the battle of Braavalla. Sigurd Ring ordered the body of the fallen king to be driven into the mound on the chariot he had used in the battle. The horse was killed, and Sigurd then had his own saddle buried in the mound, "that Harold might choose whether he would ride or drive to Valhalla." A little farther out in the mound, and apparently without regard to order, the weapons and several of the horses of the deceased were buried. With respect to several other articles discovered here, we can make the same remark as with the articles now and then found in other tumuli, that it is rather difficult to understand for what purpose they have been laid there.

We have, then, here considerable fragments of a vessel undoubtedly belonging to the Viking period. It can hardly be supposed that this is one of the ships in which the Norwegians of that period made their bold Viking expeditions in the Baltic, the North Sea, and the Atlantic. A vessel so small in size, and built so low and flat, could not be adapted to long voyages in the open sea; it can only have been used for coasting trade and shorter expeditions."

*The Gokstad ship*<sup>1</sup> (Plate LXXVIII).—In midst of a woodless plain extending northeasterly from the northern terminus of the Sandefjord is located the farm of Gokstad, and near it is a mound, for centuries known

<sup>1</sup> *Nicolaysen, N.*: Langskibet fra Gokstad ved Sandefjord, Kristiania, 1882. *Nicolaysen, N.*: The Viking ship, discovered at Gokstad in Norway, Christiania, 1882. *The Antiquary*, August, 1880; December, 1881, 1882, p. 87. *Popular Science Monthly*, May, 1881 (borrowing from *La Nature*, view of ship *in situ*). *Nordenskiöld*:



THE GOKSTAD SHIP: SHOWING LOCATION IN THE MOUND.

(Copied from R. Werner's "Das Seewesen der Germanischen Vorzeit," in Westermann's Illustrirte Monatshefte, October, 1882.)



as the "King's Mound" because, according to popular belief, a king had been buried there with all his treasures, and it was in the expectation of finding these treasures that early in January, 1880, the sons of the farmers of lower Gokstad began excavations of the mound. The Society for the Preservation of Norwegian Antiquities being informed of these proceedings, desired to take charge of the undertaking; after considerable negotiations with the proprietors they obtained the privilege of opening the mound, and on April 27, 1880, Mr. Nicolaysen, the president of the society, repaired to the spot to direct the work.

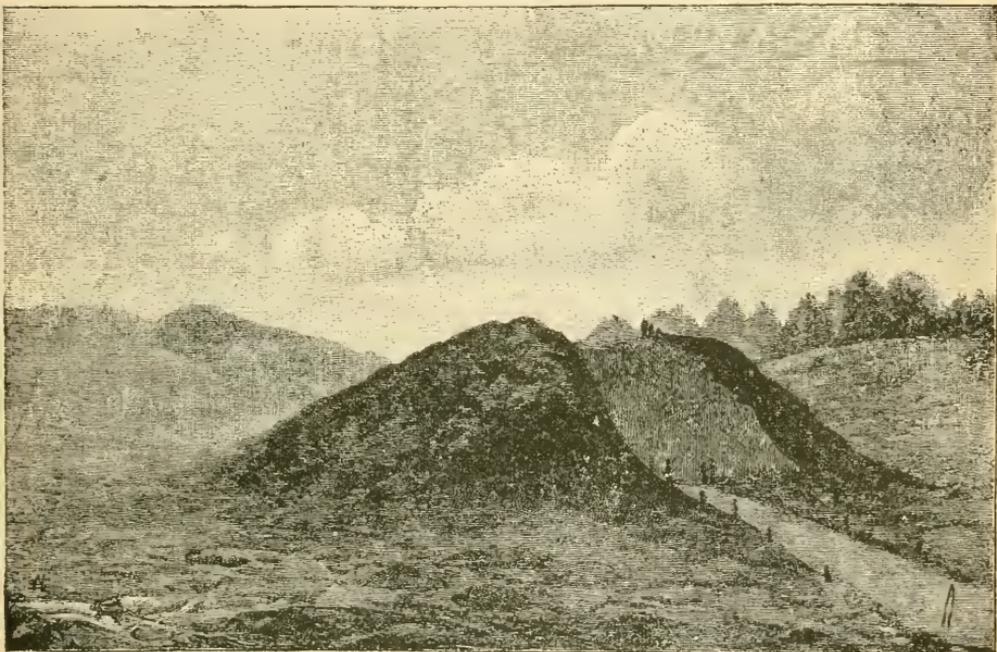


Fig. 136.

## THE KING'S MOUND.

From J. S. White, "The Viking Ship." Scribner's Magazine, vol. II, No. 5.

The excavation was conducted with great care by opening a passage-way right through the middle of the mound, and the second day already rewarded the diligent explorers by the discovery of a ship stern lying right in the track of the excavation. Upon further widening the track the entire ship was gradually laid bare (Fig. 136).

Voyage of the *Vega*, London, 1881, vol. I, p. 50 (illustration). Potter's American Monthly, 1882. Werner, Admiral R.: Das Seewesen der Germanischen Vorzeit (in Westermann's Illustrirte Monatshefte LIII, October, 1882. Preble, in United Service, May, 1883. Good Words, XXII, 759. Boehmer, George H.: Norsk Naval Architecture (in Proceedings U. S. National Museum, vol. IX, p. 455). Mémoires de la Société Royale des Antiquaires du Nord, 1887, p. 280. White, John S.: The Viking ship (in Scribner's Magazine, vol. II, No. 5). Preble, in American Flag, p. 159. Da Costa: Pre-Columbian Discovery of America, p. xxxvii. Foote's Landfall of Columbus, p. 3. Popular Science Monthly, XIX, p. 80. Tuxen, N. E.: De Nordiske Langskibe. In Aarb. f. nord. Oldk. og Hist., 1886. Van Nostrand Eclectic Engineering Magazine, XXIII p. 320. Higginson's Larger History of the United States. Worsaae, J. J. A.: Prehistory of the North (English translation), London, 1886.

In placing the ship in position at the time of the interment support had been provided by placing heavy, round logs at regular intervals horizontally against both sides of the vessel, and thus the ship could be fully excavated and left standing free without receiving additional support. (Fig. 137.)

The vessel rested upon blue clay, and to the upper limit of this all the woodwork had been well preserved; farther up, where the clay occurred intermixed with sand, the comparative lightness of the soil and its greater capacity for absorbing moisture had caused some of the wood to rot away, among it the stem and stern, with the adjoining planks, and

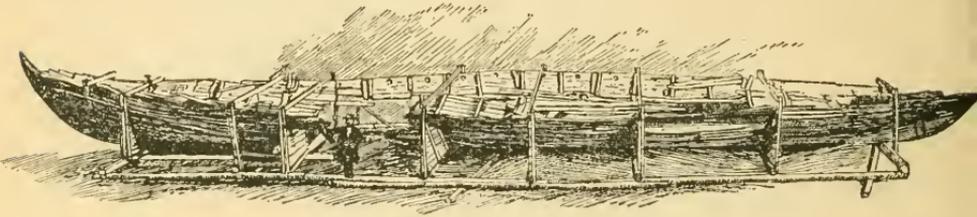


Fig. 137.

## THE EXCAVATED SHIP.

(From R. Werner, "Das Seewesen der germanischen Vorzeit," Westermann's Illustrirte Monatshefte, vol. LIII, October, 1882.)

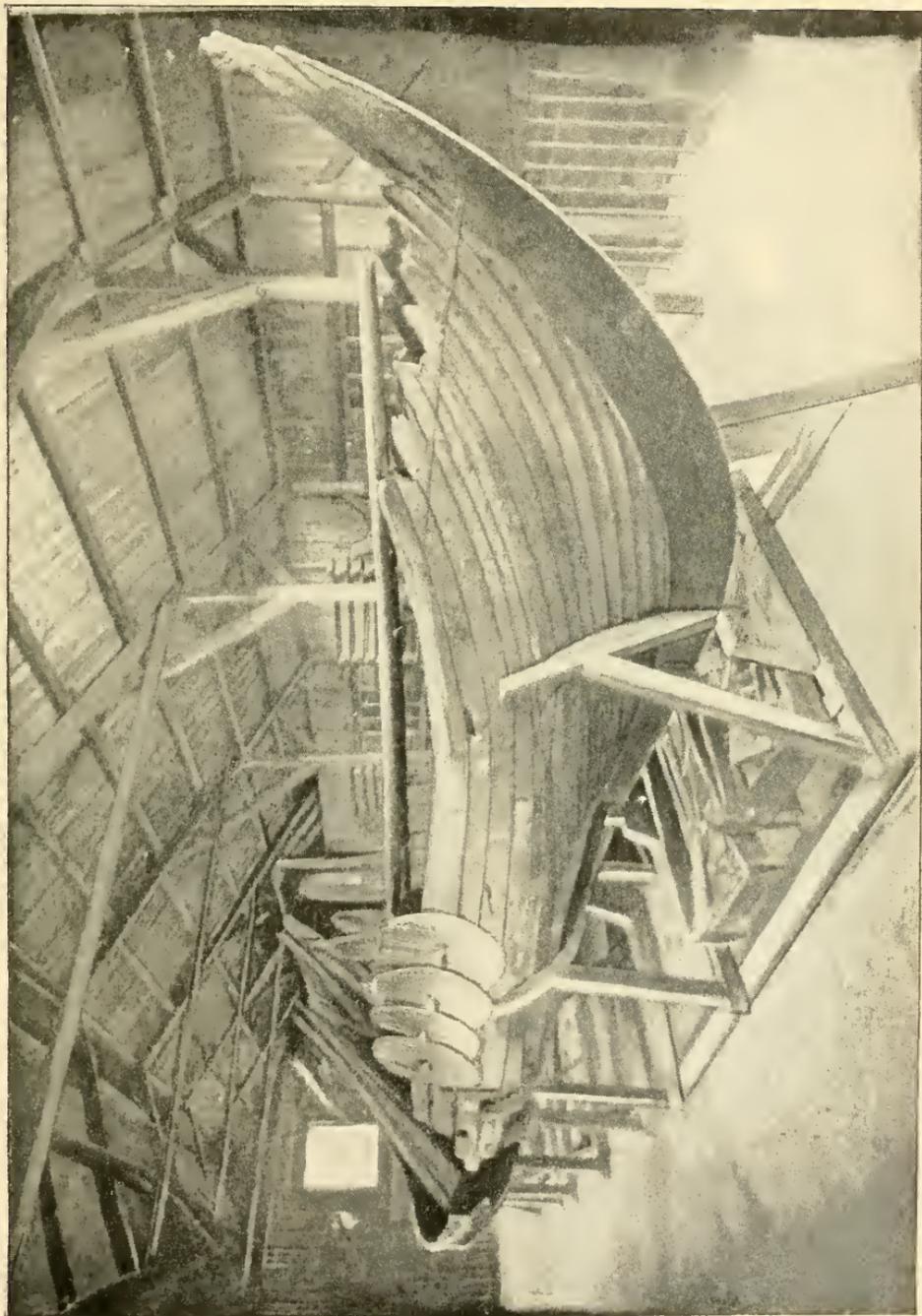
the gunwale (Plates LXXIX, LXXX), and the same fate the rest of the vessel would in all probability have shared, but for the imperviousness to moisture of the stratum of blue clay in which it was imbedded to a large degree, and for the pressure of the superincumbent stratum of earth which had bent the frames at almost right angles, thus removing them from contact with the lighter top soil.

Upon the completion of the successful excavation the vessel was removed to Christiania and now forms a great attraction among the exhibits in the Archaeological Museum of the Royal Frederiks University. (Plate LXXXI.)

I had occasion to view this interesting relic on occasion of a visit to Norway, and I will now give an account of the same from my own observations and from the description given in Mr. Nicolaysen's splendid work, "Langskibet fra Gokstad ved Sandefjord," from which I have drawn information as well as borrowed illustrations. (Plate LXXXII.)

The dimensions of the ship are: Length of keel, 66 feet (20.10 meters), with a length over all of 79 feet 4 inches (23.80 meters) from stem to stern; breadth of beam, 16½ feet (5.10 meters), and perpendicular depth, 6 feet in the middle and 8½ feet at the extremities. It is of oak, unpainted, clinker-built, and composed of keel, stem and sternposts, frame timbers, beams, knees, and external planking, and in its construction bears a striking resemblance to the Tune ship, previously described.

The keel is 66 feet in length, ending in strongly prominent stems almost perpendicular at the top, joined to the keel by an intervening fougued and grooved connection that is further secured by a double row of spikes. The height of the keel is 12 inches, with an inner convex



THE GOKSTAD SHIP. STEM VIEW.  
(From a photograph taken in Christiania, Norway.)



curvature of 5 inches in the middle; the ends are thus higher than the middle which, in connection with the prominent stems, has a tendency to increase the strength by placing the greatest draft where the ship is the broadest.

The ribs, seventeen in number, are not fastened to the keel, but lie free above it at equal distances of 3 feet. The beams rest on the top of the knees, the height of which corresponds to the tenth external plank and thus a solid basis is formed upon which the comparatively lighter superstructure rests. From the beams frame timbers extend to the height of the fourteenth strake, and further support is given to the structure by short timbers placed between every alternate frame and extending from the gunwale downward, and by similar supports mortised into the beams and with their lower ends cut so as to straddle the bottom timbers.

The beams being wider than the ribs upon which they are fastened and the frames of the superstructure, a ledge is formed upon which the ends of the bottom boards rest; these consist of thin fir boards laid edge to edge, each pair being bound together by a crossbar nailed to their underside with trenails; they are laid at right angles, but the outer layers conform to the curvature of the ship. All the boards were ornamented with concentric circles or other patterns.

The external covering consisted of sixteen planks tightened with cattle hair spun into three-stranded rope, which process would indicate that the caulking was done simultaneously with the laying of the planks. The planks vary in width from 7 to 9 inches, with a thickness of three-fourth inches; exceptions to this exist in the tenth strake, the thickness of which is  $1\frac{1}{2}$  inches, and the fourteenth, which is 1 inch thick; the two top planks are one-half inch thick only. Additional strength is thus given to those planks corresponding to the position of the beam and the ends of the short ribs.

The planking (Fig. 138) was secured to the frame in the same manner as observed in the *Tune* ship, namely, the ends of all the planks were cut tapering so as to closely fit the stem and sternposts, to which they were nailed with iron spikes; the bottom plank was fastened to the keel with iron rivets, and trenails were used to fasten the two top planks to the frames. All intervening planking (Fig. 139), although fastened to each other with rivets, were tied to the frames by means of withes made from roots and passing through clamps that had been cut out of the solid plank and corresponding holes in the ribs.

The ribs thus resting on the planks form, in connection with the thwarts, a solid body, stiffening the ship towards the sides; in the *Gokstad* ship the thwarts are the beams upon which the bottom (or deck) boards rest; nor could they be absent in a ship of this size, because clinker-built ships have their principal strength in the outer covering which is held in shape by the pressure against the well cou-

structed and braced internal framework, furnishing a resistance which the ribs alone could not offer.

To strengthen the bulkheads vertical pieces (Fig. 140) of plank, in triangular shape, were inserted; in the sternboard three holes are shown which were probably intended for the passage of the rudder ropes.

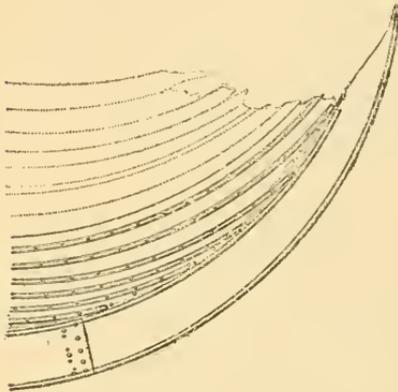


Fig. 138.

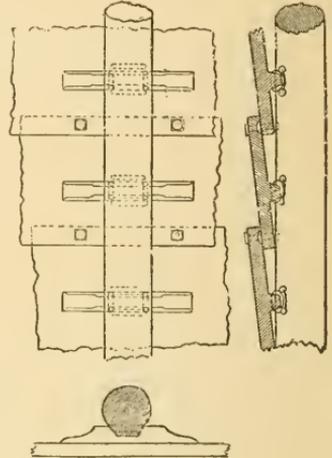


Fig. 139.

## FASTENING OF PLANKS.

(From N. Nicholaysen, "Langskibet fra Gokstad," 1882.)

The mast rests in a socket cut in two large oaken blocks of the shape of a fish-tail, laid amidships along the keel, the lower one extending over four timbers and being notched to admit them; the upper block extending over six frames, admitting the beams and being fitted to them by knees or crooked timber heads; the mast is also steadied by a loose slab which fits the opening like a lid.

Between the seventh and eighth forward frame a large wooden block is placed, probably intended to support a windlass.

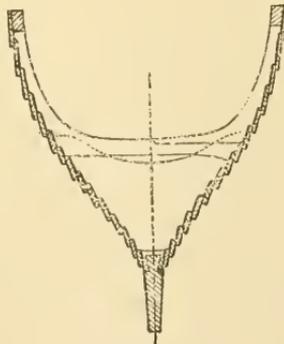
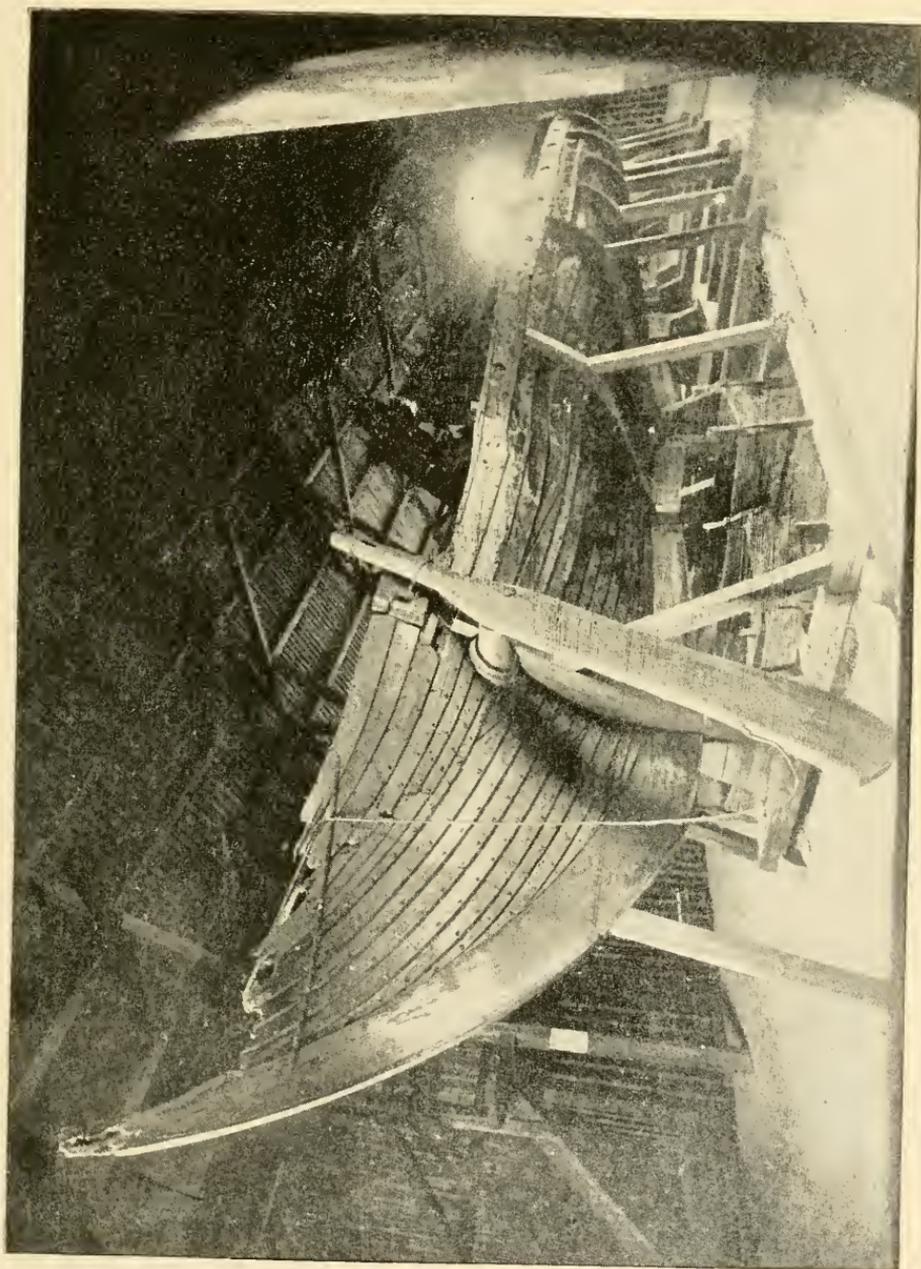


Fig. 140.

## CROSSPIECES TO STRENGTHEN BULWARK.

(From N. Nicholaysen, "Langskibet fra Gokstad," 1882.)

There are three stanchions, of which one is fastened to the mast block and the other two rest in a four-cornered step after having passed through an aperture in fish-tailed shaped blocks placed between



THE GOKSTAD SHIP. STERN VIEW.  
(From a photograph taken in Christiania, Norway.)



the third and fourth frames fore and aft; they may have been intended as supports for the spars.

In addition to mast and sail the ship carried thirty-two oars, sixteen on each side, which were plied through circular portholes (Fig. 141) cut in the third strake from the top and placed midway between each pair of knees. The size of the oars, some of which were found to have carved ornamentations, diminished from amidship toward each end, and

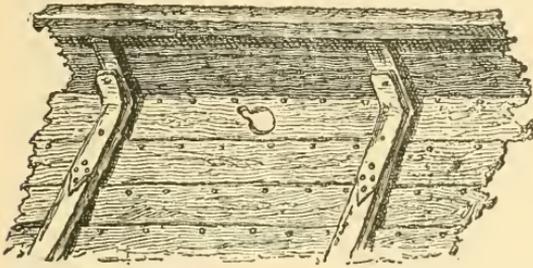


Fig. 141.

OAR POSTS OF GOKSTAD SHIP.

(From R. Werner, "Das Seewesen der germanischen Vorzeit." Westermann's Illustrirte Monatshefte, October, 1882.)



Fig. 142.

RUDDER OF GOKSTAD SHIP.

(From N. Nicolaysen, "Langskibet fra Gokstad.")

corresponding decrease is noticeable in the portholes. Back of each hole and a little above its horizontal diameter a slit is cut, through which the oars were shipped, and all being in the same direction all the blades would touch the water at a uniform angle.

Influx of water is prevented by a very ingenious application in the form of a shutter having two projections, one of which was fastened to the inside of the ship with a spike, around which they would move and open with a forward movement of the oar; when closed the circular portion would cover the port, while the lower projection, resting against a pin, would perform a like service to the slit.

The rudder (Fig. 142) consisted of a plank in the shape of a broad oar, the lower portion of which, in the middle, was provided with a



Fig. 143.

TILLER OF GOKSTAD SHIP.

(From N. Nicolaysen, "Langskibet fra Gokstad.")

round hole through which it was held to the side of the vessel by means of a rope. Its short neck was caught by a grummet; the tiller (Fig. 143) was fitted into a square aperture in the opposite direction of the blade.

The rudder was mounted with iron and provided with a cramp toward the heel.

To strengthen the upper part of the ship's side a wooden pillow, or block (Fig. 144, 145), has been laid outward and through this the grummet passed. Further down a block of conical form is nailed to the ship's

side bored through, which serves partly as a fender to keep the rudder from the planking and also afforded passage for the rudder rope.

The question of the position of rowers' benches is rather puzzling, as neither have the benches been found nor do the knees or beams give an indication of the method of the fixing of seats for the rowers. It is true the ancient writings do not state that the rowing was performed

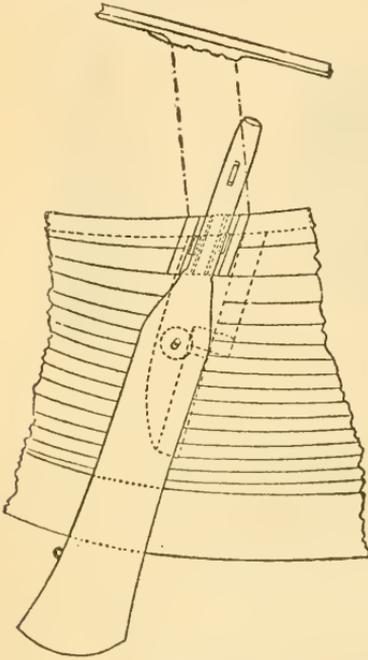


Fig. 144.

FASTENING OF RUDDER TO SHIP'S SIDE.  
(From N. Nicolaysen, "Langskibet fra Gokstad.")

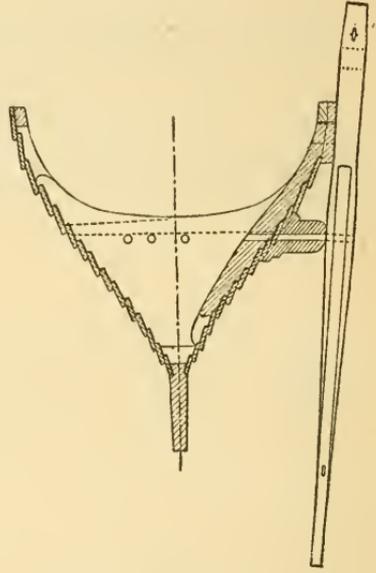
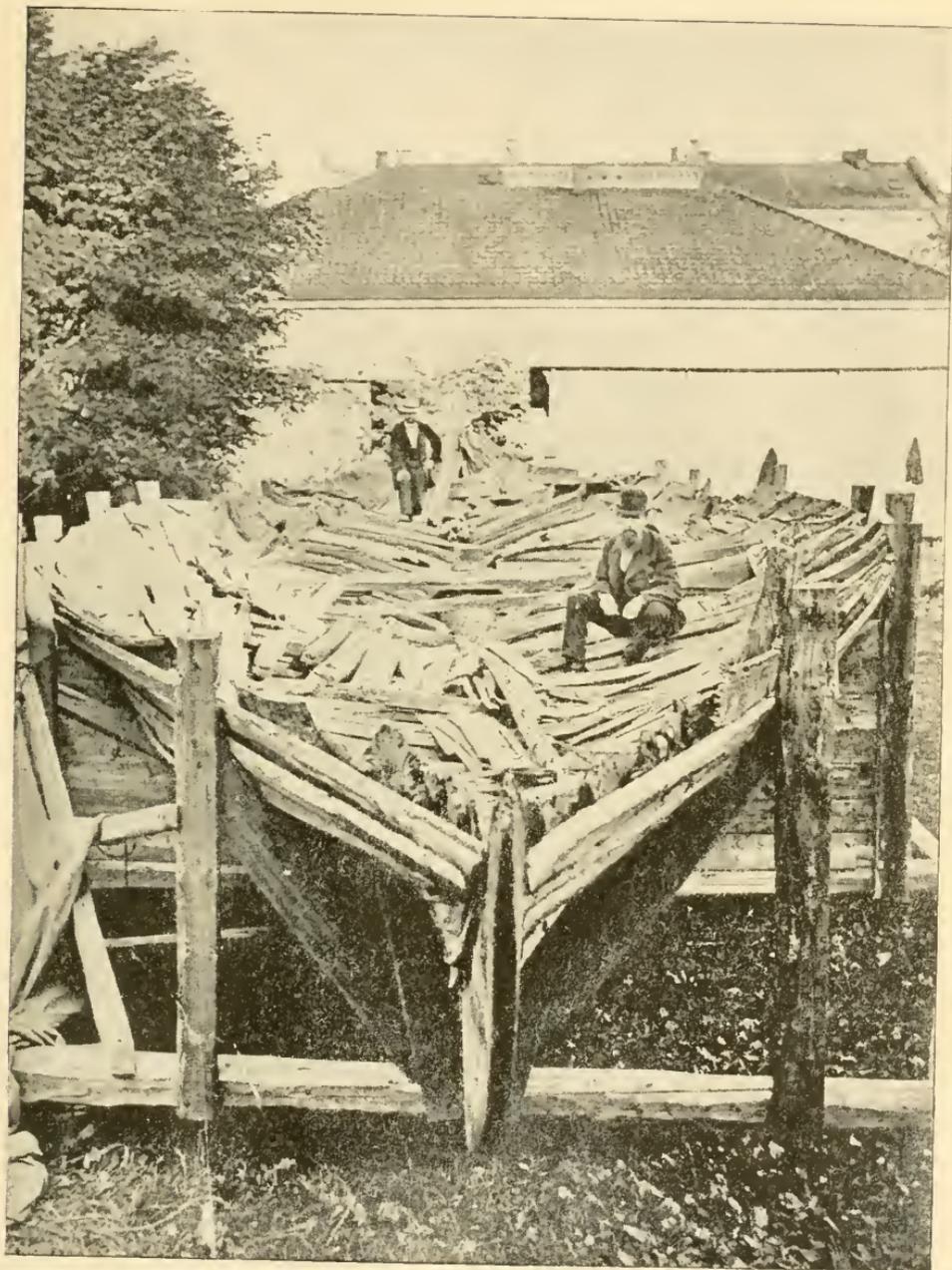


Fig. 145.

in a sitting position, yet the word *sess* (seat), as applied to the number of oars by which the vessel was classified, gives a significant indication to that effect.

Of the gunwale the greater part was decayed, yet sufficient remained to indicate between the short timbers a continuous skirting with rectangular openings which, it is supposed, were used for the tying of the cords by which the ship's tent was stretched, under which most of the hands could find shelter against the weather.

In the ship discovered at Gokstad were found the four supports of such a tent, together with fragments of the cloth and the cords. The supports are heavy boards, 11 feet 8 inches in length, finely carved at the upper extremity to represent the head of some animal, and in part painted (Fig. 146). They had been placed obliquely, so as to form two crutches, one at each end of the tent, with the carved heads projecting, and connected together by the pole, or rather transverse bar of the tent, which thus formed a gable-ended roof, extending fore and aft from the pole to the rail of the ship. The tent cloth is made of a rather fine woollen texture, white, with broad red stripes sewed on; the cords



THE GOKSTAD SHIP.

SHOWING ITS POSITION IN THE GROUNDS OF THE ROYAL UNIVERSITY AT CHRISTIANIA, NORWAY.

(From a photograph taken at Christiania, Norway.)



for fastening it are hemp. The pieces of ship's rope, of which a good many were found, are all made of bast.

Along the gunwale were hung shields—originally thirty-two, of which some along the port side had disappeared at the time of earlier attempts to open the mound. Of the remaining, some had been pressed and bent out of shape. They measured 94 centimeters in diameter and consisted of thin boards fastened together by means of the boss and by the handle. They apparently had been provided with a metallic rim which, however, had disappeared. The shields were painted, alternately yellow and black, of the same tints as the colors used upon the carved heads and upon the tiller.

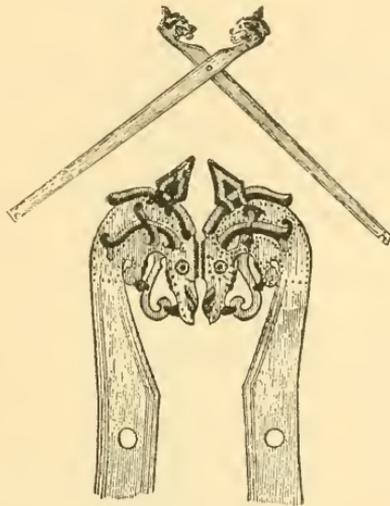


Fig. 146.

TENT SUPPORTS OF GOKSTAD SHIP.  
(From N. Nicolaysen, 'Langskibet fra Gokstad,')

A large grave chamber of wood was built in the middle of the ship from the mast toward the stern. It had the form of a gable roof, the sides consisting of round logs and the gable ends of planks placed on end. In this chamber the remains of the dead were deposited, unburnt, and no doubt on a bed, fragments of a bedstead having been found in the chamber.

Unfortunately this ship tomb had been visited by grave robbers, in all probability during the pagan era. They had dug into the mound on the port side and gained access through a large opening which they cut in the ship's side and the wall of the grave chamber. This accounts for the fact that the bones of the body had nearly all disappeared; that in the chamber there were but few articles of antiquarian value compared with what it might reasonably have been expected to contain; and, in particular, that no implement of war was found. The miscellaneous character of that still remaining, however, gives reason to infer that a manifold collection of weapons, ornaments, and utensils had originally been deposited. Thus, several iron fishhooks and a

burned checkerman of horn were found in the grave chamber. The most remarkable of the remaining articles are two ornamental mountings for belts or straps, one of gilded bronze, beautifully executed in a peculiar and characteristic style, and the other of lead. Of wearing apparel belonging to the deceased a few small fragments were found, some of gold brocade.

A great number of animals must have been sacrificed on the occasion of the burial. The bones of at least twelve horses and six dogs, as also the bones and feathers of a peafowl, were collected from different parts of the mound.

Of the numerous articles of antiquarian value found in or about the ship, more or less perfectly preserved, the following deserve special mention:

(a) Fragments of three oak boats that had been broken up previous to being deposited in the vessel, and no part of which, with the exception of the keel, can now be put together. Like the ship they were clinker-built, but instead of holes for the oars they have rowlocks of a peculiar form, fastened to the gunwale. Two of the boats have certainly carried a mast. Their size has been comparatively considerable, the keel of the largest boat being 22 feet 4 inches in length and that of the smallest 14 feet. Several of the oars belonging to the boats are preserved. They exactly resemble those used for rowing the ship.

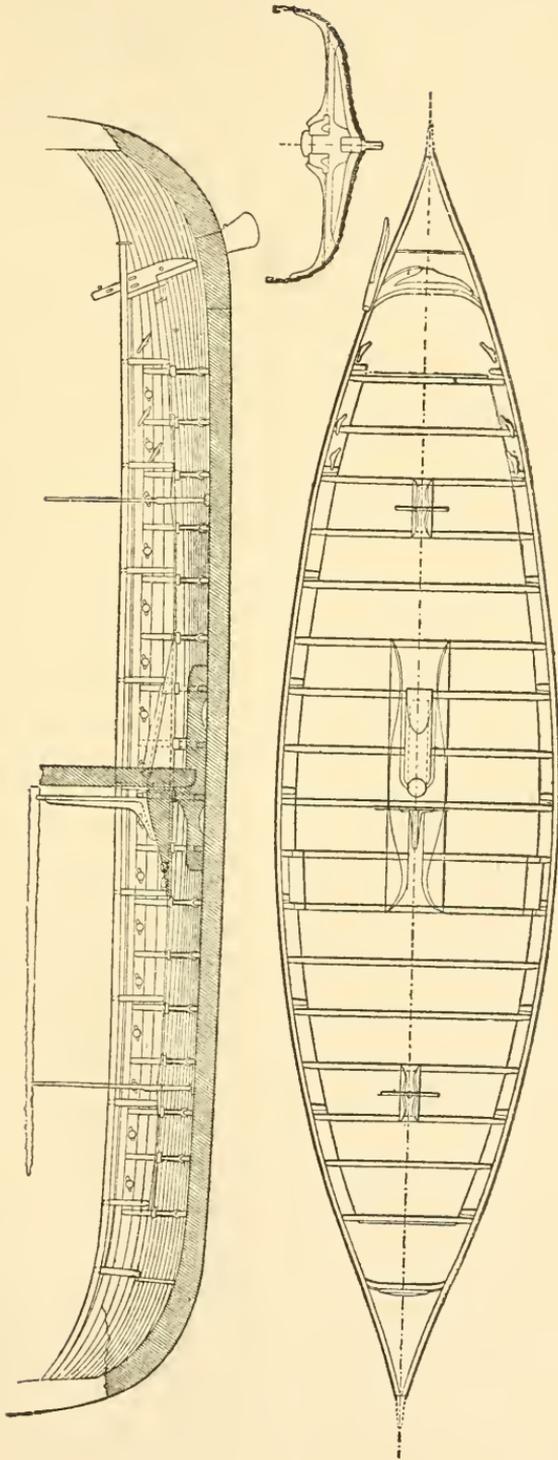
(b) The stock of an anchor; being of iron it had almost corroded away.

(c) A landing stage, or gangway, 25 feet long, but only 20 inches wide. It has the upper surface transversely ribbed to give a secure footing.

(d) Fragments of sleeping berths, at least four. These berths, a couple of which have been restored, are of much the same shape as the bedsteads now in use among the Norwegian peasantry. They are very low and put together so as to be readily taken to pieces and stowed away.

(e) Parts of a wooden chair, finely carved, that would appear to have been the high seat of the chieftain or commander of the vessel. The side pieces—in an excellent state of preservation—are modeled at the top to represent the heads of animals in precisely the same style as the upper ends of the tent supports.

(f) A great variety of kitchen utensils, among which were a very large and massive copper kettle, together with the iron chain, gracefully wrought, for suspending it over the fire; bits of a smaller kettle, of iron, and of the chain belonging to it; numerous tubs and buckets of different sizes; wooden plates; several small, finely carved wooden drinking cups, with handles; and many other articles. No trace of a fire place can be discovered in the ship, nor would it, indeed, have been easy to provide one in an open vessel of this kind. Hence the cooking utensils were only of service while coasting, when a harbor could



THE GOKSTAD SHIP. CENTRAL LONGITUDINAL AND TRANSVERSE SECTIONS.  
(From Nicolaysen's "Langskibet fra Gokstad.")



at any time almost be gained, and in those days a ship kept near the shore whenever possible.<sup>1</sup>

The various articles of antiquarian value found in the mound, together with the style of ornamentation in the carving of different parts of the ship, sufficiently attest the correctness of the inference concerning her antiquity which the mere fact of entombing a vessel in itself entitles us to draw, namely, that she belongs to the period extending from the year 700 to 1050 after Christ. (Plate LXXXIII.)

The following interesting résumé is obtained from a study of the Gokstad ship:<sup>2</sup>

Length between sterns .....	79' 4''
Length of keel .....	66' 0''
Width above gunwale, amidships .....	16' 2''
Perpendicular depth from gunwale to bottom .....	5' 7''
Draft at middle of keel .....	3' 7''
Draft at ends of keel .....	3' 2''
Gunwale above water, amidships .....	2' 11''
Gunwale above water, at sterns .....	6' 6''
Length of uppermost water line .....	67' 0''
Width of uppermost water line .....	14' 10''
Area of uppermost water line .....	square feet.. 630
Area of middle rib .....	square feet.. 24
Displacement .....	cubic feet.. 959
Displacement center before the middle .....	tons.. 30.2
Number of oars on each side .....	16
Distance between oars .....	3' 0''
Middle oar above surface of water .....	1' 6''
Length of middle oar .....	18' 6''
Entire crew .....	70
Weight of crew with accouterments .....	tons.. 10
Weight of ship and equipment .....	tons.. 20.2

*Boats of the Gokstad Ship.*<sup>3</sup>—According to saga account every large ship had its boats, sometimes two or more,<sup>4</sup> which were taken on board when the ship was made ready for sea.<sup>5</sup> They ranged from two oars (*ári*) to twelve oars (*tolfaringer*), which were worked through rowlocks (*keiper*) fastened to the gunwale and loops fastened thereto; two oars were generally worked by one man.<sup>6</sup> The boats were clinker-built, fitted with mast and sail, and had a movable floor between the frames.

<sup>1</sup> *Nicolaysen*, *Langskibet*, etc. p. 23, says: "The cooking could only be done on land, which is presupposed in the municipal law of Bergen (1276), where it is enacted that the mate shall, whensoever the ship lies at anchor in harbor, cause the crew to be put on shore and backward once a day, but the cook thrice, once to take in water and twice to prepare food."

<sup>2</sup> *Tuxen*, *N. E.*: *De nordiske Langskibet*.

<sup>3</sup> *Nicolaysen*, *N.*: *Langskibet fra Gokstad*.

<sup>4</sup> *Sigurd Jorsalafari Saga*, c. 6; *Eyrbyggja*, c. 29.

<sup>5</sup> *Egils Saga*, c. 60; *Eyrbyggja*, c. 29; *Gretti's Saga*, c. 17; *Flateyrbok*, III; *Biskups Saga*, I, 492.

<sup>6</sup> *Flateyrb.*, I, 396; *Heimskringla*, p. 784.

In the Gokstad ship fragments were found of three oaken boats with their rudders, two mast-steps, one thwart, six triangular pieces of board, a backboard, bottom boards, and two clamps with plugs. Although too much broken up to permit of restoration, the fragments give an idea of form and point to similarities with corresponding parts of the mother ship.

The boats are built of oak, unpainted, very sharp at the ends, and consist of keel, framing, and planking. The keels are 7.7, 5.4, and 4.1 meters in length, respectively, and are, at each end, fixed immediately to the stems—in the Gokstad ship an intervening piece forms the connection; the boards are connected to each other by iron rivets, and are attached to the frames by either cord or trenails. The stems lie lower than those of the ship and spring up to a point.

The boats have no beams, but simply detached thwarts; nor have they a mast partner, but are provided with a mast step similar to the block, serving as support to the stanchions in the Gokstad ship; the mast appears to have passed through a thwart, as indicated by one found with a circular hole cut through it. The rudders are of the type of the Gokstad ship, but are without the iron ring at the top, and only

one of them had an iron cramp at its head. The bottom boards were fitted between the frames and were put together in the customary manner with connecting crosspieces underneath; triangular pieces were fitted in stem and stern. The oars resemble those of the Gokstad ship; they were plied from rowlocks nailed to the top of the gunwale. (Fig. 147.)

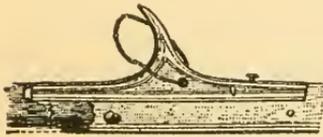


Fig. 147.

ROWLOCK ON BOAT FOUND IN GOKSTAD SHIP.

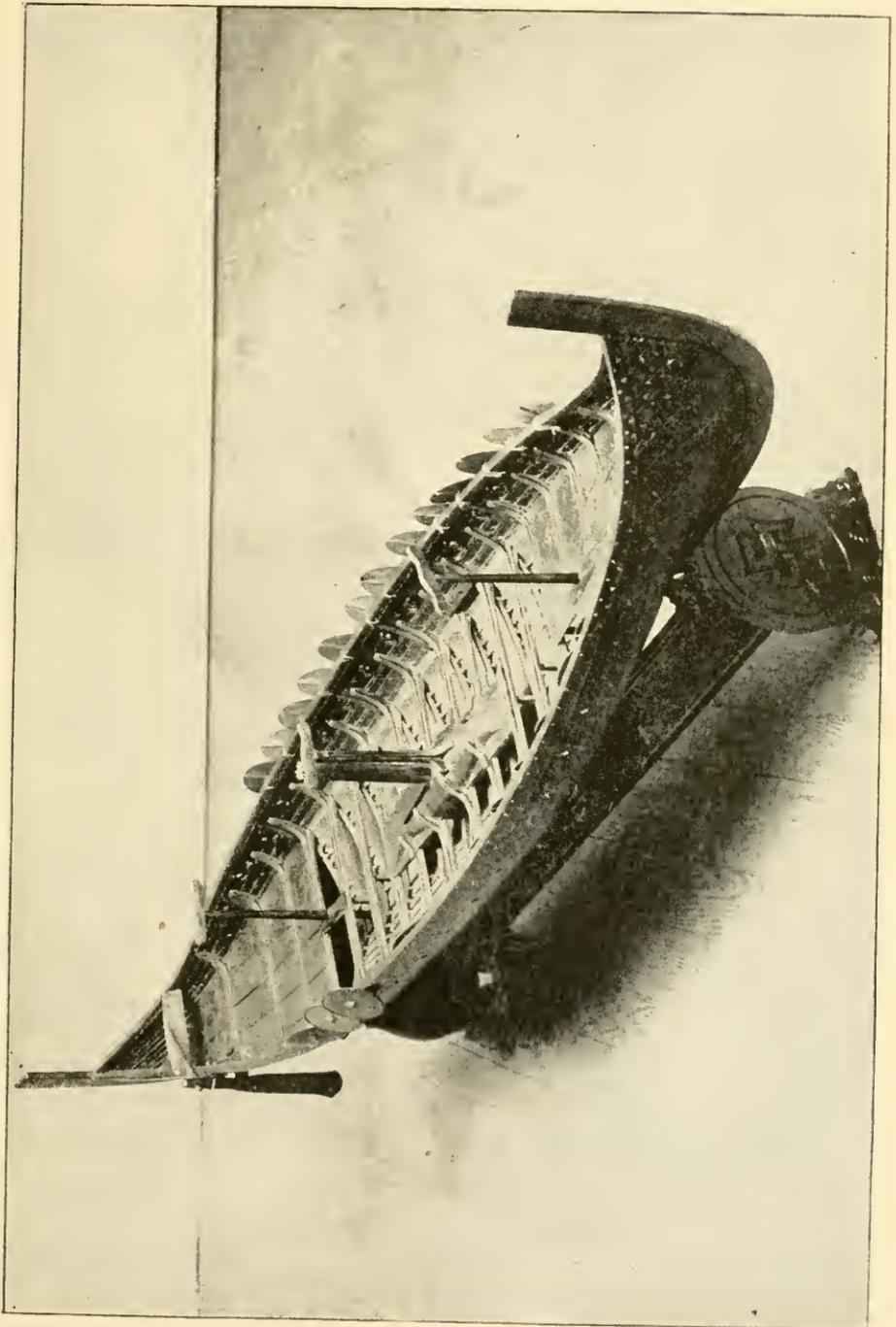
(From N. Nicolaysen, Langskibet fra Gokstad.)

The boats are, in every respect, specimens of skillful and expert workmanship, and, being the only specimens of this class of craft known to exist from that period, they are of possibly still greater antiquarian value than the ship itself to which they belonged.

*The Gloppe Boat.*<sup>1</sup>—During the excavation of a mound near the Gloppe Fjord in Bergen district, undertaken in 1890, under the auspices of the Bergen Museum, a large number of rivets were found extending at regular distances in rows which were followed up in a northwest and southeast direction, and, although of wood but few remains were found completely saturated with iron rust so as to preclude possibility of identification, the nails suggested the shape of a boat which had been placed in the mound parallel to the shores of the fjord.

The boat there buried appears to have had a length of 28 feet, by 40 inches in width; the lowest layer of nails was placed 4 feet below the surface of the mound. It consisted of five boards on each side exclusive of the top rail; it had six thwarts—distinguishable by large rivets found in their places—placed at regular distances of  $3\frac{1}{3}$  feet, the

<sup>1</sup> *Gustafson Gabriel: En baadgraav fra vikingetiden. In Bergens Museums Aarsberetning f. 1890, No. VIII.*



THE GOKSTAD SHIP.  
(Photograph of model in U. S. National Museum.)



first one being 5 feet from the bow. The seat for the helmsman was 7 feet from the stern.

The outlines as well as the construction of the craft exhibits a remarkable resemblance to the modern boats of Northfiord; both are represented in the accompanying figure (148), in which the contours of the modern craft are shown in a connected line, while those of the ancient boat are

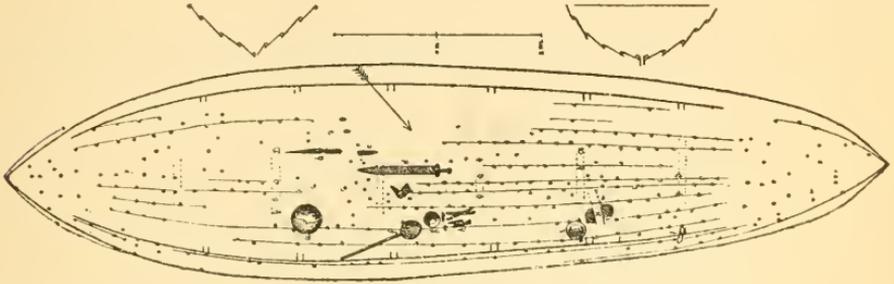


Fig. 148.

THE GLOPPEN BOAT.

(Reproduced from Gabriel Gustafson, "En Baadgraav fra Vikingetiden.")

indicated by the nails which were joined by lines, and an interruption in the rows indicate the place at which the nails were disturbed. The similarity between the two extending even to the intervals between the nails, a general description of a Northland five-seater may be of interest. As an illustration, the Söndmöre boat<sup>1</sup> (Fig. 149.) used in the fisheries along the coast of Norway from Egersund, in Lister, round the North Cape to the frontier of Russia, a distance of about 1,200 geographical miles, has been chosen. These boats are called "Nordslandsbaade" (Northlands boats);<sup>2</sup> they are described as long, narrow, and low, light and elegant, fit both for sailing and rowing,<sup>3</sup> and, on account of their peculiar construction, are believed to be more elastic, safer, and swifter in a sea way. These boats are clinker-built and have four strakes, except at the bow where there are six strakes; lower bow plank put on diagonally with end chamfered to fit on other planks, to which they are nailed; no gunwales; strengthening pieces<sup>4</sup> along the inside next to upper strake; heavy timbers; boat entirely open; six thwarts; five rowlocks; deep keel, curving up like a sled runner at each end to form stem and stern posts which are high; bottom slightly concave with much dead rise, being nearly straight to top of upper strake;<sup>5</sup> ends sharp and very flaring; small rudder; peculiar jointed tiller; single mast, stepped amidships with strong rake; four shrouds aside with toggles on lower ends that pass through beackets at the boat's side; single lugsail with narrow head tacks down to stem; the oars are

<sup>1</sup> *Bochner, Geo. H.*: Norsk Naval Architecture. In Proceedings U. S. National Museum, 1886, p. 443.

<sup>2</sup> *Diriks and E. Suudt*: In "Folkevænnen" of 1863 and 1865.

<sup>3</sup> Model in U. S. National Museum.

<sup>4</sup> *Folkevænnen* XII, p. 349.

<sup>5</sup> *Eli Suudt* "Nordlandsbaaden," p. 25.

plied from rowlocks, called "keips," which name occurs in the old sagas (Fig. 74), consisting of pieces of wood fastened to the gunwale by wooden pegs (in the absence of a gunwale they are fastened to the top plank by two iron nails), having an oblique prolongation at one end and furnished with a loop of wickerwork rope or leather, through which the oar is passed and which prevents its slipping out of the keip while rowing.

In the Gloppe boat a man had been buried, but his remains could no longer be found, nor are traces of burning shown in the mound nor

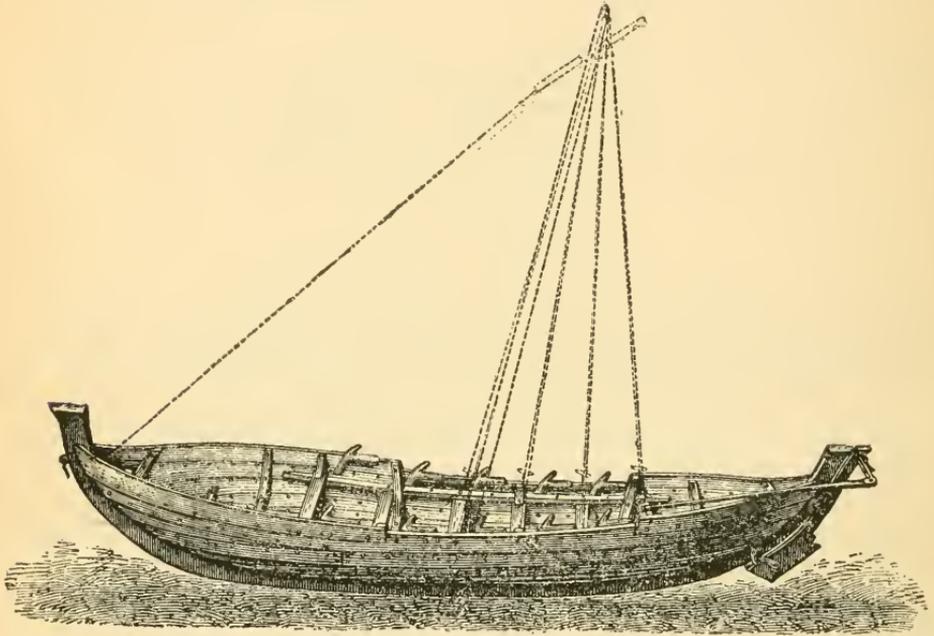


Fig. 149.

SÖNDMÖRE BOAT.

(Drawing made from model in U. S. National Museum.)

upon the articles found within the ship, consisting of a double-edged sword, an ax, a spear of elegant form and nine bronze nails, two arrows, knife with worn blade, a large file, frying pan, saucer, three hundred rivets, mostly from  $2\frac{1}{2}$  to  $3\frac{1}{2}$  inches long, some objects of iron whose application could not be determined. From the location of these articles, and most especially of the sword, which was placed with its point towards the prow of the boat, it is surmised that the body had been placed there with the feet in the same direction and therefore corresponding to the positions found in other mounds.

*The Botley War-ship.*—On the banks of the small river, the Hamble, which falls into Southampton water, about  $2\frac{1}{2}$  miles from Botley, and about 2 miles inland above Burslean bridge, which carries the main road from Southampton to Portsmouth over the river, at a place which has been inaccessible for ships for centuries, an ancient vessel of large size was discovered in 1875.

For many years tradition spoke of an ancient vessel having been wrecked on the muddy banks of the Hamble, and a few fragments of blackened wood, covered with seaweed, were pointed to from time to time when they were visible, at very low water in a double and parallel row.

The attention of Mr. E. P. Loftus Brock, the honorary secretary of the British Archæological Association, having been directed to the subject, he collected many of the facts from the gentlemen who had been most instrumental in bringing it to the public notice, and from his report I quote:<sup>1</sup>

“I am informed by Mr. Herbert Guillaum, of Botley, that about fifty years ago a rough carving was discovered accidentally, by an inhabitant of this district, to form a part of a wreck, and it was removed with the fore part of the ship. It is spoken of as having been the figure-head, and having the form of an animal resembling a lion. It was removed, and its whereabouts can not now be traced.

“The course of a small rivulet having within very recent times been turned into the river, the thick bed of mud covering the wreck has been by degrees removed and the broken timbers were much more distinctly visible, and much local curiosity to learn more of the form of the vessel was evinced. Francis Crawshay, esq., having become the owner of some property in the locality at Burkedan, undertook the work of exploration with considerable spirit and appears to have spared neither time nor money in carrying it out.

“The vessel proved to be of very considerable dimensions, being about 130 feet in length and extending from close to the water’s edge into the stream. On the mud being dug out to the depth of about 10 feet, the upright timbers, which were 14 inches by 10 inches, were found to be planked over with three layers of planks, varying from 4 to 6 inches in thickness. These had been bent to the shape of the ship and their edges were beveled. The joints had been caulked with moss and fern leaves, and these were found to be so perfect that the exact outlines of the leaves could be made out. The timbers, which are probably oak, were nearly black or chocolate color by age, and of great hardness, but the grain of the wood was very distinctive when sawed through. Traces of fire were visible upon some of the timbers. Mr. Crawshay’s excavations were continued down to the keel of the vessel, and the length, 130 feet, was taken along it.<sup>2</sup> Old saw-marks were distinctly traced on many of the timbers, and the instruments used must have been of much greater thickness than those now in use, in one place the saw-cuts being  $\frac{1}{4}$  of an inch. The timbers were put together with oak trenails,  $1\frac{1}{2}$  inch in thickness and about 20 inches

<sup>1</sup> Read before the British Archæological Association, thirty-second annual meeting, at Evesham, August 16 to 21, 1875.

<sup>2</sup> Its length is much greater than that of any other ancient vessel yet met with. The celebrated ship found in the Rother was about 60 feet long.

apart, securing the three thicknesses of boarding to the uprights. The edges of the boarding were nailed together by iron square nails with some round heads, now very much decayed. The wreck is said to be that of a Danish ship. Its large dimensions warrant this supposition, but it may be unwise, as has been done, to endeavor to fix its being abandoned on the spot where now found after so many centuries, to the Danish invasion of Wessex, 871, or to the attacks upon Southampton, a century later."

Unfortunately the researches terminated rather abruptly, the board of trade seizing the wreck and placing it in the coast-guard house at the mouth of the Hamble.

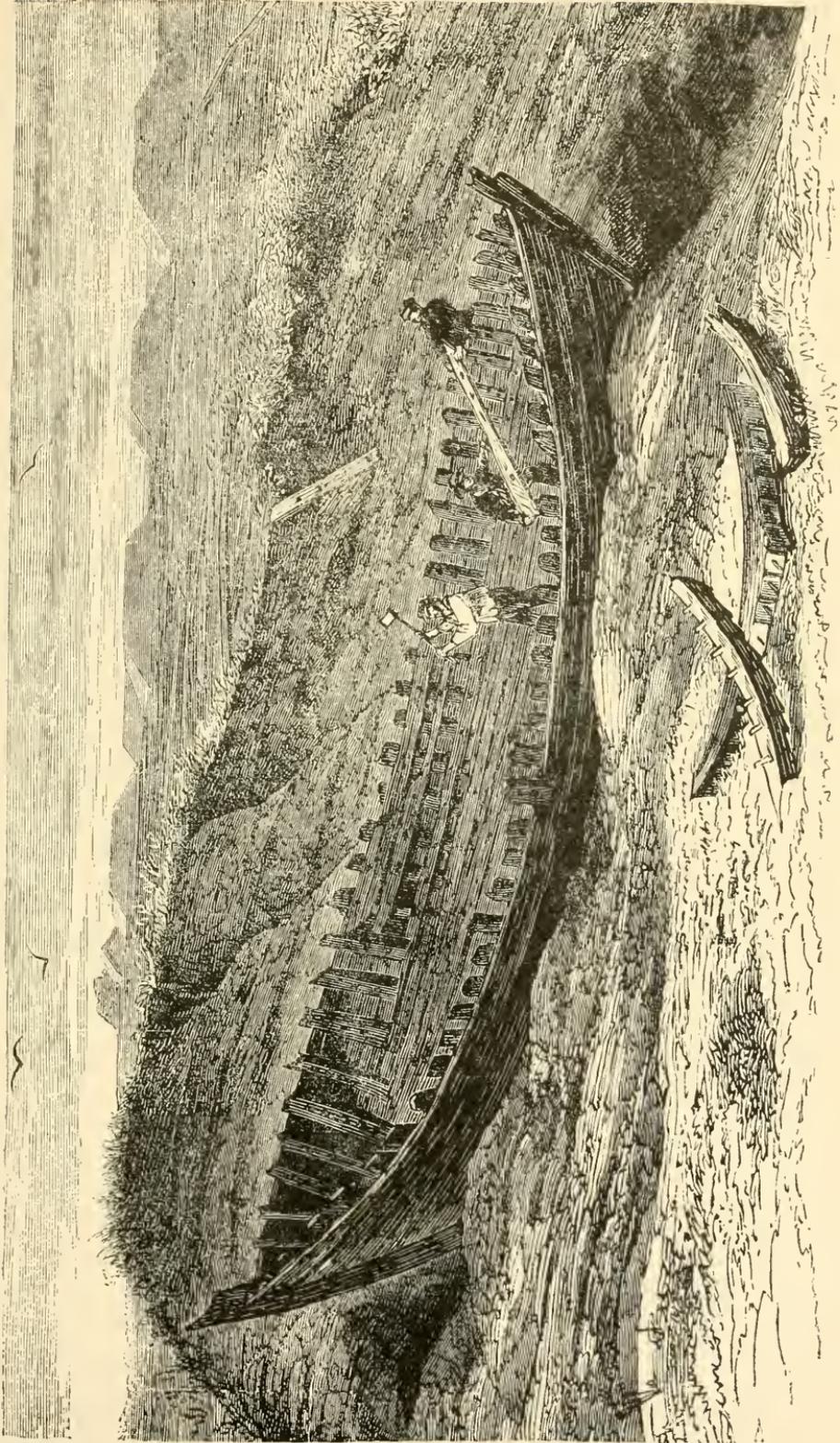
*The Brösen Boat*<sup>1</sup> (Plate LXXXIV).—On occasion of the enlargement of the port of Danzig an ancient but well-preserved wreck was discovered near the village of Brösen, about 1,000 feet from the present shore line, and buried in sea sand to a depth of 15 feet. These two facts give evidence of the antiquity of the vessel. The oldest chart of the mouth of the Vistula, published in 1651, designated the place upon which this vessel was found as solid land, while the Westerplatter, one of the favorite beaches of Danzig, now covered with a dense forest, was then a mere shoal. The rapid descent of the Vistula, together with the running ice which plows the shores, may be considered as the cause of the changes that have taken place in the configuration of the coast; yet, if the Westerplatter required almost 250 years for its development and the growth of forest, the place of the find, being located at three times the distance from the beach, must, reasonably, have required three times that space of time for the change from water to land, and the depth of the sand would indicate even a greater antiquity.

The utensils, too, found with the ship would indicate a higher antiquity. They consist of a bronze compass-lamp of  $4\frac{1}{2}$  inches diameter,  $2\frac{1}{2}$  inches high, and in the form of a flattened bulb, with cylindrical projection downward; a furrow on either side would point toward a handle within which it was swung. The lamp shows on top an aperture of  $1\frac{7}{8}$  inches, closed by a lid; three burners within a triangle were placed upon the arc.

Within the ship were found furthermore an iron ball of  $1\frac{1}{2}$  inches diameter, a drinking-glass of light-green color and supplied with a leaf-like ornamentation, two incomplete human skeletons of large proportions, the bones of which were partly broken and had turned black.

The ship measured 57 feet in length by 16 feet in width and 5 feet in height. Being open on top, and the upper ends of the ribs being broken off, it may be surmised that its depth was greater than 5 feet and that it may have had a deck, which possibly had been raised by the waves and drifted away.

<sup>1</sup> Ausgrabung eines Wrackes am Ufer des Baltischen Meeres, bei Danzig. Von M. Bischoff. In Leipziger Illustrirte Zeitung. No. 1542, 18 Januar, 1873. (Translation.)



THE BRÖSEN BOAT.  
(Copied from "Illustrirte Zeitung," Leipzig, 1874.)



It is built of oak of an ink-blue color and of such a degree of hardness that it required great exertions to break it up; it is klinkerbuilt, the planks being  $1\frac{1}{2}$  inches thick; the ribs are notched and the planks fastened to them with wooden nails of 1 inch thickness and with iron nails of 4 inches length. The iron nails had corroded away, only leaving a black powder and the holes connected by them. The wooden nails are in a good state of preservation; they are of oak, juniper, and birch trees of one year's growth, as indicated by the wood. The present wooden nails, made of pine, only last ten years. The caulking is done by means of cords twisted of the black hair of elk, bear, or other wild animal, saturated with tar that scented of amber.

It is pointed at both ends and its greatest width is one-third of the length. The stem-post was moderately rounded off; the stern-post straight. No trace was found of a fixed rudder. The bottom is flat with exception of the hollow groove towards the keel. The execution is exceedingly rough, and smooth cuts of the saw nor traces of the plane are nowhere noticeable; even the planks appear to have been split instead of sawed.

*Levy of ships.*—For the service of the king the country was divided into ship levy districts (*skipreida*), each of which had to build, equip, and man a certain number of ships of specified order, carrying not less than twenty nor more than thirty pairs of oars. Upon the declaration of war the *War Arrow* was sent to summon the warriors to their posts. The sending of the war arrow had to be performed quickly and the ancient law provides<sup>1</sup> that “when a man carries war news he shall raise an iron arrow at the end of the land. The arrow shall go with the *lendir* man and be carried on a manned ship both by night and by day along the high road (the sea). Those who drop the arrow are to be outlawed. A wooden arrow shall go into the fjords from the high road and be carried with witness, and each man shall carry it on to the other. The one who drops it must pay a fine of 3 marks. When it comes where a woman lives alone she must procure ships, and food, and men, if she can. But if she can not, the arrow shall be carried onwards. Every man in whose house the arrow comes is summoned within five days on board a ship. If anyone remains quiet he is outlawed, for both thegn and thrall shall go.”

Levies are mentioned in many sagas<sup>2</sup> and the ships thus brought together, strengthened by the numbers of vessels belonging to individuals,<sup>3</sup> formed large fleets of whose visits to foreign shores the Saxon, Frankish, and English chronicles recount many instances.

<sup>1</sup> Earlier Gulathing law, c. 312 and 301.

<sup>2</sup> Olaf Trygvason Saga, c. 15, 17, 38, 40, 107; Hakon the Good Saga, c. 3, 23; Harald Hardrade Saga, c. 31, 33, 34, 40, 46, 50, 53, 54, 83; Hakon Grayskie Saga, c. 12; Olaf Kyrre Saga, c. 108; Magnus Barefoot Saga, c. 5, 8, 16; Sigurd the Crusaders Saga, c. 16, 27.

<sup>3</sup> In the battle of Frædarberg King Hakon the Good had 9 ships and Eric's sons had 20 (Hakon the Good Saga, c. 24). Gold Harald sailed with 9 ships; Earl Hakon (Sigurd's son) had 12 large ships (Olaf Trygvason Saga, c. 12). King Harald Gormon

The monk of St. Gall tells us how early Charlemagne had recognized the bad intentions of the Northmen,<sup>1</sup> and, foreseeing evil, he ordered in the spring of 800 A. D., ships to be built upon all rivers coming from France and Germany and ships everywhere, and at all places where landings of the pirates might be expected he ordered guards to be stationed.<sup>2</sup> The most vulnerable point was the coast of his slavie tributary people and allies. Thus, in 808 A. D., Gotrik, a Danish king, surprised the Abodrites (the inhabitants of the present Mecklenburg), laid the people under contributions, and exacted a money tribute even of the Frisians.<sup>3</sup> In 810 A. D., the Northmen assailed the coast of Frisia with two hundred vessels.<sup>4</sup>

In 802 A. D., a capitulet ordered all free men living along the shore to hasten to ship upon the sounding of alarm.<sup>5</sup> In 810 A. D., Charles mustered at Boulogne the fleet which he had created, and reconstructed the old Roman pharos.<sup>6</sup>

In 828 A. D., Harold caused the Saxon counts upon the Eider a new loss.<sup>7</sup> In 845, simultaneous with an attack upon Paris, Eurik, King of the Northmen, with six hundred ships, entered the river Elbe and ransacked Hamburg.<sup>8</sup> In 852, Godfrey, son of Harold the Dane, with two hundred and fifty-two ships, harassed the territory bordering the mouth of river Scheldt.<sup>9</sup> In 860, during the reign of Ethelred, a large fleet of Northmen came to land, and the crews stormed Winchester.<sup>10</sup> In 857, the Northmen invaded the city of Paris and set fire to it. They are said to have had a fleet of seven hundred large ships, besides smaller ones, and landed 40,000 men.<sup>11</sup> In 861, the Danes, under their king, Welland, set out with a fleet of more than two hundred ships.<sup>12</sup> In 865, the Northmen entered the river Seine with five hundred ships.<sup>13</sup>

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of Denmark, sailed with 60 ships (Olaf Trygvason Saga, c. 15). At the beginning of the battle with the Jomsburg vikings, Earls Harald and Eric had 150 ships; of the Jomsburg vikings Earl Sigvald had 20 ships and Bue and his brother Sigurd had 20; Vagn Aakerson had 20 ships (Olaf Trygvason Saga, c. 43). King Trygvason sailed against the Danish king with 71 ships (Olaf Trygvason Saga, c. 110). The Jomsvikings attended the *arvel* of King Svein Tjuguskegg at Zealand with 170 ships (Jomsvikings Saga, c. 37). In 810 Harold Blátórn went to Norway with a fleet of 700 ships (Olaf Trygvason Saga, c. 24).

<sup>1</sup>Monachi Sangalli Geste Caroli II, c. 14, 757; Mon. G. H. T. ii.

<sup>2</sup>Einhard, Vita Caroli M. ed. Pertz, c. 17; Einh. Annal. ad A. 800, 157; T. I. Mon. G. H.

<sup>3</sup>Saxo Gram. Hist. Dan. VIII, 167 (ed. Stephani).

<sup>4</sup>Einhard Annal. a. h. a.; M. G. H. T. I., 197; Saxo Gram. i, c.

<sup>5</sup>Capitularia Reg. Franc. ed. Baluz, Paris, 1780, i, 377.

<sup>6</sup>Einh. Annal. a. h. a., 199.

<sup>7</sup>Einhard Annal. A., 828.

<sup>8</sup>Annal. Tredecens. ad A. 845; Vita Anskarii, 700.

<sup>9</sup>Eginh. Annal. a., 852.

<sup>10</sup>English Chronicle.

<sup>11</sup>Eginh. Ann. Barthold, (Geschichte d. Deutschen Seemacht), places this event in 885-6.

<sup>12</sup>Ibid., a. 861.

<sup>13</sup>Ibid., a. 865.

In 880, the Danes captured the Duke of Saxony, together with eleven counts, two bishops, many captains and their men.<sup>1</sup> In 893, a Danish fleet of two hundred and fifty ships landed at the mouth of the Lymne.<sup>2</sup> In 894, the Danes among the Northumbrians and East Anglians gathered one hundred ships and went south to besiege Exeter.<sup>3</sup> In 927, King Aulaf entered the Humber with a fleet of six hundred and fifteen sails.<sup>4</sup> In 993, Olave came to Staines with ninety-three ships.<sup>5</sup> In 994, Olave and Sweyn (Olaf, of Norway, and Svein, of Denmark) came to London with ninety-four ships.<sup>6</sup> In 986, Erik the Victorious, of Sweden, appeared upon the North Sea with an enormous fleet, devastated Flanders, entered the river Elbe, and stormed Stade.<sup>7</sup> In 1009, Thurkills came to England with a large fleet, and after him came another innumerable fleet of the Danes.<sup>8</sup> In 1012, Svein, with an enormous fleet, entered the port of Sandwich and forced acknowledgment by the Anglo-Saxons.<sup>9</sup> In 1016, Knut entered the Thames with one thousand two hundred<sup>10</sup> (1,000, 340, or 205 vessels,<sup>11</sup> each carrying eighty men.

The largest fleet ever assembled in the north is that which in 700 met in the battle of Brávöll. It reached from Kjöge to Skanör, so that people could walk as on a bridge from Zealand over the Sound, a distance of some 20 miles. The fleet of the opposing force consisted of 2,500 ships.<sup>12</sup>

## DEDUCTIONS.

In reviewing the preceding the question of parallelism between the ships of the North and those of ancient Greece and Rome, suggested in the beginning of this paper, may advantageously be introduced by a brief description of the more important points of similarity and dissimilarity of construction.

It has been shown that the war ship of antiquity was not a vessel of great depth, but that it was rather of slight build and of comparatively small weight, as is evident from the fact that it was often hauled ashore without the application of any special apparatus, and from the very short time often required for their construction.<sup>13</sup> They had a

<sup>1</sup>Annal. Fuldens, a. h. a.

<sup>2</sup>English Chron.

<sup>3</sup>English Chronicle.

<sup>4</sup>*Ibid.*

<sup>5</sup>English Chronicle.

<sup>6</sup>*Ibid.*

<sup>7</sup>*Adam. Bremen*, i c ii c. 29, 317.

<sup>8</sup>English Chronicle.

<sup>9</sup>Encomium Emmae Reginae, in Langebek, Script. Rer. Dan. ii, 176.

<sup>10</sup>English Chron.; Fagrskinna Saga i, c. 104; Olaf Trygvason Saga i, 89; Forn-manua Sögnr.

<sup>11</sup>*Adam. Brem.*, ii, c. 76; Encom. Emmae Reginae, 471; Chron. Saxon.

<sup>12</sup>*Worsaae: Zur Alterthumskunde des Nordens*, p. 91.

<sup>13</sup>It may be stated here that the (according to Polyb., i, 20, 9, 120, according to Orosius, iv, 7, 130) ships of Duilius and Scipio were built in sixty days, while (according to Polyb., i, 38, 5) only forty-five days were consumed in the construction of 220 ships for Hieron.

rather flat, slightly concave floor, and because of their moderate draft<sup>1</sup> they could venture into shallow water or easily land upon the shore.

The keel was generally of oak, and at its slightly upward bent ends the stem and stern posts were attached, and the connection strengthened by the insertion of a crooked timber. In the Nydam boat the connection is made by means of wooden pegs; in the Tune ship a close joint is made, while in the Gokstad ship a peculiar piece is inserted, bound to the keel by a scarfing and two rows of spikes.

In the Greek and Roman ships the ribs were seldom made of one piece, but were generally formed of three layers of timber securely bound together.<sup>2</sup>

The same process occurs in nearly all the northern ships that have become known to us. While in the Nydam boat the ribs which give the boat its shape are mostly in their natural crooked and irregularly bent shape, those of the Tune and Gokstad ships were built up of three different layers of wood, one above the other, joined together partly by wooden and partly by iron nails, the middle piece projecting. The same construction occurs in the beams, which rest on the top of the frames, where they are fastened to the overlying lower limbs of the knees and its continuation, and the ledge formed by the projection of the central piece is employed as support for the deck boards.

The ribs were not nailed to the keel, but lay loose above it, but various devices were adopted to keep them in their proper places. In the Greek and Roman ships they were fitted to the keel by notches cut in them, and were further held in place by the keelson, which, by means of notches cut in its under side, fits upon the ribs and prevents their lateral displacement. In the Gokstad ship this is in a measure effected by the fish-tail-shaped blocks which, straddling the frame timbers amidships across the 3 to 4, 6 to 12, 14 to 16 ribs, are held in place by the beams connecting them with the short ribs of the superstructure.

A further support is given to the ribs by the planking, which in the Greek and Roman ships was nailed to them, but in the Nydam, Tune, and Gokstad ships iron spikes were used only to nail the bottom plank to the keel and trenails to fix the top plank to the knees; the other planks, while riveted to each other, were tied to the frames through clamps left in the solid wood and corresponding holes in the ribs.

The Greek and Roman ships were additionally strengthened by supplemental external and internal planks at certain intervals, and internal perpendicular bolts. In the northern ships this is attained by double thickness allowed to certain strakes at points subjected to greater strain and by short frames or timbers going down from the gunwale of the Gokstad ship between each alternate pair of knees.

<sup>1</sup> *Lemaitre*: *Revue Archéol.*, p. 116; *Assmann*: *Seewesen*, p. 1616, 1626; also in *Berlin*, *Phil. Wochenschrift*, 1888, i. p. 28, estimate a greatest draft of 1.25 meters (4 feet).

<sup>2</sup> *Breusing*: *Nautik der Alten*, p. 33.

The rig was of simple nature, and although carrying one square sail, both mast and sail were taken down before battle or in making port.<sup>1</sup>

The Homeric ship carried one mast of fir, the foot of which, resting in a square hole in planks fastened upon the keel, found support in a frame formed of stout planks. In order to facilitate the lowering of the mast without unshipping it, the mast frame was open aft and extended to the sail thwart, a beam connecting the heads of a pair of ribs about amidships into which a semicircular excavation had been cut which afforded the mast support against the wind pressure.

In the northern ships the mast rests in oaken beams laid amidships along the keel and slotted to admit the frames; over this another oaken block cut to admit the beams. This block is clamped from the middle to each end and formed like a fish-tail. It is further fixed to the beams by knees of crooked timber heads and has a long opening in the back part to facilitate the lowering of the mast.

In consequence of their build and simple rigging the ships of antiquity are said to have resembled modern river ships rather than sea-going vessels,<sup>2</sup> and their main strength consisted in the rowing by which, independent of favorable wind, they were enabled to hurl themselves upon the enemy.<sup>3</sup> Consequently, the greater part of the ship was occupied by rowers with little accommodation for the crew.<sup>4</sup> Frequent landings, however, were made for the preparation of the meals<sup>5</sup> and for the night. According to the number of oars on each side the vessels were classed, and fifteen and twenty-five seaters appear to have been predominating in the southern seas in the sixth century B. C., while among the Scandinavians the sixteen and twenty seaters appear to have taken a prominent part as regular war ships.

In order not to disturb the lowering of the mast into the longitudinal space left for the purpose, the rowers' benches could not be placed across the entire ship, and they must be thought as loose boards or small seats extending along the inner board wall, in which case they were connected at one end to the board wall, and with the other end resting upon supports formed by longitudinal beams which, amidships, reached along the entire length of the ship.

In the Nydam boat—without mast—the thwarts were placed across the entire ship at the height of the frame heads, and at that height they may have served as seats for the rowers. In the Gokstad ship the beams rested upon the tenth strake—that is, about 30 inches above

<sup>1</sup>*v. Henk*: Die Kriegsführung zur See, p. 22; Werner: Besprechung von Brunn's Axoros, in Göttingen gel. Anzeig., 1882, p. 237; Breusing: Nautik der Alten, p. 71.

<sup>2</sup>*Graser*: Philol., XXXI, p. 35.

<sup>3</sup>*Lemaitre*: Revue Archéol., 1883, I, p. 142.

<sup>4</sup>*Xenoph*: Oekonom., VIII, 5.

<sup>5</sup>*v. Henk*: Die Kriegsführung zur See, p. 23; *Cartault*: La trière Athén., p. 241; *Lemaitre*: Revue Archéol., p. 144; *Assmann*: Seewesen, p. 1626; *Thukyd.*, IV, 26; VIII, 26, 101; *Xenoph.*: Hell., I, 6, 26; II, 1, 27; Eyrbyggja Saga, c. xxxix; Bergens Bylov, IX, 16.

the rowports—hence the rowing could not have been performed in standing but in a sitting position, and, although seats were not found in the ship, the very expression “sess,” as designation of the class of vessels as resultant of the number of oars, indicates that the rowing must have been performed on seats, and that, consequently, thwarts must have existed.

In the Gokstad ship three stanchions appear in the central line, each stanchion being topped off with a cross-beam in which are two semi-circular depressions. The middle stanchion is borne by a tripod spike fastened to the mast block; the other two rest on a square step in the bottom, after having passed through an aperture in the little fish-tail-shaped blocks between the beams, so that the stanchions could be removed at pleasure. The exact purpose of these stanchions has thus far been but very unsatisfactorily explained. It is known that a tent was spread over the ship, and these three stanchions have been thought to have been a support for the beams that served as a ridge. Nicolaysen,<sup>1</sup> however, says: “It may be a matter of doubt, and indeed seems hardly probable, that the three stanchions, and especially their cross-arm, had served as supports for the tilt’s ridge, and it may be proper to add that before setting up the tilt the mast had to be lowered.”

In my opinion, the exact meaning of the lowering of the mast does not imply its being unshipped and laid across the stanchions, since the mast alone, representing from 2,000 to 5,000 pounds in weight, would, for its lifting out of the socket and placing it upon the height of the stanchions, require greater force and more expeditious action, considering the occasion of its lowering, than could be expected of the limited crew represented in the ship, which did not carry one superfluous hand.

A significant fact presents itself to my view in the height of the depressions in the cross-beams of the three stanchions, which are on a level with the neck of the stem and sternposts, the place at which, in the ancient Greek and Roman ships, a braided ring<sup>2</sup> was applied, through which the double hypozome cable, intended to prevent the breaking of the ship’s back in transversely passing over the waves, were passed, and which were run over crutch-like supports along the central line of the ship. It is therefore, in my opinion, not impossible that the stanchions may have served the purpose indicated additional to crutch-like temporary supports, the material for which may be represented in the numerous round sticks<sup>3</sup> found in various places of the

<sup>1</sup> Nicolaysen: Langskibet fra Gokstad, p. 58.

<sup>2</sup> Baumeister: Denkmäler d. Klass. Alterth., III, p. 1604, Fig. 1671; Jahrb. d. K. D. Arch. Instit., 1889, 2 Heft, p. 100, Fig. 8.

<sup>3</sup> In his enumeration of the articles found with the Gokstad ship, Mr. Nicolaysen (Langskibet fra Gokstad, p. 37) describes some implements whose application does not appear to have been satisfactorily determined; among them are:

(a) Two large rough spars of fir resting on the cross-arms of the crutches or stanchions. (*Ibid.*, p. 37*b* and Pl. iv, Figs. 13, 14.)

(b) A round timber stock of pine, in standing position, having at one of its ends a perforated clamp. (*Ibid.*, p. 38*f* and Pl. iv, Fig. 11.)

Nydam, Tune, and Gokstad ships, and to which thus far no use has been assigned, although it has been suggested that they may have served as lateral supports of the mast, a mistake into which the investigators of the ancient Greek and Roman naval structures had also fallen until their application was practically illustrated.<sup>1</sup>

The most dangerous weapon of the ancient Greek and Roman ship was the spur which, in early times located below the water, appears to have been an invention of the Phœnicians, who used it in 700 B. C. The Greek located it above the water line.<sup>2</sup> Above the spur was a short ram,<sup>3</sup> representing the head of an animal, which prevented the spur from penetrating too deeply into the opposing vessel.

In Northern naval architecture, saga refers to a ship which was provided with a beard consisting of iron spikes applied to the prow;<sup>4</sup> one specimen only, however, has survived in the fir boat found at Nydam (Plate LXXV), in which a prolongation of the keel in either direction, at its juncture with the stem and sternposts, appears to have been fitted up as a spur and probably mounted with iron or bronze, although, owing to its long immersion in the morass of Nydam, all traces of the metal mounting have disappeared.

One of the most difficult problems in the discussion of Northern naval architecture is that of dimensions, there being but two instances in which the sagas give an account of the length; one of them is in the *Ormen-hin-Lange* (the *Long Serpent*), which is described as having carried thirty-four pairs of oars<sup>5</sup> by a length of keel of 116 feet, and the

(e) Six thin spars of pine or fir. The longest 7.2 meters, the second 5.30 meters in length, most likely not entire in any part, slightly thinned toward one end, but strongly at the opposite end; the third spar 4.27 meters long, with a like thinning, and at the other end hewn square; the fourth, having a round hole at each end; the fifth, 3.74 meters long, imperfect at one end, where it is hewn aslant, and having at the other end a hole; and, finally, the sixth, 3.20 meters long; its thickness entire at one end, and near that provided with a hole; round on the side toward the spar's upper end, but in the side toward the opposite end eight-lined. (*Ibid.*, p. 39e and Pl. iv, Fig. 12.)

(d) In the middle of the ship, and about 30 centimeters above its sides, a spar of fir broken toward the thicker end, and that was lying close to the wall of the sepulchral chamber and regularly tapered toward its other end. It probably first rested in the cross beams of the structure farthest aft, and at a later time it had been crushed downward together with the stanchion, and broken by the pressure of the overlying earth. (*Ibid.*, p. 44a and Pl. iv, Fig. 15.)

(e) Two slender poles of pine wood standing beside each other on the aft cross-piece of the sepulchral chamber against its wall; one of the spars cut straight at end, fitted with an iron spike, and evenly tapered toward its sharp end; the other from the middle, regularly tapered toward both ends, one of which is sharply pointed, whereas the other is broadened to a knob. Both of them were at the time of the exhumation well preserved and straight. (*Ibid.*, p. 44b and Pl. iv, Fig. 16; Pl. viii, Figs. 15, 15b.)

<sup>1</sup> *Lucbeck Emil*: Das Seewesen der Griechen und Römer, p. 52.

<sup>2</sup> *Assmann*: Seewesen, p. 1613.

<sup>3</sup> *Montfaucon*: L'Antiquité Appliquée, iv, p. 214, Pl. 134.

<sup>4</sup> *Svarfdvala*: c. iv.

<sup>5</sup> *Torfåns*: Hist. rer. Norvegiæ, c. xxxiii; *Jal*: Archéol. Nav., 1, 132; *Du Sein*; *Hjst*, d. l. marine, 1, 43.

long ship of Knut the Great, which, by a length of 300 feet, carried sixty pairs of oars.

The account of the *Long Serpent* is considered as somewhat exaggerated and it is classed among the thirty-seaters, but a little lower and narrower, and having a crew of about 300 men.<sup>1</sup>

An approximation may be had from the number of rowers' benches, the intervening spaces or divisions (*rúm*), and the specified number of men stationed therein. Reference to the longitudinal divisions (*rúms*) is made as follows:

Rand the Strong's *Dragon* had thirty *rúm*.<sup>2</sup>

Olaf Trygvason's *Trane* had thirty *rúm*.<sup>3</sup>

*Long Serpent* was 116 feet long; it had eight men in each half *rúm*.<sup>4</sup>

Aasbjorn Selsbane, of Trondhjem, had a snekka of twenty *rúm* that carried 99 men.<sup>5</sup>

Knut the Great's long ship had sixty pair of oars and was 300 feet long.

Harald of Hjåtø ship in the battle of Helgeaa had twenty *rúms*.<sup>6</sup>

King Eystein built a ship in size and shape like the Long Serpent.<sup>7</sup>

King Harald Hardradi's ship was as long as the Great Serpent and had thirty-five *rúm*.<sup>8</sup>

King Sverre's ship *Hárkuífrin* had twenty-three *rúm*.

The *Mariasuðen* had thirty-two *rúm*.

The *Oguarbrand* had thirty *rúm*.<sup>9</sup>

Vidkunn Erlingsson's *Gullbringu* had twenty divisions.<sup>10</sup>

Erling Skjálgsson had a skeid which had sixty-four oars and carried two hundred and forty men.<sup>11</sup>

In the *Diere*, built by Erling Steinvæg, each half *rúm* had eight men.<sup>12</sup>

Thorliof gave his son Eirik a skuta with fifteen seats.<sup>13</sup>

Duke Skule's ship, *Good Friday*, had thirty-six *rúm*.<sup>14</sup>

Erling Skjálgsson had a twenty-seated snekkja.<sup>15</sup>

<sup>1</sup> *Tuxen, N. E.*: De nordiske Langskibe, p. 128.

<sup>2</sup> Olaf Trygvason Saga, c. 88; Magnus the Good saga, c. 20.

<sup>3</sup> *Ibid*, c. 79.

<sup>4</sup> *Ibid*, c. 6; Munch, P. A.: Det norske Folks Historie, 1, Bd. 2, p. 361.

<sup>5</sup> Heimskringla, 355; St. Olaf saga, c. xxiv.

<sup>6</sup> Heimskringla (ed. Unger, pp. 402, 428).

<sup>7</sup> Sigurd the Crusader Saga (Heimskringla text), xxvi.

<sup>8</sup> Harald Hardradi Saga, c. 61.

<sup>9</sup> Konungssögur, pp. 66, 77, 165.

<sup>10</sup> Flateyrbok ii, 600.

<sup>11</sup> Olaf Trygvason Saga, c. 105; St. Olaf Saga, c. 184; Heimskringla (ed. Unger), pp. 231, 414.

<sup>12</sup> Konungssögur (ed. Unger), p. 223.

<sup>13</sup> Olaf Trygvason Saga, c. 20.

<sup>14</sup> Flateyrbok ii, 121.

<sup>15</sup> Magnus Erlingsson Saga, c. 25; Olaf Trygvason Saga, c. 102; St. Olaf Saga, c. 60, 150.

Erling Skjálgrsson had a fifteen-seated skúta.<sup>1</sup>

Eindrid the Young had a snekkja of twenty rúm.<sup>2</sup>

King Haakon's ship *Dragon* had twenty-five rúm.<sup>3</sup>

King Haakon's dragon *Mariusnøen* had thirty half rúm.<sup>4</sup>

King Haakon in his expedition to Scotland used a dragon of twenty-seven rúm.<sup>5</sup>

Bishop Haakon of Bergen ship had forty-five rúm.<sup>6</sup>

The smallest number of men stationed in a half rúm appear to have been two;<sup>7</sup> when three were employed, one was for rowing, the second to protect the rower, and the third to fight.<sup>8</sup> When extraordinary speed was required four men were placed at each oar,<sup>9</sup> while the largest number of occupants of a half rúm is given at eight men.<sup>10</sup>

It is evident that with an increase of occupants of each rúm or half rúm a corresponding increase had to be made in the dimensions, as shown in the Long Serpent, which, with thirty-four rúms, had a length of keel of 116 feet, while the ship of Knut the Great, with less than double the number of oars, measured 300 feet in length.

The vessels had five compartments, of which two were in the stern, namely, the lofting (*lypting*), in which the commander had his berth, and the foreroom (*fýrri-rúm*), which was occupied by those next in rank, and which also served as storage place for the great armor chest;<sup>11</sup> two were in the stem, namely, the *hals*, *stafnlok* or *lokit*, in which the stem-defenders who bore the standard were quartered,<sup>12</sup> and aft of this the *sax*. The central part of the ship, around the mast, occupied by the rowers, was called *krapparúm*. With an increase in the number and size of the oars employed, and in the entire crew, additional accommodations had to be provided both for quarters and for the more successful plying of the oars, which, by an increased size demanded increased internal leverage. While thus in a sixteen-seater, with a crew of about seventy men (allowing two men for each half division<sup>13</sup>), the stem and stern compartments occupied about 30 to 32

<sup>1</sup> Magnus Erlingssons Saga, c. 25; Olaf Trygvason Saga, c. 102; St. Olaf Saga, c. 60, 150.

<sup>2</sup> Heimskringla (ed. Unger, cit. by Nicolaysen) p. 784.

<sup>3</sup> Flateyrbok III, 166.

<sup>4</sup> Ibid., 196, 197.

<sup>5</sup> Konungssögur (ed. Unger, cit. by Nicolaysen) p. 464.

<sup>6</sup> D. Norv VIII, No. 119.

<sup>7</sup> Flateyrbok I, 396; III, 41; Egils Saga, c. 58.

<sup>8</sup> Hakon Herdibreid Saga, c. 6; St. Olaf Saga, c. 48.

<sup>9</sup> Konungssögur (ed. Unger cit., by Nicolaysen) pp. 60, 465.

<sup>10</sup> Olaf Trygvason Saga; Munch, P, A; Det norske Folks Historie, I, Bd. 2, p. 371.

<sup>11</sup> Heimskringla, p. 709.

<sup>12</sup> Ibid., p. 53; Egils Saga, c. 37.

<sup>13</sup> One for rowing, one for protection, one for fighting, according to Hakon Herdibreid Saga, c. 6; St. Olaf Saga, c. 48.

feet, leaving 48 feet in all, or 3 feet for each room longitudinally, the five-fold accommodations had to be provided for the crew of Knut the Great's ship,<sup>1</sup> in which eight men were stationed in each half division. Applying, then, a uniform scale throughout, each division should have occupied at least  $4\frac{1}{2}$  feet longitudinal space against 3 feet as in the sixteen-seater. Unsatisfactory and uncertain as this method may be, in the absence of other data it affords the only means of approximately computing the length of the ships.

The determination of width is still more difficult, there being in the sagas but one instance in which it is stated that a ship of thirty-two oars on each side (probably the *Mariasæe* owned by King Sverre) for its passage required a channel of 7.53 meters (25 feet, 10 inches) to be cut through the ice.

A scale might be had in the length of oars, which for most effective rowing require an internal leverage of 1 against 2 to 3 external leverage. An oar of 18 feet, therefore, would require for its handling at least 6 feet internal space, or 12 feet for the two corresponding oars, and at least 5 feet should be added for the longitudinal central shaft in which the mast is to be raised and lowered, thus giving a width of ship of 17 feet for an 18-foot oar. (It may here be stated that in the Gokstad ship, fully described elsewhere, oars were found of 16 and  $18\frac{1}{2}$  feet in length, while the width of the ship is 16 feet and 10 inches.)

For the determination of height but one insufficient account exists additional to the known ships, this being in the ship built by Ealing Steinvaeg, Rider the Messenger, and Earl Philippus of Tunberg, in 1206, which was so high that "a man must be one of the tallest who, standing on the frames, could with his broadax touch the ceiling of the flooring."<sup>2</sup> The *Korsuðen* being built by Gunner in 1253, at Ravnholt in Bohuslen, was 4.23 meters (14 feet) above the water line,<sup>3</sup> and Bishop Haakon of Bergen, ship built in 1339 was 1.88 meters ( $6\frac{1}{4}$  feet) high.<sup>4</sup>

As explained in the preceding, actual finds have shown the longitudinal distance between the oars to have been 3 feet for the smaller vessels, gradually increasing to  $4\frac{1}{2}$  feet for the largest vessel, of which the saga has given an account; allowing them a constant of 16 feet for each, the stem and stern cabins, we are enabled to give an approximation of the length of the various classes of vessels.

The 13-seater would thus have a length of 71 feet; 15-seater, 77 feet;<sup>5</sup> 16-seater, 80 feet;<sup>6</sup> 20-seater, 92 feet; 22-seater, 98 feet; 23-seater, 101 feet; 25-seater, 119 feet; 27-seater, 126 feet; 30-seater, 137 feet;<sup>7</sup>

<sup>1</sup> Konungsögur (ed. Unger, cited by Nicolaysen, Langskibet fra Gokstad, p. 186).

<sup>2</sup> Konungs sögur (ed Unger, cit. by Nicolaysen) p. 223.

<sup>3</sup> *Ibid.*, p. 425, 426.

<sup>4</sup> D. Norv. VIII, No. 119.

<sup>5</sup> Actual length of Nydam boat, which is a 15-seater.

<sup>6</sup> Actual length of 16-seater Gokstad ship.

<sup>7</sup> Computed by N. E. Tuxen: De Nordiske Langskibet at 160.

32-seater, 152 feet;<sup>1</sup> 34-seater, 159 feet; 36-seater, 167 feet; 45-seater, 212 feet; 60-seater, 302 feet;<sup>2</sup> 64-seater, 318 feet.

The following table is a résumé of the length of the ships discussed in the preceding pages:

Locality.	Discovered and described by—	Year.	Length.
			<i>Feet</i>
Botley, England.....	Brock.....	1875	130.00
Gokstad, Norway.....	Nicolaysen.....	1880	80.00
Nydam, Denmark.....	Engelhardt.....	1863	77.50
Tune, Norway.....	Rygh.....	1867	73.33
Storhaugen, Bergen, Norway.....	Lorange.....	1887	*66.66
Brösen, Danzig, Germany.....	.....	1874	57.00
Vold, Borre, Norway.....	Nicolaysen.....	1852	53.33
Snape, England.....	Davidson.....	1862	48.00
Nydam, Denmark, ship's boat.....	Engelhardt.....	1863	55.00
Vendel, Upland, boat I.....	Stolpe.....	1881	34.66
Vendel, Upland, boat IX.....	do.....	1882	31.70
Vendel, Upland, boat X.....	do.....	1882	31.17
Véndel, Upland, boat XI.....	do.....	1882	30.66
Vendel, Upland, boat VII.....	do.....	1882	29.67
Gokstad, Norway, ship's boat.....	Nicolaysen.....	1880	25.66
Gloppen, Bergen.....	Gustafson.....	1890	28.33
Vendel, Upland, boat IV.....	Stolpe.....	1882	26.66
Snotra Trondhjem.....	Undset.....	1874	25.00
Vendel, Upland, boat III.....	Stolpe.....	1882	24.66
Vendel, Upland, boat II.....	do.....	1882	23.66
Snotra Trondhjem.....	Undset.....	1874	23.00
Valneset Trondhjem.....	do.....	1873	21.67
Vendel, Upland, boat VI.....	Stolpe.....	1882	21.67
Gokstad, ship's boat.....	Nicolaysen.....	1880	18.23
Kvelds, Norway.....	do.....	1884	20.00
Nalum, Norway.....	do.....	1887	19.00
Gokstad, ship's boat.....	do.....	1880	13.66

\* Keel.

#### WITHOUT IDENTIFICATION.

Lackalånga, Sweden.....	Bruzelius.....	1856	.....
Mokkebyst, Norway.....	Lorange.....	1887	.....
Ultuna, Upland.....	Nicolaysen.....	1855	.....
Thov, Nordland.....	Rygh.....	1853	.....

In considering the subject of ancient shipbuilding absolute dependence should not be placed in the accounts handed down in the sagas, which were often considerably overdrawn in an attempt to bestow praise upon the originator, or, if even correctly conceived, by transmission experienced modifications which finally were incorporated in the written records made at a much later period, and which formed the

<sup>1</sup>Long Serpent, according to saga account, was 160 feet in length.

<sup>2</sup>Knut the Great's ship is said to have measured 300 feet in length.

only sources of information until, within recent years, comparisons have become possible by the finding of ancient ships in a more or less perfect state of preservation. The knowledge gained from these structures has been employed by the late N. E. Tuxen,<sup>1</sup> director of the dockyard

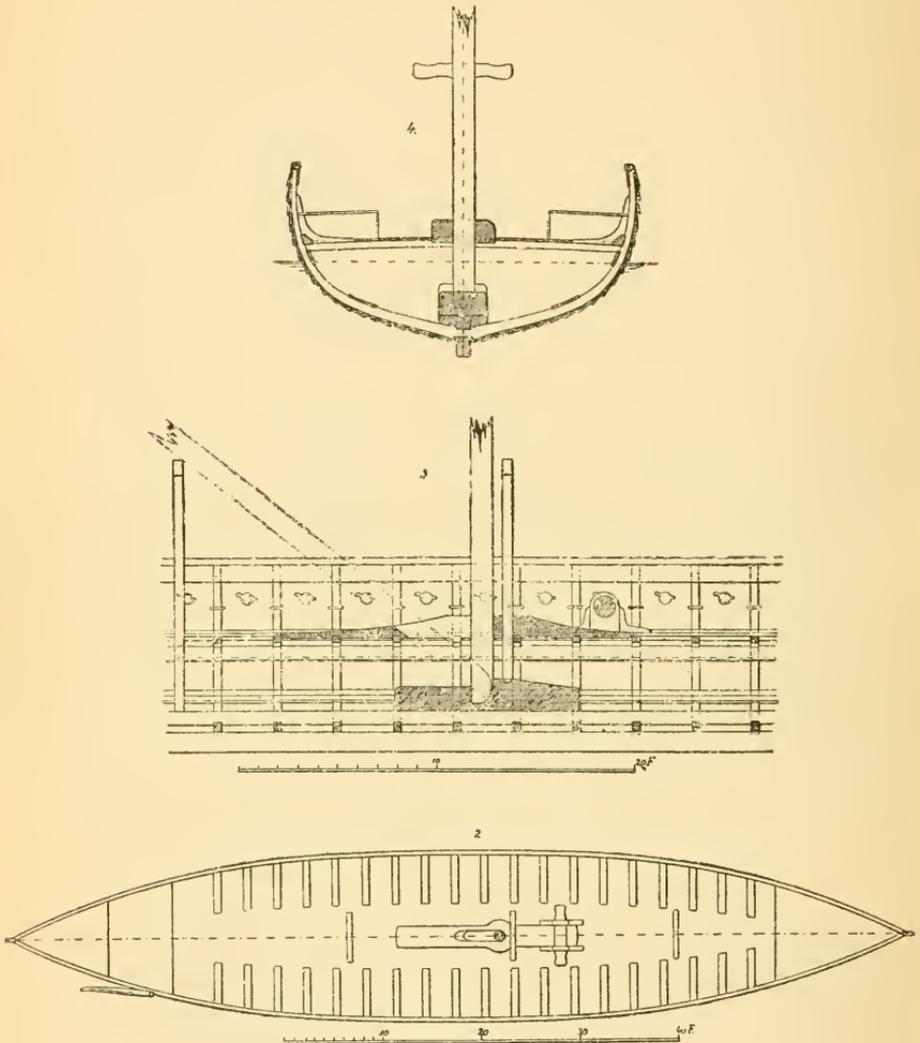


Fig. 150.

PLAN OF A PROJECTED "TWENTY-SEATER."  
(Copied from N. E. Tuxen. "De nordiske Langskibe.")

at Copenhagen, Denmark, in preparing construction plans of two vessels of capacity often mentioned in the sagas. His résumé is appended in tabular form.

In order to obtain good lines and stability, the question of displace-

<sup>1</sup> Tuxen, N. E.: De nordiske Langskibe. In Aarb, f, nord. Oldk, og Hist. Copenhagen, 1886.

ment should be the first to be found, and this is obtained by computing the weight of the ship, together with all the material, crew, equipment, etc. In the present instance it is a 20-seater, that is a ship carrying twenty oars on each side, that engages our attention.

The dimensions of a 20-seater (Fig. 150) should be as follows: Length of keel,  $71\frac{1}{2}$  feet, with a curve of 6 inches; length between stems, 90 feet; width amidship, 17 feet; perpendicular height amidships, 8 feet, curving toward the prows, which are elevated several feet above the gunwale.

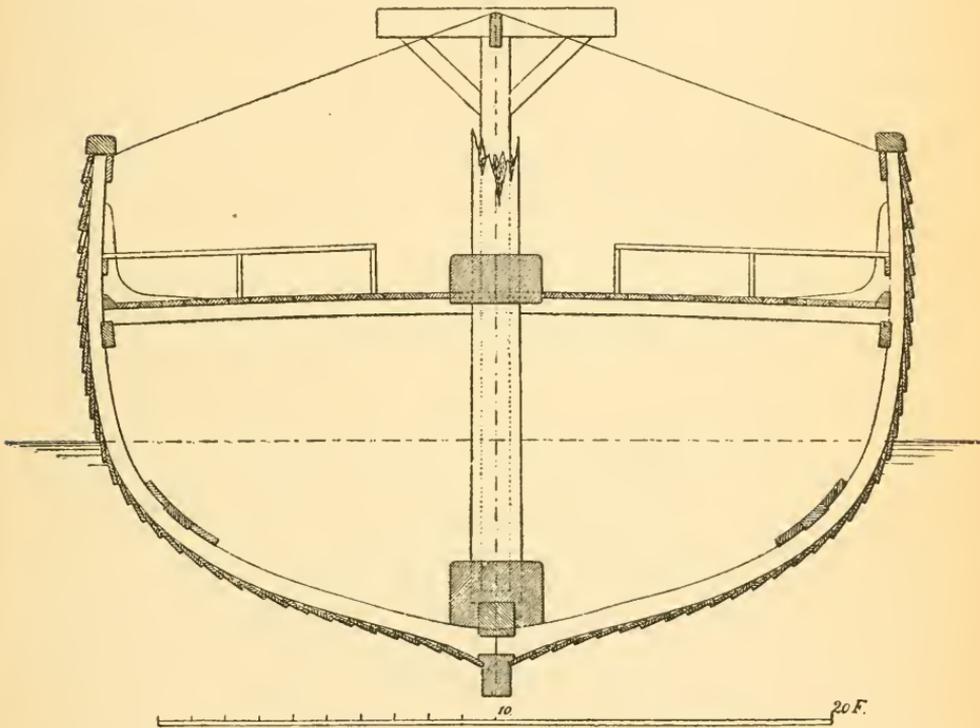


Fig. 151.

PLAN OF A PROJECTED "THIRTY-SEATER."

(Copied from N. E. Tuxen, "De nordiske Langskibe.")

The material employed to be oak or spruce with strong, stout ribs, keelson and gunwale; the planking  $1\frac{1}{4}$  inches thick, fastened to the timbers with iron rivets. The deck in the hold 2 feet below the water line and 4 feet above the keel to be covered with boards  $1\frac{1}{2}$  inches thick, and represents an area 900 square feet. Upon it and resting against the ship's side are benches 5 feet long amidships, and decreasing toward the stems and from these the oars, twenty on each side, are plied through holes placed 3 feet above the water and 3 feet apart.

The seats are separated longitudinally by an opening 7 feet wide for the raising and lowering of the mast which by a height of  $61\frac{1}{2}$  feet and a weight of 2,000 pounds carried a sail that represented a surface of 1,400 square feet.

The forecastle room is 12 feet long, 10 wide, and  $6\frac{1}{2}$  feet high, and the cabin in the stern 15 feet long by  $11\frac{1}{2}$  feet high.

A crew of ninety men required for the ship together with accouterments and provisions for about four to six weeks weighs 24 tons.

The entire weight of the ship inclusive of crew and equipment is computed at 66 tons. The corresponding displacement is obtained by length of water line of 82 feet by 16 feet in width and a draft of  $4\frac{3}{4}$  feet in the middle.

The 30-seater (Fig. 151) is constructed on the same general plans as the 20-seater, but is built stronger and having between each pair of ribs a short rib reaching to the water line.

The length of the ship is 120 feet keel with a curvature of 12 inches; length of hold 107 feet; between stems 160 feet; width  $23\frac{1}{2}$  feet, and depth amidships 9 feet, the gunwale curving 5 per cent bring the stems about 17 feet above water. The forward cabin is about 11 feet above the water, 22 feet long and 15 feet wide, while the stern cabin is 26 feet in length.

The deck, representing 2,000 square feet, is 4 feet above the water, and upon it are thirty seats upon each side, the twenty in the middle being 8 feet and the stem and stern banks only 5 feet wide, with an interval of  $3\frac{1}{2}$  feet between the oars which are plied through holes 6 feet above the water.

The central longitudinal space between the seats is 7 feet in width; the mast has a height of 80 feet weighing between 4,000 and 5,000 pounds and carries a sail representing a surface of 2,550 square feet.

The crew is estimated at two hundred and sixty men, which, with their accouterments and provisions, will weigh 118.3 tons; the weight of the ship, built of spruce, together with its equipment, is 153 tons; its water line is 144 feet in length by 23 feet in width and  $7\frac{1}{2}$  feet draft, representing a displacement of 271.3 tons.

The *Long Serpent*, according to Saga account, was a thirty-four-seater, and had a length of 74 ells. The ell, according to authority, is  $1\frac{1}{2}$  English feet; hence, length of ship is 111 feet. In a ship of that length the extreme breadth is computed at 22 feet, with a depth of  $13\frac{1}{2}$  feet, and a displacement of 296 tons.

The following table represents the results obtained by Mr. Tuxen<sup>1</sup> in computing and preparing construction plans for a twenty and a thirty-seater:

<sup>1</sup> Tuxen, N. E.: De nordiske Langskibe. In Aarb. f. nord. Oldk. og Hist. Kjöbenhavn, 1886.

Table showing dimensions and results of computation for projected vessels.

Specified details.	Twenty-seater.	Thirty-seater.
Length between stems.....	90 0'	160' 0"
Length of keel.....	71 6'	120' 0"
Width above gunwale amidships.....	17 0'	23 6"
Perpendicular depth from gunwale to keel.....	9 0"	15 6"
Draft at middle of keel.....	4 9'	7 6"
Draft at ends of keel.....	4 3"	6 6"
Gunwale above water amidships.....	5 0"	9' 0"
Gunwale above water at stern.....	9 0'	17 0'
Length of uppermost water line.....	82' 0"	144 0'
Width of uppermost water line.....	16 0'	23 0'
Area of uppermost water line.....square feet..	920	2,314
Area of middle rib.....do.....	42.7	101.3
Displacement in cubic feet.....cubic feet..	2,085	8,614
Displacement center before the middle.....tons..	65.7	271.3
Metacenter above uppermost water line.....	5.405	6.204
Center of gravity of system above water line.....	1.941	2.493
Metacenter above center of gravity.....	3.464	3.711
Entire height of mast.....	61 6'	80' 0"
Length of yard.....	36' 0'	49 0"
Area of sail.....square feet..	1,400	2,550
Center of sail above center of pressure.....	38 875"	44 750"
Stiffness moment: sail moment.....	9 579"	17 650"
Deck above uppermost water line.....	1' 0"	4 0"
Length of hold (kraproom).....	61 0"	107' 0"
Number of oars at each side.....	20	30
Distance between oars.....	3' 0"	3' 6"
Middle oar above surface of water.....	3' 0"	6 0"
Length of middle oar.....	18' 0"	30' 0"
Crew in hold (kraproom).....	80	220
Entire crew.....	90	206
Weight of crew, weapons, provisions, etc.....tons..	24.0	118.3
Weight of ship and equipment.....do.....	41.7	153

These proportions are fully represented in the Gokstad ship, which so beautifully illustrates the art of shipbuilding in the north, and of which Mr. Nicolaysen on page 17 of his description of the northern Longship from Gokstad justly and proudly says:

"That there may yet be found in many parts of our country, near the coast, tumuli containing ships in tolerable preservation is by no means uncertain. . . . Certain, nevertheless, it is that we shall not discover any craft which, in respect of model and workmanship, will out- rival that of Gokstad. For, in the opinion of experts, this must be termed the masterpiece of its kind, not to be surpassed by aught which the shipbuilding craft of the present age could produce. Doubtless, in the ratio of our present idea, this is rather a boat than a ship; nevertheless, in its symmetrical proportions and the eminent beauty of its lines is exhibited a perfection never since attained until, after a much later but long and dreary period of clumsy unshapeliness, it was once more revived in the clipper-built craft of our own country."