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Trawlerman Knots and Netting

by Pieter van de Griend

Wij slaan er de pezen en boeten het net.
Ook wordt er vakkundig een stuk in gezet.
Wij maken de scheuren, al zijn ze vaak groot.
Daarmee verdienen wij ons dagelijks brood.
Twee pezen, twee zijen, het net is gereed.
En honderd netten vormen een vleet.
Zo`n hele vleet neemt een logger dan mee.
Dus zonder ons kunnen de vissers niet naar zee

Dutch net mender's song from the 1900's.

Prologue

Characteristic of trawlers in harbor are the smelly mountains of colorful trawls heaped on their decks. These big tangled messes of green and orange nylon, rusty chains and bright yellow floats do not appear of much. However, when dragged through the ocean they are immensely impressive contraptions. Submerged they are a collaborative mix of netting, bobbins, steel wires, chains and floats. They come alive by sifting fish from millions of tons of water and allow the crew to drag the catch to the surface. Fig.1. illustrates a deep sea ottertrawl [12].

The basic principle of a trawl is to drag a funnel-shaped net through the water, collecting the catch in the (closed) rear end. Two centuries ago, beamtrawls were rope constructions, attached to a steel rake and dragged over the seabed at the end of a 6-inch hemp hawser behind a sail-powered trawler [19,p57]. Approaching 1900 fishing boats were equipped with ottertrawls, powerful combustion engines and forces increased [25, pp153-155]. From this point in time onwards, we see trawl developments skyrocket. The scale changed along with the technical demands and, hence, the resulting fish-catching contraption. Trawls nowadays contain heavy-duty iron work, king size shackles and bolts. The enormous forces have long ago done away with natural fibred media. Consider some contemporary trawl dimensions from the Faroese trawler *Krúnborg*. This vessel is equipped with two Vónin Pelagic 2048 meters trawls with 32 meters meshes. Super 12 Dyneema twine forenet and twin codends – taking loads of 600 tons and 800 tons respectively. Although technology soars, knots remain a constant factor.

Trawlerman Knots?

What justifies a separate treatment of trawlerman knots? For one, sources are hard to find [18], [20]. Some issues of *Knot News* ago, we met the Codline Knot, a classical trawlerman knot specimen, but are there any other special knots? Despite the range of modern media on board of any trawler, there remain numerous instances where knots are required. Rope working techniques, as found in most seamanship manuals, are generally used by fishermen for getting their tubs out to the fishing grounds. However, from there onwards the game is different. Often the variety of rope-problems, which trawlermen meet, requires specific structures for solution. Needless to say that there is abundant scope for creativity. Fishermen do not waste time and as a rule their knots are super efficient, simple and easily reproduced in case a similar rope problem comes knocking at the door again. As most knots tied by trawlermen are net-related, let us first take a look at nets and then focus on other specific knots.

Netting – Historical aspects

Of course it is never clear whether excavated nets were actually intended for fishing. They could, after all, merely have been used as cargo nets for some transportation type. Their basic technology, however, can be discerned. Comparative study shows that nets were used in various formats, designs and qualities.

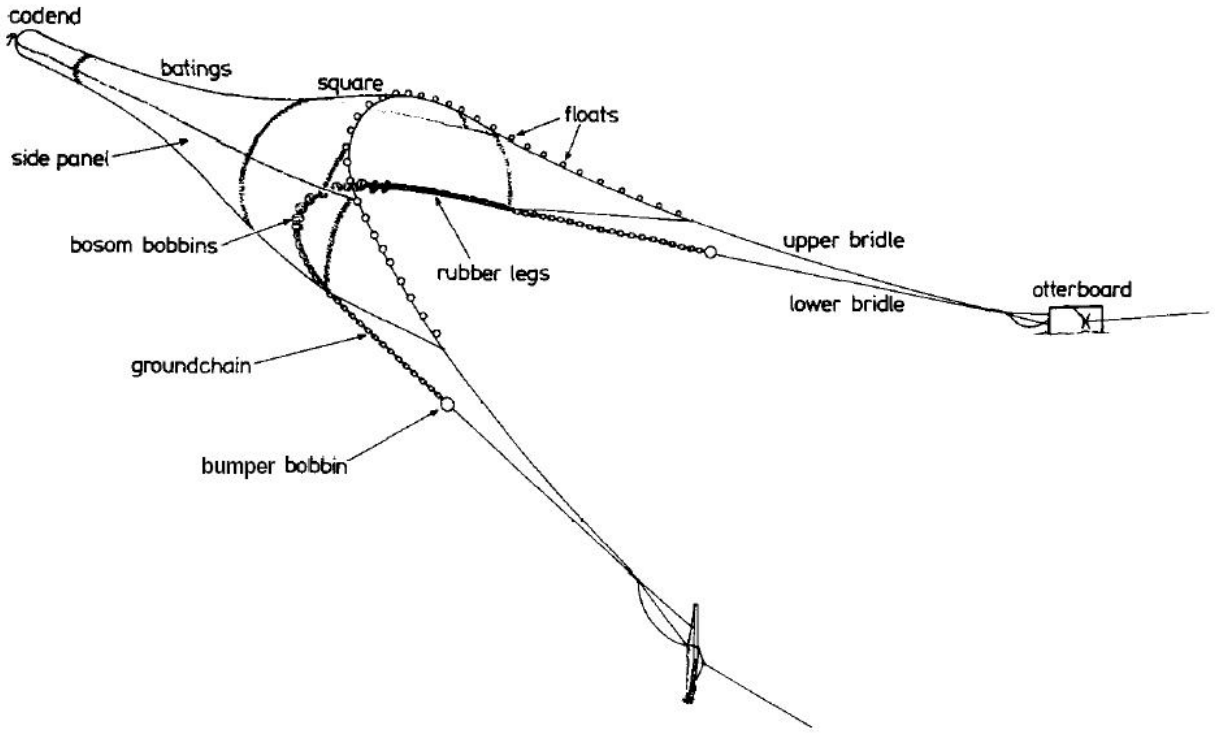


Fig1. Twin-bridle rig for a four panel trawl. Source R.D. Galbraith [12].

Abundant archaeological evidence proves that nets have been used in prehistoric times. On the American Continent netting specimens, dating from well before Hispanic invasion times, have been found all the way from Peru to Alaska [7]. Nets were used by the Egyptians as amphora nets [24, p52]. In Europe nets have been used since the Stone Age (10.000 years ago). There are rock art images which are interpreted as stylized nets. Notable is the impact of nets in the myths and sagas of different peoples. In the Norse Edda, Loki, the god of light, shows Man how to make nets [4]. Nets triggered lots of superstition [21, pp1-13]. However, here we shall be interested solely in nets used in fishing.

Netting - Sociological aspects

Depending on the mesh size the making and mending of nets requires special manual abilities. Before the big large-meshed sisal deep-sea trawls came onto the scene netting had small meshes and thin twine. This required agile hands and nimble fingers. For that reason women were employed for mending and the manual production of nets. Fortunately there exist many excellent accounts. Along all European shores, from Aberdeen [11] to Scheveningen, the French [15], Iberian and Irish coast [14] and across the Atlantic to North America [17] accounts can be found. Net mending traditions have been described for almost every net making community in the world, from the Hawaiians [23] to Maori's in New Zealand [8]. Fishery Officer MacLaren in Northern Rhodesia was struck by the widespread ignorance on net knots and conducted his personal survey showing some common structures and Sheet Bends up to handedness illustrated below [16, p85].

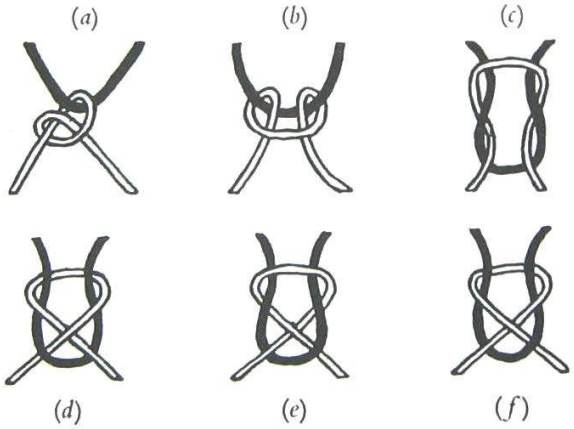


Fig.2 Knot types collected by Maclaren [16].

As long as net dimensions permitted, nets were taken ashore after every trip for maintenance. Fishing villages would have special locations for mending and preserving nets. In Dutch, for example, they even had special names for these fields, such as *boetveld* and *taanweide*. During more recent times nets never left the ship for repair. If they left the deck it was either to fish or to be discarded.

Net makers used to bring their own netting needles to the job. They were made of pliable elm- or ash wood. Manufacturing and mending nets was a demanding task. Mesh sizes soon became regulated by law. Mending nets was a summer activity. New nets were manufactured during the winter. After 1900 nets were produced by machines. Mending, however, still is manual labour-intensive. Especially repair at sea threatens to remain a manual activity for a long time to come. Net mending requires skill and adeptness. Out on the ocean, you may encounter men flicking netting needles as fast as lightning, but they are few and far between. Most trawlermen cannot mend ripped netting. This is not surprising when you see the sorry shambles in which a shredded trawl may arrive back onto the deck after a stuck. If you do not have a mental image, or concrete knowledge, of how a trawl is composed you are utterly lost. Add to that the discomforts of a storm-tossed deck and the necessity of knowing how to cut netting. On the other hand, if you know how to cut nets and are motion-resistant, you will manage to mend a ripped trawl at sea. One thing I would like to highlight. Cutting net, severing the appropriate mesh parts to clean a rip, is well-described in the literature. Slashing knots, however, is a well-ignored skill few master.

As said, anthropological aspects of the netting communities from all over the world are accessible in some documented form. Many famous fishing ports have museums dedicated to their (former) livelihood. Knotters should visit such places to get an impression of the real picture with respect to working knots. You may glean an impression from the Grimsby trawler museum pages on the internet [27].

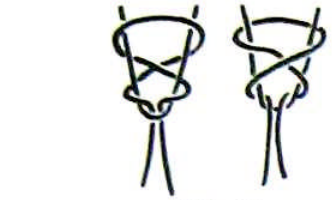


Abb. 14
Symmetrischer Doppelknoten.

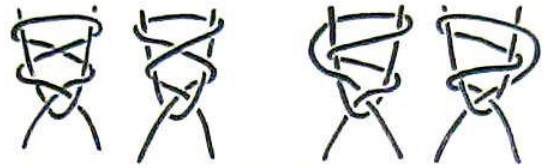


Abb. 15
Asymmetrischer Doppelknoten in zwei Darstellungen

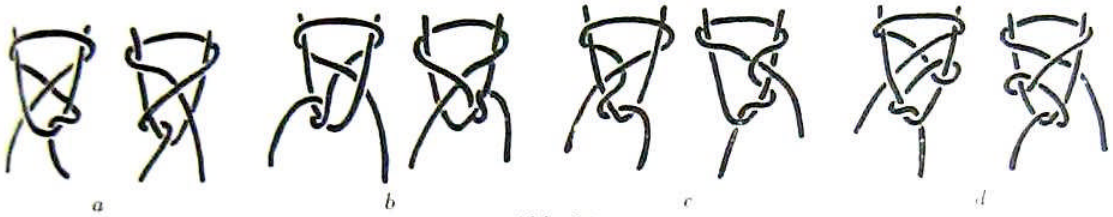


Abb. 16
Doppelknoten mit mehrfacher Schenkelumschlingung

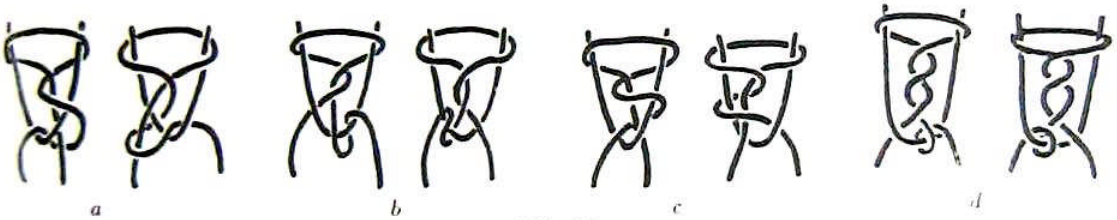


Abb. 17
Verschiedene Doppelknoten.

Fig.3a Overview of netknots by Andras von Brandt [5, p250].

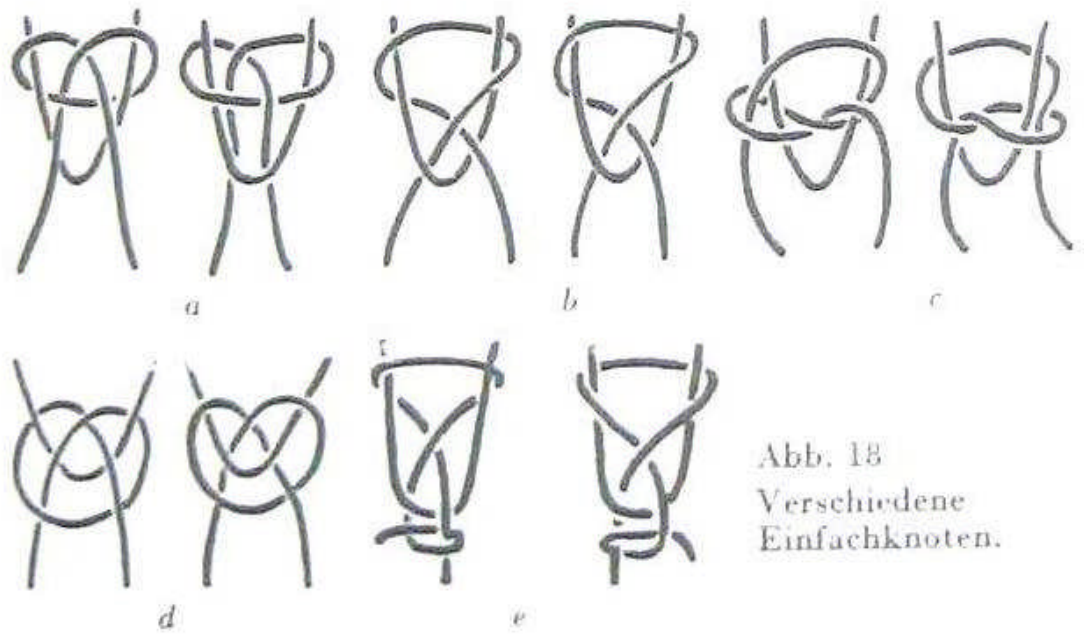


Fig.3b Overview of net knots by Andras von Brandt [5, p250].

Netting - Technical demands

Nets are considered one of the primary textile technologies [4, p109]. Over time many innumerable different methods for joining net materials into meshes have been invented. This statement may not say much till you start realizing that the net principle is more than tying knots in some systematic manner. As a product, a net must be easily produced, man-handled and maintained. In short, a net is the result of a technological analysis process. In that respect an influential German architect of the 1850's, Gottfried Semper, once made a statement which hits several nails on the head simultaneously [22, p316]:

> *"A very ingenious and ancient application of the knot led to the invention of the network, which even the most savage tribes know how to make and use for fishing and hunting. The mesh of the knot has the advantage that a damaged net does not affect the whole system and is easily mended"*

Having a piece of net is merely an initial step in making a "trawl-system". Trawl design begins by thinking about the configuration of wires which has to form the skeleton of this submerged flying machine, which sails at a speed of 2-5 knots over the seabed, catching fish. Trawl design determines operational quality and performance. It is a specialized field in its own right which we shall not delve into here. Assuming we have the complex of wires the next step is filling the "gaps" and making the funnelshaped bag.

The net segments must be cut to exact shape to carry the load of the submerged contraption without tearing. Next these panels must be attached to each other and the wires. Of course the net panels merely fill the open areas between the bridles. The panels must take a little as strain as possible, because netting easily rips.

Net knots must fulfill a number of demands, they must be easily made, secure and easy to construct during the production of sheets of netting, but moreover when mending nets. In coarse natural fibers, such as sisal, virtually any tangle holds. Many traditional knots in synthetic media fail miserably in terms of security and require additional chemical and/or thermal treatment to ensure stability of both knot and mesh [5].

Repair and maintenance are other factors to consider. Mending nets there are many techniques for which I will refer to some excellent textbooks on this subject [3], [13]. Most important factor to keep in mind is regularity of the work. In a mended piece of net, irregular meshes may destroy the trawl as soon as it hits the water. Net plates are very sensitive to asymmetric load and their reaction is predictable: immediate ripping.

The oldest monograph on net making is presumably Rev Bathurst's. Although he complains about the lack of literature in his field, there are many references to Duhamel, suggesting accessible earlier published

work. Bathurst's book contains beautifully drawn plates. He shows the Sheet Bend structure, names it "*Bend Knot"* and states *"it is as indispensable as the netter's right hand"* [2, p24]. Even though the Sheet Bend gets a lot of attention as net knot, many other knot types have been proposed as alternatives. Figs. 3a and 3b reproduce a compilation by Andras von Brandt [5]. Most of von Brandt's structures are merely (experimental) suggestions for net *manufacture*. During the net *mending* process uncountable many other variations may be found.

Research in netting is ongoing. In attempts at getting fuel consumption down, aspects such as drag by meshes and knots is investigated. In this context the knotless netting development should be mentioned. Here the knots have disappeared completely. The meshes consist of twisted fibers or chained stitches. During the manufacturing process the legs of the adjacent meshes are inter-braided, forming the knotless mesh. In Fig.4 samples of the Rashel knotless braiding type are given.

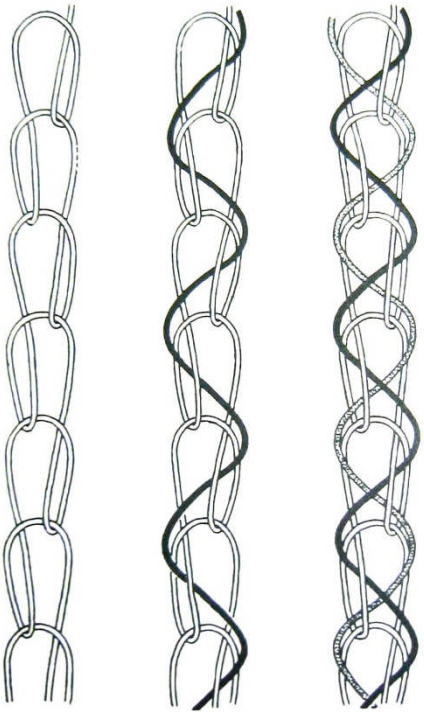
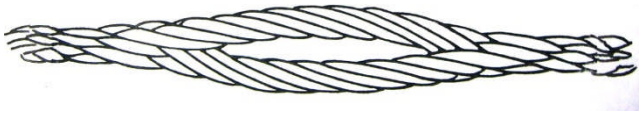


Fig. 4 Rashel knotless netting [6]

Wire Splices

On a sailing trawler the beamtrawl was towed by a thick hemp hawser. The beam principle was soon superseded by otterboards and wire ropes. Next wire rope made its entry into the actual trawl. The beam became the ground rope with its bobbins. Most other natural fibred ropes were replaced by stronger media. Contemporary trawls are quite dependent on wire. The skeleton between which the net plates are attached is in fact nothing but a high-tension wire frame. When the boat stops towing the trawl collapses onto the seabed.

The way trawlermen work with wire really deserves a dedicated article. However, here we happily list some less profound observations. Splices are multi-strand knot forms and trawlermen usually stick to two well-known types when it comes to wire; the Liverpool Eye Splice and the Cut Splice [1, p465, #2832, p543].



Although snapped wires are a fact of trawlermanlife, parting wires, which may be up to 42 mm in diameter, are not an everyday event. When mishap does strike, Short Splicing is no option and a Cut Splice of about three fathoms is put in. For fancy elaborations, such as wire long-splices, I have never met any trawlerman with either time or patience.

The Cut Splice emerges naturally as soon as the principles behind the Liverpool Eye Splice are mastered. After all, why should one learn many distinct techniques if a single, universally applicable, way of working will suffice? By the way, this also explains why the ravel-preventing Wall Knots left the longliner scene to make place for spliced eyes. About a foot in length, which are used to make… knots. Back Splices were no option.

One would be inclined to think that splicing monstrously dimensioned wire would require special tooling. Well, out on a wild-bucking trawl deck there are strikingly few of such gadgets. Wire is simply stretched along the trawl deck (held with some simple but strong sisal bindings!) and a considerable amount of torque is removed before the splicing commences. As is well-known, wire splicing differs from rope splicing. In a rope splice the strands are tucked in an over under manner. In a wire splice the strands spiral around a dedicated strand. After the wire's lay has been loosened, it is just a fight with the marlin spike to get the strands to twist round each other in a handsome fashion.

It is noteworthy that, according to *Boteler's Dialogues*, the Cut Splice has been used for almost 400 years at sea [9, p138]:

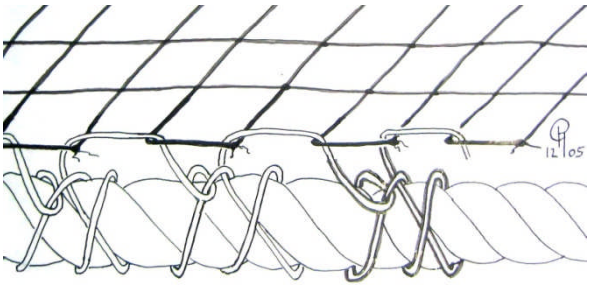
"Now of these splices there are two sorts: the round splice which is the interweaving of the ends of two ropes, one into another; and the other which is (barbarously or rather bawdily) called the cunt-splice, and this is when the strands of either rope are put into one another, a good distance off from the very ends, and those very ends left out unspliced; by which work is fashioned a long slit, the which with these rude name-coiners begat the name"

There is not much to be found documented on the trawlerman wire splicing topic [18], [20]. On the internet, however, I found information on the Grimsby Trawler Museum pages [27].

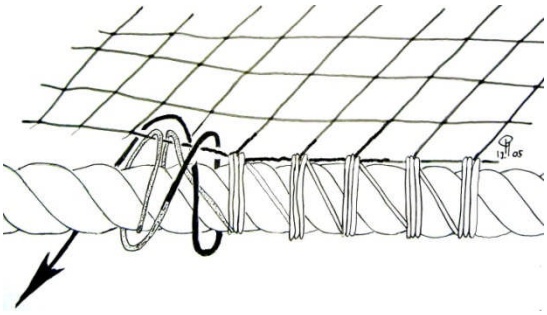
Rope Rimmings

A patch of netting is not particularly useful. Sharply pulling the meshes along the rims may distort and rip the fabric. In order to create reinforcements, ropes are attached along the outer legs of the rim-meshes. This can be done in a number of ways. Either so-called fly meshes are used, or the meshes are lashed directly to the reinforcing rope. Both methods have their advantages and disadvantages.

Most common method is where a row of fly meshes are hitched to the rope, attaching the net plate to the rope [10]. This allows for some self-adjustment when the net is operational and eases repair should damages occur. Rolling Hitches possibly in various (capsized) forms are used for this task [13, p39].

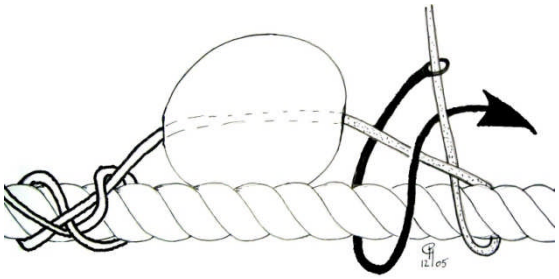


The second set of techniques is more cumbersome and lashes the mesh legs directly onto the rope. Along the length of the rope the meshes' legs carry the load at evenly spaced intervals. There exist several techniques for achieving this goal, many of them based on the Marline Hitch. Often a batch of meshes are taken together and connected to the rope. This is the case where the trawl belly panels are seamed onto the belly ropes.



Headrope Float Attachments

The headrope forms the upper rim of the trawl gap. To aid opening, buoyancy is increased by means of floats. The floats are attached to the headrope as a string of beads. The most commonly used hitches are the Groundline Hitch [1,p291, #1680] and the Picket-Line Hitch [1,p291, #1676]. On trawlers this knot is usually called the Side Knot, as it is used in net mending to make the side of a mesh. These hitches are structurally identical, but change in tying direction, c.f. illustration below.



The first reference to the Groundline Hitch I have encountered dates from 1834 [26]. I agree with Clifford Ashley that the Groundline Hitch and the Picket-Line Hitch are obscure structures. On land their shared structure occasionally shows up. At sea it is a totally different story.

Epilogue

Here we took a look at trawl-related knot developments from Western sources. However, all over the world people have devised their own specific trawl-knots. In Ganghzou, on the Yellow River, in Southeast China, I have seen a shrimp fisherman attach a bamboo pole in a self-correcting fashion by means of Constrictor Knots to his beamtrawl. Another subject we have not touched is that of wire and rope-stoppers. They are a subject in their own right [18, p67], [20, p9].

In the fourth and final installment of this little series on industrial fisherman knots we look at the structures employed in the hook-and line fishery as it was conducted by North Atlantic sloop fishermen well over a century and a half ago.

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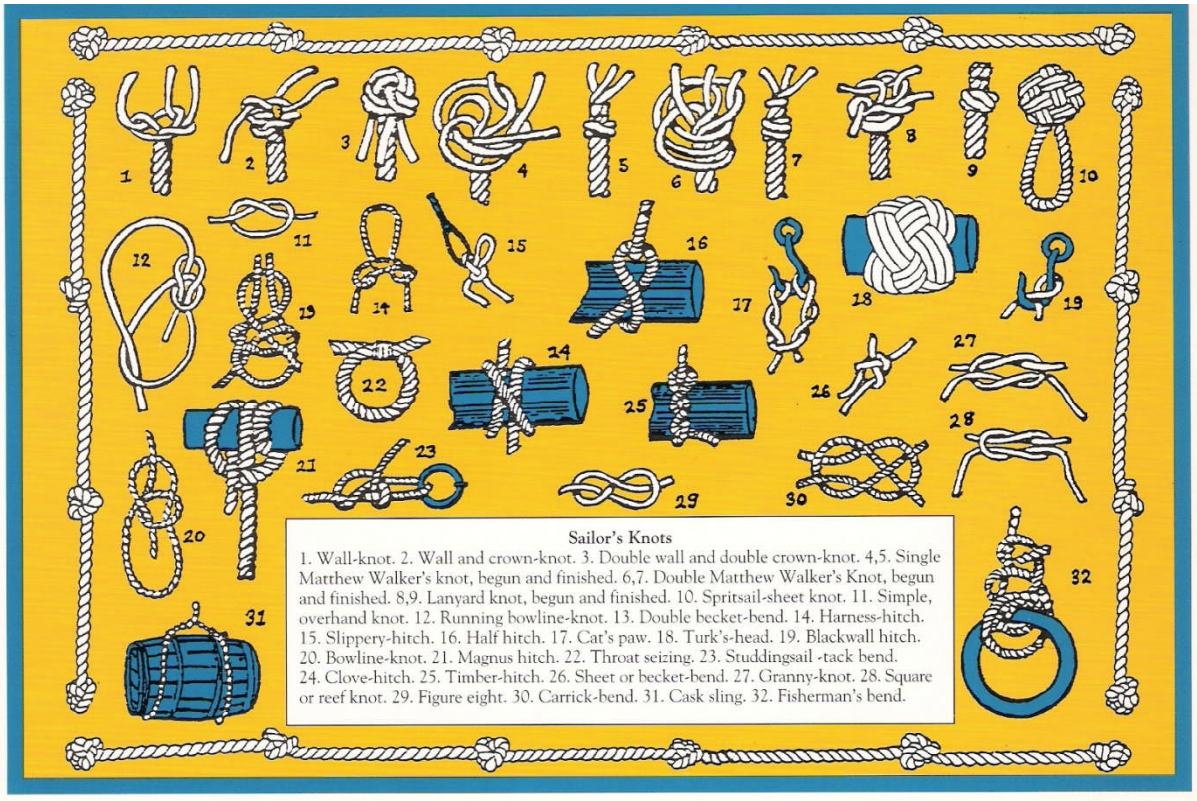


Branch Bits

Darrell Ausherman of , California sent in this useful information: "Ever put a shirt on and notice a little thread sticking out from a button? If you did, you know by now what happens if you pull on the thread. It's time to get out the needle and thread, or is it? Here is a quick fix.

Take a piece of thin whipping thread and tie a constrictor knot around the thread under the button – like you were tying a constrictor around the stem of a mushroom. Tighten and cut off the excess thread. The constrictor squeezes the threads holding the button on and prevents those threads from slipping. You can then slip off the original little thread. And as a bonus, you get a little stem for your button, which is usually only found on high quality suits (they sew on with a spacer between the cloth and button, then they apply frapping turns around the thread.)

⌘

From the Editor. Many of you have noticed that the last issue of KN had the wrong date on it. It was sent out as May 2005 and it should have been May 2006. Please correct your copy (if you already have not), the person responsible for this reprehensible act has been subjected to a "treatment" that will insure it will not happen again (he was denied any string for a week!)

From the Mailbag

Andrew Lyle of New Zealand contacted me a week or so ago to let me know about some rigger's tools that are for sale. A journeyman rigger friend passed away recently and his widow has two boxes with all his tools that she wants to pass along to a good home.

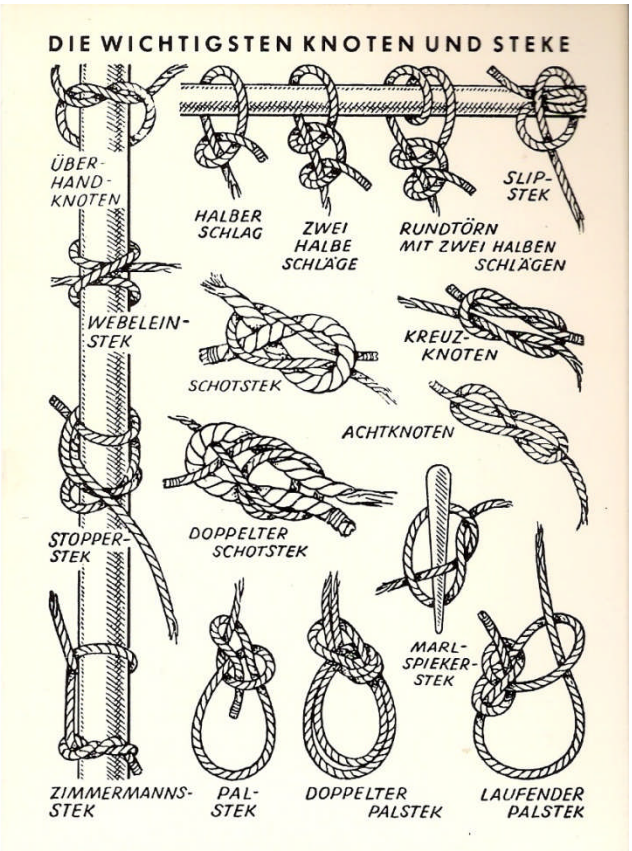
The inventory consists of heaving/serving mallets, wooden fids, spikes, pull-through etc. Many of the tools were made by riggers/sailors of the South African Navy.

If this sounds interesting please contact Mr. Lyle at bluenose@webmail.co.za or telephone at +6442331833.

His postal address is:

Mr. Andrew Lyle

Wellington
New Zealand



Dan Cashin at Mullica Hill, New Jersey Living History for the G.A.R. Museum and Library, October 2004 with lanyard by Joe Schmidbauer