

Ropemaking from 800 CE to
1500 CE with a focus on bast
ropes in northern Europe

Compiled by Erik Brinkman



Foreword

The inner bark on trees, the *bast*, has been used for cordage in the nordic countries for thousands of years up until the last century. The basic bast rope looks almost the same through this millennia long period. To the untrained eye a bast rope looks like any other rope, but there are some very interesting variations that can be done using these ropes that can not be done with modern ropes.

The main focus of the text is cordage made from the bast from *Tilia*, commonly called *linden*, *lime* or *basswood*¹. This text will use *linden*.

The general public usually think of the rope walk as the earliest technique for making ropes and there is very little knowledge of the earlier methods. When researching this I saw small hints of an earlier technique and my interest was piqued when I understood the simplicity of it and that a single person could make ropes by themselves.

The general texts on this subject are all short and more detailed texts only focus on individual locations and there is no overarching text delving into details at the same time as spanning over several locations and time periods. This text is my attempt at this for me to use as a reference and hopefully others can find it interesting as well.

I find many texts on the internet quite vague and it's hard to understand what is well sourced and what is the author's own opinions or commonly held beliefs. My intention is to have sources for 90% of the information and it should be clear where I have not. It goes without saying that this layperson's text is subject to selection bias with regard to which information I find interesting and credible.

This text is meant more as a reference text than as an introduction to the subject and in the reference section I list literature I find suitable for delving in the subject. It's intentionally written quite dense and concise and the reader is meant to follow the footnotes for further reading and many of the sources are available online, and most of the others can be found via a university library.

Two locations in the text are mentioned many times and they are the viking settlement of *Hedeby* in northern Germany and *Bryggen*, which was a settlement in medieval Norway.

The text ends on a lighter tone with my Swedish translations of some old German verses about ropemaking.

Uncredited illustrations and photos are by me.

Erik Brinkman
Sweden, 2023

¹ Merriam Webster dictionary

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Ropemaking etymology and history

The nomenclature used for someone making ropes can often be found in names for persons or places. The earliest written occurrence in English for *Roper* was in 1226 and for *Rope-maker* in 1388².

In German *Selemechere* was used in 1150, *Seilerre* in 1244³, *Selslaghere* in 1261, *Repslegere* in 1265, *Reper* in 1282⁴, *Repwindere* in 1280, *Seilwinder* in 1395 and *Repemeker* in 1477⁵. The use of *-winder* declined towards the end of the middle ages just as the use of the reel was declining with the introduction of the rope machine.⁶ This is interesting as the reel is in Swedish called a *vinda* and the word was in the medieval period also a verb meaning to make a rope⁷.

The German word *schlagen* can mean *to lay*. The saying 'ein Bein über das andere schlagen' for example means to lay one leg over the other.⁸ *Reepschlager* can literally be translated to *Rope layer*.⁹

In Swedish the word *Repslaghere* is mentioned in the 1340s¹⁰ and *Repa karl* 1420-1450¹¹.

In Danish *Repvinder* was used in 1375.¹²

In Norwegian the word *Bastari* was used in 1276 for someone making bast ropes.¹³

The craft probably had a low status in viking society, since in the Eddic poem of *Rígsþula* it is mentioned as slaves' work.¹⁴

German has two distinct words for ropemakers - *Reepschläger* and *Seiler*. All *reepschlägers* lived in the coastal cities and made strong and long ropes for the shipping industry while *seilers* made simpler ropes for agricultural and domestic use.¹⁵

The oldest ropemakers guild in Germany was formed 1355 in Frankfurt am Main.¹⁶

² Murray, James 1914: A New English Dictionary On Historical Principles Vol.8, p. 790

³ Eichhoff, p. 18

⁴ Eichhoff, p. 6

⁵ Eichhoff, p. 33-34

⁶ Eichhoff, p. 41

⁷ Söderwall, p. 983

⁸ Eichhoff, p. 64

⁹ Magnus, p. 34

¹⁰ Granlund, p. 14

¹¹ Söderwall, p. 253

¹² Nilson, p. 73

¹³ Schølberg, p.134

¹⁴ *Rígsþula*, Eddukvæði: Þjóðminjasafns Íslands, verse 9

¹⁵ Eichhoff, p. 1

¹⁶ Weber 1971, p.23

The *reepschlägers* were vital to the city's economy and were held in high regard. They were well organized in guilds and developed a technical vocabulary for their trade. In times when their trade was booming the ropemakers could concentrate on laying the ropes and hemp spinners formed their own guilds. The hemp spinners were allowed to make ropes, but only thin ones.¹⁷

The *seilers* did not use the rope machine¹⁸ and were poorer and in periods of low-income they acquired the right to trade in by-products such as oil, soap, pitch, torches, whips, flails and the like as a substitute. Hard times forced some to move to the coastal towns where they could do odd jobs in ropemaking, knotting and braiding that the highly skilled *reepschlägers* were reluctant to do.¹⁹

In southern Sweden the professional cordage makers still used linden bast for cordage production in the fifteenth century²⁰. Small-scale non-professional production for farm use and for sale at market places has been carried on until the last century in Scandinavia.²¹ The craft did not require any great investment, in contrast to the hemp cordage industry.²²

It's typical for ropemakers working with bast to also handle the raw material themselves, but it is likely that some also bought the material from other districts where it was produced.²³

Nordic languages seem to have distinguished between *tåg* for vegetable ropes and *rep* made of animal products.²⁴

¹⁷ Eichhoff, p. 10

¹⁸ Eichhoff, p. 65

¹⁹ Eichhoff, p. 19

²⁰ Nilson, p.143

²¹ Schølberg, p.127

²² Schølberg, p.134

²³ Schølberg, p.124, Magnus 2021, p. 30

²⁴ Granlund, p. 11

Rope anatomy

All ropes from Hedeby²⁵ and Bryggen are plied and not braided. That cordage is plied means that two or more strands are twisted together in such a way that they prevent each other from unraveling.

When discussing the twist direction of a fiber or a rope this text will use the terms *S-* and *Z-direction*. To determine the twist direction look at the center section of the letter and see if it aligns with the direction of the cordage.



More modern cordage uses very thin fibers that are spun into thin *yarn* and several yarns are formed in a *strand*, and two to six strands are plied into a *rope*. And two to six ropes can be plied into a *cable*.

Bast fibers on the other hand are wider strips and they are therefore spun into a thicker *string*. And this single string is used as a *strand*. And two or more strands are plied into a *rope*. And while modern ropes only are plied at the most one more time into a cable, these older ropes were sometimes plied two more times to form thicker cordage. These are in the literature simply called rope.



One piece of bast fiber rolled up

This text will sometimes use these more technical terms. They are based on Schølberg²⁶, but adjusted to Ole Magnus' vocabulary:

Stage I: A string consisting of spun fibers in S- or Z-direction

Stage II: Two or more Stage I elements plied together.

Stage III: Two or more Stage II elements plied together.

Stage IV: Two or more Stage III elements plied together.



²⁵ Körber-Grohne, p.67

²⁶ Schølberg, p.77

Over 95% of the Stage I elements in Bryggen are S-spun. It is possible that the Z-spun elements were made by left-handed spinners.²⁷

Stage II cordage

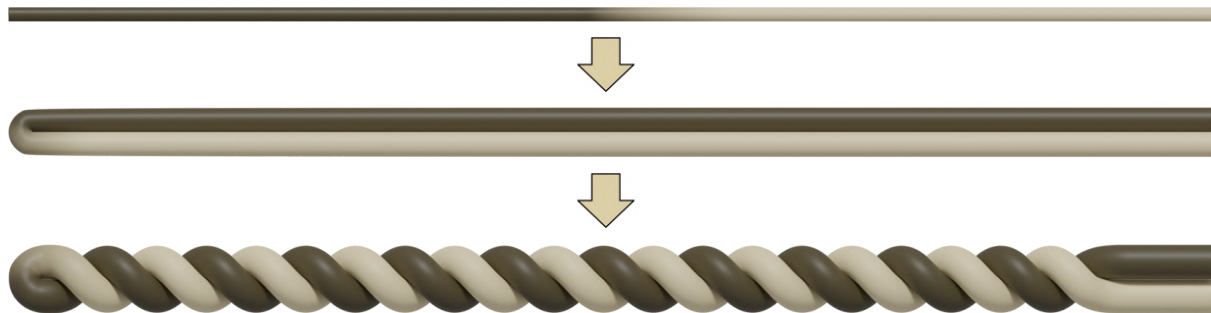
When cordage was plied for small-scale production, or when only a limited length was needed, it was often, right up to recent times, made by hand by doubling a single Stage I element.²⁸ The result seems mostly to have been even²⁹, but there are also some finds of very uneven cordage being used.³⁰ When making cordage by hand the result can be uniform even if the strands are of different thickness.³¹

Rope made this way can be distinguished from rope made on a ropewalk by the ends where one can see the strands turn. Many finds have this unique feature proving this method was used.³² It is not easy to see if a rope was handmade if the ends have been cut.



3-ply rope with the typical turn of the strands locking the third strand

For a 2-ply rope a single stage I element was folded in the middle before plying the strands.



For a 3-ply rope the single stage I element was folded from $\frac{1}{3}$ of the length. This resulted in a 2-ply rope with one strand having extra length. This element was then folded and wormed along the 2-ply rope forming a third strand by forcing it between the other two strands. The result was a cord with two closed ends, each with the loose end drawn through the little end loop and thus locked and secured from fraying.

²⁷ SchØlberg, p.112

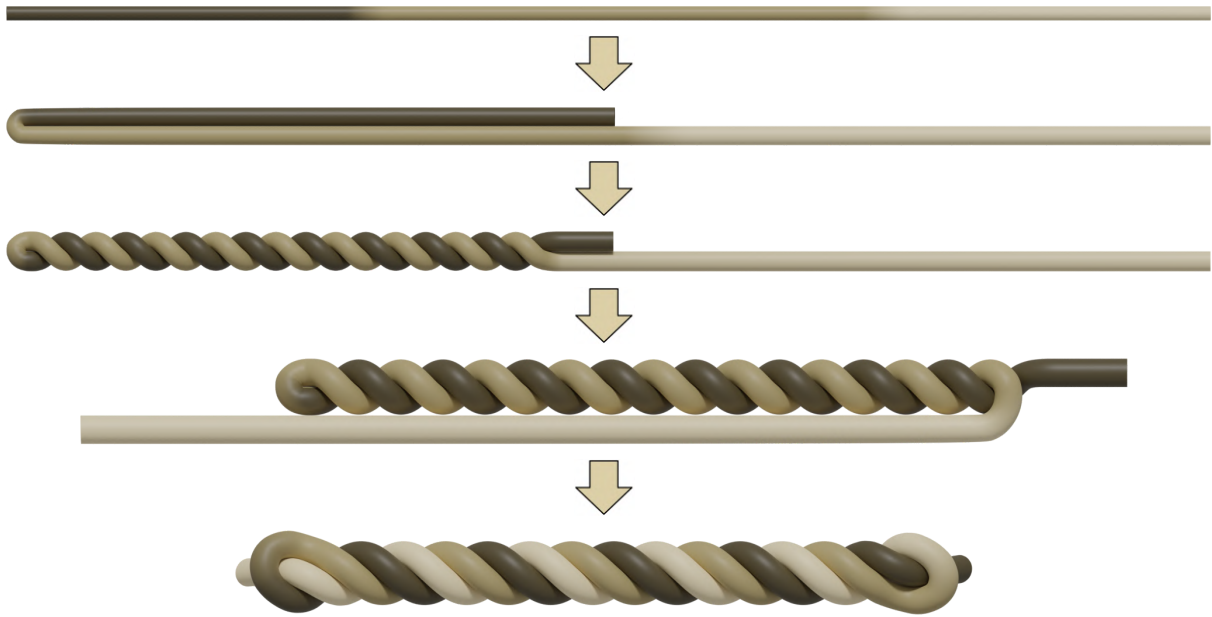
²⁸ SchØlberg, p.117, Magnus 2006, p. 33

²⁹ SchØlberg, p.104

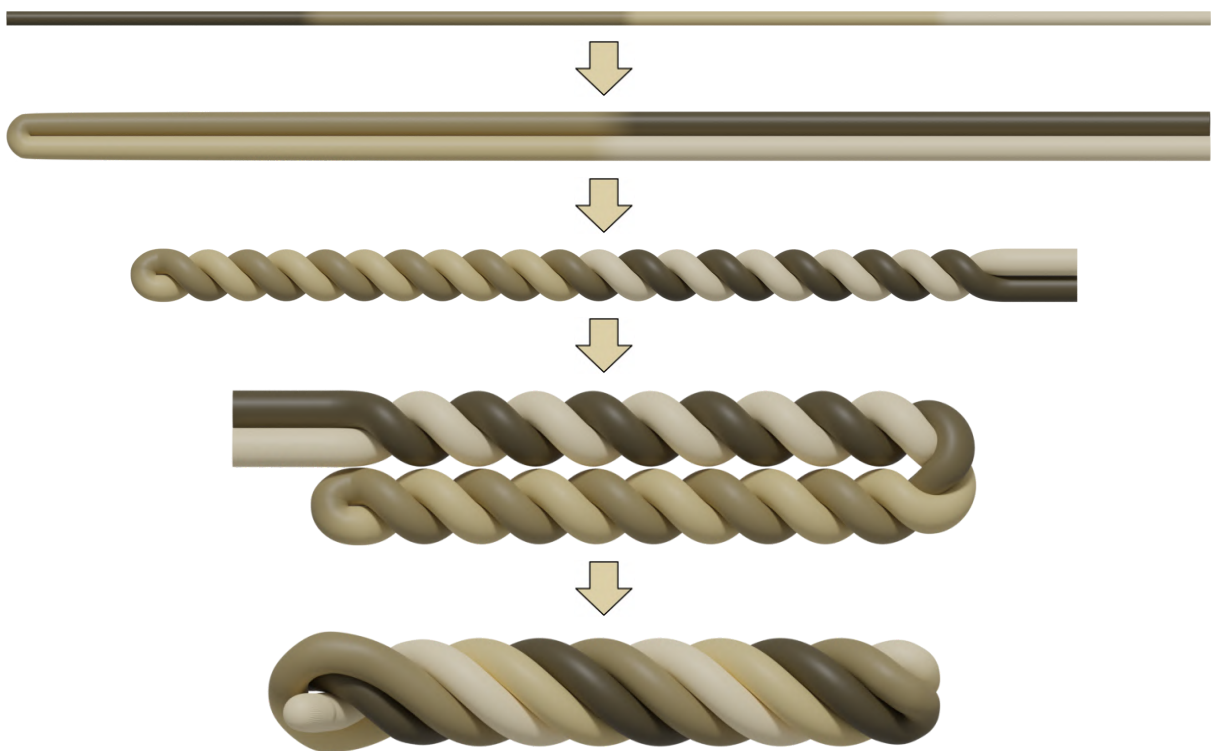
³⁰ Magnus 2021, p. 40

³¹ Magnus 2021, p. 16

³² Magnus 2006, p. 33



For a 4-ply rope a 2-ply rope was first made and that was then folded again by worming one half of the rope between the two strands forming a 4-ply rope. Modern 4-ply ropes have a thin cord in the middle, but this heart was not used in this time period.³³



³³ Schølberg, p.117

It is impractical to spin too thick stage I elements and bast ropes normally only have one Stage I element in each strand. Thicker ropes were therefore made by plying multiple Stage II elements together forming Stage III and Stage IV cordage.

Stage III & IV cordage

Thicker Stage I element's have a rougher finish making it more liable to wear. Therefore a Stage III rope is often a better, but a more expensive product than an equally thick Stage II rope.³⁴ A stage III rope can be made by doubling a Stage II rope.

The illustrations are shown with neutral colors, and also with colored strands to visualize the construction.



In Hedeby there are finds of 70mm ropes that consist of three 2-ply ropes that were plied together. And there are also finds of two of these ropes plied together to form a 100mm thick stage IV construction.³⁵



³⁴ Schølberg, p.126

³⁵ Körber, p.80



Most Stage III cordage in Bryggen consist of a combination of 2- or 3-plied elements ³⁶



There is also a find in Bryggen of a 160mm thick 4-plied Stage III rope that was made of 2-plied stage II cordage.³⁷

While normally when making bast rope only one Stage I element is used in each strand, there are in the early medieval period a few exceptions to this rule in the Bryggen finds where several stage I elements were bundled together into a strand. These few finds follow the normal rules of twisting each stage in the opposite direction from the previous stage.³⁸

Stage IV constructions are only seen in the viking age, and this of Stage III constructions almost fell out of use in the early 14th century when a new kind of strong cordage took over.

Untraditional Cordage

In the 13th century³⁹ we see a new kind of bast rope being developed that Schølberg terms untraditional cordage.⁴⁰ Here we see a systematic use of many thinner Stage I elements used in the same strand, and this strand is twisted in the same direction as the Stage I elements. This Stage II element can look like a stable form of cordage by itself, but it is not as the twist is in the same direction as the string and it needs to be plied in one more stage to be stable.

³⁶ Schølberg, p.122

³⁷ Schølberg, p.123

³⁸ Schølberg, p.123

³⁹ Magnus 2021, p.30

⁴⁰ Schølberg, p.122



Schølberg argues that this makes the rope smoother and more pliable but also weaker than if thicker stage I elements would have been used.⁴¹ Magnus on the other hand compared these untraditional bast ropes with traditional bast ropes on the standing rig on a ship and concluded after several seasons that the new kind was stronger.⁴²

This new kind of bast rope makes up almost $\frac{1}{3}$ of the cordage finds in Bryggen after 1332.⁴³ Almost all the Stage III cordage are 3-plied.

This could be a reaction to imported hempen cordage and that the ropemakers tried to emulate its properties⁴⁴, or it could be a sign that the spinning and plying parts of a ropemaker's trade were being separated. When using thinner Stage I elements one does not have to know the thickness of the finished cordage and can make the string in the dimension that is the quickest to produce⁴⁵ and then simply increase the number of Stage I elements to get the desired strand thickness. This could either indicate that the ropemaker now made large batches of Stage I elements without directly plying it to shorten the lead time between receiving a rope order until it is finished, or it could be that some craftsmen now specialized in only spinning.⁴⁶

We see some cordage that has a different number of stage I elements in each strand. The only important factor is that all strands are of similar thickness. It is easy to imagine a whole workshop or village all making strings in different thicknesses for use in a single large rope.⁴⁷

One interesting find in the Gedesby ship is a rope where 14 Stage I elements form a strand, but the four elements forming a core in the strand are thicker than the surrounding elements.⁴⁸

This kind of bast rope is to my knowledge not seen in later periods.

⁴¹ Schølberg, p.124

⁴² Magnus 2021, p. 78

⁴³ Schølberg, p.125

⁴⁴ Schølberg, p.134

⁴⁵ Magnus preferred 5-7 mm. Magnus 2021, p. 81

⁴⁶ Magnus 2021, p. 33

⁴⁷ Magnus 2021, p. 83

⁴⁸ Magnus 2021, p. 36

Final thoughts on cordage construction

It seems like if the vikings were not able to spin thick strings why they made stronger ropes by making Stage IV constructions. When techniques were developed in the early medieval period to make thicker strings there was no longer any need to make Stage IV constructions. And then the string thickness shrunk again when techniques were developed to use several strings in each strand.

Tools

While thin fibers like wool can be spun with a spindle, the bast fibers are too thick and must be spun either by hand or by using devices providing more torque.

The reel

The reel was known in the ancient world and was used in construction work and mining as a winch, but it was probably not used for spinning until later. The major difference between a winch and a reel is that the reel often is of lighter construction.⁴⁹

When spinning the ropemaker places a bundle of fibers over one of the arms of the reel and sets it in motion by tugging on the string in a circular motion. The reel is kept in motion by rhythmically tugging on the string. This work is typically done sitting with the reel within reach and when an arm's length has been spun the reel is stopped and the newly spun string is wrapped onto the reel and the ropemaker again sets the reel in motion and continues to spin on the string and continuously wrap it as it gets longer.⁵⁰



Depiction of a ropemaker using a reel (and a monk slipping away from the ropemaker wife's bedroom)⁵¹

When spinning thicker string the reel is used to a lesser degree for twisting and more for storing it, but the reel helps with both spinning and storing while plying strands into a rope.

It is not known when the reel was introduced in Scandinavia, but it is believed to have come from the east of the Baltic in the early medieval times at the latest⁵². We see that the diameter of cordage increased in the viking age⁵³ which could be a consequence of an increase in ship size and this could have pushed for technological progress in ropemaking in the form of introducing the reel.

⁴⁹ Schwartz, p. 2347

⁵⁰ Weber 1971, p. 25

⁵¹ Geoffroy IV de la Tour Landry and Marquart von Stein and Dürer, Albrecht 1493: Der Ritter vom Turn: Universitätsbibliothek Freiburg, leaf 33b

⁵² Nilson, p. 74

⁵³ Magnus 2006, p. 31

We know that the vikings used more slender reels for winding thread, but we do not know if they used the rope reel or not. The technique when making the rope is basically the same regardless if a reel is used or not as it only assists and the finished rope looks exactly the same.

The reel can have two or four arms and the simpler two armed is believed to be the elder. The four armed type has a greater capacity for storage of finished product and made it easier to spin thicker and longer strings and could explain why exceptionally thick elements have been found in Bryggen and not in Hedeby.⁵⁵ A ropemaker does not need any large area when using a reel and an area in Copenhagen is said to have been called *Rebwinderboderne*, meaning *Rope twister's booths*.⁵⁶



*Thread winding reel from the Oseberg ship. The base was not found.*⁵⁴

Improvements of the reel

The reel in its simplest form made spinning easy and provided a magazine to store the spun material and worked well for spinning bast. But when spinning hemp you do not need to insert each fiber individually and can therefore increase the spinning speed. The first improvement can be seen in *Die Hausbücher der Nürnberger Zwölfbrüderstiftungen* where led weights have been added to the reel⁵⁷ as the added mass helps keep up the speed of the device. And the magazine for spun material has been removed and the ropemaker instead keeps the yarn stretched. I think this was to remove the need for stopping the reel for wrapping the yarn for storage.



*Depiction from 1425 of a ropemaker using an improved reel*⁶¹

The ropemaker now needed elongated workplaces and sometimes bridges⁵⁸ and city walls⁵⁹ were used for this. The oldest use of the word *Reperbane* is from 1390 in Riga⁶⁰.

⁵⁴ Photo from Vikingskipshuset, Oslo

⁵⁵ Schølberg, p.126

⁵⁶ Magnus, p. 34, but sources on wikipedia states different etymological background for the name

⁵⁷ Weber 1988, p. 3

⁵⁸ Weber 1971, p. 23

⁵⁹ Eichhoff, p. 42

⁶⁰ Eichhoff, p. 43

⁶¹ Mendel I, *Die Hausbücher der Nürnberger Zwölfbrüderstiftungen*, 15th century, fol 16r

The next improvement involved tilting the axis of the device. This helped in turning the device when the length of the yarn increased as a horizontal yank now transformed into rotational energy. The shape changed from a cross to a wheel. This is in German called a *Laufer*.⁶²



*Depiction of a ropemaker's workshop with a Laufer*⁶³

While the old reel could be used for both spinning and plying, the improved reels could only be used for spinning lighter herbaceous fibers such as hemp.

⁶² Weber 1988, p.4

⁶³ Capsule 1225, HB 13 447, about 1550: Germanisches Nationalmuseum Nürnberg. Dating is from personal correspondence with Dr. Christian Rümelin at Germanisches Nationalmuseum

Handheld reel

Small handheld reels have been used in later periods for spinning and plying thin cordage and there is a find in Bryggen that could be the handle for such a reel. Similar reels existed in the medieval period. Depictions show them being used for other uses but it is plausible that they also were used for making cordage and they would be suitable for spinning both bast and hemp.



Depiction from 1440 of a reel used for handling measuring rope⁶⁴



Depiction of hemp spinning on a handheld reel in the 1780s⁶⁵



Possible handle for a handheld reel found in Bryggen⁶⁶

⁶⁴ The Hours of Catherine of Cleves, The Morgan Library MS M.917/945, p. 105

⁶⁵ Svabo, Jens 1924: Føroyaferðin, tab. VII

⁶⁶ Øye, p. 55

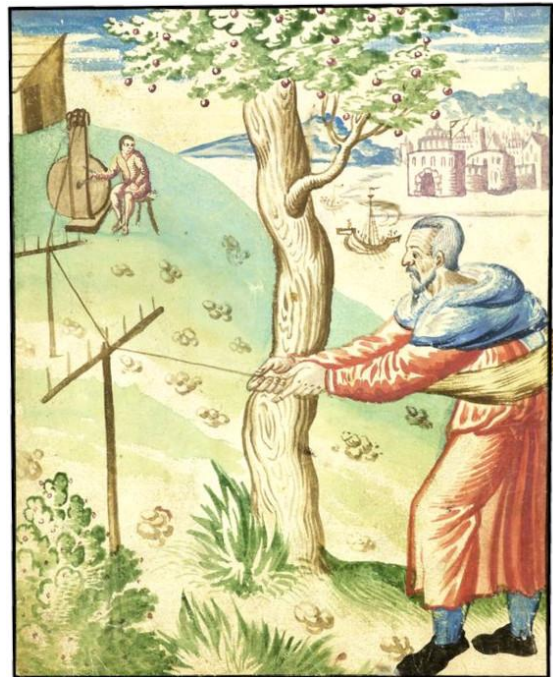
The spinning wheel

The spinning wheel where a large wheel drives a smaller spindle is first mentioned in 1298 in regulations for manufacturing of fabrics in Speyer⁶⁷ and is shown 1380 being used in cordage making in France.

Spinning hemp requires a stronger built spinning wheel compared to spinning wool.⁶⁸



Depiction of a spinning wheel from around 1380.⁶⁹



Spinning wheels developed their more familiar form factor over the centuries, this one from 1576.⁷⁰

Whirls

The oldest mention of whirls for ropemaking is from Lübeck in a will from 1350⁷¹ and the oldest known picture of using whirls is in a manuscript that dates from 1420.⁷² This book depicts many fantastical inventions, so I do not think one should view the image too literally.

It is important that the strands are of even thickness when using whirls as different thicknesses require different amounts of twist, and when using whirls all strands are twisted the same amount along the entire length.⁷³ This adaptation to different thicknesses is done automatically when plying ropes by hand. It is harder to maintain the same thickness when using bast compared to hemp and therefore it is not suitable to make bast ropes using whirls and it was in 1375 forbidden by law in Hamburg.⁷⁴

⁶⁷ Nilson, p. 42

⁶⁸ Nilson, p. 43

⁶⁹ Phébus, Gaston 1380: *Livre de la chasse*, 619: Bibliothèque nationale de France. This edition is believed to be the oldest remaining edition of *Livre de la chasse* and copied from the original, fol 42v

⁷⁰ Mendel II, *Die Hausbücher der Nürnberger Zwölfbrüderstiftungen*, 16th century, fol 35v

⁷¹ Eichhoff, p. 65

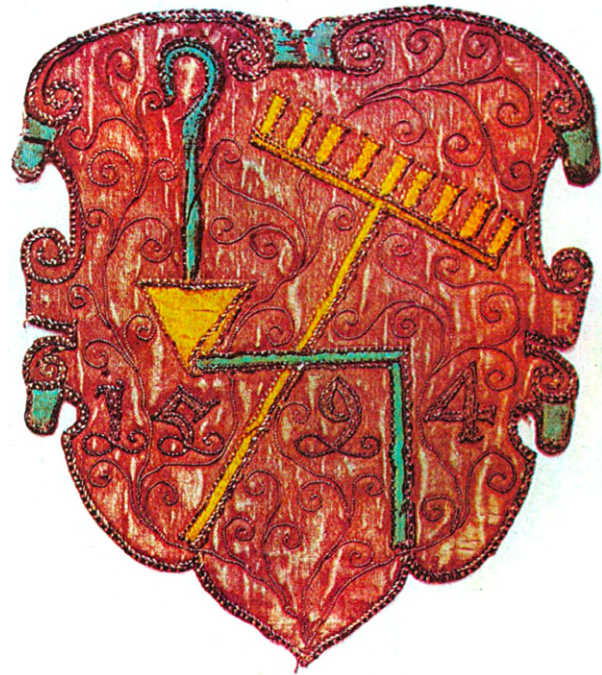
⁷² Weber 1971, p. 28

⁷³ Magnus 2021, p. 15

⁷⁴ Eichhoff, p. 65



The earliest depiction of whirls⁷⁵



Coat of arms for the ropemakers guild in Frankfurt 1524.⁷⁶

Whirls were used by the professional ropemakers and were a popular symbol for guild coats of arms and seals.⁷⁷

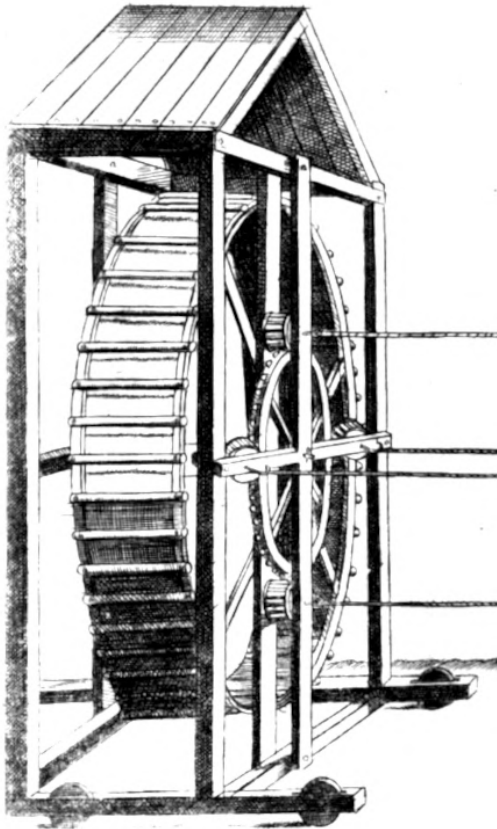
The idea of using gearing to drive the whirls was first illustrated in 1595 and this device was driven by a treadwheel. But this book also depicts fantastical inventions so it is hard to know what was built and what was not. The rope jack as it is known today was introduced in the 18th century.⁷⁸

⁷⁵ Kriegs- und Pixerwerch, Codex 5014, 1420: Kunsthistorisches Museum in Vienna, fol 55r

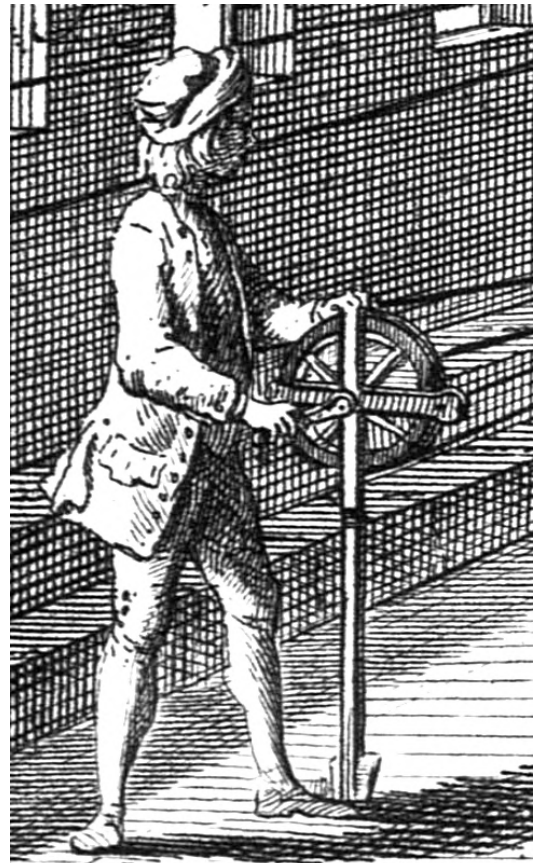
⁷⁶ Weber, p. 22

⁷⁷ Eichhoff, p. 65

⁷⁸ Nilson, p. 101



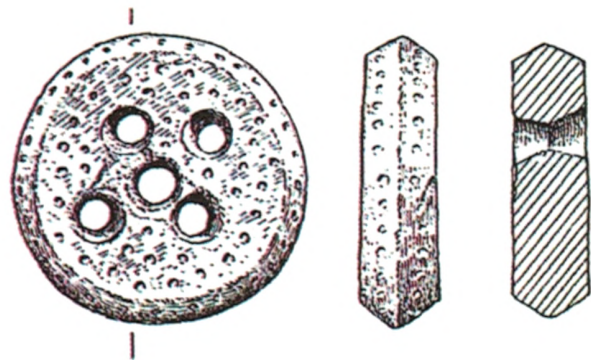
The earliest depiction of a rope jack⁷⁹



Rope jack from 1763⁸⁰

The perforated disc

Both Schietzel⁸¹ and Weber⁸² theorize about ropemaking using perforated discs as a top. Weber sees such a disc being used in the image from Kriegs- und Pixenwerch; the only thing I see is a simple top made by a stick. Schietzel argues that the cordage in Hedeby was made entirely by hand and does not mention the possibility of using a reel. It is then doubtful that the cordage would be plied using a technique not seen for half a century rather than the much simpler technique described by SchØlberg being used in Bryggen⁸³ with a reel.



Sandstone disc from the 5th - 6th century CE⁸⁴

⁷⁹ Veranzio, Fausto 1595: *Machinae Novae*, p. 194

⁸⁰ Diderot, Denis 1763: *Encyclopédie, ou dictionnaire raisonné des sciences, des arts et des métiers*, Planches tome III, Pl. I. Cordiere

⁸¹ Schietzel, p.370

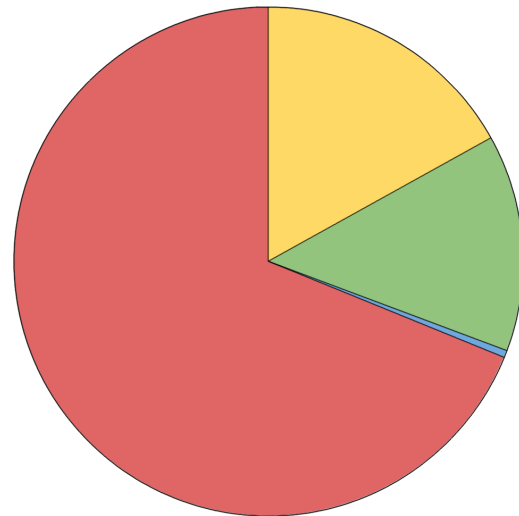
⁸² Weber 1971, pp.28

⁸³ SchØlberg, p.103

⁸⁴ Weber 1971, p. 29

Materials

The finds in Hedeby, Bryggen and Birka⁸⁵ are rather special seen in a modern perspective as practically all cordage are made from Nordic trees and shrubs⁸⁶ and there are no finds of either roots, reeds or herbaceous bast fibers such as hemp.⁸⁷



● Bast 69% ● Single shoots 17%
● Bundle of twigs 14% ● Wood cordage 1%

The cordage in Bryggen can be divided into these different groups⁸⁸

Bast cordage

Manufacture of linden bast cordage in northern Europe has been an unbroken tradition from the Mesolithic (9000–3000 BC) to the last century.⁸⁹

Linden bast has always been regarded as the superior wood bast⁹⁰ but other kinds can be used as well. Oak was commonly used in Hedeby, and in Bryggen juniper was used as a substitute to linden. There are vague indications that elm, willow and yew have been used as well.⁹² Ole Magnus questions the use of oak bast as he does not consider it a usable bast. That oak is thought to have been used in Hedeby could possibly be a case of misidentification in the research done in the 1960s.⁹³



Bast cordage from Hedeby of different thicknesses⁹¹

⁸⁵ Olsson, p. 200

⁸⁶ Schølberg, p.74

⁸⁷ Schølberg, p.76

⁸⁸ Schølberg, p.75

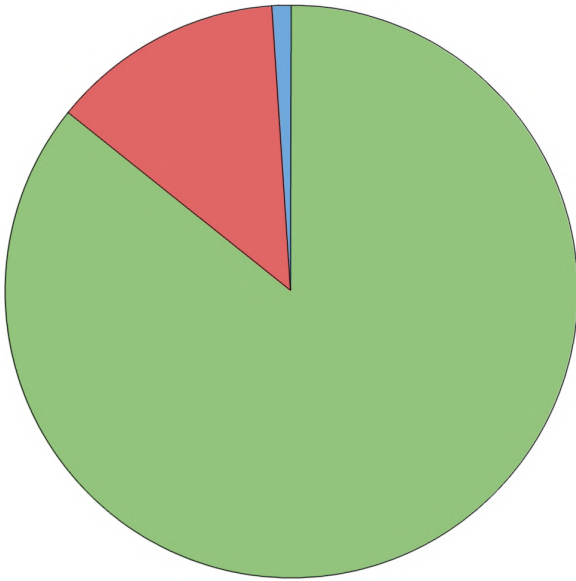
⁸⁹ Myking, p. 65

⁹⁰ Schølberg, p. 126

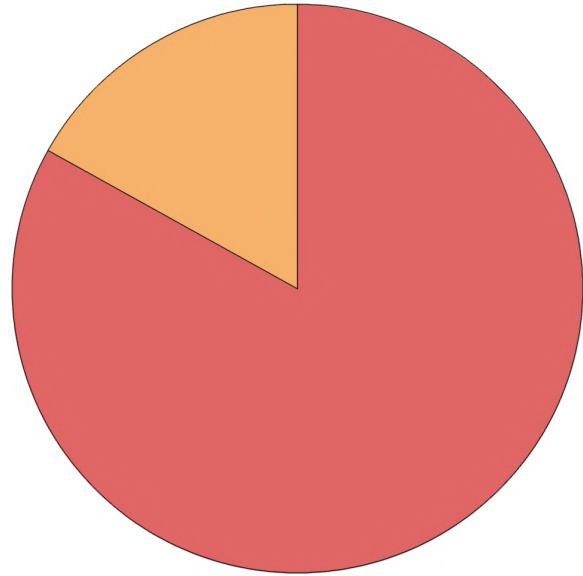
⁹¹ Körber, p.68

⁹² Schølberg, p. 132

⁹³ Magnus 2020, p. 19



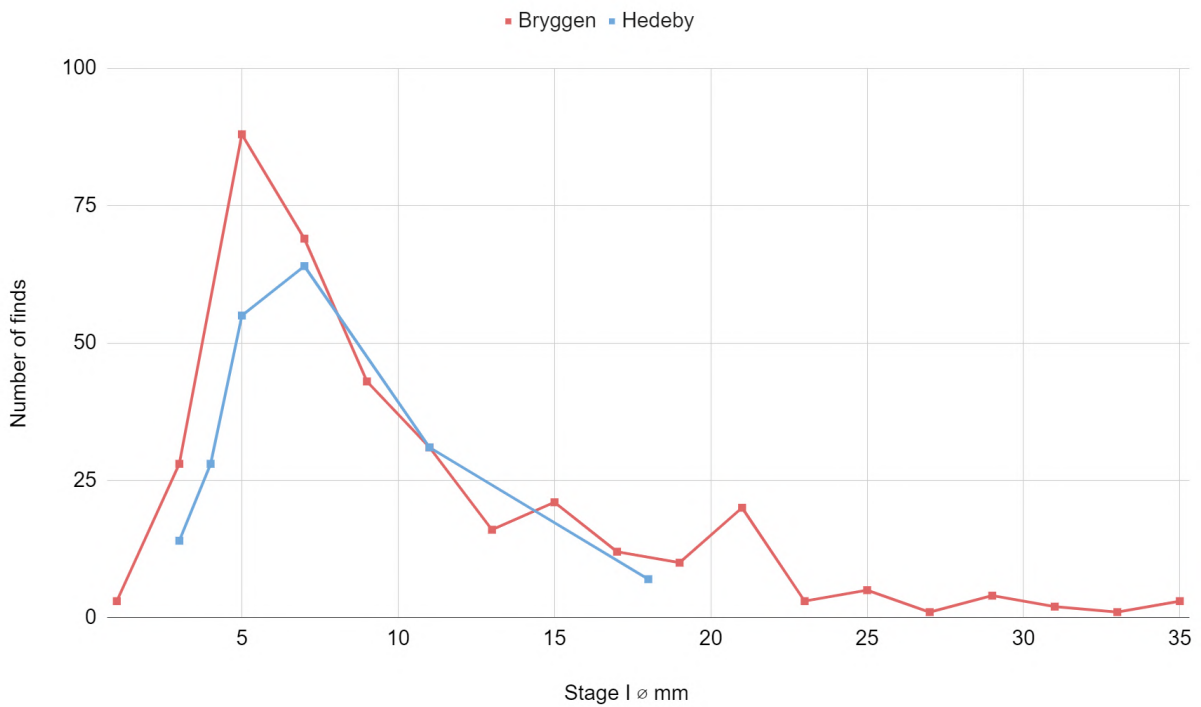
● Oak 86% ● Linden 13%
● Willow 1%



● Linden 83% ● Juniper 17%

Species of bast in Hedeby⁹⁴

Species of bast in Bryggen⁹⁵

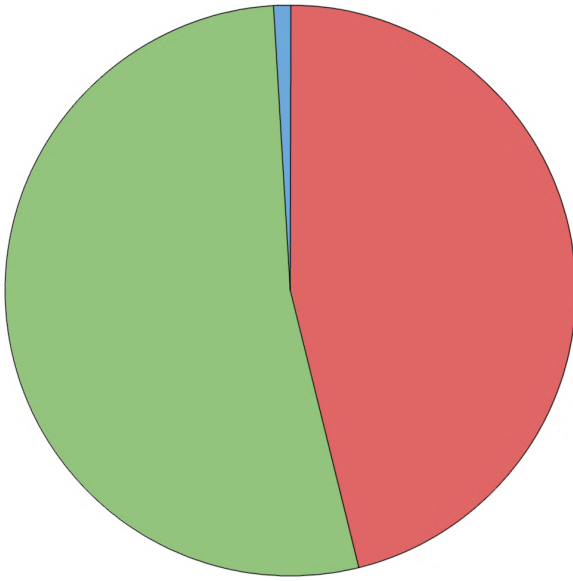


Distribution by diameter of Stage I elements in bast cordage from Hedeby and Bryggen⁹⁶

⁹⁴ Körber, p.73

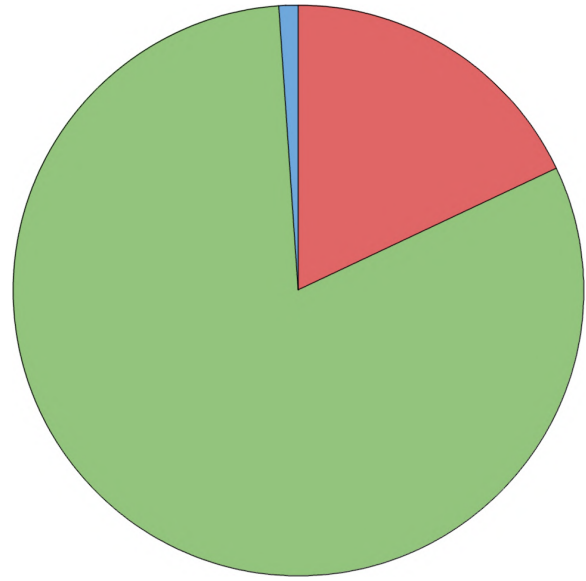
⁹⁵ Schølberg, p. 105

⁹⁶ Körber, p.70 & Schølberg, p.111



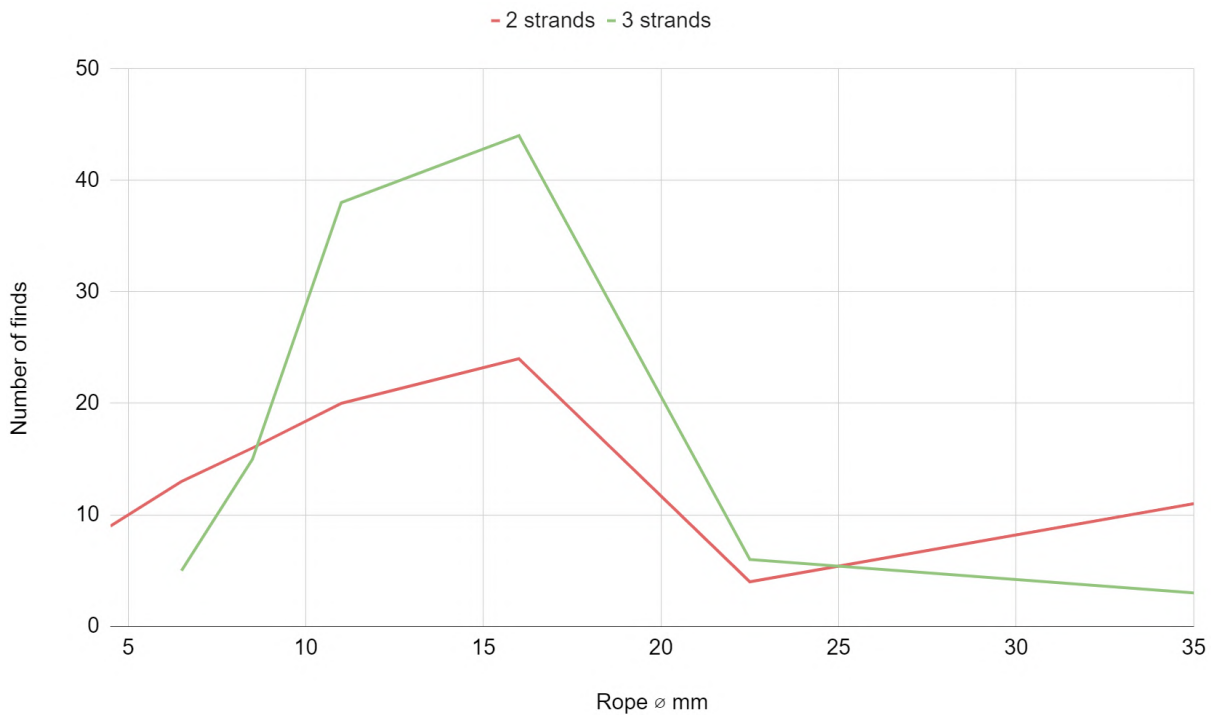
3 strands 53% 2 strands 46%
4 strands 1%

Number of strands in Hedeby cordage⁹⁷



3 strands 81% 2 strands 18%
4 strands 1%

Number of strands in Bryggen cordage⁹⁸



Thickness of cordage in Hedeby⁹⁹

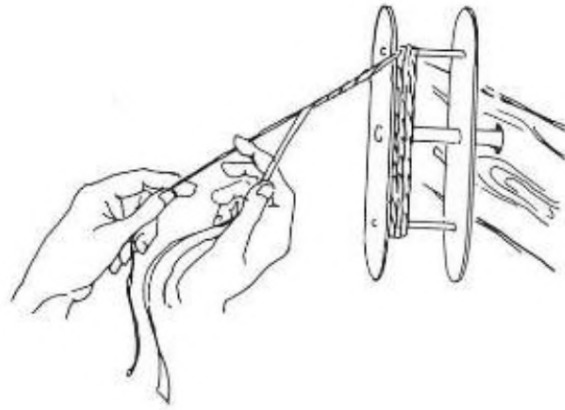
⁹⁷ Körber, p.70

⁹⁸ Schølberg, p.115

⁹⁹ Körber, p.70

Cordage made from bast has less tensile strength than hemp cordage, but it does not stretch as much.¹⁰⁰

When spinning bast the most basic technique is to spin all the fibers in a bundle, but a more refined technique is to also add a wrapping strip around the bundle. This is only possible when using a reel fastened to a solid support as it frees up both hands for handling the material. This wrapping strip keeps the surface of the string much smoother and is found in Bryggen after 1170.¹⁰¹



Applying the wrapping strip¹⁰²

14% of the Bryggen finds has a wrapping strip and this strip was always of the best quality regardless of the quality of the bast in the core.¹⁰³ When spinning the bast the wrapping strip is held at an angle of about 45° from the core and the strip wraps around the twisted core.¹⁰⁴

Bast cordage was used for both the standing and running rig on a ship¹⁰⁵, but one can argue that it is not really suitable for the running rig as it is susceptible to fraying.¹⁰⁶

Much cordage found in Birka is tarred.¹⁰⁷ There are signs that some cordage in Bryggen has been treated with grease¹⁰⁸ or a resin-like coating.¹⁰⁹

¹⁰⁰ Magnus 2021, p. 75

¹⁰¹ Schølberg, p.103 & p.126

¹⁰² Schølberg, p.103

¹⁰³ Schølberg, p.114

¹⁰⁴ Schølberg, p.104

¹⁰⁵ Magnus 2021, p. 34

¹⁰⁶ Schølberg, p.131

¹⁰⁷ Olsson, p. 201

¹⁰⁸ Körber, p.80

¹⁰⁹ Schølberg, p. 112

Wood strip cordage

When there is not enough bast available people have used pine wood instead. Thin slivers can be extracted from the sapwood of pine.¹¹⁰ There are finds of this in Bryggen and it has been used up to the last century in some areas of Scandinavia. A wrapping strip can be used like with linden bast. Linden bast was considered superior and wood strip cordage was mainly used in fishing as it was more resistant to rot but could become brittle when dry.¹¹¹



Cordage made from wood strips¹¹²

Hemp cordage

Hemp has been cultivated in Scandinavia since the first centuries CE¹¹³ but only on such a small scale that there are no finds of hemp cordage from the viking age or early medieval period. Cordage made from hemp was permanently established in western Europe in the 14th century. The hemp was mostly imported from east of the Baltic and was introduced in larger amounts in Scandinavia in the 15th century coinciding with the introduction of new boat types. Hemp cordage has a greater flexibility and strength which makes it valuable for the running rig on ships.¹¹⁴

One possible explanation why there are no finds of hemp cordage in the earlier periods could be that it breaks down easier than bast cordage.¹¹⁵

Miscellaneous vegetable cordage materials

Twig cordage is made from multiple twigs bundled together for the construction of the Stage I element. Additional twigs successively overlap one another, thus lengthening the bundle. All but the thinnest twigs are without bark. Birch and willow are the most common species. Very thick ropes could be made this way and the thickest one in Bryggen is a Stage III construction with a diameter of 76mm.¹¹⁶

¹¹⁰ Modéer, p.38

¹¹¹ SchØlberg, p.102 & 104

¹¹² SchØlberg, p.100

¹¹³ Larsson, Mikael & Lagerås, Per 2015: New evidence on the introduction, cultivation and processing of hemp (*Cannabis sativa* L.) in southern Sweden

¹¹⁴ SchØlberg, p.133

¹¹⁵ Magnus 2021, p. 8

¹¹⁶ SchØlberg, p.83

Young woody stems were also used for short cordage for tying and they were split to make them more pliable. They could be multi stranded. Birch and willow are once again the most common species and used without bark.¹¹⁷

A 2-ply cordage made from thin oak bark was found in Hedeby.¹¹⁸

There is a very exotic find in Bryggen of cordage made from coconut fibers which must have come from a very distant harbor.¹¹⁹

Animal products

Ropes could be made of animal skin and were very strong. While vegetable ropes almost always were plied, ropes made from animal skin were often also braided. The skin could be cut spirally to create very long strips. Walrus skin is mentioned in 890 for use on ships and was exceptionally strong and expensive.¹²⁰

The hair of horses, cattle and pigs were used to make ropes.¹²¹

Inorganic cordage materials

A piece of asbestos cordage was found in Bryggen and is the only non-organic cordage find. It is a stage III construction. Asbestos cordage is also known from the Neolithic period in scandinavia.¹²²

¹¹⁷ SchØlberg, p.78

¹¹⁸ Körber, p.82

¹¹⁹ SchØlberg, p.100

¹²⁰ Granlund, p. 12

¹²¹ Granlund, p. 12 & 14

¹²² SchØlberg, p.127

Special constructions

Hand made rope made from bast can have features that rope made on a ropewalk simply can not have as these are made at the same time as the rope is plied. Today we are used to first buying the rope, and then customizing it for its use. But when using hand made rope you could customize the rope as it was being made.

Laid eyes

Permanent eyes today are made by splicing the end to form an eye on a ready made rope. But this is a later invention and I have not seen any evidence of it during the viking age or the medieval period¹²³ in northern Europe. Some say that the vikings used splicing, but I agree with Ole Magnus that *Laid eye* is a better term for these features.¹²⁴

Instead of what we normally call splicing, permanent eyes were formed at the same time as plying the rope. While a spliced eye is formed with the ends of a rope's strands, these eyes are formed with the bight of the strands. Tensile tests show that these are stronger than spliced eyes.¹²⁵ There are to my knowledge two variants.

Laid eyes are found in both the viking age¹²⁶ and medieval periods¹²⁷ in several different locations. The result is normally a Stage II construction, but there is also a find where it was a Stage III construction.¹²⁸

Variant A



This variant of the laid eye is found both in the viking age¹²⁹ and the medieval period.¹³⁰ These are normally made on 3-ply ropes, but there is also a find of this variant in a 2-ply form from 14th century Denmark.¹³¹

¹²³ With the exception of a very primitive splice, see *Marline eye splice* under *Knots*

¹²⁴ Magnus 2006, p. 33

¹²⁵ Magnus 2006, p. 33

¹²⁶ Schietzel, p.514 & Brøgger-Shetelig, p. 67 & Granlund, p. 143

¹²⁷ Kock, p. 343 & Magnus 2021, p. 64 & SchØlberg, pp.119

¹²⁸ Granlund, p. 143

¹²⁹ Granlund, p. 143

¹³⁰ SchØlberg, pp.119

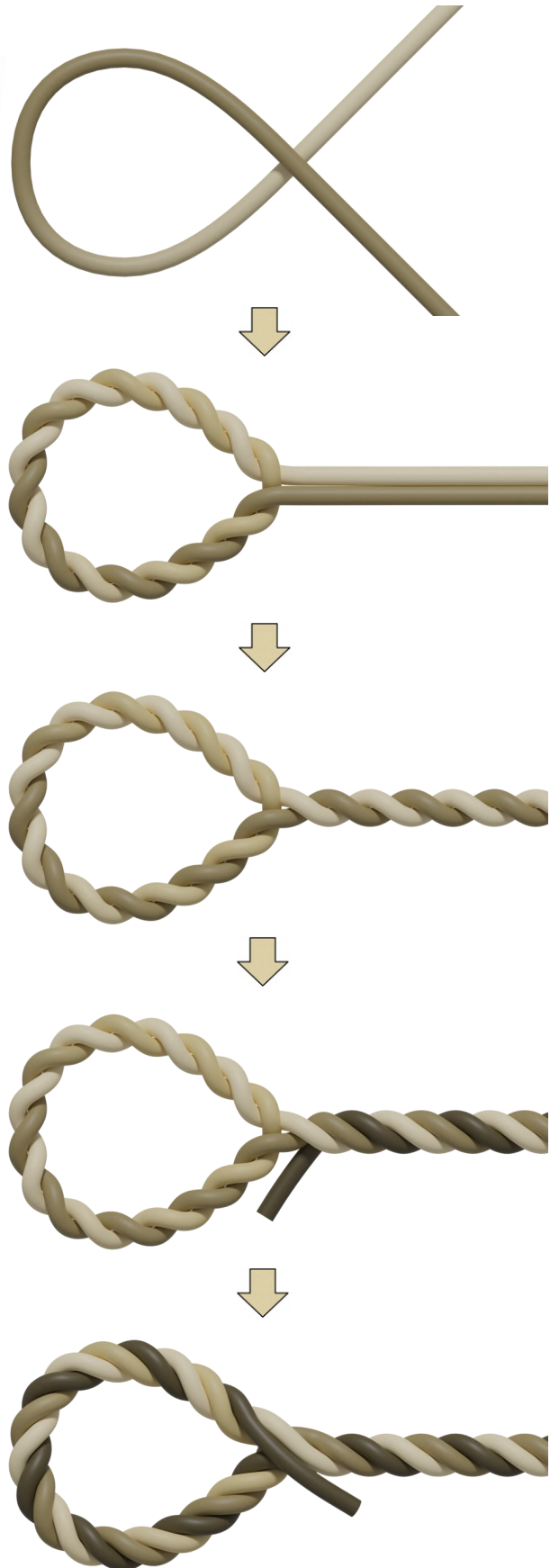
¹³¹ One can argue that this 2-ply rope could also be what is left of a 3-ply rope.



2-plyed variant¹³²

To make this variant you start at $\frac{1}{3}$ of the length of the string and form a circle. One end of the string is plied around the circle. You now have a 2-ply grommet. Ply the two ends to form the rope and just like any other 3-plyed rope one of the strands will come back as a third strand. This strand is then plied around the eye. It is unclear how this end is fastned, but in Bryggen we see that this strand goes up the rope again as a fourth strand before ending. Maybe it sometimes was tucked under a strand.

This variant can also be made with the same result in the other end of the rope, but it is done in a different way.



¹³² Kock, p. 343

Variant B

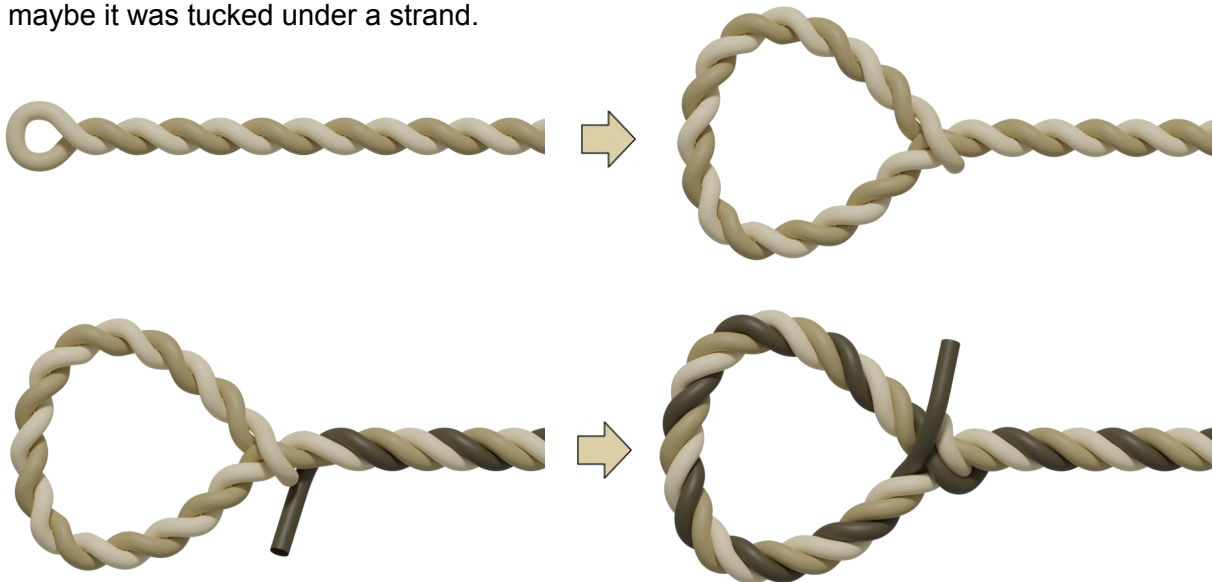


This variant looks less refined, but is simpler to make. It is found in the medieval period¹³³, and there are finds from the viking age that could be this variant as well.



Laid eye from Hedeby that could be of variant B¹³⁴

To make this variant you start off like a normal 3-plyed rope, but make a small eye when you first turn the string back on itself. Then pull this small eye back over the rope and form the correct size of eye. And when the third strand comes back again ply it around the eye by first going down the side with the first eye. Again it's unclear how this strand was secured, but maybe it was tucked under a strand.



This variant can also be made with the same result in the other end of the rope, but it is done in a different way.

¹³³ SchØlberg, p.119

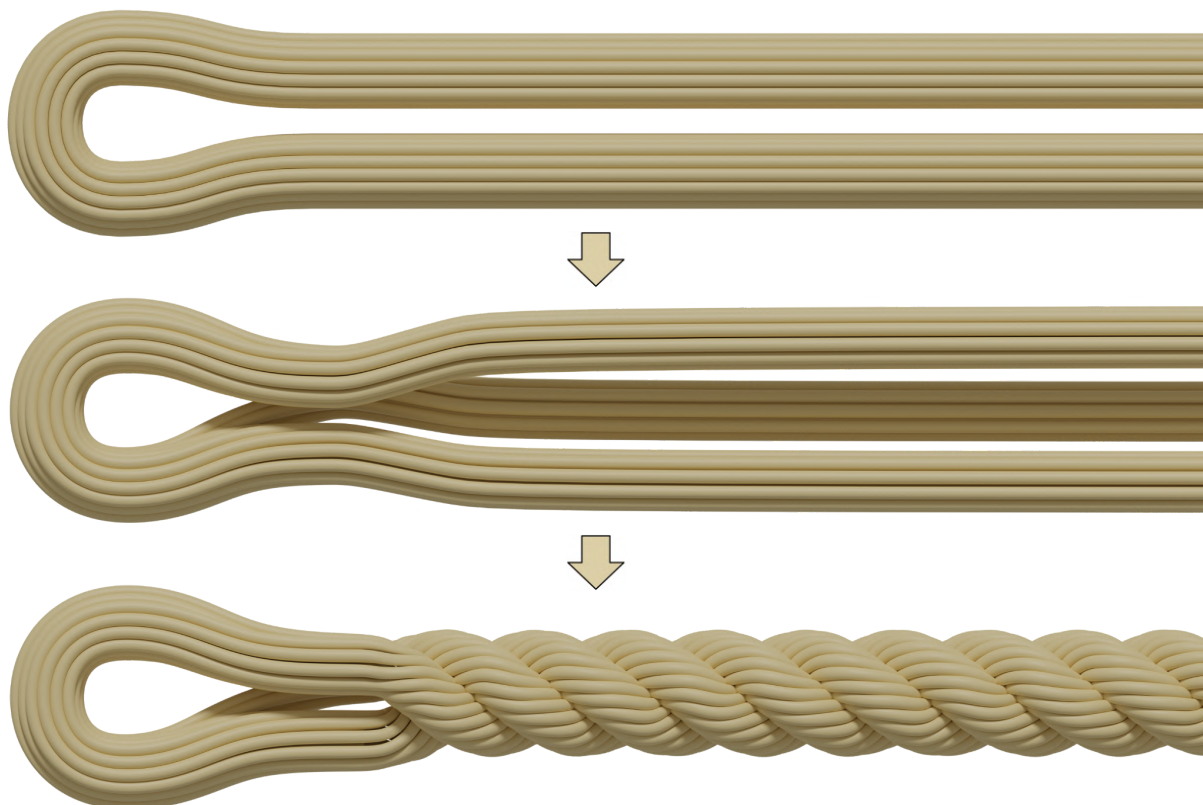
¹³⁴ Schietzel, p.514

Large permanent eye¹³⁵



This eye is neither laid nor spliced. Instead the eye was created when the Stage I elements were first doubled before the rope was plied.

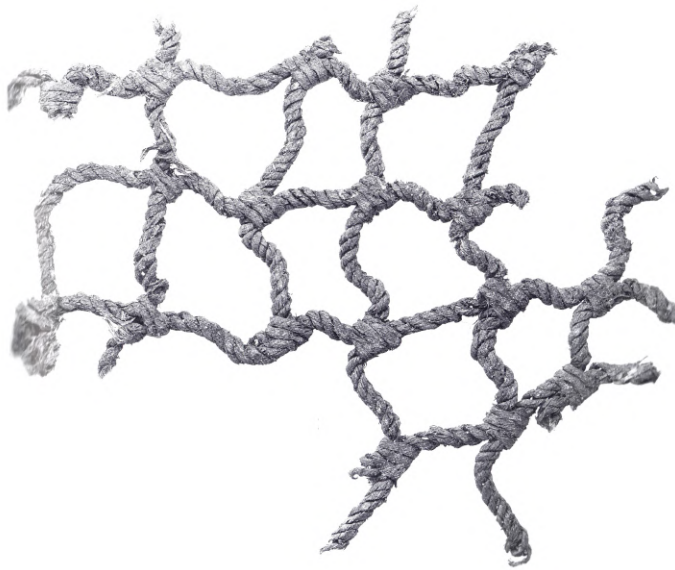
The cordage is of the aforementioned untraditional variety and consists of about 38 Stage I elements. These are not plied in the eye, but are parallel to each other. After the eye the strings are divided into three strands and plied. The Stage I elements are S-twisted and so are the strands, and these are then Z-plied into a rope.



The eye was then served with a single Stage I element. It is possible that the rope was used as a shroud on a ship.

¹³⁵ Schølberg, pp.122

Laid nets



3-ply net from Hedeby¹³⁶



2-ply net from Hedeby¹³⁷.

Nets made from bast have been found in both Hedeby and Bryggen and they differ from nearly all other known nets. Nets are normally made by first plying the cordage and then knot it into a mesh, but these nets were formed simultaneously as the cordage was plied. These and a find in Nydam Bog¹³⁸ are the only known finds of this unique type of net.¹³⁹

While the mesh in 'normal' nets are made by wrapping the whole cordage in a knot around the previous mesh, these nets connect by just wrapping a single strand around the previous mesh. On some nets it is not always the same strand that does this¹⁴⁰, but on other 3-ply nets we see that a 2-ply rope was first made and the third strand was then used to do this connecting.¹⁴¹

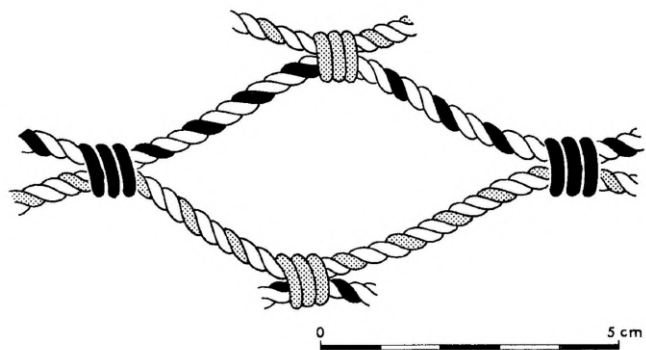


Illustration showing how a 3-ply net is plied¹⁴²

The nets in Hedeby are both 2- and 3-stranded while only 2-stranded ones have been found in Bryggen.

¹³⁶ Brandt, p.70 & Schietzel, p.371

¹³⁷ Körber, p.81

¹³⁸ Magnus 2006, p. 33

¹³⁹ Brandt, p.73

¹⁴⁰ Brandt, p.69

¹⁴¹ Magnus 2006, p. 33

¹⁴² Brandt, p.71



Illustration of 2-ply net from Hedeby¹⁴³ and Bryggen¹⁴⁴



Illustration of a simpler 2-ply net from Bryggen.¹⁴⁵

We do not know what the nets were used for. They are too coarse and have too large openings for fishing nets, but could have been used for hunting or as cargo nets.¹⁴⁶ Large nets in linden bast have been used since 1520 on the west coast of Norway in whaling to close off fjords. One such net is said to have been 50 meters long with mesh sides of 30cm, but it is not known if they were made with this technique or not.¹⁴⁷

The thickness of one of the Hedeby finds is 6mm¹⁴⁸ and the ones in Bryggen are 6.5, 9 and 20mm.¹⁴⁹

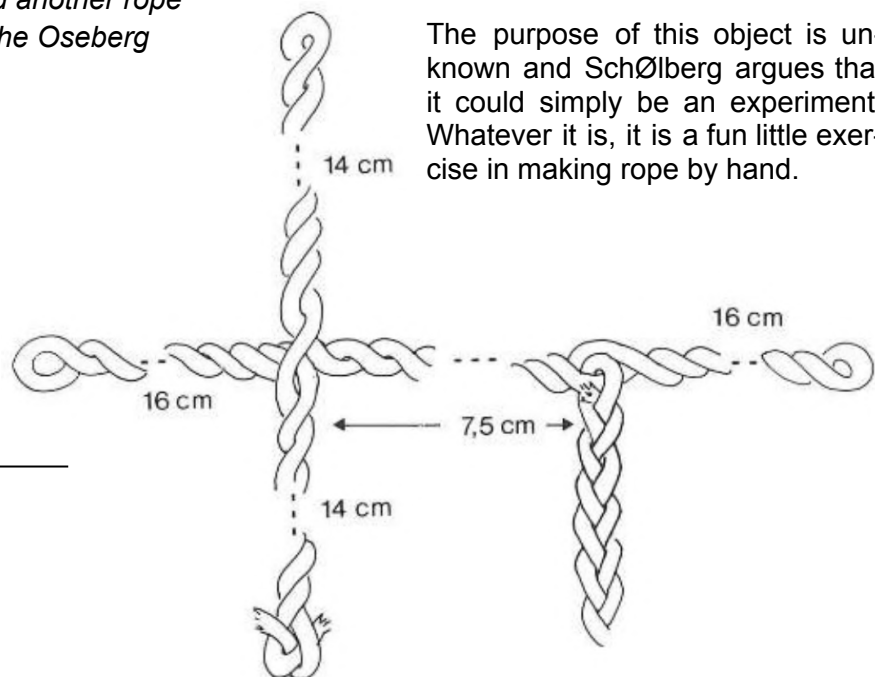
Cringle



A rope is plied around another rope forming a cringle on the Oseberg ship¹⁵⁰

Cross like item¹⁵¹

A curious item was found in Bryggen from the late 12th century made from juniper bast. It is cross shaped with a braid fastened to one of the arms. What makes it special is that three of the four ends of the arms are closed meaning that it was plied by hand and not made from a ready-made rope.



The purpose of this object is unknown and Schølberg argues that it could simply be an experiment. Whatever it is, it is a fun little exercise in making rope by hand.

¹⁴³ Körber, p.81

¹⁴⁴ Schølberg, p.119

¹⁴⁵ Schølberg, p.119

¹⁴⁶ Brandt, p.73

¹⁴⁷ Schølberg, p.121

¹⁴⁸ Brandt, p.69

¹⁴⁹ Schølberg, p.121

¹⁵⁰ Brøgger-Shetelig, p. 67

¹⁵¹ Schølberg, p.118

Knots

This is a list of knots that I have found evidence for in the viking age and medieval period. When a reference says (ABOK #834) it refers to knot number 834 in the encyclopedia The Ashley Book of Knots. This list does not include turk head knots due to their many variations.

Cordage made from bast holds knots better than hemp cordage. This can explain why bast cordage can have surprisingly simple knots.¹⁵²

Overhand knot (ABOK #4)



Overhand knot from the Oseberg ship¹⁵³

It seemed to be common to use an overhand knot to secure the ends from fraying¹⁵⁴ and as a stopper knot¹⁵⁵. It is possible that overhand knots were also used to mark distances on a rope to be used as a measuring device.¹⁵⁶

Sheetbend (ABOK #1431)



Sheetbend from the Oseberg ship¹⁵⁸

The sheetbend was common in Birka¹⁵⁹

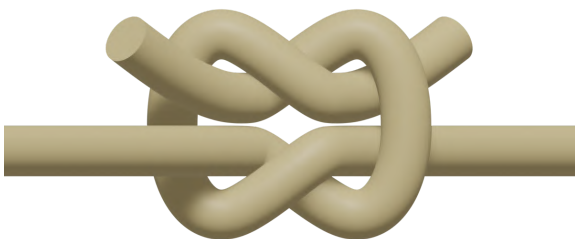
2 strand terminal knot



Terminal knot, 14th century¹⁶⁰

This is a variation of a wall knot (ABOK #775).

Square knot (ABOK #1204)



The square knot was used in Scandinavia¹⁵⁷

¹⁵² Magnus 2021, p. 61

¹⁵³ Brøgger-Shetelig, p. 67

¹⁵⁴ Olsson, p. 202

¹⁵⁵ Magnus 2021, p. 62

¹⁵⁶ Olsson, p. 203

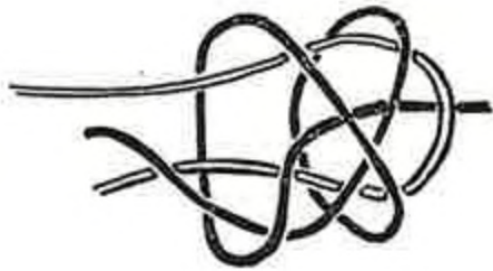
¹⁵⁷ Olsson, p. 202

¹⁵⁸ Brøgger-Shetelig, p. 67

¹⁵⁹ Olsson, p. 202

¹⁶⁰ Kock, p. 343

Complicated bend



*Bend from the Oseberg ship*¹⁶¹

This knot from the Oseberg ship looks improvised in my eyes, telling me that knot making was perhaps not so refined in the viking age.

Grommet (ABOK #2864)



*Grommet from Hedeby*¹⁶³

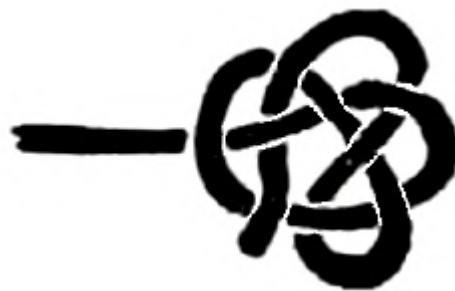
Manrope knot (ABOK #847)



*A manrope knot sculpted on a medieval silver spoon*¹⁶²

What look like common grommets have been found in both Hedeby and Bryggen.¹⁶⁴ I think it's reasonable that these are grommets because a variant A of a laid eye starts out just like a grommet.

Button



*From a 13-century shoe in TØnsberg.*¹⁶⁵

This could be argued to be a variation on the Oysterman's Stopper (ABOK #526).

¹⁶¹ Granlund, p. 143

¹⁶² Bengtsson, p. 6

¹⁶³ Körber, p.68

¹⁶⁴ SchØlberg, p.122

¹⁶⁵ Granlund, p. 143

Marline eye splice (ABOK #2772)



Primitive eye splice in the medieval Gedeby ship¹⁶⁶

It is not individual strands that are passed under other strands in this primitive splice, but the rope itself is passed under the strands to form the eye.

¹⁶⁶ Magnus 2021, p. 64

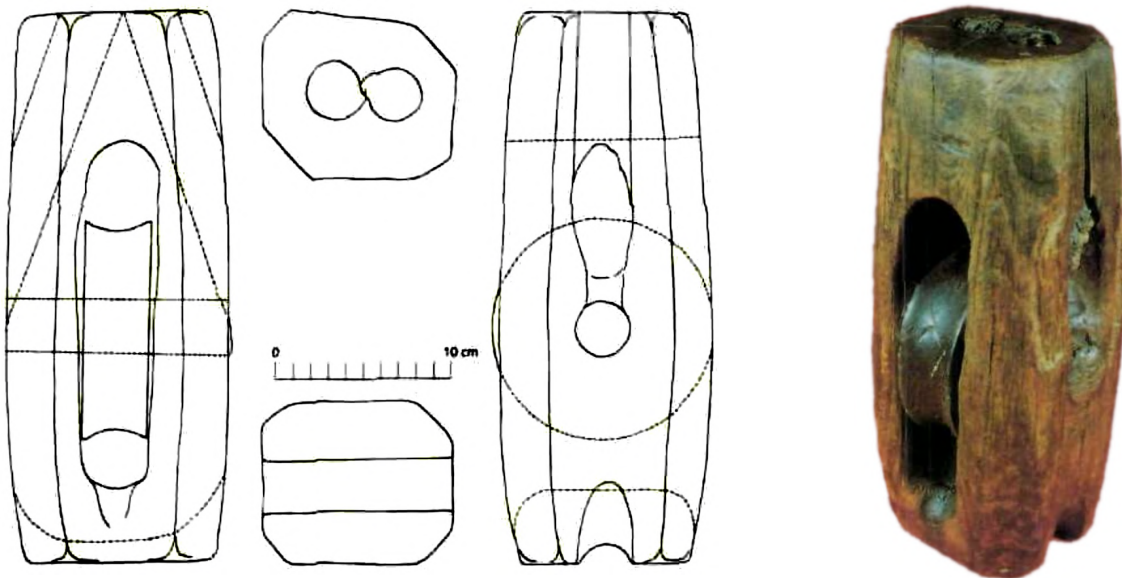
Rigging details

Rigging details are seen on many medieval illustrations and there also is a model of a spanish carrack from the early 15th century showing the rigging, but the authenticity of parts of it is questioned.¹⁶⁷

Here follows a small list of rigging details found that I know of.

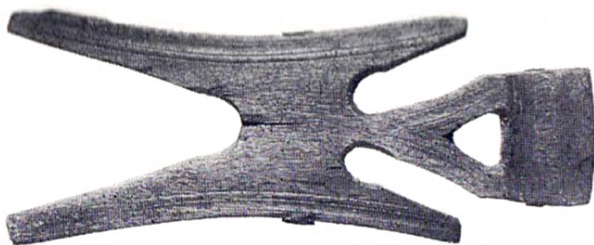
Block from a small cog from early fifteenth century¹⁶⁸

This single block could have been fastened to the yard and part of the brace. The block is made from ash wood and the axle for the pear wood sheave is from boxwood. A piece of rope is left in the block, but there is no information on its material.



Sketch and photo of the block

Miscellaneous rigging details



Rigging detail from Gökstad ship¹⁶⁹



Rigging detail from Gökstad ship¹⁷⁰

¹⁶⁷ Hocker-Vlierman, p. 53

¹⁶⁸ Hocker-Vlierman, p. 53

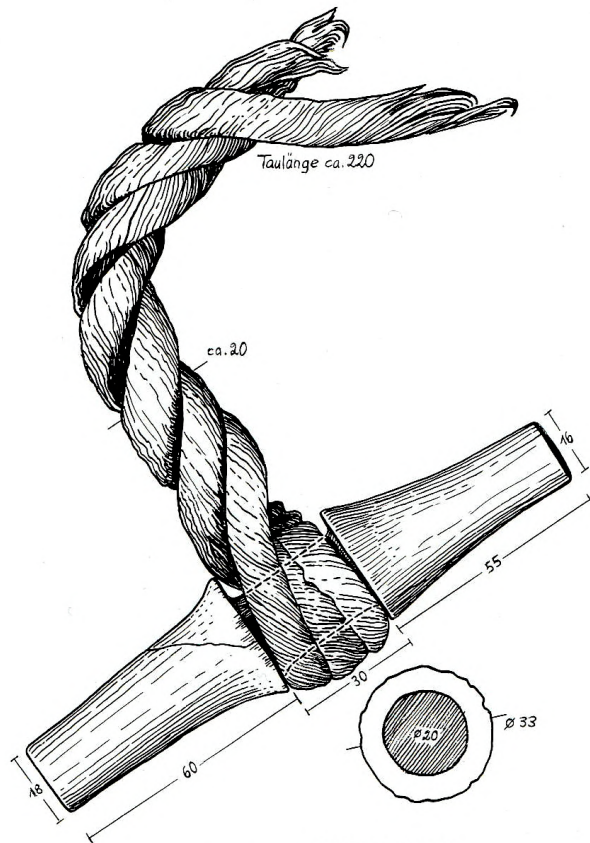
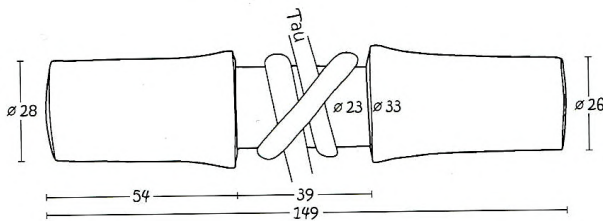
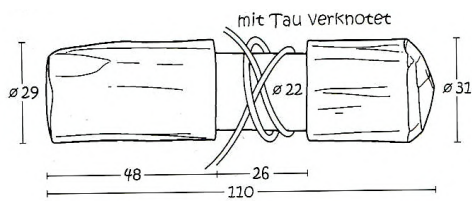
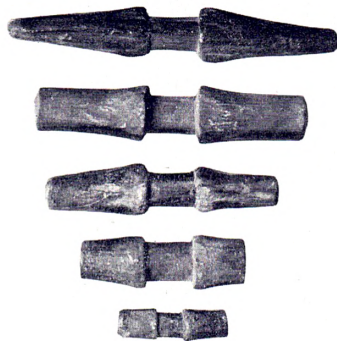
¹⁶⁹ Brøgger-Shetelig, p. 115

¹⁷⁰ Brøgger-Shetelig, p. 66

Toggles



Toggles of many sizes and shapes have been found from the viking age.¹⁷¹



Examples of toggles fastened to a rope, note that this can only be done at the same time as the rope is plied by hand as it is not the rope itself that is wrapped around the toggle, but its strands.¹⁷²

¹⁷¹ Brøgger-Shetelig, p. 66 & Schietzel, p.502 & Olson, p. 83

¹⁷² Schietzel, p.503

Reproducing bast cordage

Linden bast can be very hard to come by if you don't harvest your own, and if you do it can be very expensive. I have found that cheap bast from the palm tree raffia that can be bought in any hardware store or garden center works quite well.



Raffia bast bought in a hardware store.

It looks quite similar and more importantly it also handles similarly so both spinning and plying is done in the same way and the same laid eyes and -nets can be demonstrated.



Raffia bast on the top and linden bast below

But it has its limitations and I have not been able to buy raffia bast of good enough quality to do a wrapping strip around the string.

Verses about ropemaking

I do not know anything about poetry, but instead of simply translating the verses word by word I tried to keep the metre. And they are in Swedish as I'm even less of a poet in English.

The Fraudulent Ropemaker

Den fuskande repslagaren

Jag är en usling och ingen mäster
Då jag blandar lin och rester
Som jag sedan med hampa täcker
Och hoppas att folk ej upptäcker

Ich bin ain schalk ond öch ain ludez-
vnd wirt zemen flachs ond kuder-
vnd han es mit hanf über zogen. Di-
mit han ich die lüt betrogen.



The book *The Eight Charlatans*¹⁷³ from the middle of 15th century depicts eight different ways craftsmen can trick their customers and what to look out for. The ropemaker is shown to cut the hemp with flax and scraps.

¹⁷³Die acht Schalkheiten, 15th century: Bibliothèque nationale de France, p. 9

The Ropemaker

Der Seyler.

Repslagaren

Jag är repslagarn och gör förstås
tågvirket som heter tross
även rep till att hissa faten,
och den lagbrytande saten
Jag gör även nät och giller
För gädda, fasan och iller
Repen kan va' stora och små
De är alla sig lika ändå



Ich bin ein Seyler / der zum theil/
Kan machen die langen SchiffSeyl/
Auch Seyl zum bauw / dran man allein
Auffziech Mörder / Zimmerholz vñ Stein/
Ich kan auch machen Garn vnd Netz/
Zur Jägerey vnd zu der Hek/
Darzu auch FischNetz / groß vnd klein/
Sonst auch allerley Strick gemein.

The book *Authentic Descriptions of all the World's Trades*¹⁷⁴ shows not quite all of the world's trades, but over a hundred of Europe's. They all are shown with a woodcut and a verse about what they are doing.

¹⁷⁴ Amman, Jost and Sachs, Hans 1568: *Eygentliche Beschreibung Aller Stände auff Erden*: Bayerische Staatsbibliothek, fol 99r

The Just Ropemaker

Småtjuvar får en snara,
De stora man låter gå.
Om allt omvänt kunde vara
Mer rep jag hade sålt då.

Die kleinen Diebe hängt man auf,
Die Grossen lässt man laufen.
Wär umgekehrt der Welten Lauf,
Würd' ich mehr Strick verkaufen.

This verse was written outside of ropemaker Conradi's workshop on Mauernstraße 26-27 in Celle, Germany. He moved here 1879¹⁷⁵ but the verse is said to be from 1764.¹⁷⁶

In 1938 a new ropemaker moved in, Dollenberg. The nazi government disapproved of the verse and forced him to replace it with something less crude.¹⁷⁷ However when the ropemaker moved to Bergstraße 37 in 1958 he had the old verse once more painted above his entrance.



The old storefront with the new verse¹⁷⁸



The new storefront with the old verse¹⁷⁹

¹⁷⁵ <http://www.seilerei-dollenberg.de>

¹⁷⁶ Nebelspalter, das Humor- und Satire-Magazin 1936: Heft 35 p. 2

¹⁷⁷ I can not find this source anymore. It was in a book called something like 'Nazi war crimes in Celle'

¹⁷⁸ Google review of Steakhouse Apache

¹⁷⁹ Flickr.com

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