

“FABRICATION OF WEBBING”

- Fishing nets– pieces of webbing joined together by appropriate joining method
- Webbing constitute large number of meshes usually of uniform sizes.
- Net – no. of meshes of fixed dimension.
- Normal mesh has 4 sides of equal length /legs– bars– Diamond shape.
- Webbing by hand or by machine.
- Webbing meant for fishing nets are usually braided with single bent knot.
- Double sheet knot for double strength
- Hand braiding becomes a dying art.

- Webbing consists of thread, twine, cord, the intersections of which are firmly knotted to form meshes or interspaces.
- **Direction of netting : (N-direction)**
- Force parallel to the diagonal of mesh which tends to tighten the knots keeping them in correct position.
- (direction by which the webbing grows)
- **Direction of braiding: (T-direction)**
- Perpendicular to the direction of netting & parallel to general course of rows formed during braiding.
- (direction of braiding)
- **Row :**
- Series of loops or half meshes aligned in the direction of braiding. It is half mesh in height.

- Two successive rows to be braided to increase depth of netting by one mesh.
- **Selvages :**
- Edge portion of a netting made of thicker twine & larger meshes and take up the excess strain acting upon the netting.
- Size of netting:
- No. of mesh in T direction & N direction.
- Eg. 1000 T X 200 N

● **NET BRAIDING :**

- Making webbing by hand.
- Mesh sizes, twine thickness, length, depth of webbing are parameters to consider before starting.,
- **Requirements : twine, net fabrication stand, mesh gauge, needles**
- **Mesh stick/mesh guage:**
- Piece of hard wood, flat or rounded
- Precise sizes to get uniform mesh with required dimensions.
- **Needles :**
- Holds the twine used for braiding
- Needles made of wood or plastic.
- Size varies to suit particular mesh size & twines

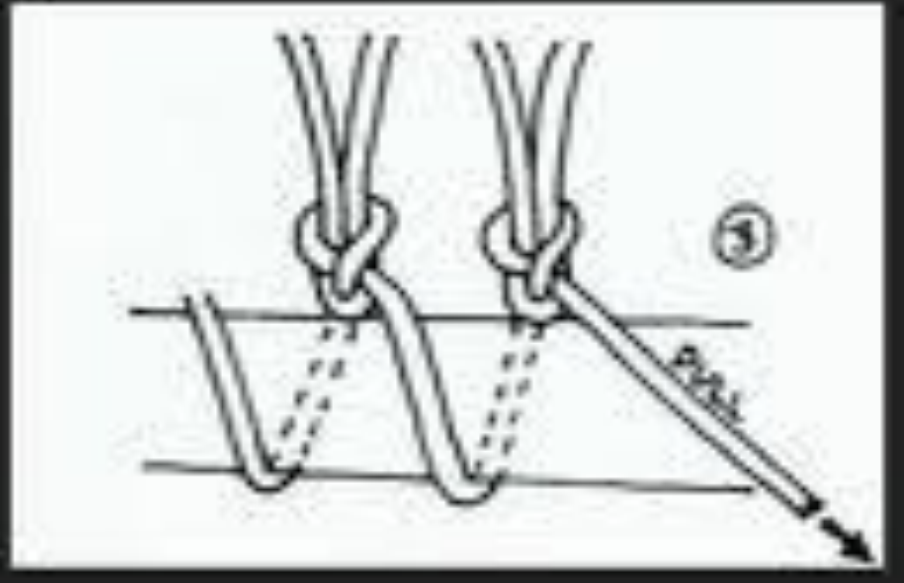
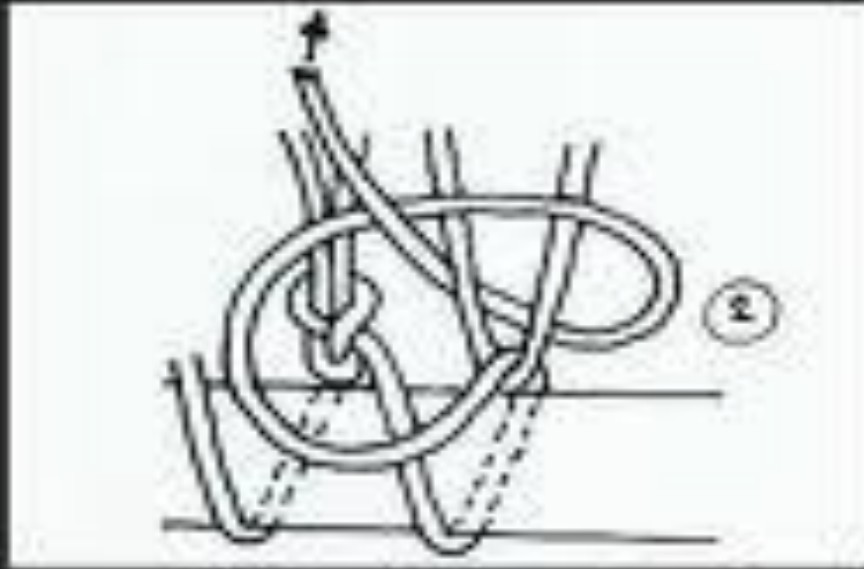
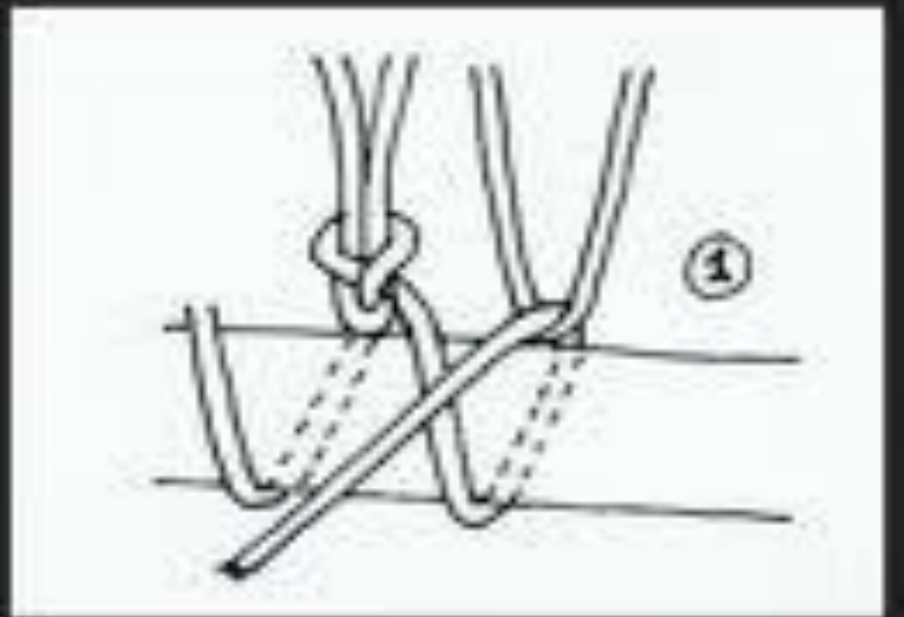
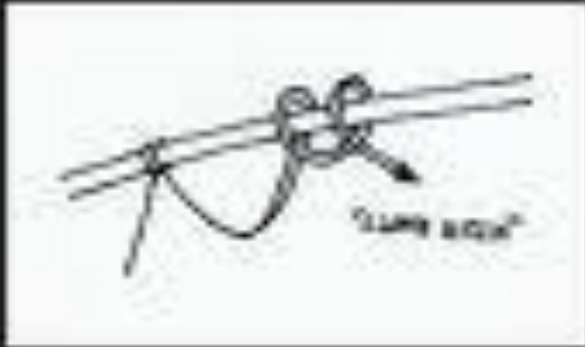
- Needle is filled by twisting twines around the tongue of the needle.
- Then wound around it on alternate sides.

- **Braiding method :**

- A line is made between two suitable fixtures – foundation line.
- On it a row of loop is made in T direction– “set up row”
- Clove hitches are made from left to right.
- For 8 loops of length, 9 clove hitches are made.



- No. of clove hitch is one extra over & above the required no. of meshes.
- When it is over, a mesh guages is used to get uniform size meshes.
- After 1st row, foundation line is reversed & loops are made over previous ones.
- Type of knot depends on end requirement.
- Generally, single sheet bend used
- Process of making rows continues till required length of netting.
- Topmost edge of webbing is **Head** and lower most is **Foot**.



- Two sides of netting along the width are called ‘Selvedges’.
- Changing of foundation line necessary for working always from left to right.
- Two rows of braiding constitute one row mesh

- **SHAPING OF WEBBING :**

- Rectangular netting like in gill net do not need shaping, but conical nets like trawl & bag nets need to obtain required shape.
- Three ways of shaping hand braided webbing, bating, creasing & fly-meshing.
- In machine made webbing, it is cut to shape to get desired taper.

- Shaping by tailoring is for ready made netting.
- Shaping for hand braided netting is by fly mesh, regulating mesh size and baiting & creasing.
- Fly meshes are left over meshes at the selvedge of webbing & employed to shape a trawl net wing piece.
- Regulation of mesh size is by increasing or decreasing size of mesh progressively.
- Needs use of gauges of diff. size.
- Required shape of net is obtained by increasing/reducing no. of meshes at regular intervals.
- This can be either on one side or both sides.

- **Taper ratio:** no. meshes lost in width/ no. meshes lost in depth (R=decrease in width/ decrease in depth)
- **Baiting :**
- Shaping by reducing the no. of meshes in concerned rows.
- Two loops of previous row is taken in one knot & thus decreasing breadth of net by one mesh.
 - $$\frac{\text{No. of meshes to be reduced}}{\text{No. rows in which to be reduced}}$$
- Bating rate :
- Made 2nd & 3rd meshes from selvedge of trawl net.

- **Creasing :**

- Altering the shape of a webbing by increasing no. of meshes in concerned rows.
- Done by making small extra mesh beside the mesh
- Just finished by making a second knot in same place before picking up the next.
- Extra small mesh is picked up in the next row as full mesh, thus increasing the breadth of netting.

$$\circ \quad \frac{\text{No. of meshes to be increased}}{\text{No. of rows in which to be increased}}$$

- Creasing rate = $\frac{\text{No. of meshes to be increased}}{\text{No. of rows in which to be increased}}$
- Made near selvedge of trawl net.

- Ratio of baiting and creasing :
- Effected at uniform intervals to obtain required shape of netting.
- $$\text{Baiting / creasing} = \frac{m_1 - m_2}{2d}$$
- Where, m_1 & m_2 = no. of meshes of a panel in T (length) direction in upper & lower edges & N (depth) direction respectively.
- this ratio used when creasing/baiting done on both sides of netting.

- Where, creasing/baiting done on only one side,

- $$\frac{m_1 - m_2}{d}$$

- The ratio will be ,

- $$d$$

- T direction (top) = 400 mesh

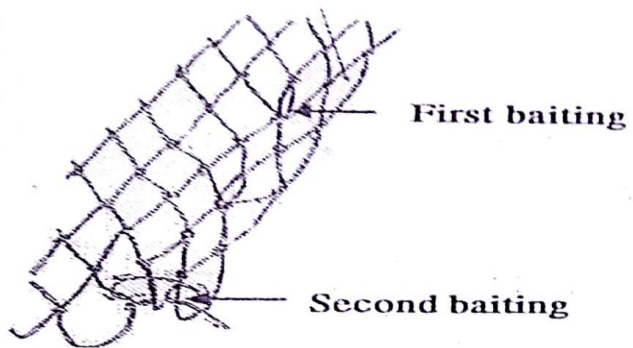
- T direction (bottom) = 100 mesh

- N direction (depth) = 300 mesh

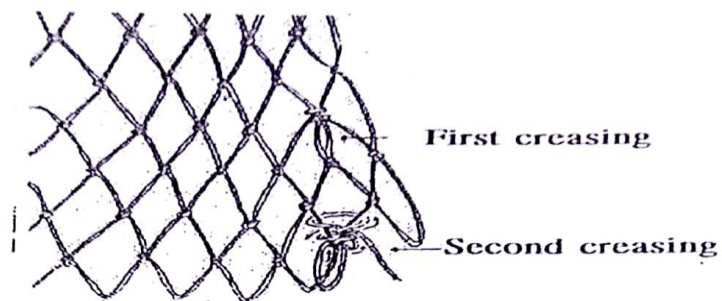
- **Fly-meshing :**

- Full sized mesh but only two knots instead of four.
- This is made on the edges of the webbing by missing out the last mesh of previous round.
- Purpose is to allow the main netting to be kept as away as possible from contact with seabed or to give resilience to the netting.
- Fly-mesh reduces the breadth of netting by one mesh in 2 rows.
- Shaping of edge of a net eg. trawl net
- Bating/creasing done on inner or outer edge of the net or the centre depending on shape or design of net

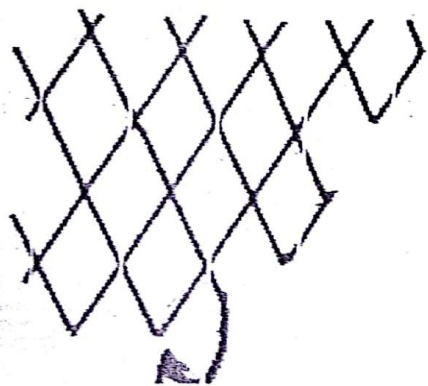
- The first clove hitch in braiding is called a halfer.
- When it is released from setting up twine, leaving a single end of twine & not a loop.
- After last loop is made, an end of twine is left, normally at the opposite edge of net.
- This is second halfer.
- Usually made with double twine to have more strength at the joint of webbing to rope.
- Top = 100 mesh
- Bottom = 20 mesh
- Depth = 100 mesh
- One side fly mesh, another side creasing.



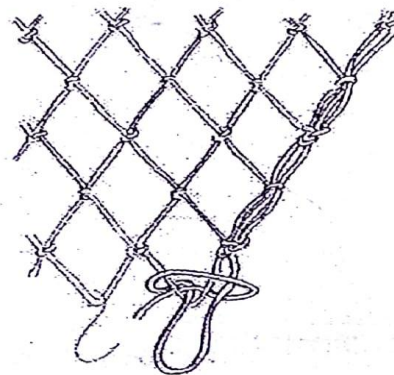
a) Baiting technique



b) Creasing technique



c) Fly Meshing technique



d) All bar braiding (Flat baiting) technique

Source: Garner (1989)

● **TAILORING OF WEBBING BY CUTTING :**

- When on large scale manufacture of nets Braiding is time consuming & uneconomical.
- In this case, machine made webbings are cut to desired shape.
- Tailoring of webbing means cutting the netting to shape.
- In case of specified shapes, webbings are cut.
- While cutting, 3 factors are to be considered :
 - (i) no. of meshes at the start of cut
 - (ii) no. of meshes required at the end of cut
 - (iii) length of meshes of the section to be cut.

- **Method of tailoring:**

- Cutting patterns are four types :

- All points, all meshes, all bars & combination of the above

- **Point cut :**

- Cutting at right angle to the general course of netting

- Called vertical or N cut.

- **Bar cut :**

- Cutting parallel to the line of sequential mesh bars serving one or more adjacent bars.

- Also called B cut.

- **Mesh cut :**
- Cutting of two legs in each knot in horizontal direction.
- Also called T cut or horizontal cut.
- **Combination cut :**
- Combination two types of cut i.e. point cut + bar or mesh cut + bar depending on shape /taper required.

- Tailoring rates :

- Varying degree of taper in the webbing.
- Brought about by combination of point cut & bar cut.
- If, N = No. of meshes to be reduced
- L = No. of meshes in height of a triangular webbing
- P = No. of points to be cut
- B = No. of bars to be cut is $2N$ irrespective of cut.
- To have a triangular webbing having N meshes at base & L meshes in height,
 -
 - $P = L - N$
 - $B = 2N$

$$\begin{aligned} \diamond P &= \frac{L - N}{2N} \\ \diamond B & \end{aligned}$$

- When width(N) is longer than the depth (L), the formula is :

$$\begin{aligned} \diamond M &= \frac{N - L}{2L} \\ \diamond B & \end{aligned}$$

- Where, M = mesh cut,
- B = bar cut, N = no. of meshes in width &
- L = no. of meshes in depth

- Eg. top – 100 meshes, bottom – 50 mesh, depth – 50 mesh
- When not specified, it is assumed that taper required on both sides.
- So, 25 meshes to be reduced on each side in a depth of 50 meshes.

$$\frac{P}{B} = \frac{L - N}{2N} = \frac{50 - 25}{2 \times 25} = \frac{25}{50} = \frac{1}{2}$$

- Cutting pattern followed on both sides is 1 point and 2 bars.

- **MOUNTING :**

- Attachment of netting to a supporting rope or frame is mounting.
- Fixing of netting to a line or rope around all or some of its edges at any definite degree of closeness or openness of meshes is Mounting.
- Single mesh or in groups are fixed on main line by mounting yarn.
- Mounting methods for head & foot rope are diff. from methods use at sides.

- **METHODS OF MOUNTING :**

- **i) Reeving :**

- Simplest & easiest method of mounting.
- A line is reeved through the head meshes & ends are fixed at required distance by clove hitch.
- Eg. gill net, stake net & head rope of beam trawl.

- **ii) Stapling :**

- A twine thicker than the netting twine is used for tying the edge of the net to the main line.
- End of mounting twine is tied to main line or head rope by a rolling hitch with first mesh.

- Its free end is passed thro particular no. of meshes & hitched on to main line at regular intervals by a clove hitch.
- This continues till the other end of netting where it is stapled with main line by rolling hitch.
- **iii) Norselling :**
- Meshes are mounted at fixed intervals to main line by special short line (norsel) of appropriate length directly or by a mounting line to which meshes are attached.
- Special hitch norsel hitch is used to tie norsel to rope.
- Type-I : meshes fixed directly to main line by norsel.
- Type-II : meshes mounted at fixed intervals by norsels by means of mounting yarn to which meshes attached.

- **Hitching :**

- Meshes directly fixed on working rope by mounting yarn using hitches.

- **Rigging :**

- Process of fitting the necessary ropes & accessories to make net ready for fishing.
- Well constructed net may give unsatisfactory results due to defective rigging.
- Ropes, floats, sinkers etc. should be right type & fitted in correct position so that net acquires the required shape during operation.

- **Marling :**
- Mounting yarn reeved through meshes & then knotted on main line at intervals by marling hitches.
- Eg. wings of small trawls.

- **Setting/sitting :**
- In this, meshes are first stapled to bolch line.
- This is fixed to working rope by knotting with small strips of twine.
- This is setting or sitting.

● **HANGING OF NETS :**

- There are different ways of fixing netting to ropes. Fixing a netting to a line or rope around all or some of its edges at any definite degree of closeness or openness of the meshes is called mounting.
- Mounting of webbing to a specified relationship between length of that part of the final rope or frame on which it is mounted & the length of netting.
- Hanging influences efficiency of gear esp gill nets.

- The hanging coefficient (E) is used to describe how tightly or loosely netting is to be hung on to a head rope or foot rope. The definition of a hanging coefficient is:

$$E = \text{Hung length of netting} / \text{Stretched length of netting}$$

- The most useful form of this equation is used to find how far apart you need to tie hangings, that is, the hung length. The rearranged equation becomes:
- $\text{hung length} = E \times \text{stretched length}$



- The prawn trawl shown hangs three 50 mm meshes in a group. The stretched length will be $3 \times 50 \text{ mm} = 150 \text{ mm}$. The hanging coefficient was specified on the gear plan as $E = 0.5$. The hung length, or the distance between hangings is:
- hung length = $E \times$ stretched length
= $0.5 \times 150\text{mm}$
= 75mm

Hanging ratio may be expressed as decimal fraction (0.50 decimal) or vulgar fraction ($\frac{1}{2}$) or as percentage (50%).

- Horizontal & vertical hanging coefficients :

- $E_h^2 + E_v^2 = 1$

- E_h = horizontal hanging coeff.

- E_v = vertical hanging coeff.

- If one is known other can be calculated as

- $E_v = \sqrt{1 - E_h^2}$

- $E_h = \sqrt{1 - E_v^2}$

- **JOINING OR WEBBING :**

- Joining diff pieces of webbing.
- Diff pieces are made & then joined together to form a single unit of net webbing.
- Method of joining are two types *viz*; sewing and seaming.

- **i) Sewing :**

- Joining by weaving with twine as net making.
- One extra row is formed while sewing.
- Used for joining pieces horizontally.
- Two types of sewing :

- When meshes are equal in both panels but width varies, joining by mesh to mesh.
- In another, meshes differ, but width may vary or same.

- *ii) Seaming :*
- Method of joining two parts of webbing by winding & fastening a twine at intervals with a hitch without forming a row of half mesh.
- Twine is reeved loosely through the meshes & stopped by hitch at intervals to prevent slipping.
- Two types of seaming :
- First case, no. of meshes are same in both panels.
- Easily joined by taking up mesh to mesh.
- Second case, no. of meshes vary, take up ratio is calculated & smaller meshes are incorporated at appropriate spaces of larger meshes.

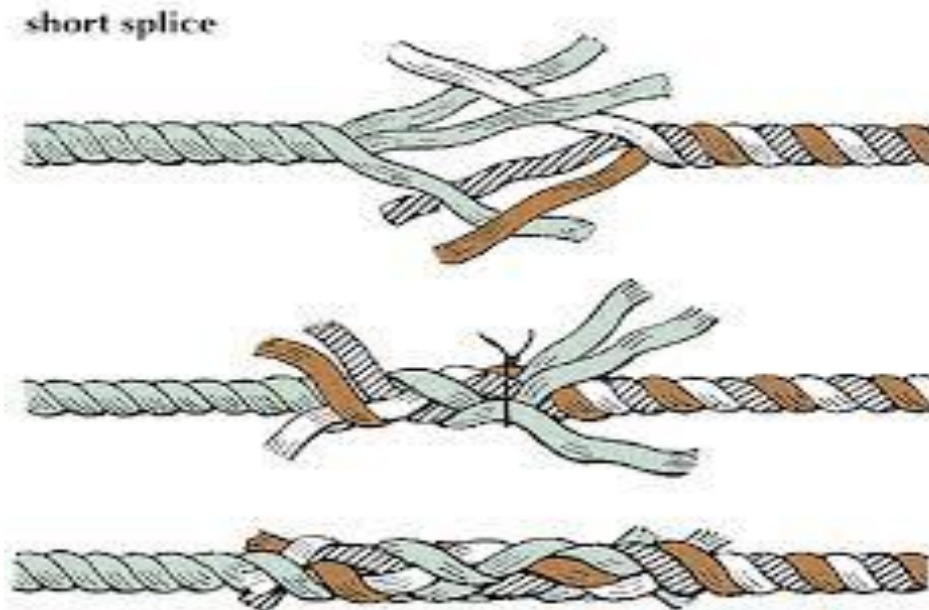
- **Splicing of ropes :**
- Method of joining ends of two ropes together or making an eye at the end of a rope.
- Commonly used splices :
- Eye splice, short splice, back splice & long splice.
- **(i) Eye splice :**
- Loop or eye made at the end of a rope by turning the end back & splicing it through the standing part.
- It reduces breaking strength of rope by 5%.

Eye Splice

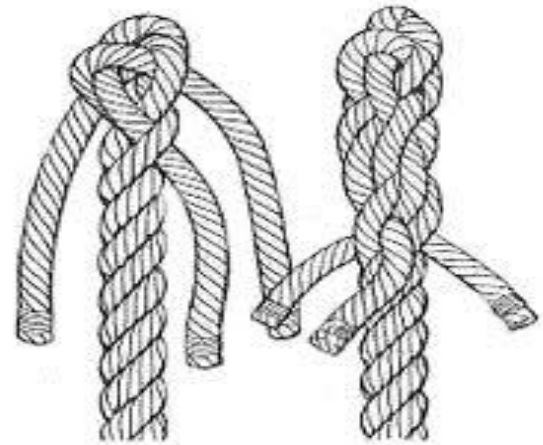


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- (ii) short splice :
- Splicing two ropes of equal size permanently It increases the dia of rope along the length of splice & decrease the strength by 15%.
- Strongest method of uniting two ropes.



- **(iii) back splice :**
- **Strands at the end of rope are kept together permanently without unlaying.**
- **Preferred where rope does not pass through a block.**



- (iv) Long splice :
- Join two ropes without increasing thickness over the splice area.
- Required where rope is reeved through a block.

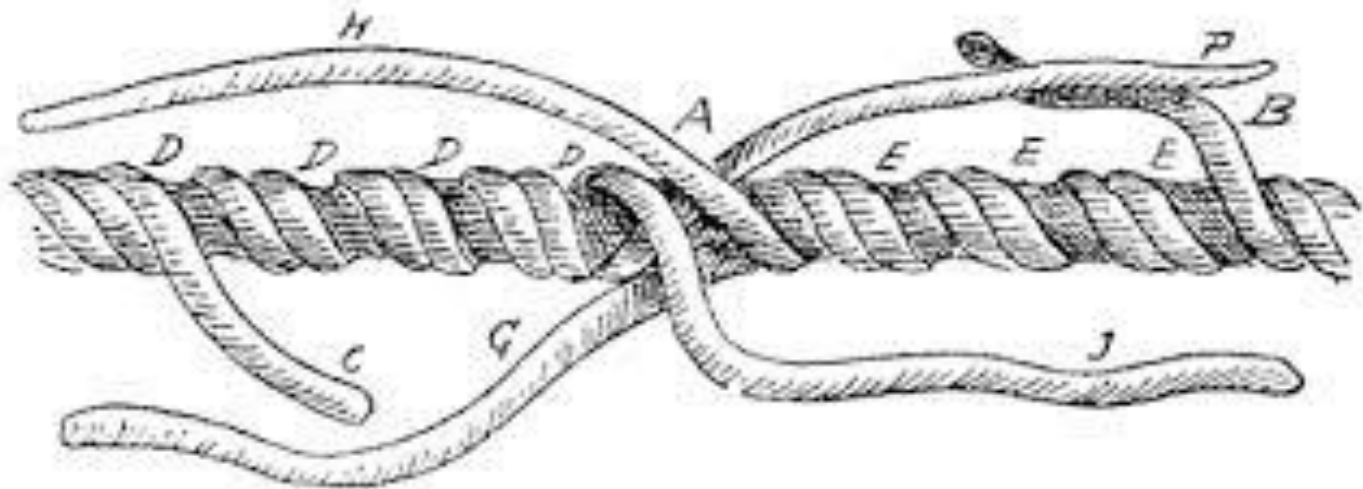


FIG. 107.—Long splice.

MENDING

- Process of repairing the damaged nets.
- Done either on board or in workshop ashore.
- Damage if considerable, repaired by mending.
- Damage if irreparable, it is to be cut at particular portion & replace with suitable netting.
- Operation of preparing edges of a tear before repairing is called Trimming or Clean cutting.
- Tear is a cut or damage on the webbing of a net.
- Tears have to be repaired without changing mesh size & material.
- Knots made also should be similar.

- Shape of hole in the netting varies based on tear & it may be rectangular, square, triangular, zig-zag, oblique or irregular as required.
- Tear is trimmed by cleaning up the edges of tear by eliminating bars.
- After cleaning up the edges consists of only points & meshes plus two bars.
- One at start of the repair & the other at finish.
- Repair start with a three legger (knot having three strands intact) & ends with three legger.
- Every other knot lining the trimmed hole is a pick up & a sider.

- Picks up & sidlers are knots having two strands intact & are sheet bend & double hitch respectively.
- Different knots used in net mending :
- Double sheet bend
- Single sheet bend
- Side knot
- Repair of different types of tears :
- i) Repair of simplest tear:
- A side mesh cut on inside piece of a netting is simplest tear with only two bars .

- Mending by tying thread to needle.
- A double sheet bend at upper most bar.
- Then same knot at the end bar.
- a length of twine equal to one mesh bar left between the two points of attachment.
- **ii) Repair of horizontal tear :**
- single row inside the panel is torn.
- Left with starting & finishing bars.
- Mending by double sheet bend on starting bar.
- Single sheet bend on mesh to be picked up.
- Mending by connecting meshes.

- Double sheet bend at end bar.
- **iii) Vertical tear :**
- Tear in all points on inside of the panel without cutting edges.
- Double sheet bend at starting bar,
- side knot at right & left.
- Mending by making side knots on both sides till near end bar.
- Double sheet bend at end bar

- **iv) Rectangular tear :**
- Hole is of rectangular shape after trimming with start & end bar at upper & lower corners
- Double sheet bend at starting bar,
- Braiding done on upper meshes to right edge in the first point.
- Braiding towards left until the point.
- Braiding repeated alternatively in both directions
- After last point is reached, picking up meshes of lower edge.
- End finishing bar with double sheet bend.

