

KNOT NEWS

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Tacking Turk's Head Knots

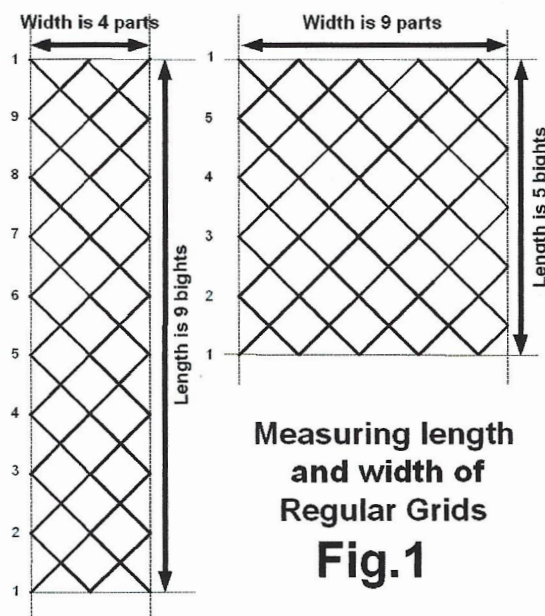
Pieter van de Griend

Introduction

Surely every knotter has tried tying a Turk's Head Knot (TH) at least once in his life. However, just in case you have never met a TH, here comes a definition. They are flat braids, which are bent into a tubular form by fusing the ends. THs are often described as possessing an Over 1 Under 1 weave, also known as Casa Coding. The coding is the collective name for the crossing configuration of the knot. Studying such knots it turns out that this O1U1-coding is not all that important. What is significant are the grids cast by these knots as their "shadows". In this article grids are diagrams devoid of crossing parity. Let's consider the grid-diagrams of so-called Regular Knots.

The size of a Regular Knot grid-diagram can be measured by means of the number of parts, i.e. the width of the flat weave, and the number of bights, i.e. the length of the weave. As TH braids are cylindrical, their width equates to the number of times the string-run traverses the spar. In Fig.1 two examples are given. The leftmost sample has 4 parts and 9 bights. The rightmost sample has 9 parts and 5 bights. In ABOK parlance [1, #1319-1321], the first one could be the grid-diagram of a Narrow Turk's Head (NTH),

because it has more bights than parts. The other could be the grid-diagram of a Wide Turk's Head (WTH), because it has more parts than bights. If the difference between the number of bights and parts is exactly 1, we speak of Square Turk's Heads (STH).



It is well known that if the number of parts and the number of bights have a common divisor equal to one, such a knot can be tied with a single strand [1,p233][2,p354]. If these numbers have a common divisor greater than one, then that is the number of required strings to complete the knot.

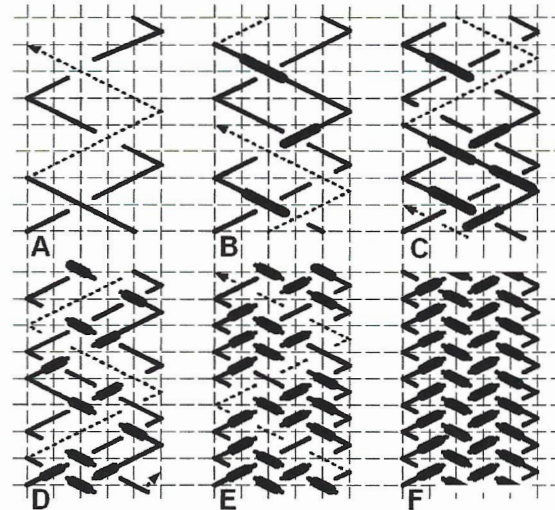
If you have tied such THs, you will have discovered that, in general, larger ones can be obtained by expanding smaller ones. However, NTH stay NTH, WTH stay WTH and STH stay STH at the end of the ride. Many techniques to raise Turk's Heads have appeared in print [1], [2], [3]. Moreover, there exists a well-developed theory [4]. Here I want to take an introductory look at a mix of expansion techniques and theory. I shall do so by means of one of the smaller, less easy to obtain, NTH. During our study we shall discover why it is so hard to come by. Please note that in the following we *shall speak of Regular Knots and their grid-diagrams* rather than TH. It is left as an exercise to the reader to draw up a grid-diagram and transform it into some form of TH by applying a coding. Hint: the so-called Casa Coding (U1O1) will always be possible, irrespective of the grid-diagram's dimensions.

NTH of 5 parts and 8 bights

Many 8-strand projects curiously need a single stringer NTH with 8 bights. Of course you can make a 3 part 8 bight TH, but often it is too narrow and you need something wider. Making the 7 part 8 bight STH is easy [1,p236], but often that sample is too wide. Getting the 5 part 8 bighted beastly is a challenge. Expanding it from a smaller Casa-coded NTH usually fails. Why is this?

In the drawing below (Fig2.A-F) the construction of the 5 part and 8 bight TH is given. If you try making one, you will find that in this MOBA (Most Over Braiding Algorithm) a staggering 22 out of its $4 \times 8 = 32$ crossings are over crossings. For a long time during the construction, all of your bights are quite uncontrollable, unless you are an octopus. They remain renegade right up till the last moment where the final strand races through the mess and settles the weave. Changing all

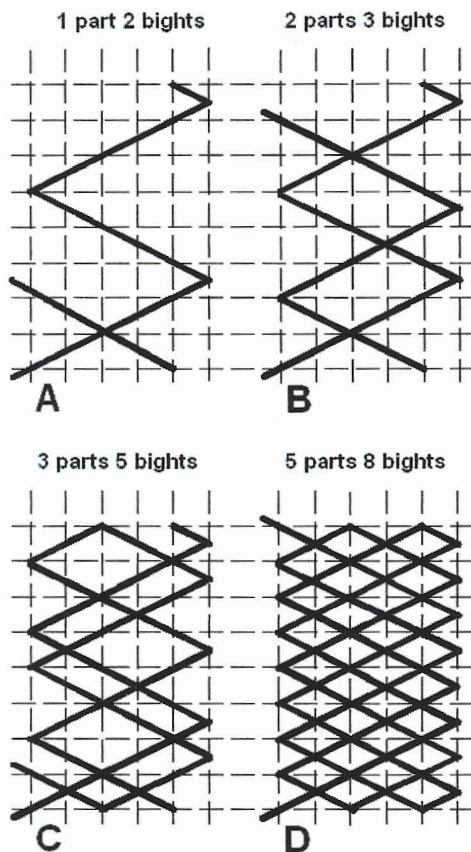
crossings in the knot and retying it, you will find that you would still be left with a bunch of hard to handle loops and bights. Moreover, now they have to be lifted all of the time. Why is this the case? After you tried tying this little pest I will explain.



5 part 8 bight
Casa-coded Regular Knot **Fig.2**

Ready? Okay, what's the answer? Well, the path through the so-called Regular Knot Tree tacks every time it hits a new node. What?!? Yeah, you heard me right. Let's take it all in slow-mow.

Consider the grid-diagrams of Fig.3. In the first one you will see that there is a 1 part 2 bight grid, c.f. Fig.2A. Fig.3B conceals a 2 part 3 bight grid, c.f. Fig.2B. Fig.3C shows the grid-diagram of Fig.2C. Finally, in Fig.3D, there appears our 5 part 8 bighted goal, c.f. Fig.2F. Consider the way the working end (wend) passes relative to the standing end (stend) every time they meet. Hmm, there seems to be an expansion of some sort. The first (Fig.3A) is to the left (or above if you wish), the other (Fig.3B) to the right (below) and finally one to the left (above) in Fig.3C. Let's now look at the Regular Knot Tree to understand what is going on here.



Expanding a Regular Knot
1/2 - 2/3 - 3/5 - 5/8

Fig.3

The Regular Knot Tree (RKT)

Aspects of this wonderfully symmetric gadget have been discovered independently by many knotters, but Schaake and Turner have written extensively about it since the 1980's [4]. What is this peculiar downward growing knot-tree? It is a mathematical explanation of why regular grid-diagrams behave the way they do upon expansion. The RKT consists of nodes harbouring number pairs p/b , which have a common divisor equal to one. Sounds familiar somehow? Single stranded TH ring a bell? So, the RKT contains all single stranded Regular Knot grid-diagrams and how they can be derived from one another. In other words, the RKT contains our TH ancestral family relationships.

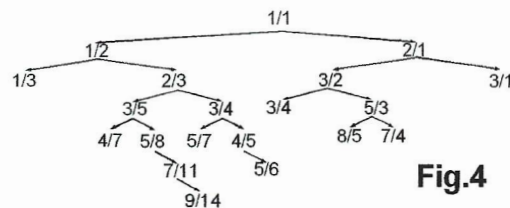


Fig.4

Top section of the Regular Knot Tree (RKT)

You start in the top with a Regular Knot grid-diagram of 1 part and 1 bight and then follow two simple rules. Moving down along any branch in the tree you can either continue along the same path, or take a turn (deviating from the straight path). In the following we shall call that a tack. Depending on the kind of track you intend to follow through the RKT, there are two rules based on some Fibonacci Arithmetic, to find the part- and bight values of the node. Rule 1: If you tack, you add the two parts numbers and the two bights numbers of the immediate predecessors to obtain the new parts and bights number respectively. Rule 2: If you do not tack, you subtract the forelast's predecessor's values from twice the values of the immediate predecessor's values.

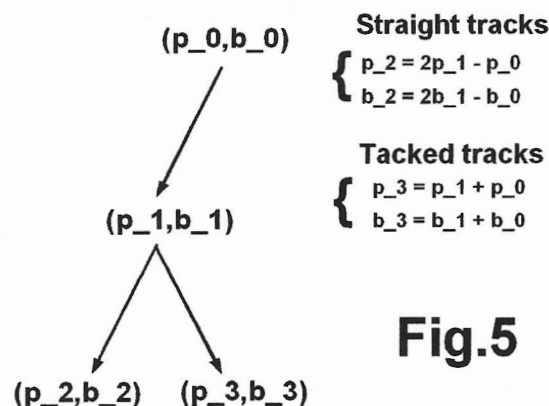


Fig.5

Simple as can be, right? Let's take a look at our 5 parted 8 bighted little friend. Can you see its placement in the top section of the RKT depicted in Fig.4? Note that getting there means we must follow a path $1/1 \rightarrow 1/2 \rightarrow 2/3 \rightarrow 3/5 \rightarrow 5/8$. A path consisting of tacks only.

What do these RKT paths represent? They are the possible types of expansion, which you can choose from when you hold any TH. As is well known, you can do a TH-expansion above or

below the standing part. For more details see [3]. A slight warning is in place here. The RKT only informs you how the *grid* of the Regular Knot behaves. If you want to know how to let the coding follow the grid-expansion, you must delve into the theory. Also note the symmetry in the RKT's left and right-hand side, representing NTH and WTH. Try placing ABOK's STH in this tree.

Coding persistence

If you consider the well-known expansion of the Casa-coded Regular Knot $3/5 \rightarrow 7/11$, it is obvious that the path skips a node, $5/8$ in this case. This is the secret behind the Casa-coded expansions. Any U1O1-coded TH, you try to expand, will show a jump of one RKT-node on a straight path.

Lessons learnt

My modest goal was to introduce the RKT and to place some of its immediately useful facts in a context. We have seen that the 5 parts 8 bighted regular grid-diagram shows to be a tacky TH, not to be derived from any other Casa-coded Regular Knot by means of a simple expansion.

Note that the regular grids of the STH follow two neat straight paths. From the RKT it is now immediately obvious that there can be only 4

types of Casa-coded STH expansions, a fact stated by Ashley without proof [1,p235].

We have been discussing simple knotties here, but try making their really big tack-at-every-node brothers. You may now understand why you sometimes encounter serious problems with lots of loose bights and weaves caving in or why some TH are more elusive than others. I hope this small introduction to the relationships between the RKT and single stranded TH will (1) help you understand how to achieve even more complex knots and (2) show you that there exists a theory to guide you through this all. Good luck!

References

- [1] C.W. Ashley, *The Ashley Book of Knots*, Faber and Faber, London, isbn 0-571-09659-X, 1977.
- [2] B. Grant, *Encyclopedia of Rawhide and Leather Braiding*, Cornell Maritime Press, isbn 0-87033-161-2, 1972.
- [3] P.v.d. Griend, "A Simple Expansion Technique for Turk's Head Knots", *Knot News*, issn 1554-1843, No.11, June 1998.
- [4] A.G. Schaake and J.C Turner, Research Reports RR1/1, RR1/2, No.165, Department of Mathematics and Statistics, University of Waikato, Hamilton, New Zealand, 1988.

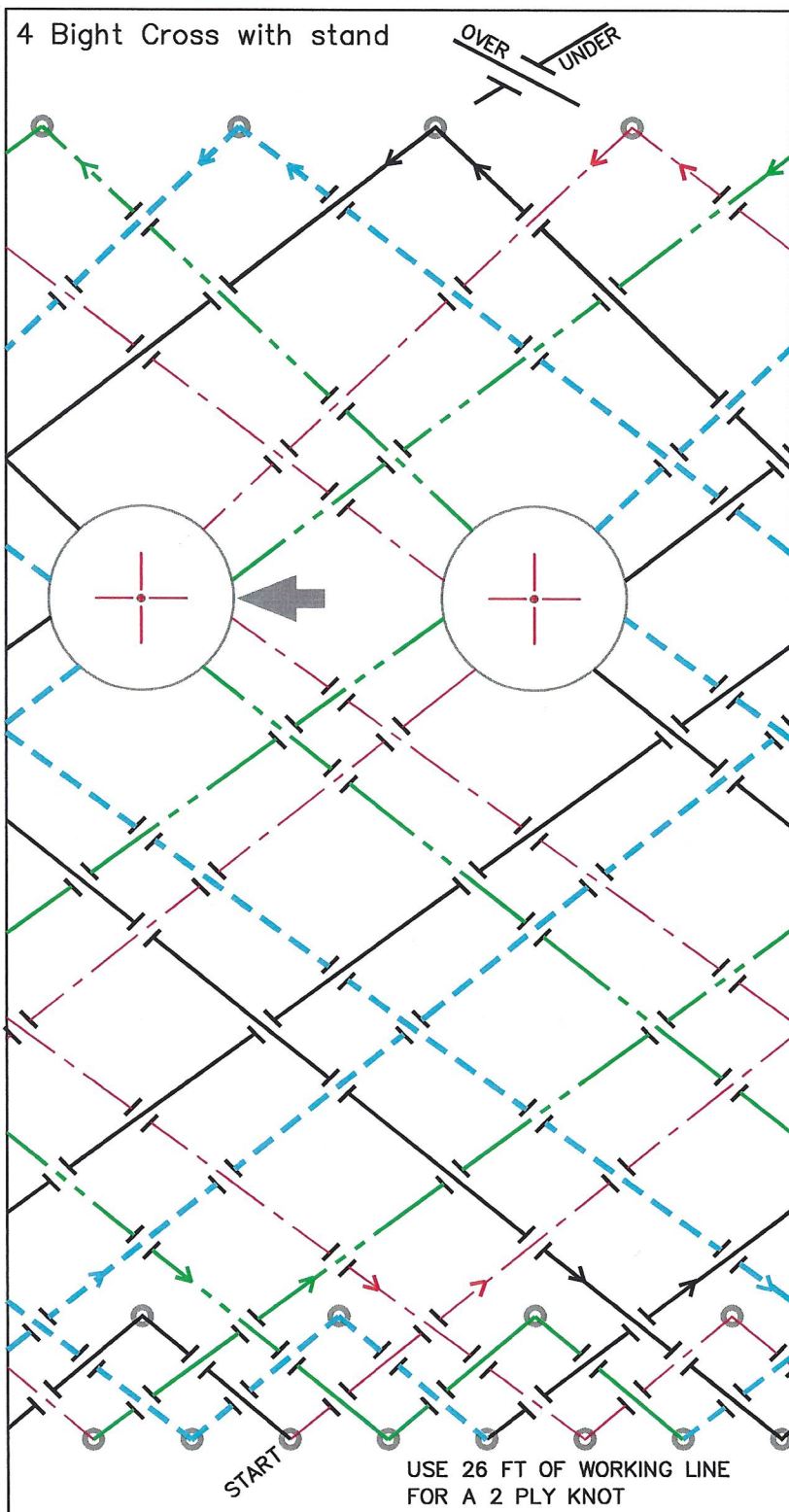
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Stiphout January 2005.

Sailors have an idiomatic language of their own which provides about everything needed for a discussion of knots. A splice is *put in*, a hitch is *made fast* or *taken*, two ropes are *bent* together, a knot is *put in*, *made* or *cast* in a rope. A sailor *takes a turn*, he *belays*; he *claps on* a stopper, he *slacks away*, and *casts off* a line. He *clears* a tangle, he *opens* a jammed knot, and he *works* a TURK'S-HEAD or *sinnet*. But about the only time he actually *ties* is when, his voyage over, he *ties up* to a wharf. The word *tie* is used so seldom by the sailor only because it is too general a term for daily use, where something specific is almost always called for. But when a sailor refers to the subject as a whole he always speaks of "*tying knots*" of "*knot tying*"

Clifford W. Ashley
The Ashley Book of Knots

ASSEMBLY INSTRUCTIONS:

1. CUT OUT THESE TEMPLATES, AND TAPE TO THE PVC PIPE. THE TEMPLATE SHOULD WRAP CLEANLY AROUND THE PIPE, AND THE LINES SHOULD MATCH AT THE INTERSECTION. COVER ALL DRILL LOCATIONS WITH CLEAR TAPE TO PREVENT DAMAGING THE PAPER.
2. USING THE SMALL DRILL BIT, DRILL A SINGLE HOLE TO THE CENTER OF THE PIPE AT EACH GRAY DOUGHNUT.
3. DRILL THE LARGE HOLES WITH THE 7/8" HOLE SAW.
4. INSERT THE SMALL PIPE INTO THE HOLES IN THE LARGE PIPE SO THE ARROWS POINT TOWARD EACH OTHER.
5. FILL THE PIPES WITH NEWSPAPER, THIS WILL PREVENT THE NAILS FROM FALLING OUT. INSERT THE NAILS AT THE GRAY DOUGHNUTS WITH SOME OF THE NAIL STICKING OUT.



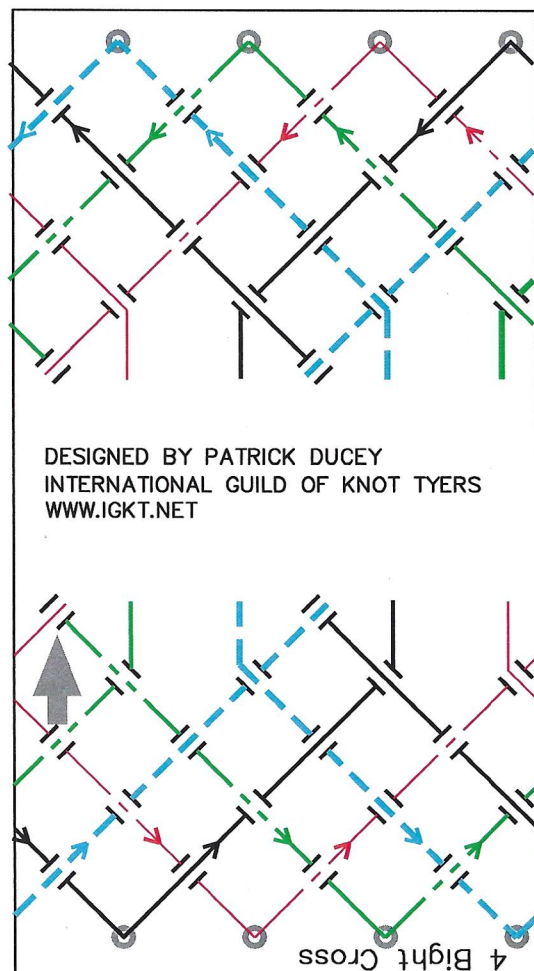
KNOT TYING INSTRUCTIONS:

PULL OFF 26 FT OF STRING AND TIE A KNOT AROUND THE NAIL AT "START". LAY THE STRING ON THE TOOL FOLLOWING FIRST THE RED LINE, AND PAYING ATTENTION TO THE OVER-UNDER PATTERN. AFTER TYING ONE COMPLETE PASS THROUGH THE ENTIRE KNOT, PULL OUT THE NAILS, SLIDE THE PIPES APART, AND SLIDE THE KNOT OFF. CONTINUE THE WORKING END THROUGH THE KNOT UNTIL YOU HAVE ADDED A SECOND (OR MORE) PLY.

TO TIGHTEN THE KNOT, LEAVE A COUPLE OF INCHES OF THE WORKING END HANGING OUT OF THE KNOT. PULL THE SLACK IN THE PLIES FROM THE WORKING END BACK TOWARD THE BALL OF STRING. IT DOESN'T TIGHTEN UP LIKE YOU WOULD TIE YOUR SHOES, BUT GRADUALLY AS YOU WOULD WORK A LUMP OF CLAY. EACH TIME YOU PULL A LOOP, PULL A LITTLE MORE STRING OUT UNTILL YOU HAVE THE CROSS AT THE SIZE YOU FEEL IS APPROPRIATE FOR THE MATERIAL YOU ARE USING.

WHEN YOU HAVE PULLED OUT THE LAST LOOP, CUT THE CROSS FROM THE BALL OF STRING. PULL A FEW TUCKS OF THE CUT END BACK SO THE CUT END COMES OUT IN THE STEM OF THE CROSS. WHERE IT LEAVES THE KNOT, TUCK IT INTO THE CENTER OF THE KNOT, AND OUT THE BOTTOM OF THE KNOT. CONTINUE THE WORKING END INTO THE KNOT UNTIL IT COMES OUT WHERE THE CUT END STARTS. TUCK THE WORKING END INTO THE CENTER OF THE KNOT AND OUT THE TOP OF THE KNOT. GIVE EACH END A TUG, AND CUT IT OFF FLUSH WITH THE KNOT. THE ENDS SHOULD RECEDE INTO THE KNOT, AND STAY HIDDEN.

PARTS REQUIRED TO MAKE THE CROSS TOOL:
8" LENGTH OF 1" SCHED 40 PVC PIPE
5" LENGTH OF 1/2" SCHED 40 PVC PIPE
24 SMALL NAILS
DRILL WITH DRILL BIT FOR THE NAILS
7/8" HOLE SAW
SOME NEWSPAPER



From the Editor/Treasurer

I have been contemplating for a long while of ending my editorship of this newsletter at 50 issues. It seemed like a nice, round number and a good place to stop. Since this is issue number 49, I thought it would be a prudent to publish this idea to you and see what you thought. To be or not to be? That is the question! [Groan] I have also thought that it would be more proper of me to continue on (at least) until the end of this year, since so many members are paid up until December and this newsletter is one of the "benefits" of membership. Mr. Pieter van de Griend of Stiphout in the Netherlands has suggested that I carry on for another 50 issues! I have always said that this Knot News is a labor of love, unhappily, lately it feels more like labor than love. Maybe I just need a break to catch my breath and recover my enthusiasm?

I am also looking to hand over the job of Treasurer at the AGM in July. Unless directed otherwise, I will be sending the balance of our account (less what I need for the remaining newsletters) to our Secretary, Pat Ducey, after that meeting.

Surely this is not an ending, but the beginning of another chapter in the history of the PAB.

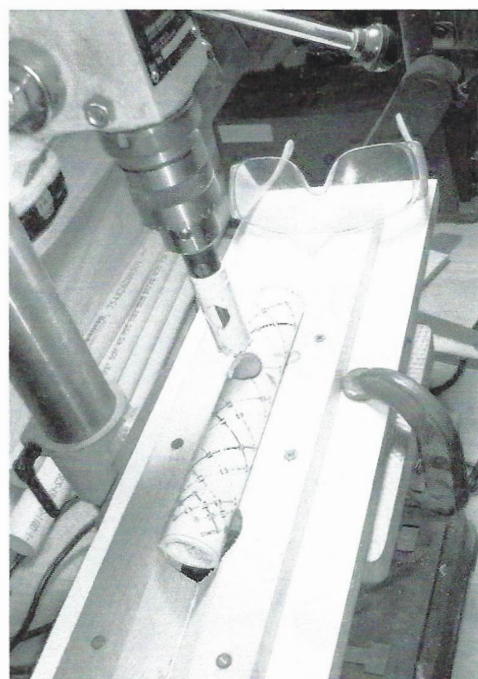
Turk's Head Cross

by Pat Ducey

In this edition of *Knot News* I have asked Joe to enclose the plans for the tool to make a Turk's Head Cross with stand. This is a knot tool that has evolved over many years, and taken many forms. I think this is the best method for tying this knot. Typically, I use a #30 line, and I end up with a 4" tall cross that stands on its own. It takes some care to keep the knot from being lopsided, but with practice, it comes out

okay. The largest line I used was some 7/8" line that Roy Chapman donated at the Fall Fisherman's Festival in Seattle. I scaled up the template to fit on 4" and 2" pipe. If you are interested in tying this knot on a larger scale than would fit on this tool, let me know and I will help you out.

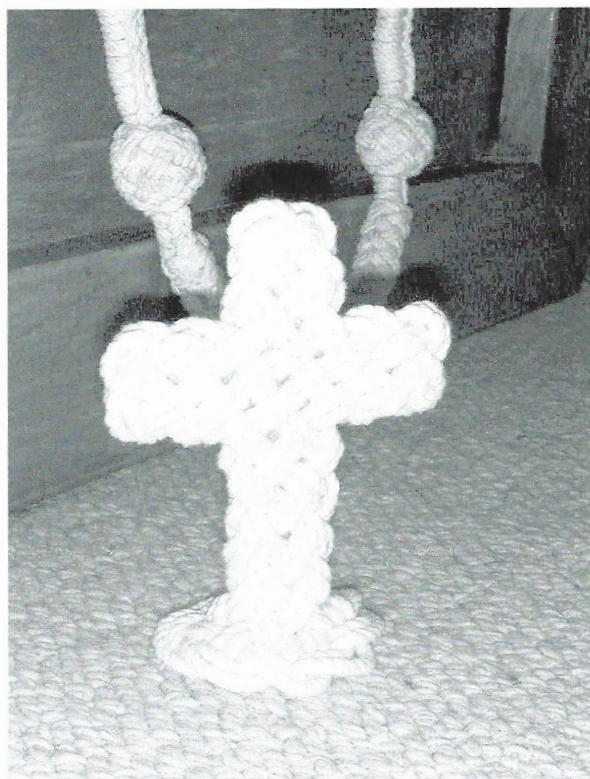
In the drill photo, you can see the centering jig I have made to hold the pipe when it's drilled. I prefer using the round hole saw, sometimes spade bits tear up the pipe as it drills through. I put the safety glasses in the picture as a reminder to always use appropriate safety precautions around tools.



The other photo is a close up of a completed knot. It takes me about three hours to tie one of these, but it is much faster now that I use this tool. When I tied these in hand it was an all day project.

I have also posted a similar template, without the stand, on www.KHWW.net. If you have questions about this or any other knot template I have created, ask in the

KHWW forum. I also keep an eye on the IGKT forum at www.IGKT.net.



From the Mail Bag

Charlie Bell of Westminster, California sent in these great photographs of his latest project.



Sword Mat in place

I recently made two Sword Mats for the *Brig Pilgrim*. These mats will be used to protect the capping and the bulwarks when the anchors are fished up and lashed. The anchors are the old fashion type and weigh about 600 pounds"



Mr. Charlie Bell with his mat

Nets

By Geoffrey Budworth

Definition – Net: a regular arrangement of holes of the requisite size held together by twine.

Netting is a pleasant activity with an element of quiet mental focus that is as beneficial to blood pressure as Zen meditation or stroking a pet animal. This *Knot News* article will not teach you how to make a net but aims merely to stir and spur you to learn, or revive your familiarity with,

this fundamental but neglected aspect of our craft.

Net making is one of the oldest surviving handicrafts. Fragments of Stone Age nets have been retrieved from archaeological sites; and it may be that not all primeval hunters were male for women, with hand-held nets, could catch and kill smaller fish and animals.

In the 15th century English 'War of the Roses', the Yorkists are said to have spread nets across gaps in hedgerows to ensnare the Lancastrian cavalry. Each net was about 24 feet in length and 4 feet wide, with nails projecting from every second knot, to injure any horse and rider who blundered into them.

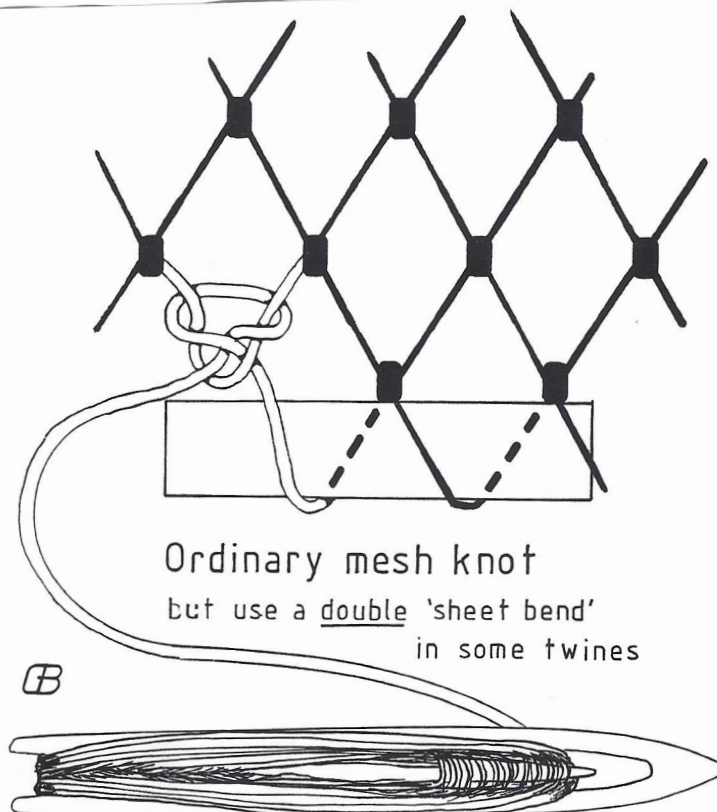
During sea fights between square-rigged warships, misleadingly named *boarding nets* might be draped fore-to-aft from the rigging, to prevent enemy crews from jumping aboard. *Splinter netting*, by contrast, stretched horizontally between main and mizzen masts, about 12 feet above the deck, to safeguard the gunners engaged below from falling debris; and, incidentally, it is claimed to have saved the lives of crewman who fell from aloft during battle.

Poachers after rabbit, hare or wildfowl, often made their own nets as to buy them could bring unwanted attention from the local constabulary. Professional bird catchers required the finest and lightest meshes (of silk). Nets used for illicit fishing were referred to guardedly in public places as *square hooks*.

In genteel households wives indulged in net making, a pastime that caused the cleric and satirist Jonathan Swift (1667-1745) to observe: "*The reason why so few marriages are happy is because young ladies spend their time making nets, not making cages.*"

Custom-made nets could be found as late as the first half of the 20th century forming parcel racks on vintage railways and map pockets in classic automobiles.

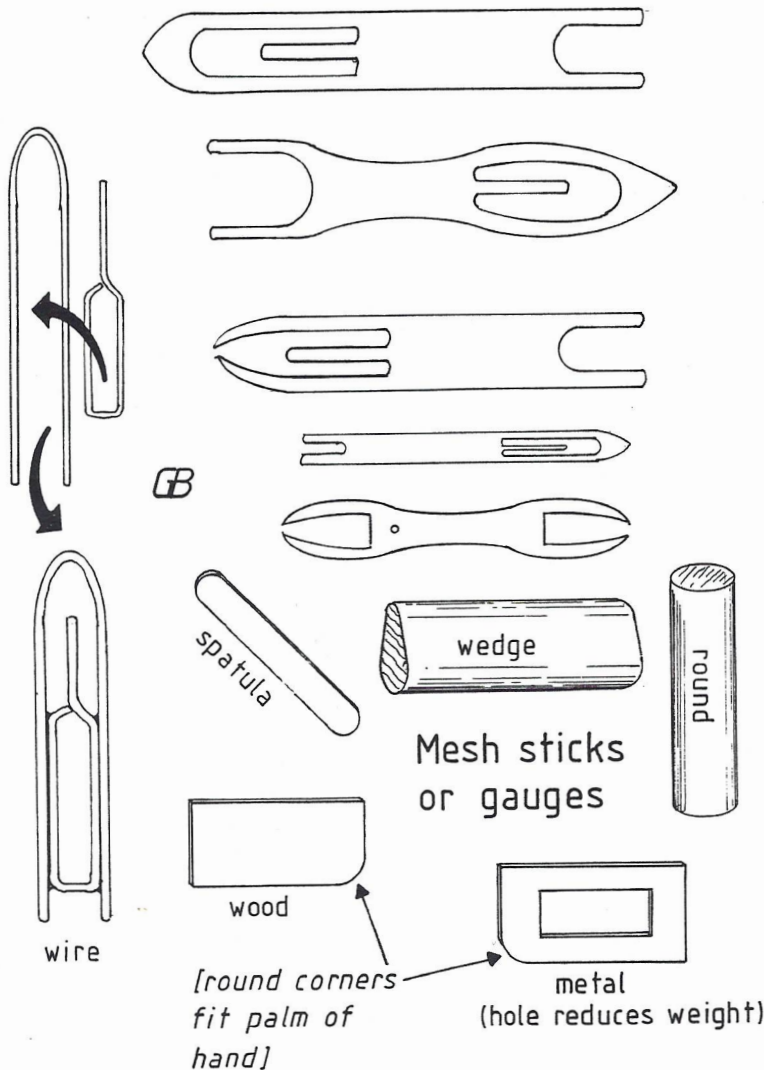
Nets are as versatile as they are flexible, with domestic, commercial, ceremonial, industrial, and military uses. They are employed: as capacious tote bags, which fold up when empty to fit in a pocket; to dictate the mode of play (and the score) in many games; for deep sea fishing as well as childish dabbling in seaside rock pools; by arts and crafts practitioners; to safeguard farm and garden produce from wild



depredation; as a safety provision in sports grounds and arenas, circus rings, construction sites; for cargo handling, salvage work and camouflage; as a hammock or to protect an infant in cot or pram from curious cats; to secure loads on trucks and automobiles.

Lengths of mass-produced, man-made netting may be purchased and then simply tailored to suit the requirements of the job in hand. Mending a damaged net, let alone creating individual netting artifacts, must still be done by hand. The necessary tools – see illustrations – are few and can be home made (of wood or metal), store bought (nylon) or sought in flea and antique markets (wood, metal, bone and ivory).

Netting needles



Nettling needles store and carry twine. They average around 6 inches in length but may be as short as 3 inches or up to a foot long; the larger the diameter of the twine, the bigger the needle must be in order to hold a useful amount and reduce the number of joining knots, but the load must not be too bulky or it will not pass through the chosen mesh size. (Netting needles, incidentally, are ideal for storing quantities of small cord and twine whether or not they are actually used to make nets.)

Mesh sticks or gauges ensure that all meshes emerge the same size. They can be flat, round or wedge-shaped in cross section, or improvised from anything suitable (e.g. a six inch rule.) As mesh size varies from net to net, several mesh gauges may be required. Meshes are usually diamond or lozenge shaped by *creasing* (adding meshes, from the word "increasing") and *bating* (decreasing meshes, from the word "abating"). Mesh size is critical to the use of any net and in regulated trades, such as the fishing industry, is subject of legislation and inspection.

Once any net has been made, there are opportunities for persnickety fingers to finish off and embellished it with knots, seizings or whippings, sinnets and splices.

Mending nets was – and still is – of necessity done at sea, or alongside the quay or jetty; but the initial net making and finishing were traditional cottage industries, carried out by family members (mostly female) and on a 'closed shop' basis. As a consequence there is a dearth of useful written instructions from that era. How-to books on netting for mass market date from the mid-20th century, one of the later and better publications being:

Down East Netting, A History and How To of Net Making, by Barbara M. Morton. Published (1988) by Down East Books of Camden, Maine. ISBN 0-89272-231-1