

KNOTS, HITCHES AND BENDS

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ROPE 1

KNOTS, BENDS

HITCHES

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The principle of a knot is that no two parts which would move in the same direction if the rope were to slip, should lie alongside of and touching each other. This principle is clearly shown in the square knot "I."

Practical Terms

- Knot:** A loop or fastening in a rope.
Bend: Attaching two ropes together or to an object.
Hitch: Attaching a rope to an object.
Taut: Drawn tight or strained.
Bight: A loop in the rope.
Fall: The rope in a hoisting tackle.
Tackle: An assemblage of ropes and blocks.

Below is given a list of knots which are illustrated on the following pages:

- A. **Bight of a rope.**
 B. **Simple or Overhand Knot.**
 C. **Figure 8 Knot.** May be employed as a stop on a rope; is less injurious to the fiber and more easily undone than either single or double overhand knot.
 D. **Double Knot.**
 E. **Boat Knot (Marlin-spike Hitch).** Suitable for quickly making a rope ladder or getting a temporary pull on a rope with a marlin-spike. No free ends required to form this knot. The point marked *p* must always be at the back of the spike or rung of ladder, away from the direction of the weight or pull.
 F, G, H. **Bowline.** A generally useful knot when a loop of any sort that will not slip is required, as in a sling for lowering a man, or fastening a bucket to a rope.
 I. **Square or Reef Knot.** Commonly used knot for joining ropes of equal size when not of very large diameter. Fairly easily undone when properly tied.
 J. **Sheet Bend or Weavers' Knot.** The best knot for small cord, twine or fish line.
 K. **Sheet Bend with a toggle to facilitate untying.**
 L. **Carrick Bend.** Employed for joining heavy ropes. Ends must be lashed to prevent knot pulling together and to facilitate untying.
 N, M. **Stevedore Knot.** Useful as a stop on a rope to prevent the end going through an eye, as in a pulley block. It is also employed instead of sewing the rope end with twine.
 O. **Slip Knot (Simple Running Knot).**
 P. **Flemish Loop.** Neither so secure or so easily done as a bowline. The security depends almost entirely upon the check knot.
 Q. **Chain Knot with Toggle.** This method of shortening a rope has the advantage that when toggle is pulled out the rope entirely undoes itself under a slight strain.
 R. **Half Hitch.** A quick and simple way of securing a rope to a timber when no great pull is expected.
 S. **Timber Hitch.** Best and simplest of all timber hitches and may be used for towing or otherwise handling timber, rods, pipes, etc.; also for starting lashings on any kind of pole work.
 T. **Clove Hitch.** Most useful of all hitches as it will take a strain in either direction without slackening. Used for mooring ships, on heads of derricks for guy lines and all kinds of rigging work. It is easily undone, or a bight may be put in instead of one end to use as a slip. When commencing to tie the hitch on a horizontal bar, the rule is over and back below, or the reverse of the procedure in tying a half hitch.
 U. **Rolling Hitch.** This lashing is used for getting a grip on a large rope with a smaller one. Made in chain it can be applied to wire ropes and will not slip when the load has been

taken up. Also suitable for hauling on electric cables, or withdrawing a diamond drill or other rods. For securing, the end *e* may be brought down and lashed to the large rope.

V. **Timber Hitch and Half-hitch.** For raising or lowering timber, the half hitch should be placed high above the center of gravity to avoid slanting.

W. **Blackwall Hitch.** A convenient method for returning an empty rope on a hook.

X. **Fisherman's Bend.** For securing a rope to a chain or link or the bail of a bucket. Lashing of end is necessary to prevent pulling through.

Y. **Round Turn and Half-hitch.**

Z. **Wall Knot.** For finishing off a rope end. Form a bight with strand 1 and pass the strand 2 around the end of it, and the strand 3 around the end of 2, and then through the bight of 1, as shown in Z. Haul the ends taut, when the appearance is as shown in AA. The end of the strand 1 is now laid over the center of the knot, strand 2 laid over 1, and 3 over 2, when the end of 3 is passed through the bight of 1, as shown in BB. Haul all the strands taut, as shown in CC.

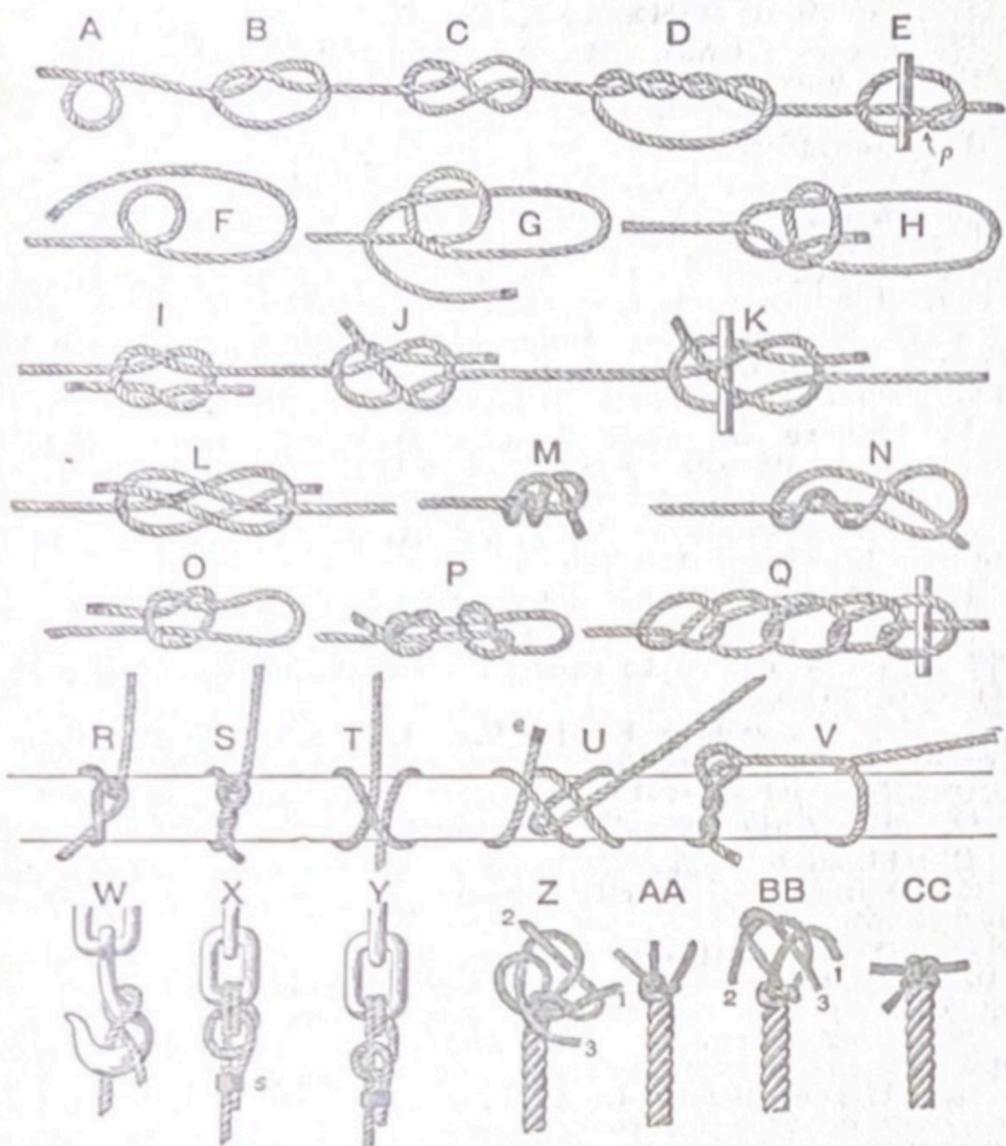


Fig. 12 **Bowline II.** A method of attaching the end of one rope to the standing of another. A half turn is put in the standing and the end of the other rope taken through as in tying an ordinary bowline. This knot is practically a sheet bend.

Fig. 16 **Packer's Knot.** A modification of the simple slip knot but having the advantage when pulled tight, of biting on the standing at A and not easily slipping back. It can be made permanent by an added half hitch on the standing.

Fig. 18. **Modified Fisherman's Bends.** For securing ropes to poles or bars. Adapted to heavy strains.

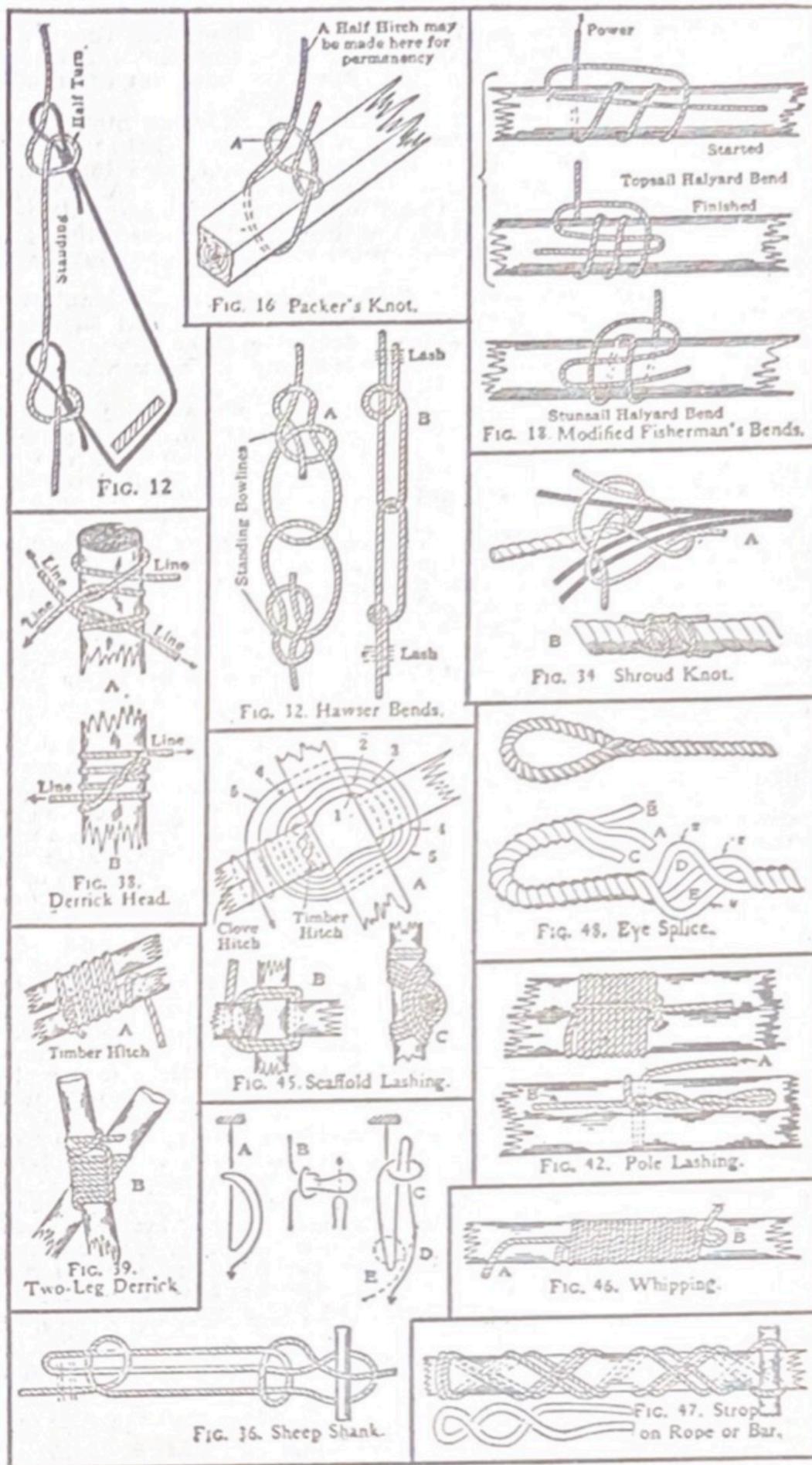


Fig. 32. **Hawser Bends.** These bends are for joining heavy ropes. The bowline bend shown at A is strong and reliable. The half hitch bend B makes an excellent permanent joint on heavy ropes.

Fig. 34. **Shroud Knot.** This is a useful method for joining rope ends to make a sling or instead of a short splice. As shown at A, a wall knot is started in the white rope, then the strands of the black rope are passed through the loops; another wall knot is then made with the black strands, and the two knots tightened up. A further wall may then be made on each side of the joint, or as many as may be desired.

Fig. 36. **Sheep Shank.** A quick and effective method of shortening a rope. No free end is required. Either a half hitch or a boat knot may be used, and the loops may be lashed or secured by a toggle as shown. The first position A is as in making a bowline; the second position C shows one end finished. A half hitch is put in the end D, and the bight E is passed through it as shown. B shows the alternative method, employing a boat knot.

Fig. 38. **Derrick Head.** Two clove hitches are employed as shown in A for two sets of lines. If it is desired that the lines should leave the pole from opposite sides, further half hitches may be put on until the overlaying of the turns brings the end around as shown in B.

Fig. 39. **Two-leg Derrick.** In A is shown the lashing started with a timber hitch and the end drawn through between the two poles. After the legs have been opened out, one or two turns are taken around vertically between the poles to bind the other turns together, and the lashing finished off with a clove hitch as in B.

Fig. 42. **Pole Lashing.** The bight is laid as shown in the lower sketch, and, after a sufficient number of turns are made, the end B is taken over outside the turns and put through the bight, and the whole tightened.

Fig. 45. **Scaffold Lashing.** This lashing is started with a timber hitch and is shown diagrammatically at A. B shows the first stage of lashing, and C shows a side view of the finished lashing. If desired, wedges may be driven into the lashing to thoroughly tighten the turns.

Fig. 46. **Whipping.** For binding splints to a fractured span.

Fig. 47. **Strop on Rope or Bar.** An endless strop or sling is made and wrapped around the bar as shown. The ends of the sling are alternately passed through each other. The power is of course to be applied to the toggle. This is a most excellent method for getting a strong grip on a smooth bar or tube. Suitable for hanging a block or tackle to a gin pole or a mast or rope. The sling should be made of relatively small rope as it grips better. More powerful than a rolling hitch.

Fig. 48. **Eye Splice.** Open the rope as shown and pass the end B through to the back at D, and the end C through E; the center strand A will lie between the two strands X and Y. A is now passed over X and under Z; B over Z and under Y; C over Y and under X. All three ends are now up, lying between two of the strands of the other part or standing of the rope. The process of over the next on the left and then under the next strand but one is repeated as many times as the proposed load calls for.

Knots are Weak. If a knot or hitch of any kind is tied in a rope its failure under stress is sure to occur at that place. Each fiber in the straight part of the rope takes proper share of the load, but in all knots the rope is cramped or has a short bend, which throws an overload on those fibers that are on the outside of the bend and one fiber after another breaks until the rope is torn apart. The shorter the bend in the standing rope the weaker is the knot. The approximate efficiency of several types of knots in per cent. of full strength of the rope is given in the table below:

| Kind of Knot | Efficiency |
|---|------------|
| Eye Splice over an iron thimble..... | 90 |
| Timber Hitch, Round Turn and Half hitch..... | 65 |
| Bowline Slip Knot, Clove Hitch..... | 60 |
| Square Knot, Weavers Knot, Sheet Bend..... | 50 |
| Flemish Loop, Overhand Knot..... | 45 |
| Full strength of dry rope, average of four tests..... | 100 |
| Short Splice in the Rope..... | 80 |