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Building a copy of the Gokstad Faering

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This is the story of the building of a replica Viking craft. Being only 22 ft (6·7 m) long and having 4 ft 6 in (1·37 m) beam, the Gokstad faering does not conform to our usual image of a Viking boat. However, the smaller craft shows all the construction details found in the larger ships. A close examination can help us to see some of the principles the Vikings applied to their boatbuilding.

Key words: Gokstad faering; replica; boatbuilding.

The original faering was excavated in 1880, together with two small boats and the large Gokstad ship of 80 ft (24·7 m) l.o.a. Dated to about 880 AD, the faering was built for two oarsmen and one helmsman. Her modern day home is the Viking Ships Museum in Oslo. Following a long period of research, the author prepared to build a replica of the Gokstad faering in the winter of 1994, using green timber and tools similar to those used by the Vikings. The master to the apprentice was to be the original Viking shipwright, the relationship merely inconvenienced by the delay of a thousand years or so.

Before building, lines drawings were obtained from Arne Emil Christensen of the Viking Ships Museum in Oslo. The Viking Ship Museum of Roskilde was visited and, with the help of Eric Andersen, some of their replica boatbuilding practices were studied. Similarly, a monograph published by the National Maritime Museum, Greenwich (McGrail, 1974), gave a detailed account of how Harold Kimber, a traditional boatbuilder, constructed a copy of the Gokstad faering. Although the methods and materials used to build the Greenwich faering varied in some details from Viking, clear analysis and photographs meant that it was possible to contemplate building a replica without having the opportunity to visit the original in Norway.

A familiar section of the Bayeux tapestry points towards the use of axes, particularly a felling axe and a small handled axe. One shipwright appears to be using an auger and spoon bit. Notably, there appear to be no large adzes, and, in particular, no saws (MacLagan, 1943: figs 37, 38). Similarly, a find from Mästermyr (Arwidsson & Berg, 1983) produced only one small saw, resembling a keyhole saw (McGrail, 1980). Clearly all wood was split using axes and wedges.

It is often said that traditional boatbuilders built by eye or from memory. To some extent this is misleading. It might be more accurate to say they built from the last boat, copying and altering where necessary: 'build me a boat like the one you built for Ola last year, but two feet longer and with rather more beam aft' (Christensen, 1972: 237). As the original faering was hundreds of miles away, two scale models were made from the lines drawings (Fig. 1). Subsequently, the new boat was lofted full size on chipboard. From these lines patterns were cut for the various parts of the hull.

Laying the keel

Good, straight-grained, green oak was obtained. The timber for the keel, for example, was an 18 ft (5·5 m) log that was straight-grained and knot-free with a slight bow matching the rocker. The boat was built in a long garden shed during evenings, holidays and weekends, a much longer process than the time taken by the full-time Viking shipwrights. It was therefore necessary to devise a way to keep the oak fresh and to prevent drying out. Large ditches were dug, lined with polythene sheeting and filled with water. The oak was stored in these tanks until needed.

Once the shape of the keel had been determined, it was time to work the oak trunk with an axe. The

Figure. 1. Applying the tar mix to the keel and stempost. This is an early experimental model, built to work out the constructi details of the stem post. (Photo: Clare Seal.)

upper surface was shaped first. The short-handled axe was most useful for this process. Working green oak on a spring evening is one of life's pleasures. The axe keeps its edge and quickly removes soft chips; it really is not hard work. To stop any drying-out the wood was treated with a mixture of equal parts of Stockholm tar, linseed oil and turpentine. This became a necessary finish. Some timbers were treated with as many as eight or nine coats of the tar mixture (Fig. 1).

The oak for the keel was twice the desired width, so the log had to be cut along its entire length. Using only Viking-style tools, it was decided to split the log. A line was carefully marked along the grain and wedges were driven in slowly. It was a delicate business. At one point the split started to move perilously close to the marking. To combat this, holes were bored with a brace and bit and a small keyhole saw was used to saw back across the grain to direct the split on to a new track furth away from the marking. Could this have been way in which the small saw from the Mästerm find was used?

Using axes and chisels, the keel was work down to a T or Y section along its length with changing bevel. The top surface of the keel w slightly hollowed with a round-soled plane. On complete and covered with the tar mix the keel w mounted on a strongback, a wooden beam su ported above the ground on stands (Fig. 2). Thr moulds were made to the lines drawings a notched in above the keel at the centre and ha way between the centre and the stem and ste posts. It is unlikely that the Vikings would ha used such moulds and they are certainly counter Scandinavian boat building tradition (McGra 1974: 44). It is possible that spalls of wood woul have been wedged in place from the overhead bea

Figure. 2. The inside of the shed, with the keel on its strongback. (Photo: Clare Seal.)

and used to push the strakes out to the desired shape.

Stem and stern posts

The stem and stern posts are the structures that make the Viking boat unique. Conventionally, a wooden boat has a stempost into which the planks are rebated. However the Viking stem is an altogether different shape. It has 'wings', which come out from the stem to meet the strakes, which are then scarfed to them. Why the Vikings developed this method of construction is a matter for debate. Earlier Saxon ships, such as Graveney and Sutton Hoo, did not go in for this elaboration. It could be argued that the stem- and sternposts make the boat stronger, providing a stronger fixing for the strakes. One of the most interesting theories is put forward by Crumlin-Pedersen (1986), who suggests that the stem and stern posts were crafted by specialists and, as such, they dictated the design pattern or plans for the rest of the boat.

The stem and stern posts were sculpted from baulks of oak 4 ft 6 in by 18 in by 12 in (1·37 m × 0·46 m × 0·3 m), which had to be returned to the water tank at the end of each work session. The profile was chalked and roughed out with a short, two-handed axe. The centre of the stem was hollowed out with a gouge and mallet, while the outer side of the stem was eventually

finished with the round-soled plane. The joint between the keel and the stem is a simple scarf, payed with tar and fastened with two nails clenched over roves.

Garboard strakes and sheer strakes

Green timber was used for the planks and strakes. The Viking shipwright would have split an oak trunk radially, first in half along its length, then in half again, and so on like segments of a cake, ending up with thin wedges which could be worked down with a broad axe to form thin boards. In the case of the faering these boards are just under 0·5 in (12 mm) thick. The faering is characterised by its three broad strakes on either side. The garboard is 15 in or so (38 cm) at its widest. Therefore the width of the trunk would need to be twice this, and allowing for sapwood this would require a trunk of some 3 ft (0·9 m) in diameter. For a privately-funded project such an extremely large oak was not practical, and so one-inch green oak sawn boards were used. These were worked down using a bowl adze across the grain and finished with a round-soled and a smoothing-plane. The garboards are made from two planks scarfed approximately amidships. The scarfs were joined with small copper nails and luted with sheep's wool and Stockholm tar.

The garboards are fitted to the underside of the T section of the keel and scarfed to either end of the stem and stern wings. Thus, in order to get a watertight fit, it was necessary to remove and re-fit each board anything up to ten times. During fittings they were held in place with home-made wooden clamps with a long 18 in (46 cm) reach, tightened by driving a wedge of wood in from the top. The garboards have a tremendous twist from amidships to stem and stern. However, because they are made from green timber, it was possible to coax the boards around without steaming. This had to be done over a number of days. Each day the board being wedged in a little further until it reached the required shape.

Each garboard has a shallow groove, a luting cove, along the length of its lower edge, where it would overlap the T section of the keel, into which was placed a luting of sheep's wool and Stockholm tar. The wool was spun on a distaff and, for the clumsy-handed boatbuilder, proved to be one of the most difficult tasks of the whole project. The thread was plaited to make a thick, even cord and then placed in the groove where it was coated with Stockholm tar. The tar was rather thin and runny and needed to be heated until it had a more rubbery consistency on cooling. Once the boards had been fitted, they were drilled with a very thin guiding hole and fastened with a nail driven in from the outside and through a rove on the inside. Nails and roves obtained from Scandinavia were very close to the shape of the original, although these modern galvanised nails are less strong than the Viking originals made from high quality iron, smelted with charcoal. An overhead beam which ran the length of the boat acted as a centre line and a piece of string held from this could be used as a measure to ensure that both the port and starboard garboards were the same shape and measurement when finished.

During the fitting of the garboards two of them split, both from the scarf at the stem end. Of course this represented many hours of work and caused not inconsiderable frustration. However, the pain was relieved when it was found possible to recycle these and re-shape them into the narrower and shorter three plank sections of the port second strakes. The original boat has exactly the same features: it seems possible that the original boatbuilder had the same problem and solution. Spring came and all around scraps of green oak developed minute splits as the wood dried out. It was alarming. Clearly the boat was not going to be finished until well into the summer. Drying out would be a real problem. Surely the original builder would have worked beside water. The boat was covered in hessian and kept regularly doused with the hose pipe and polythene placed on top. This continued for the rest of the building period.

For the sheer strakes, two 24 ft (7·3 m) by 16 in (40 cm) boards of larch were used. They were reduced with adze and plane to a 3/4 in (19 mm) thickness. The top 3 in of the sheerstrake were left 1 in thick to give a stronger gunwale. The strength of the boat relies on the sheer strake being one long continuous piece with no scarfs, so the fitting had to be exact. If a scarf at either end was inaccurate the whole plank would be wasted. It was a tricky and exacting process. Once this was riveted, the shell was complete.

Framing

The shell of the Gokstad faering is strengthened by three slender frames. There is an inclined frame or *stammering* at each end. The central frame has a heavier cross-section. The fore and aft frames are

Figure. 3. A partly-shaped crook, which will eventually become part of the midships frame and beam. (Photo: Clare Seal.)

each made from oak crooks (Fig. 3). It took a great deal of searching through various woodlands to find the correct shaped limbs, which were then shaped with axe, drawknife and spoke shave. They were notched and fitted over the strakes and secured to the strakes with a treenail, driven from the outer side of the strake into a hole bored through the frame. The treenail is held in place with a wedge driven into its inboard end.

Steering and propulsion

Viking boats are steered with a steering-oar fastened to the starboard side of the ship. The steering-oar was made from one piece of oak. Much research has been done into its shape (Andersen, 1986). A small, removable tiller was made and held with a peg into the top of the steering oar. At first it was fixed at right angles to the blade, as in Christensen's plans (Christensen, 1996; McGrail, 1974). However, this was later changed to 45 degrees, making it far easier for the helmsman to sit in the stern. Christensen's drawings for oars of 10 ft 6 in (3·2 m), with a pointed blade, were copied in larch. As with the larger ships, the oars are held against kabes. These were shaped from elbows of timber, where a branch grows out from the main trunk at about 45 degrees. The oar pivots against these and is held in place on the return stroke by a loop of rope passing through a hole in the kabe and around the oar, thus the oars can be shipped with ease.

In late summer of 1996 the finished *Segle* was lifted from the strongback, over the garden path and onto the waiting trailer, driven with great care down to Cockwood harbour, and eased into the water (Fig. 4). The rest of the summer was spent rowing around the River Exe, finding out just what the faering would do. The long oars demanded careful practice, but gave a graceful sweep that allowed the boat to glide elegantly through the water. A system of one port oar for'ard and one starboard oar aft was found to be the most efficient method of rowing. After some technical adjustments to the steering oar, *Segle* was found to be very responsive. Most surprising of all was the way that *Segle* rode the waves, albeit within the relative shelter of the Exe. She sits very low in the water, yet her high bow and stern mean that if pushed into the wave, the boat simply parts it and then rises on the crest.

Rigging the faering with a square sail

It is difficult to believe that any self-respecting Viking would not have thought 'how does the faering sail?' Eric Andersen's diagrams and views on the Viking rig (1986) were studied, together with the sail of a replica faering from the early 20th century in Exeter Maritime Museum. This faering had been rigged with a mast 12 ft (4 m) high and a cotton square sail. The Viking sail would have been of woollen cloth, apparently used in Norway until the 19th century (Cooke *et al.*, 2002). Viking rope would have been of walrus hide, unavailable in Exeter, or horse hair which, according to Andersen, is beautifully soft and supple. For *Segle*'s sail, cotton was used, and manila rope. A V-shaped *rakke* (mast parrel) was cut from an elbow of elm.

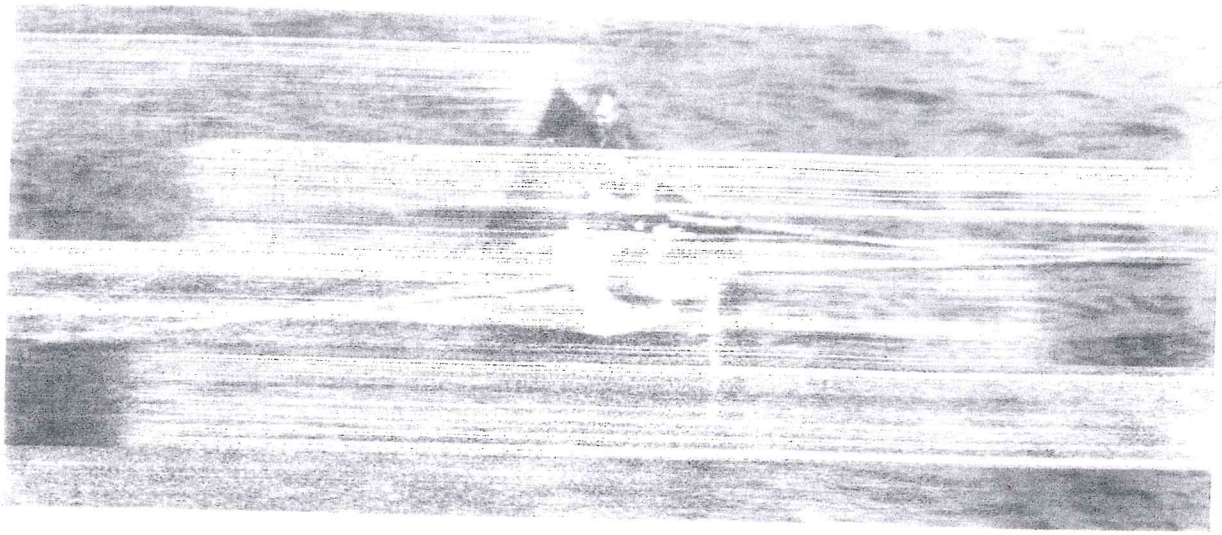

Figure 5. *Segle* safely tethered. (Photo: Roy Adams.)

Tentative sailing trials started in February on a cold, grey and uninviting day. It takes a crew of three to sail her most efficiently and before the wind she flies (Fig. 5). She is incredibly responsive to the steering-oar and use of sail and tide can save a lot of rowing. A lack of keel depth means that she cannot sail close to the wind. When tacking, it is easier to take the sail down and row round, although many sailors, notable Edwin Gifford in both his reconstructions of Saxon boats, have shown that tacking is possible. However, for the smaller faering, there is little point in trying to get her to sail to windward when it is easier and more efficient to row. The faering is a rowing boat which may be sailed.

Ageing

Segle has been kept in the water for more than seven years, taken out, scraped and re-tarred once a year. It is vitally important that time out of the water is kept to a minimum, otherwise drying out and distortion quickly occur. It is likely that Viking boats would have been kept constantly in the water. *Segle* is used regularly, her logbook recording an average of 50 outings per year. She has been subjected to extremes of temperature, from some very hot days in the summer of 1996, to a winter when Cockwood harbour froze over for several days. She took all this very much in her stride, continuing to sit prettily on the water.

After a year, however, a bowing in the garboards across the strake occurred, most noticeably around the treenails. It appeared as if the frames had tightened and as a result pulled the treenails upwards, bringing the garboards with them. The distortion was considerable and were it not for the fact that the boards were green, they would undoubtedly have split. It also explains why the treenails in the original were juniper. Not only would their natural oils have helped prevent rotting, but being a softer wood they would have popped through the strake, rather than running the danger of splitting it. It also suggests that the frames might well have been made from seasoned timber and therefore have been more stable.

Some splitting and warping has occurred elsewhere, mostly around the scarf joints on the planks. These have been given very thick coats of Stockholm tar as extra sealing. In hot weather hessian soaked in seawater is lain across all vulnerable joints to try to reduce drying out. A Viking boat requires care, and suggests that the originals may have been housed in boathouses or nausts to provide some protection from the destructive forces of sun and rain. However, the effects of ageing on *Segle* suggest that green wood boats can tolerate a reasonable degree of warping, splitting and movement.

Conclusion

Perhaps surprisingly, the project shows that it is possible for one man with no boatbuilding experience and moderate skills to construct a faering.

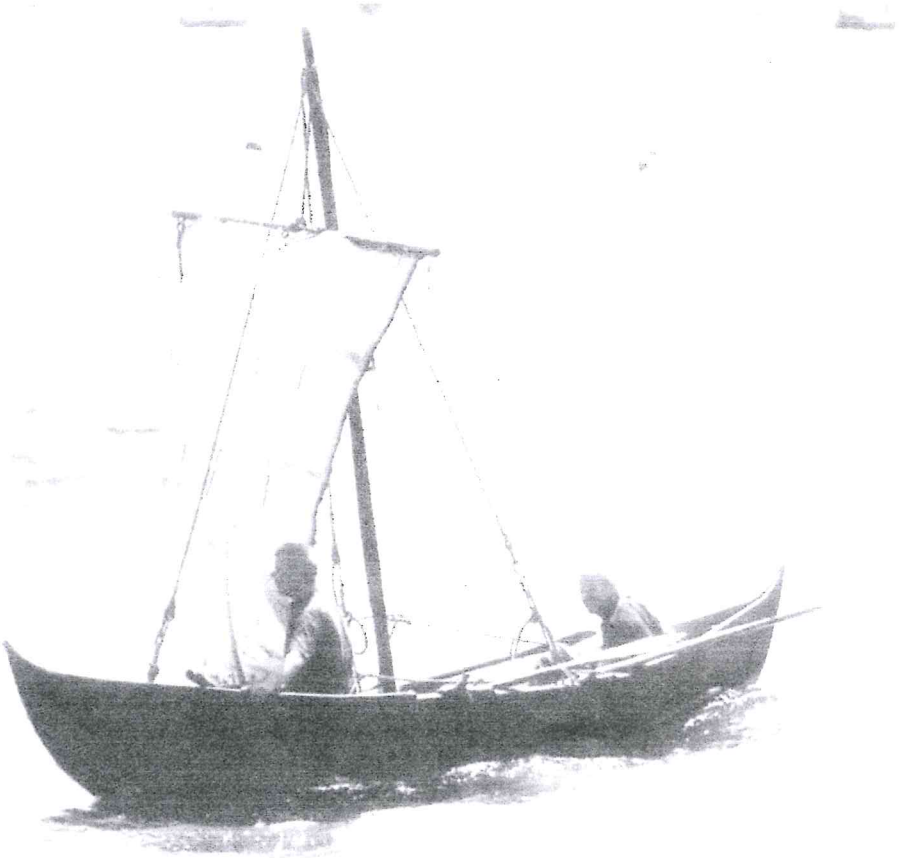

Figure. 5. Segle under sail using the square rig. (Reproduced by kind permission of West of England Newspapers Ltd.)

Therefore perhaps Viking boatbuilding is not the mystery it might appear. *Segle* was built at weekends and evenings over a period of 17 months. Using green wood is not only possible but makes the job more practical, and once the problems of storage have been overcome, far easier, particularly when you have no saws. The original faering would have required a massive, knot-free and straight-grained oak. Given that native oak forest once covered much of northern Europe, we must not underestimate the material available in the 9th century. The amount of timber used, and in particular the width of the strakes, the complex stem and stern posts and the elegant lines make this a very special boat. Indeed, she was special enough for a chieftain to take on a voyage to the other world. The faering sails well, though within the limits imposed by low freeboard and shallow draft, and it is difficult to believe that the thought of sailing the boat did not also occur to its Viking owner. Her speed on the water, lack of storage room and complexity of construction suggest that she might be seen as a kind of sports car to be enjoyed, polished on a Sunday afternoon, and taken for a spin on the fjord.

Perhaps more whimsically, the Gokstad faering's fine lines, careful construction details and elegance allow us to glimpse another kind of Viking, an altogether nobler savage than the man we might otherwise have contemplated.

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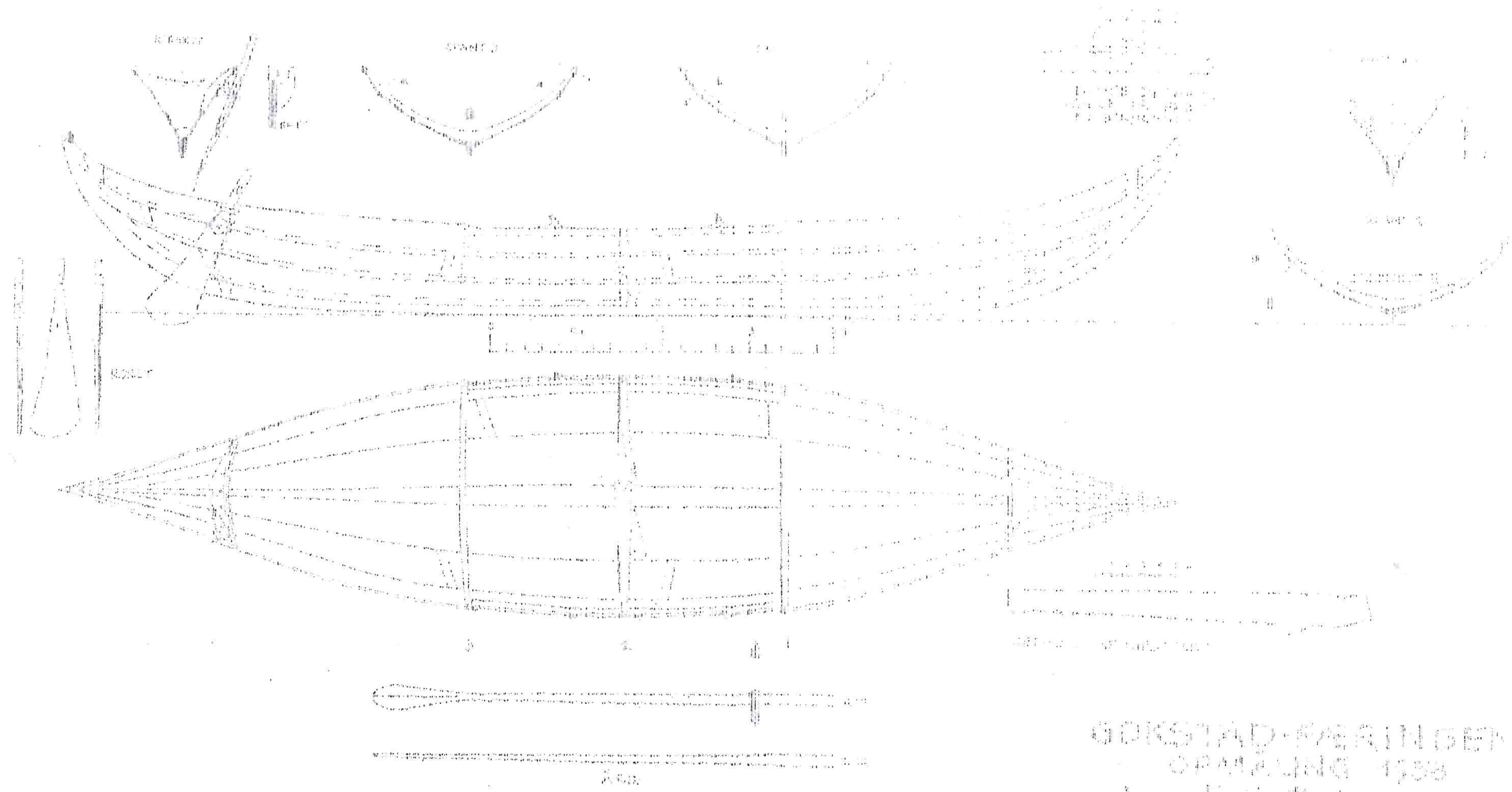
TEGNING AF BÅDEN



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