

Boy Scout Rope Work

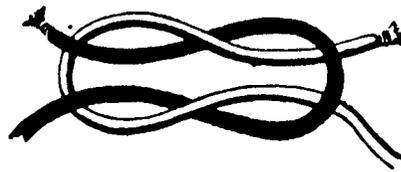
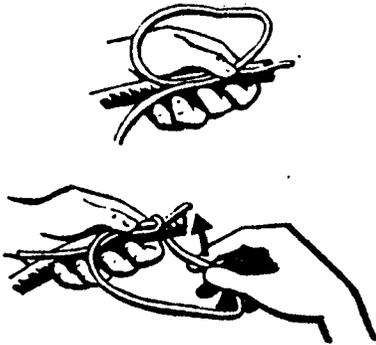
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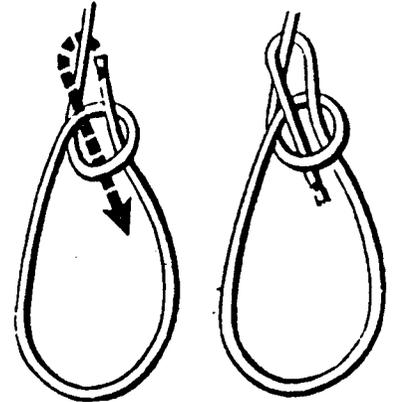
KNOTS

AND HOW TO TIE THEM

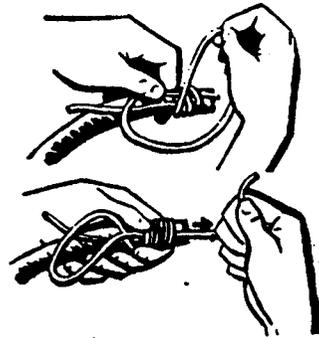
WHIPPING



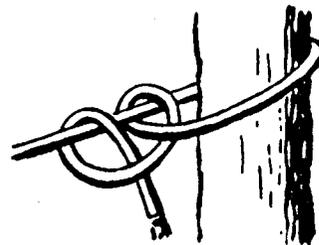
SQUARE KNOT



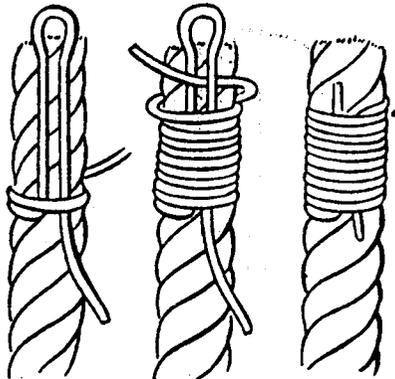
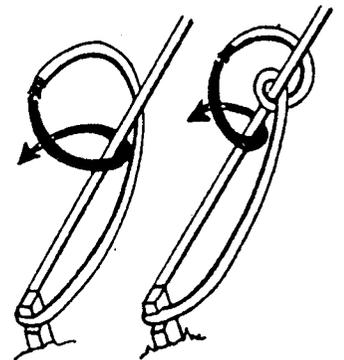
BOWLINE



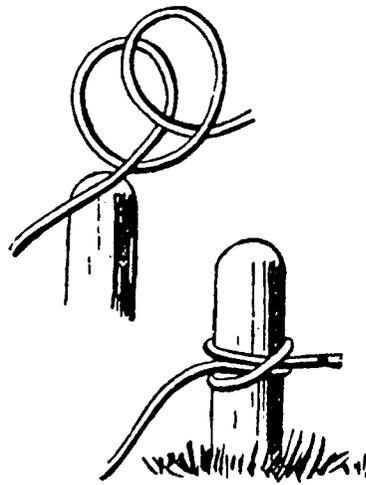
AMERICAN WHIPPING



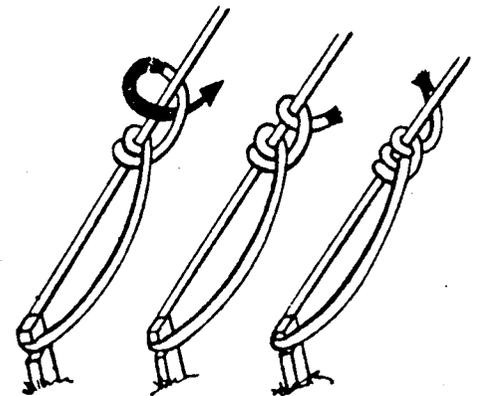
TWO HALF HITCHES



ENGLISH WHIPPING



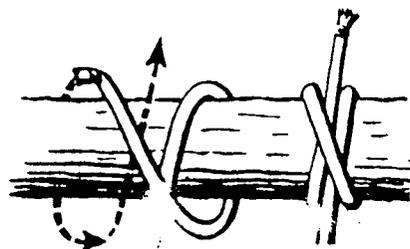
CLOVE HITCH



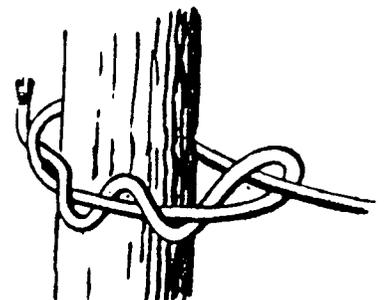
TAUT-LINE HITCH



SHEET BEND

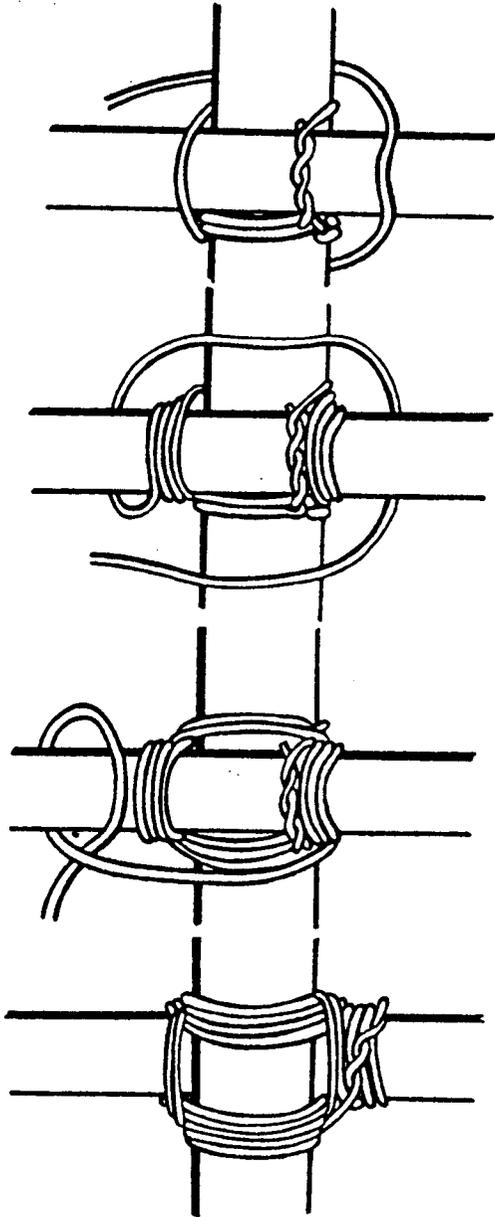


CLOVE HITCH OVER SPAR

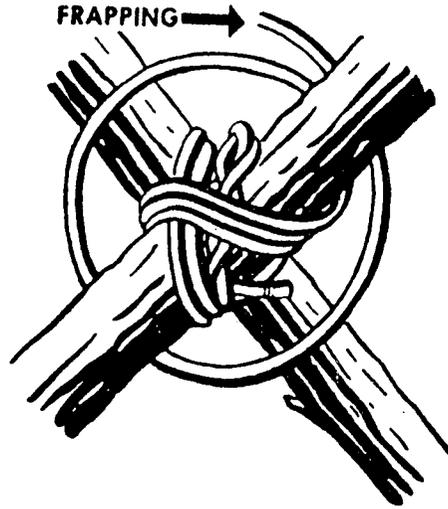


LASHINGS

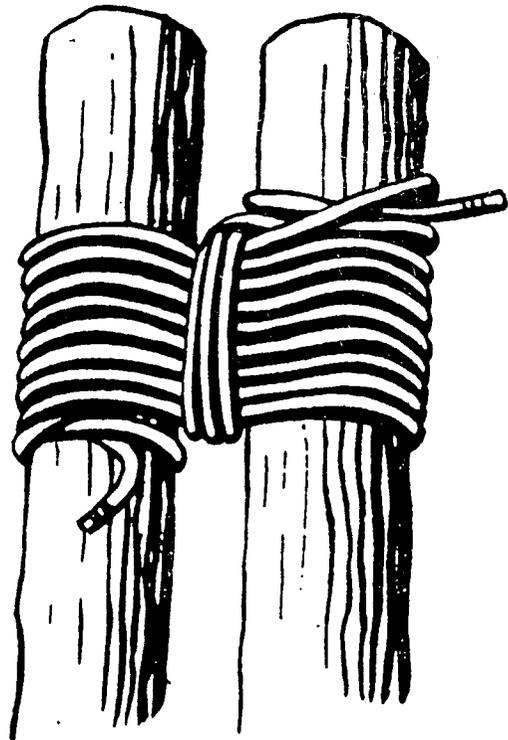
SQUARE LASHING

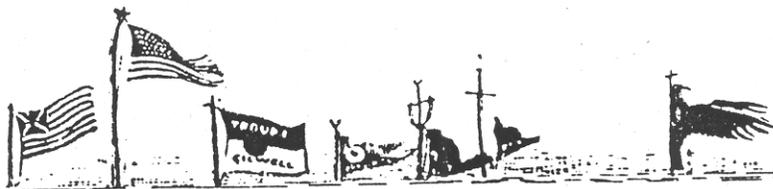


DIAGONAL LASHING



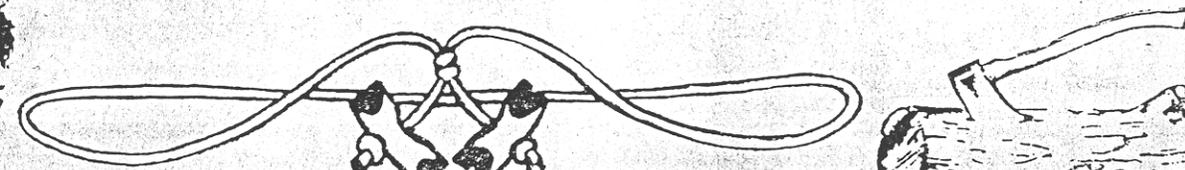
SHEAR LASHING



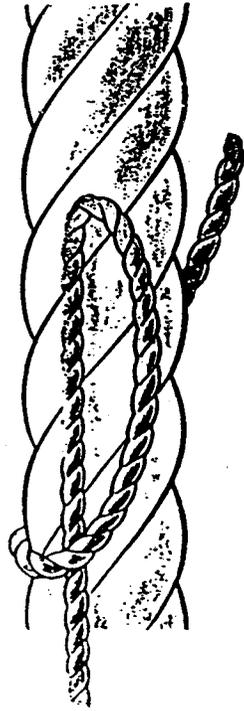


WOOD BADGE

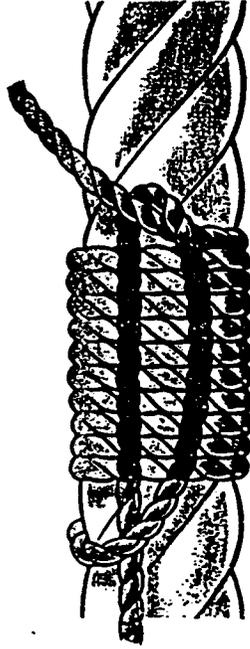
KNOTS AND SPICES



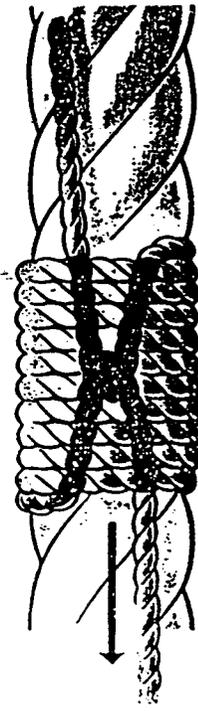
WHIPPING ROPE PREVENTS RAVELLING



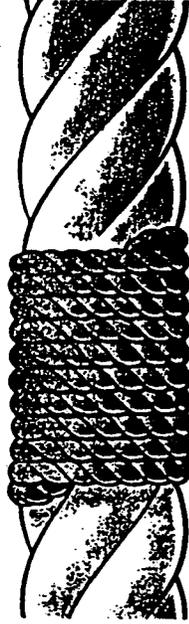
1. LAY A BIGHT ALONG THE ROPE



2. WIND YARN TIGHTLY AROUND BIGHT AND ROPE. INSERT WINDING END THROUGH BIGHT



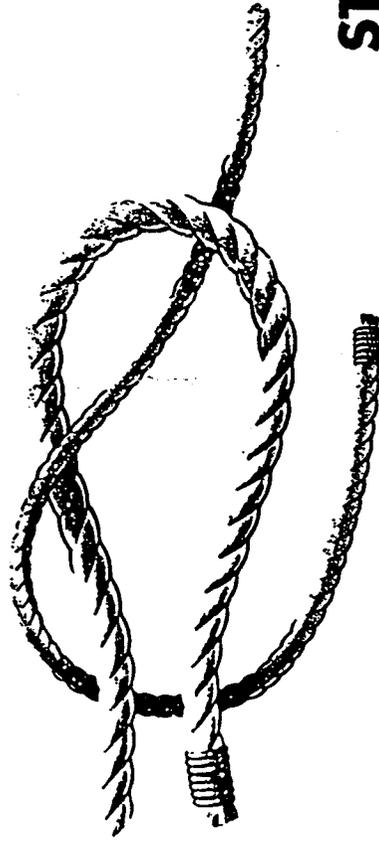
3. PULL STANDING END DRAWING BIGHT OUT OF SIGHT



4. TRIM BOTH ENDS OF YARN CUT ROPE

SINGLE SHEET BEND

USED TO JOIN WET ROPES
AND ROPES OF UNEQUAL SIZE



STEP 1.



STEP 2. DRAW TIGHT

BOWLINE ON A BIGHT

USED TO FORM A DOUBLE LOOP
THAT WILL NOT SLIP, CAN BE TIED
AT ANY PLACE IN THE ROPE



STEP 1.



STEP 2.



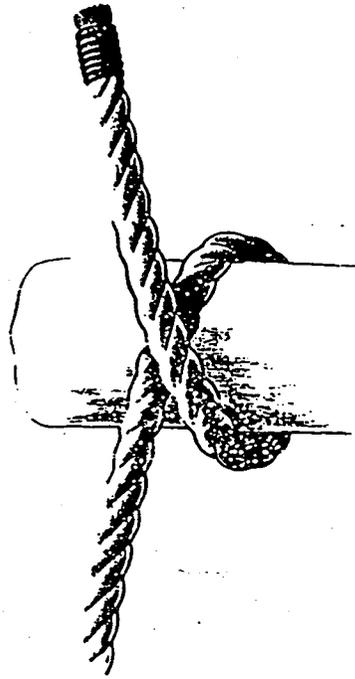
STEP 3.



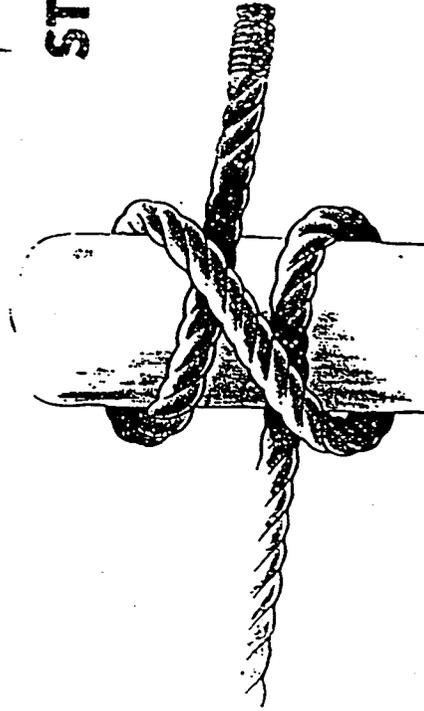
TIGHTEN HERE →

STEP 4.

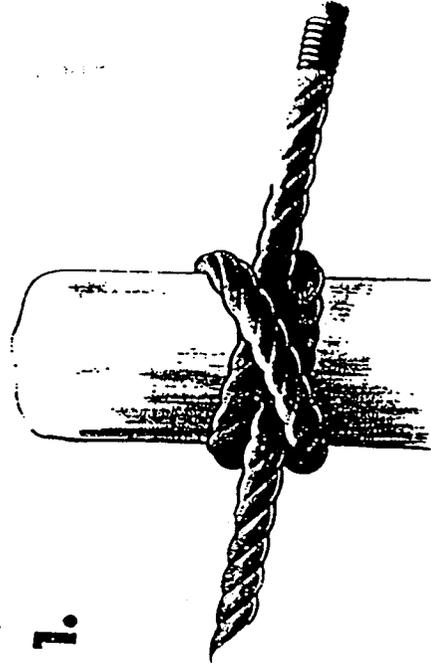
**CLOVE HITCH USED TO FASTEN AN OBJECT AND TO START
AND FINISH LASHINGS**



STEP 1.



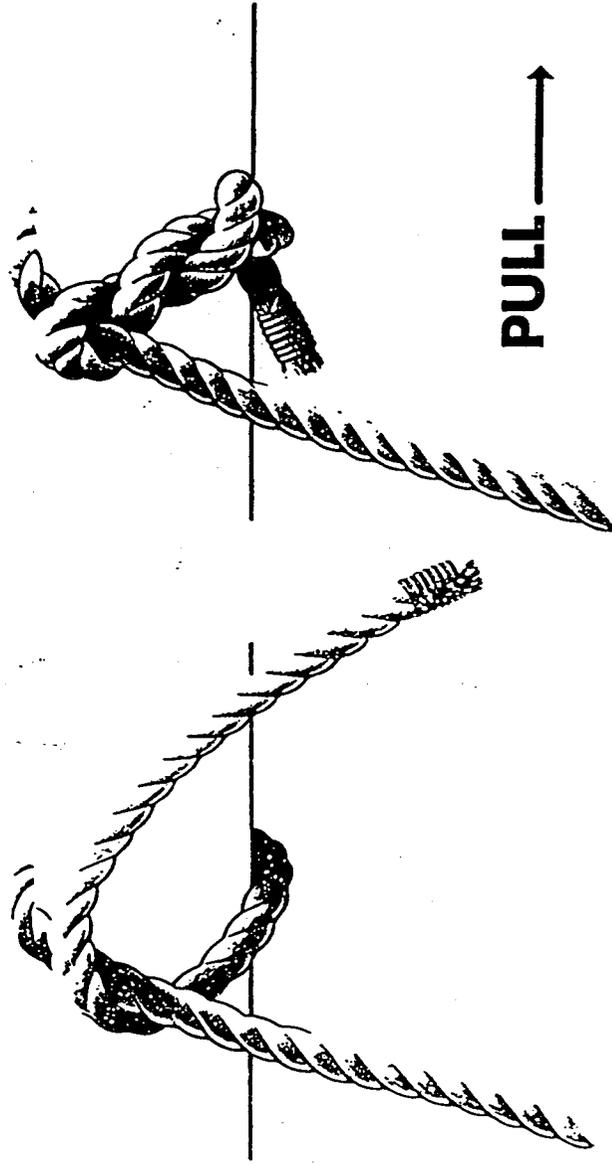
STEP 2.



STEP 3. DRAW TIGHT

TIMBER HITCH

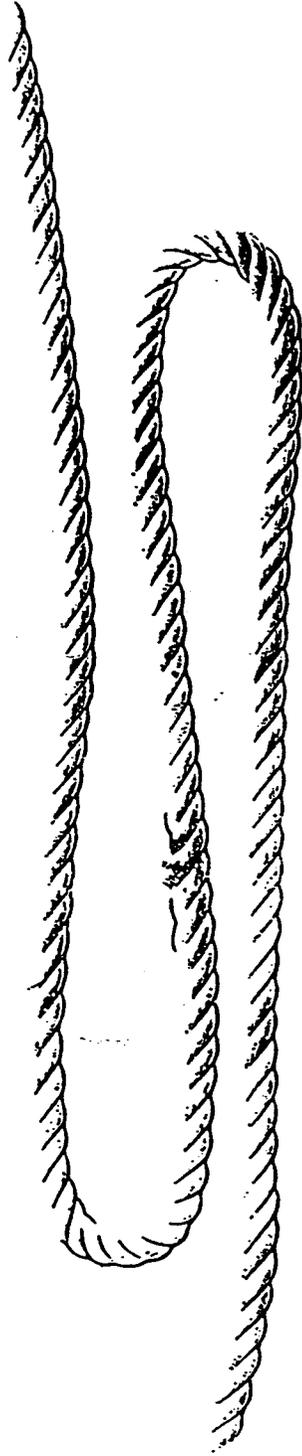
USED FOR DRAGGING LOGS OR PIPES
DOES NOT JAM; UNTIES READILY WHEN PULL CEASES



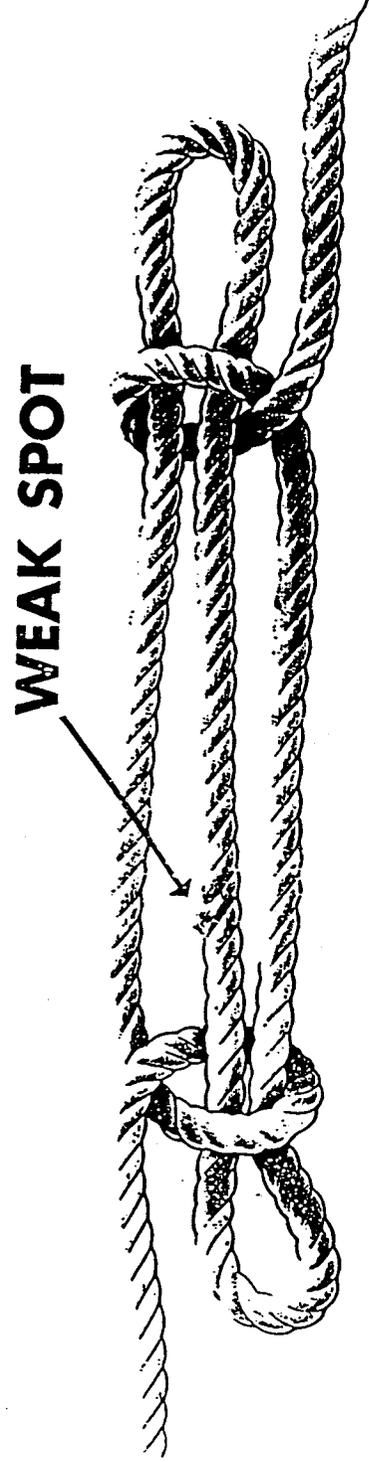
STEP 1.

STEP 2. DRAW TIGHT

**SHEEP SHANK USED TO SHORTEN A ROPE, OR TO
BY-PASS A WEAK SPOT**



STEP 1.

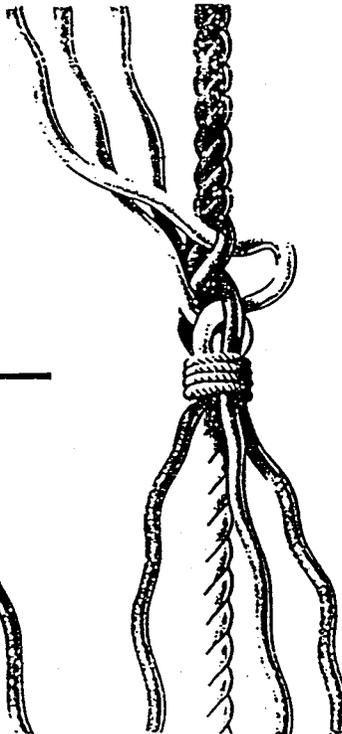


STEP 2. TENSION MUST BE MAINTAINED

SHORT SPLICE (CONT'D)



3. DRAW THE STRANDS OF ONE ROPE ALONG THE OTHER ROPE AND MAKE A TEMPORARY TIE

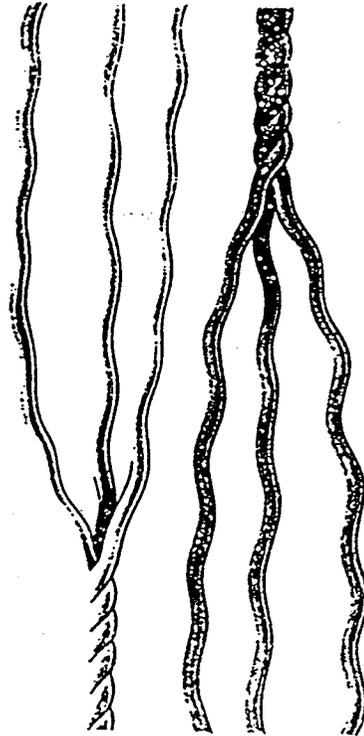


4. PASS ONE STRAND OF THE FREE ROPE OVER THE NEAREST STRAND OF THE OTHER ROPE AND UNDER THE NEXT STRAND

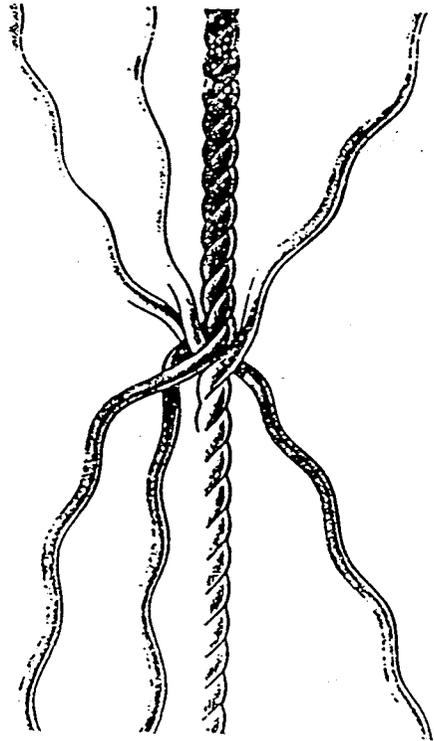


5. CONTINUE CROSSING STRANDS AT RIGHT ANGLES

LONG SPLICE USED TO JOIN ROPES WITHOUT INCREASING DIAMETER



1. UNLAY ABOUT FIFTEEN
TURNS FROM EACH END



2. BRING ROPES TOGETHER
AS IN SHORT SPLICE

LONG SPLICE (CONTD) FOR ALL STRANDS

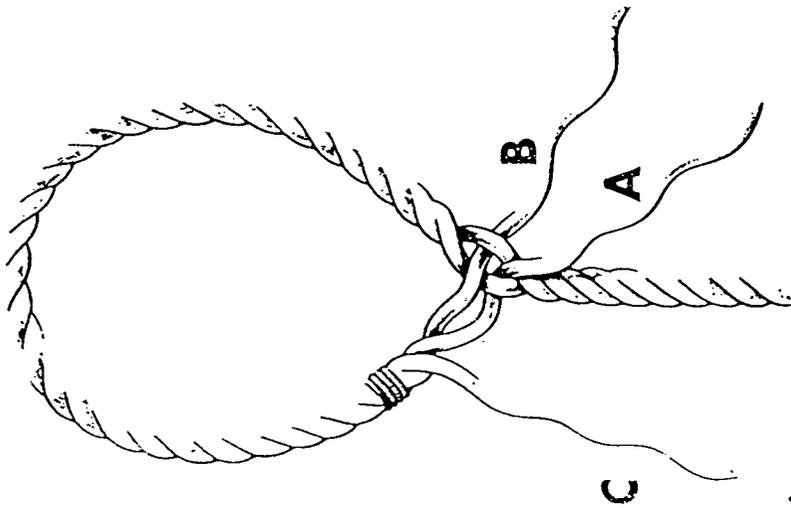


6. BE SURE THE ENDS OF THE STRANDS PASS EACH OTHER

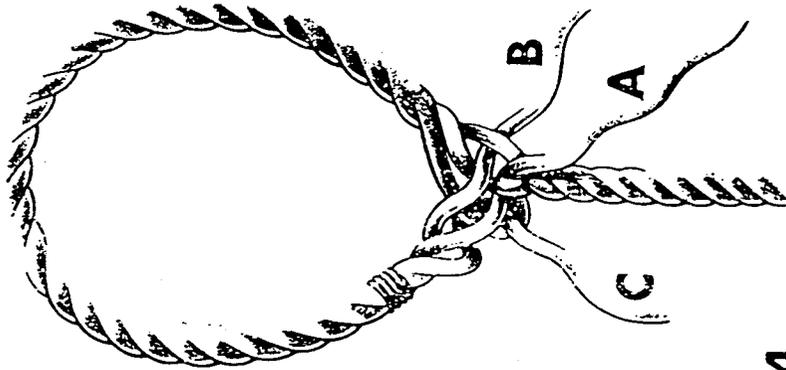


7. TUCK AND FINISH AS IN THE SHORT SPLICE

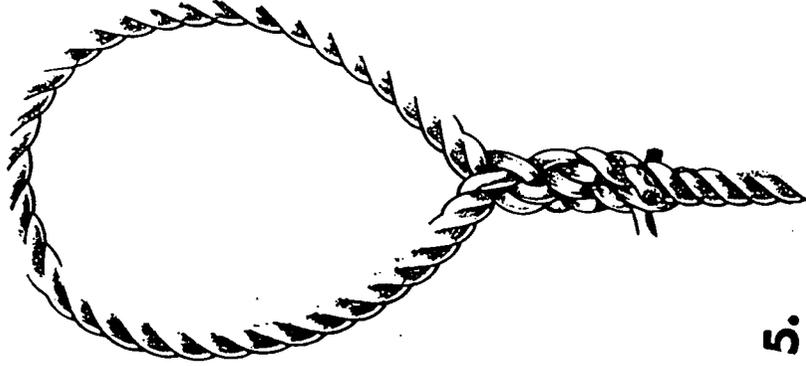
EYE SPLICE (CONT'D)



3. PASS STRAND (B) UNDER THE NEXT STRAND OF ROPE



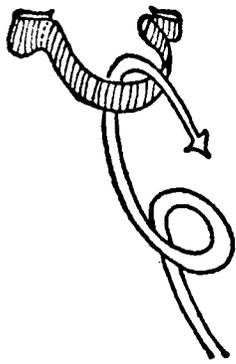
4. PASS STRAND (C) UNDER THE LAST STRAND OF ROPE



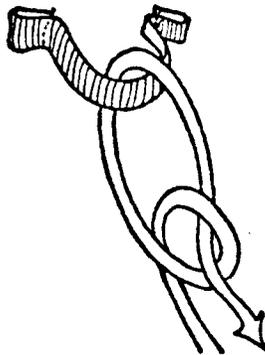
5. TUCK THE THREE STRANDS INTO THE ROPE AS IN THE SHORT SPLICE

BOWLINE

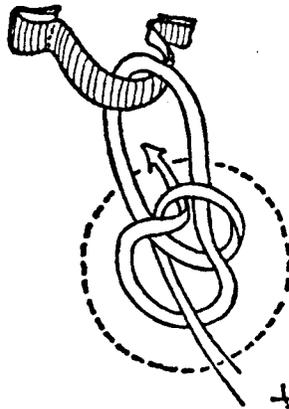
Used to form a secure, nonslip loop in the end of a line. For attaching guy lines to tent loops, one end of clothes line to a tree or one loop to another.



1. Loop over and thru.



2. Up thru loop and over.

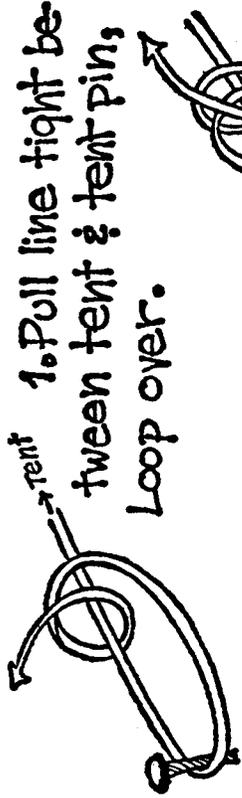


3. Around and over, down thru loop, and out.

To tighten: Snug up parts and pieces shown in dotted area.

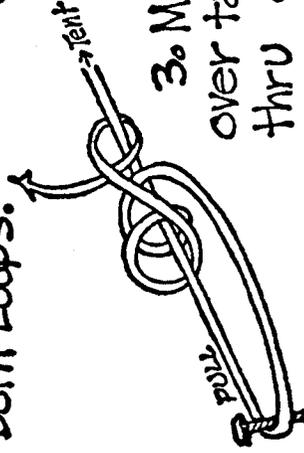
TAUT LINE

Used as a secure sliding knot that tightens under load. For tightening tent guy lines, loose end of a clothes line and pack lines.



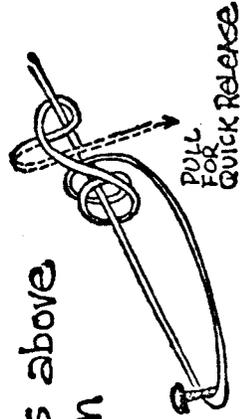
1. Pull line tight between tent & tent pin, Loop over.

2. Loop over again and cross over both loops.



3. Make third loop over taut line and thru cross over.

To tighten: Snug up parts & pieces. To tighten on tent-slide knot toward tent:

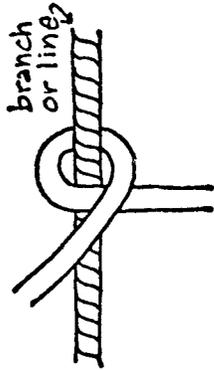


Variation: Same as above. Continue as shown by dotted line.

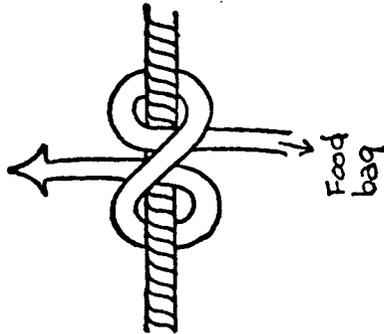
GLOVE HITCH

Used as a secure hitch around a branch or another line. For attaching tent guyline over pack frame, around branch or hanging food bag from a line.

1. Loop around, cross over.

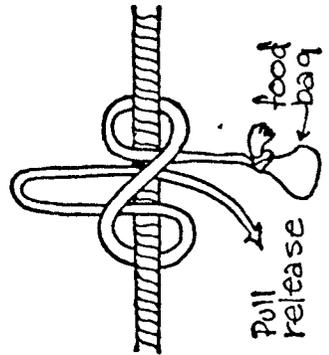


2. Around again, over branch-then under crossing line.



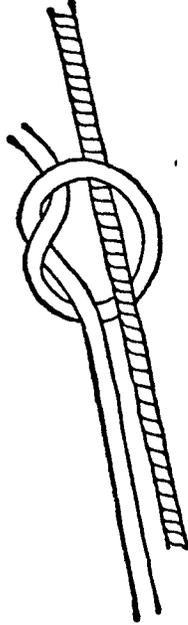
To tighten: Squeeze loops together while pulling ends.

VARIATION: Quick release clove hitch particularly handy for removing net bag from line.

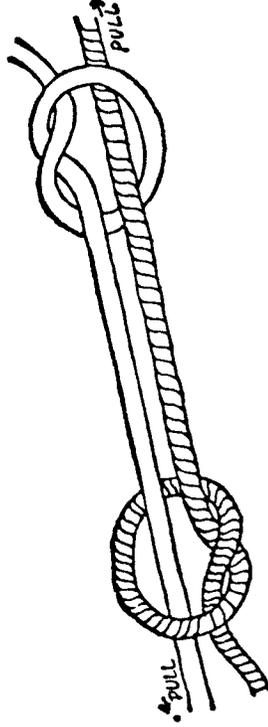


FISHERMAN KNOT

Used to join two pieces of line together in a more positive manner than a square knot. For adding on to tent guylines.



1. Place ends of two lines parallel and make a loop around both.

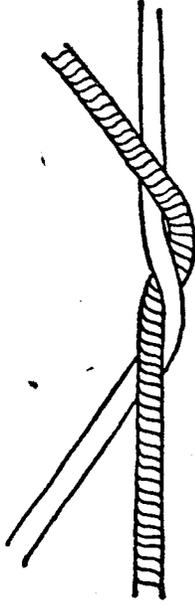


2. Same for opposite end.

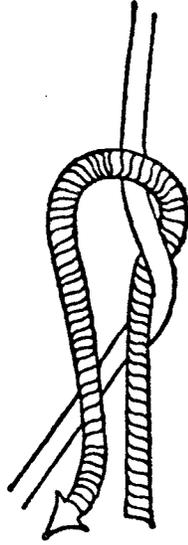
To tighten: Tighten each loop separately then pull loops together. Tighten each loop again.

SQUARE KNOT

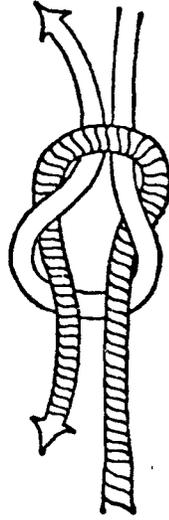
Used to join together lines of the same diameter and material, such as shortened shoe lace, bandana, sling or bandage.



1. Twist



2. Loop (BLACK)



3. Over and out (WHITE)

may best be handled with a bowline around one tree and a tautline around the other tree.

One knot you'll use each time you pitch your tent is a sliding tautline, and you will recall each tent line is secured to tent pull loops with a bowline.

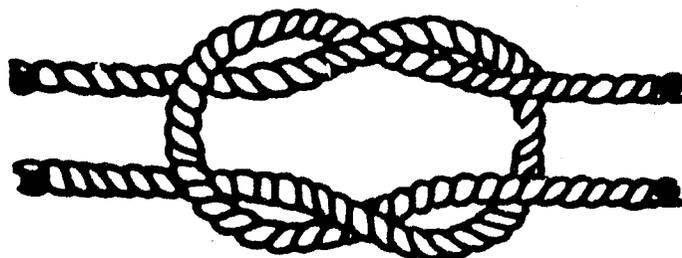
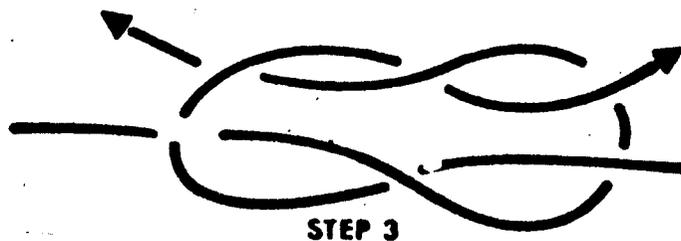
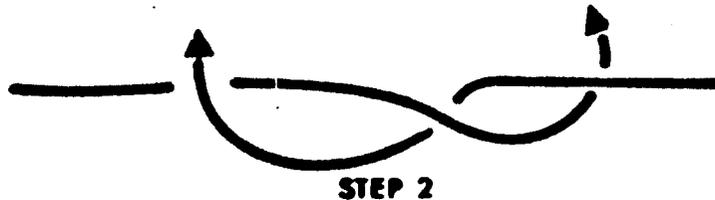
Other words, the five necessary knots shown in this brief chapter are used repeatedly in backpacking. Knots are presented in order of manual dexterity required, from least to most. Practice at home and in car camps prior to your first backpack and you'll hike with increased confidence. If you think it's difficult to tie these knots, try sketching them.



REEF KNOT

1.
 - a. Take one of the ropes to be joined together in each hand and cross the left hand one over the right hand one.
 - b. Pass the end of the right hand one over the standing part of the left hand one. Pass the end of the left hand rope under the standing part of the right hand rope.
 - c. Take the ends of the rope in each hand and pass the right hand one over the left hand one. The left hand one is passed over and under the loop that is formed by the right hand rope. Study the diagrams on the opposite page indicating the steps very carefully.

2. This knot is used for joining two ropes of equal thickness, and is also used to tie triangular bandages in First Aid. It is quickly untied and is a useful knot for general purposes.

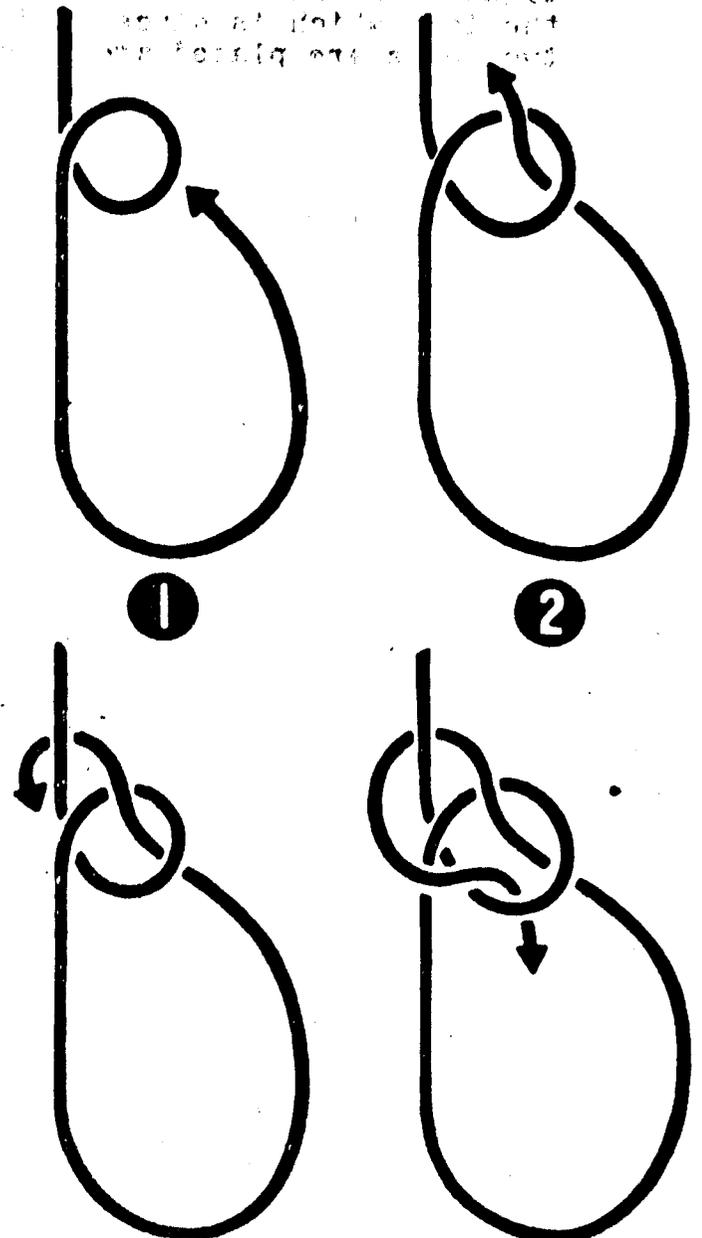
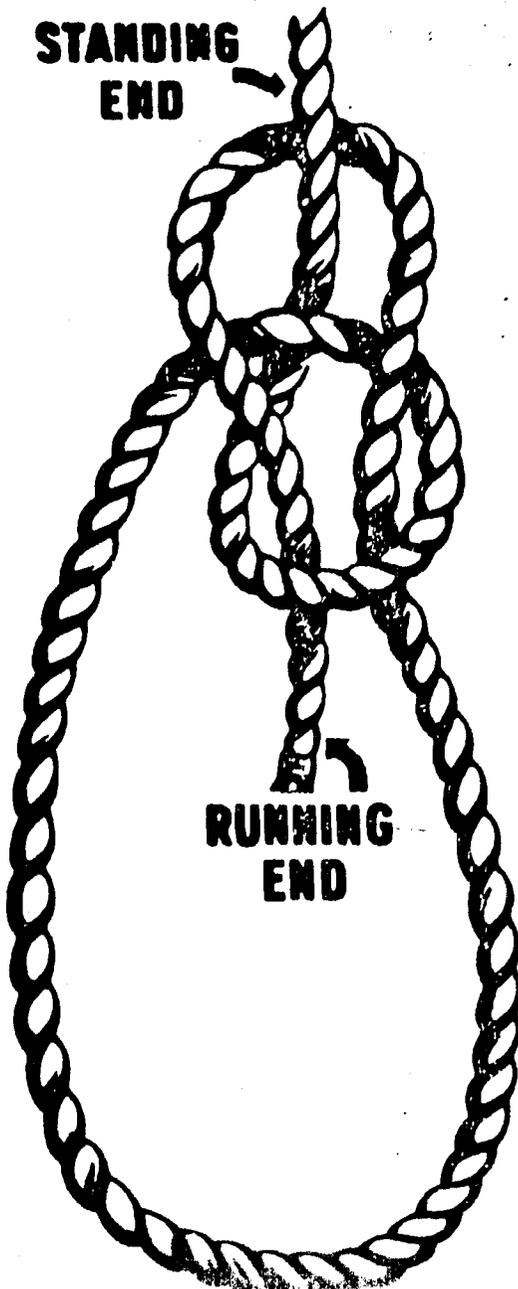


BOWLINE

DOUBLE BOWLINE

1. a. Take the running end of the rope in the right hand and pull it across the upturned palm of the left hand to form a hitch.
b. Pull loop to required size, pass running end, held in right hand up through the hitch held in the left hand.
c. Then pass it underneath the standing part.
d. Thence, back down through the hitch held in left hand. Tighten by pulling standing part and running end.

2. A Bowline is used for forming a non-slipping loop at the end of a rope and is a most useful anchoring knot. It may also be used for attaching a rope to a person as a life-line.

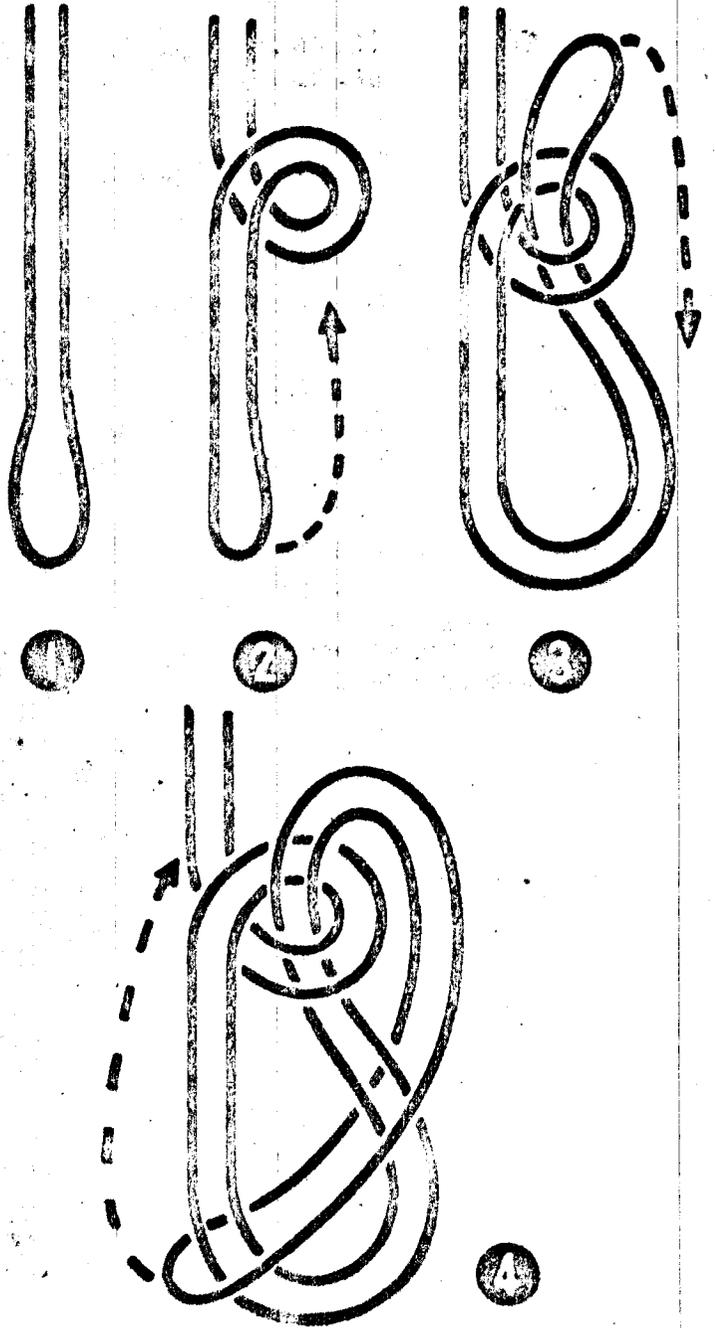
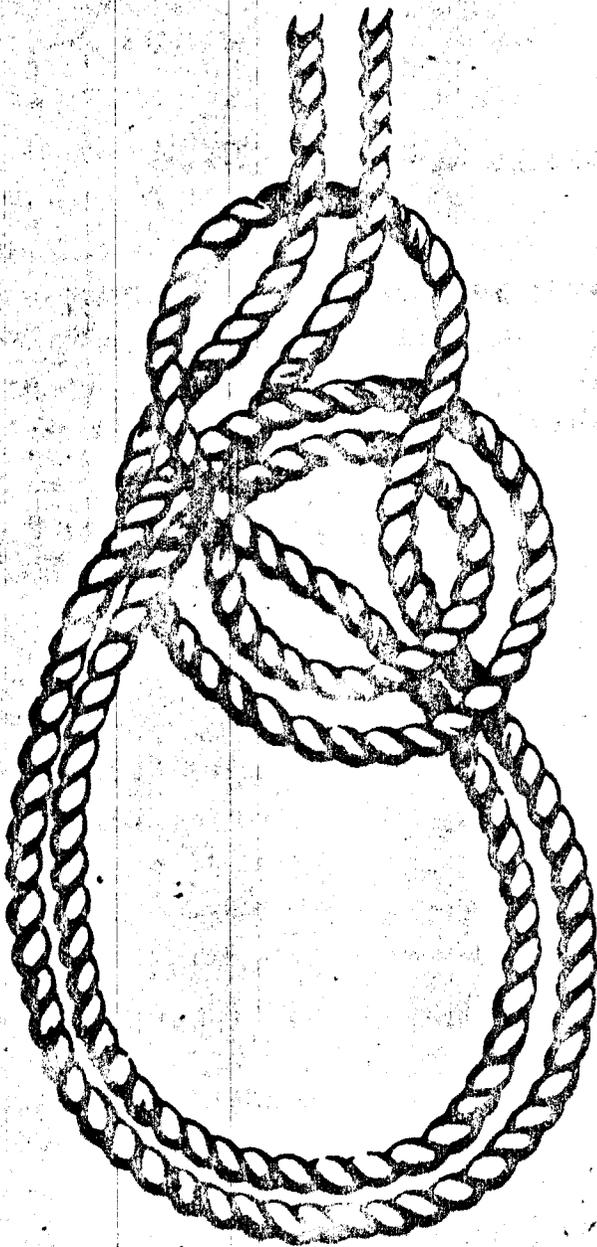


BOWLINE-ON-A-BIGHT

- STEP 1 (Double rope is used). Form a Hitch as tying a Bowline.
- STEP 2 Pass the free end up through the Hitch as tying a Bowline.
- STEP 3 Bring the free end towards you, drop it, and bring the two loops through it.
- STEP 4 Pull on the two ropes which form the right side of the loop. This will draw the loop, which has passed through the bight, behind the loop in the double rope.

This knot is most useful to form a sling in raising or lowering litters or ladders horizontally. It can also be used as a life basket for raising or lowering a conscious person by giving support to the chest and legs.

CHAPTER VIII
NS 4



BOWLINE - ON - A - BIGHT

DOUBLE BOWLINE

1. This knot is tied as a Single Bowline but a double rope is used. Once tied, it forms three loops which can serve as a Life Basket. This is the only knot to be used on an unconscious person as a Life Basket.

2. To make a life basket, determine the amount of rope needed by measuring from one hip, pass the double rope under the feet and up to the other hip. The three loops in the finished basket must be the same size.

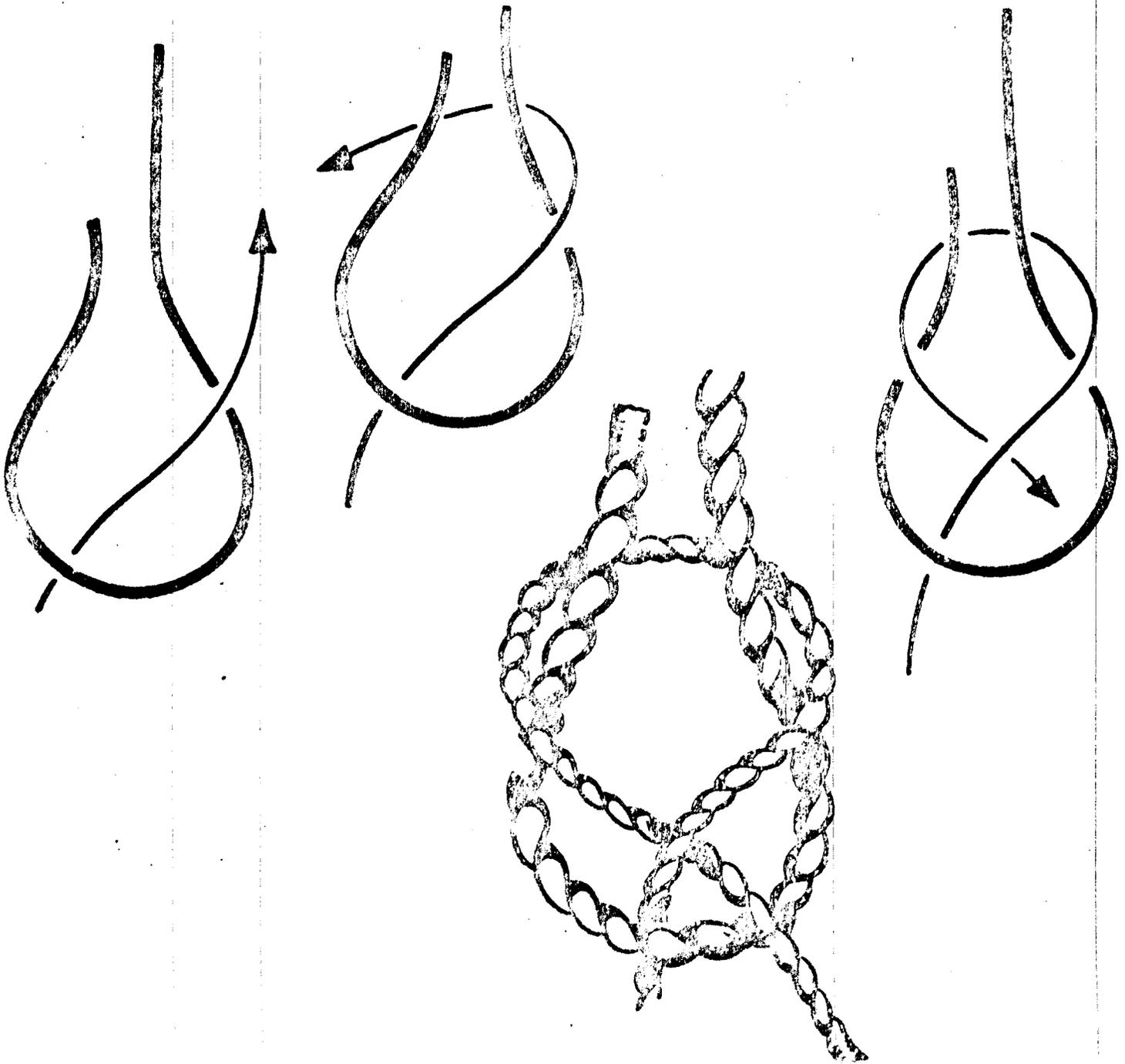
3. When the running end is placed through the loop, hold the loop at the belt line with the left hand and extend the right hand holding the running end to arms length at eye level, grasp the double rope at the loop with the fingers of the left hand and the correct measurement will be secured when the running end is passed around the standing part. Pull all three loops even and tighten the knot. The double rope which was the free end now forms the loop which is placed under the casualty's arms. The other two loops are placed around each leg.

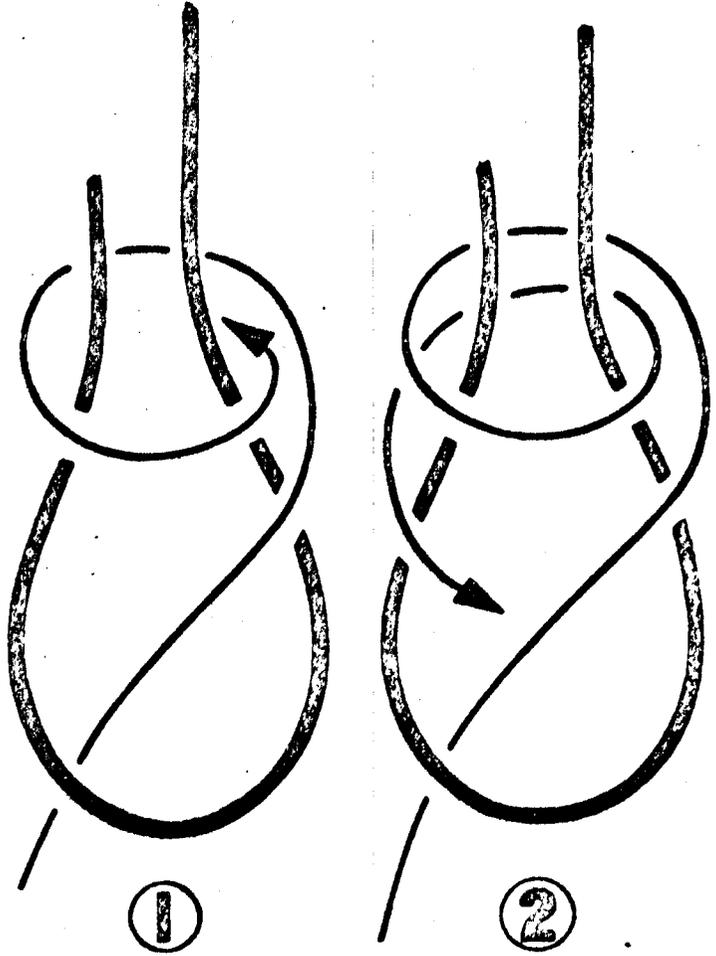
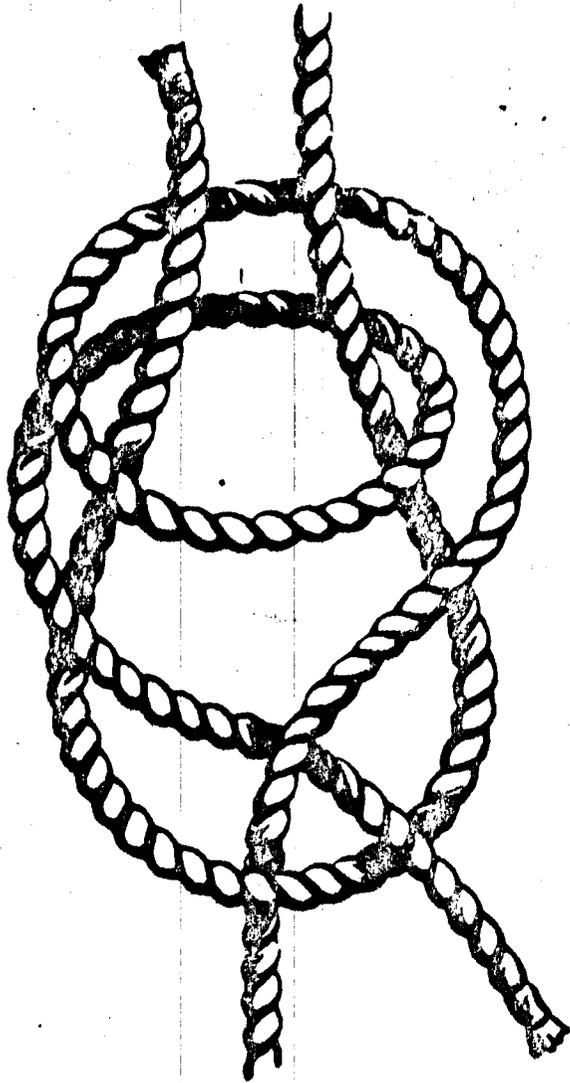


6

SINGLE SHEET BEND

1.
 - a. Form a loop in the larger rope. Pass the running end up and through the loop to the right.
 - b. Pass the running end around behind the double part of the larger rope from the right side.
 - c. Pass the running end over the smaller rope in the center of the loop and over the right side of the loop in the larger rope.
2. Sheet bends are used for joining two ropes of different sizes.





DOUBLE SHEET BEND

FIGURE OF EIGHT LASHING

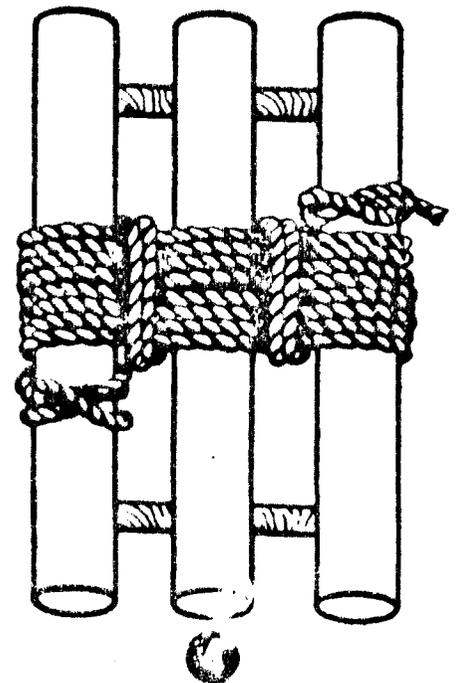
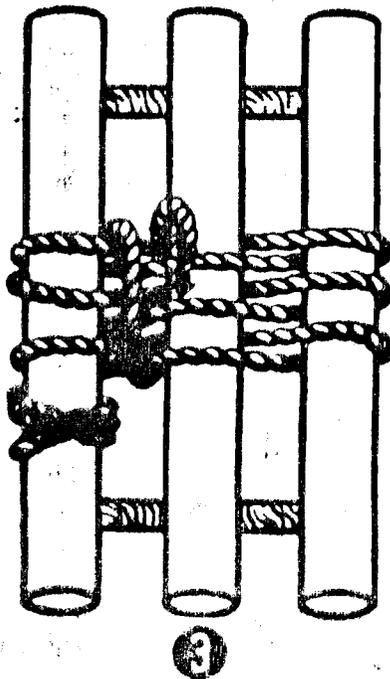
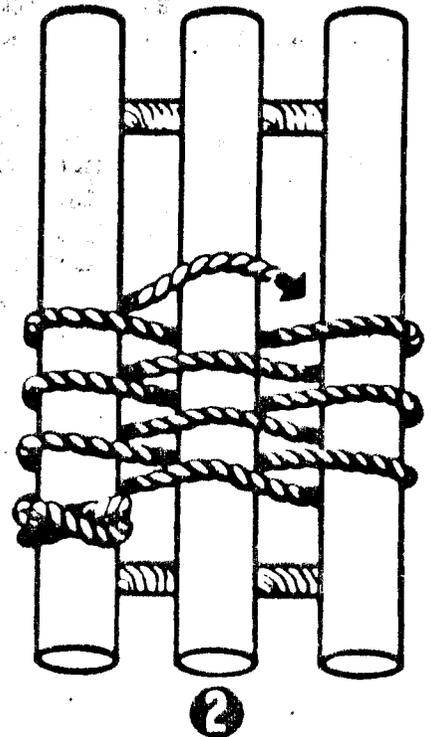
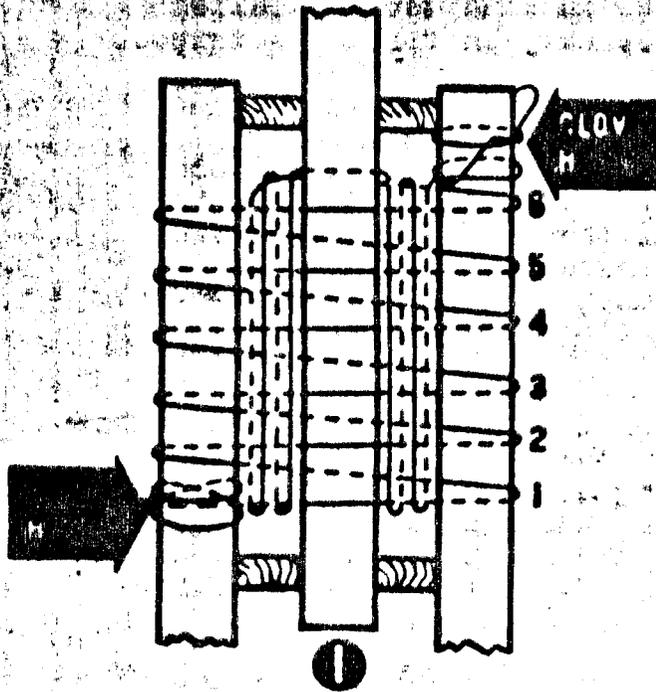
This lashing is used to bind three parallel poles together as may be necessary in forming a tripod.

STEP 1 Lay out three spars with their butts flush on trestles. Mark all three spars at the point where the centre of the lashing will come, (approximately 36 inches) from the tip of the shortest spar. Insert spacer blocks above and below the marks.

STEP 2 Start the lashing with a Clove Hitch on the near spar slightly below the marking. Carry the ends and take the lashing over and under the three spars in a Figure of Eight fashion for at least six turns, working upwards. Make two frapping turns around the lashing between the spars. Finish with a Clove Hitch at the top of the lashing on the outside spar.

9

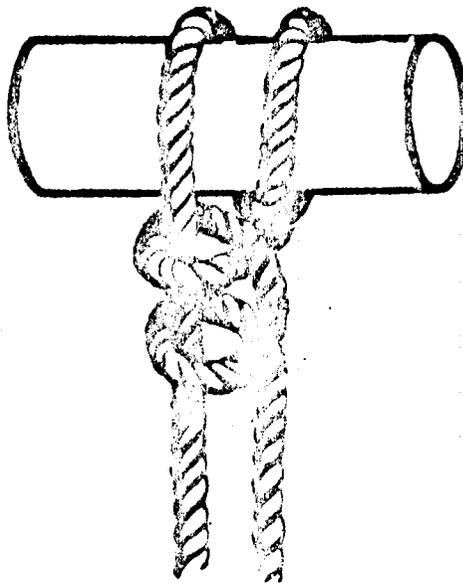
FIGURE OF "8" LASHING



10

ROUND TURN AND TWO HALF HITCHES

1.
 - a. Stand facing the pole, wrap the rope over the top of the pole, catch it underneath and wrap it around over the top again.
 - b. Take the running end and pass it around the standing part between the pole and the place on the standing part where the running end crosses.
 - c. Carry out 1b. again and pull tight.
2. A Round Turn and Two Half Hitches is used for securing a rope to a spar when an adjusting knot is required for securing guide lines to a picket.

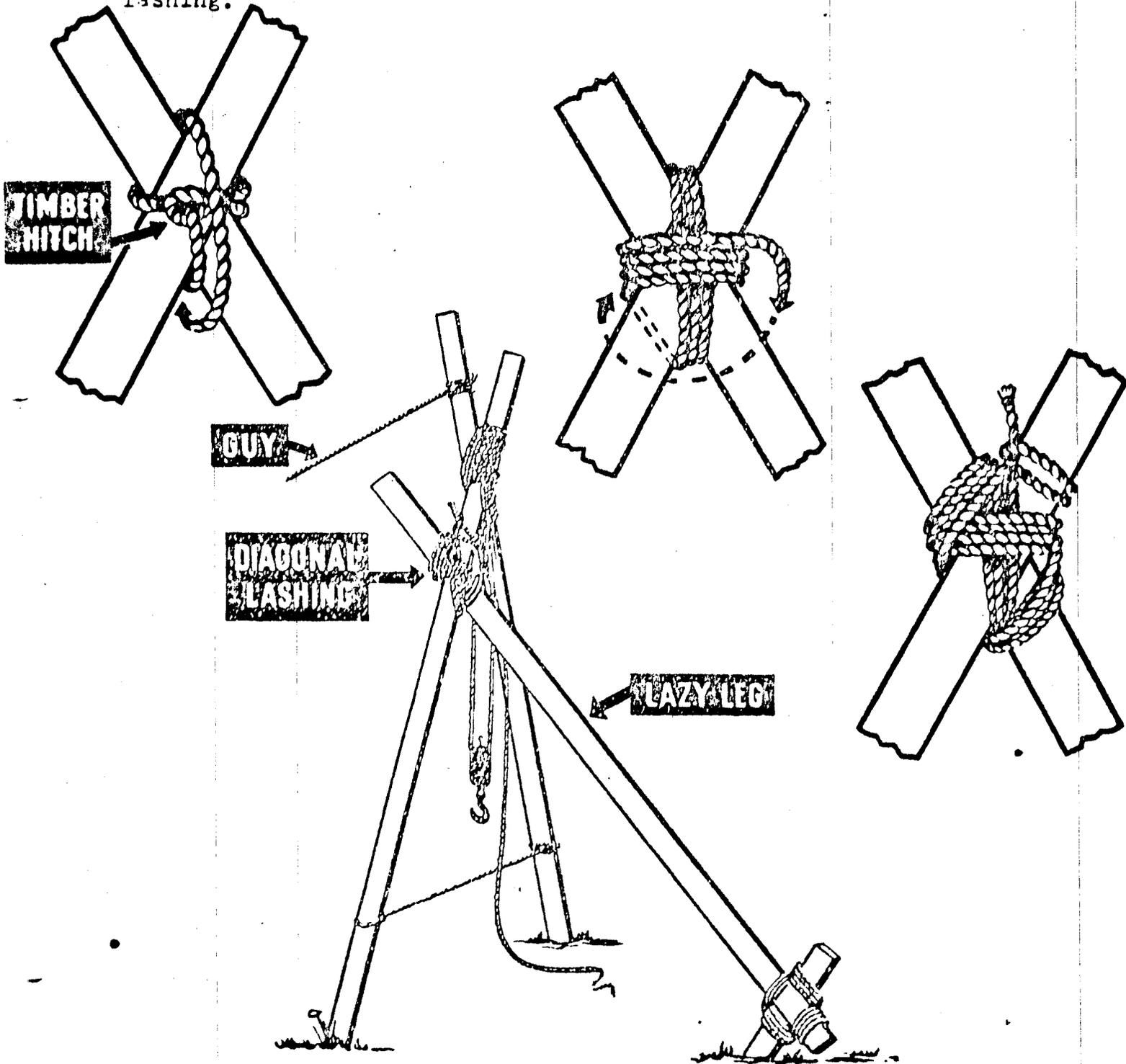


**ROUND TURN AND
TWO HALF HITCHES**

DIAGONAL LASHING

1. This Lashing is used to lash together two spars at an angle other than a right angle, especially where their method of use may cause them to spring apart.

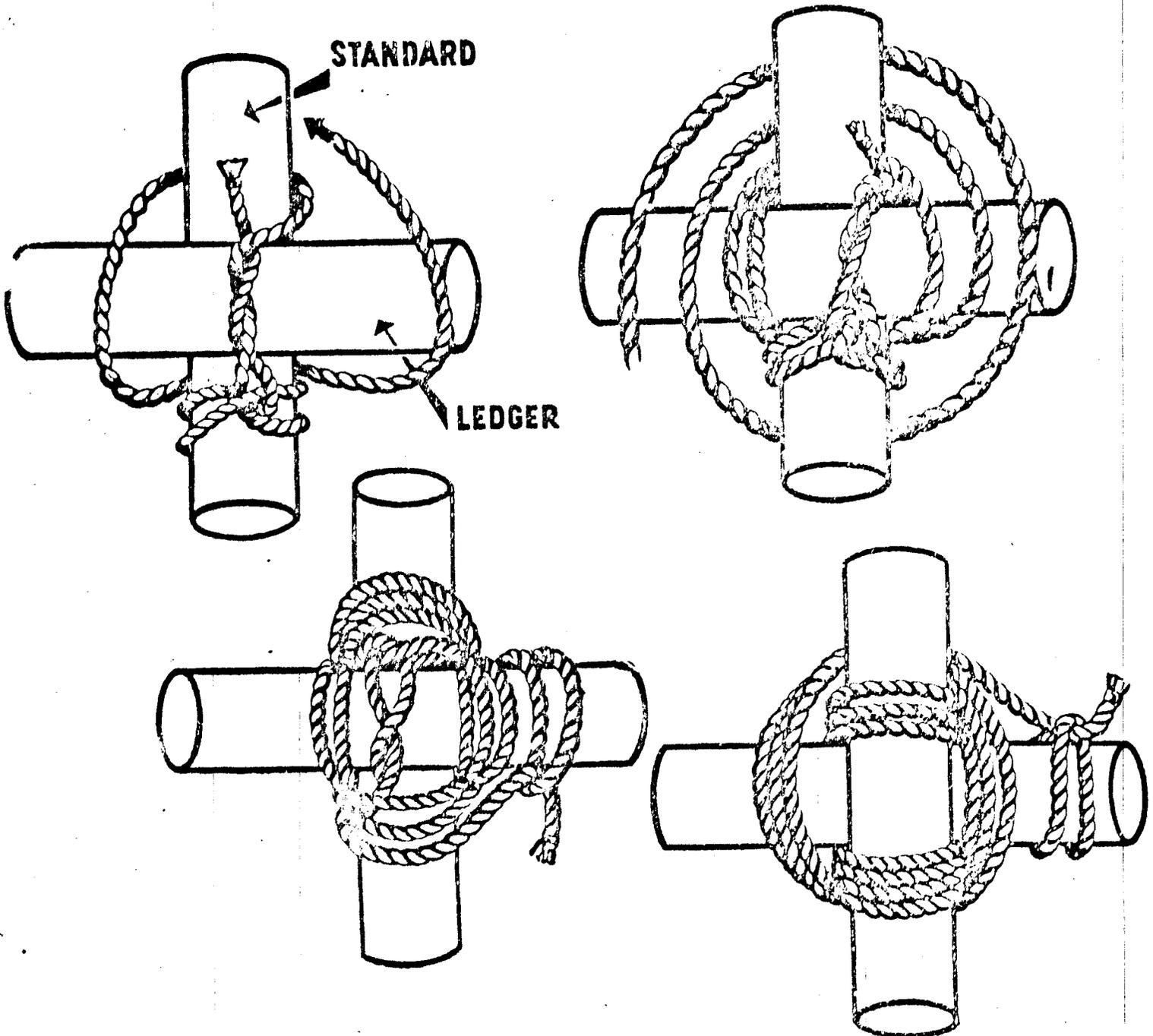
2. Lay out two spars on trestles crossing them at the desired angle, where the lashing is required. Start the lashing with a Timber Hitch around both spars horizontally. Then take four vertical turns around both spars and draw taut. Take four horizontal turns around both spars and draw taut. Finally, put four frapping turns over the lashing between the spars and draw taut. Finish with a Clove Hitch on the upright spar above the lashing.



SQUARE LASHING

1. The Square Lashing is used to lash together two spars that touch and cross at right angles. For example, it can be used for securing the cross head to derrick pole.

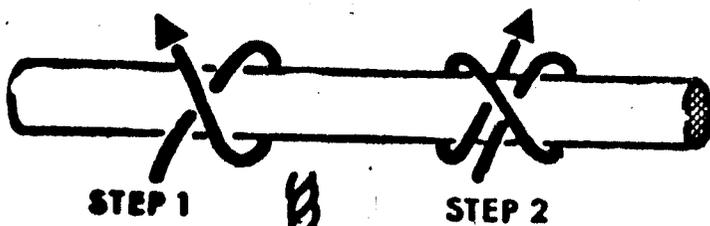
2. Lay the cross head (Ledger) on top of the pole (Standard) at right angles and not less than 18 inches from the top of the pole. Start the lashing with a Clove Hitch around the standard below the ledger marrying the long and short ends together. Take the married ends over and around the ledger and standard, repeating this circuit three or four times working inwards on the standard and outwards on the ledger drawing the rope as taut as possible. Take four frapping turns around the whole lashing between the standard and ledger, draw taut and finish off with a Clove Hitch on the ledger.



SECURING KNOTS WHERE A ROPE HAS TO BE MADE FAST TO A SPAR OR POLE

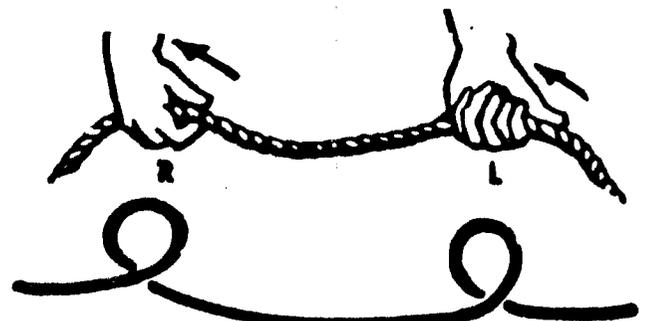
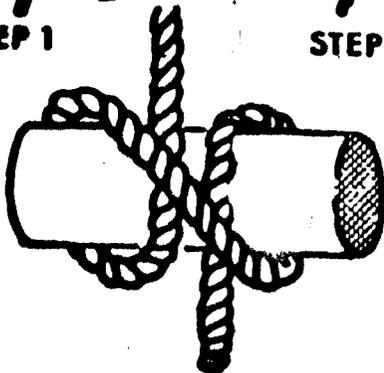
CLOVE HITCH

1. To tie at the end of a rope:
 - a. Stand facing the pole that the knot is to be tied around and holding the rope between your body and the pole, pass the running end over and around the pole bringing it out underneath the pole on the right side of the standing part.
 - b. Pass the running end over the top of the pole and bring it around underneath. Then pass the end up under the same part of the rope that crosses the standing part of the first loop. See 1A and carefully follow the diagrams.
2. To tie in the centre of a rope:
 - a. Grasp the rope in your left hand with the knuckles up, thumb in and turn your hand over so the knuckles are down and the thumb out. With your right hand grasp the rope with the knuckles down and the thumb out and turn your hand over so the knuckles are up with the thumb in. These actions should form two loops as indicated on the opposite page;
 - b. Put the two loops together with the loops made by the right hand in front and place both loops over the end of the pole and draw tight.
3. This Hitch forms the basis of many securing knots where ropes have to be made fast to spars, poles or other supports and can be used either at the end of a rope or in the centre.

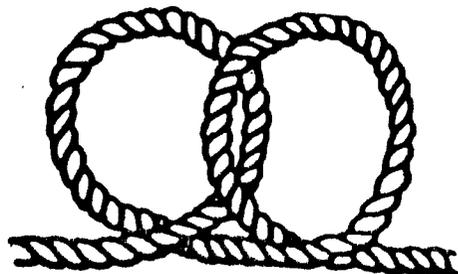


STEP 1

STEP 2

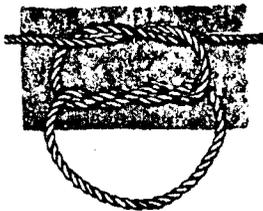


STEP 1 COMPLETED



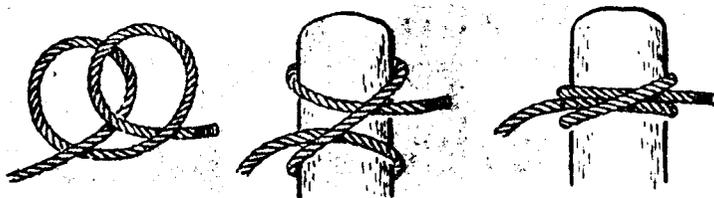
TO TIE IN CENTRE OF A ROPE

THE SURGEON'S KNOT



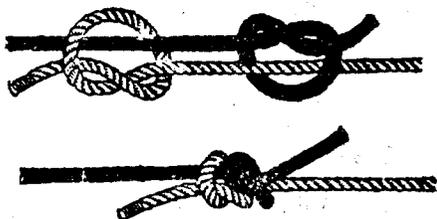
CLOVE HITCH

THE "GENERAL UTILITY" HITCH, ASHORE



THE FISHERMAN'S KNOT

JOINS FISHLINES, SMALL ROPE, TWINE



THE RUNNING BOWLINE

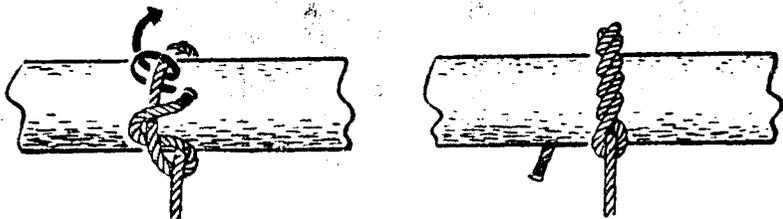
FOR RETRIEVING OBJECTS OVERBOARD
AND PACKAGE TYING



THE HALF HITCH A BASIC KNOT FORM

TIMBER HITCH

USED FOR TOWING AND HOISTING



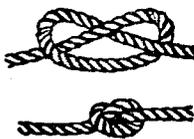
1
Untrustworthy



2
Fairly Reliable



THE OVERHAND KNOT

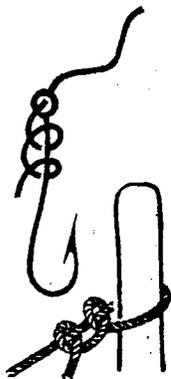


TWO HALF HITCHES

QUITE SECURE—USED FOR MOORING

NECK HALTER

FOR HORSE OR COW



CARRICK BEND

USED FOR HEAVY ROPES, HAWSERS, CABLES



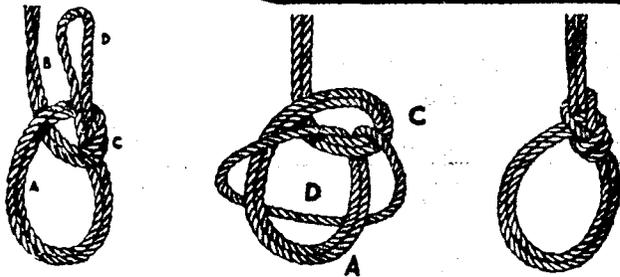
Useful Knots

and how to tie them

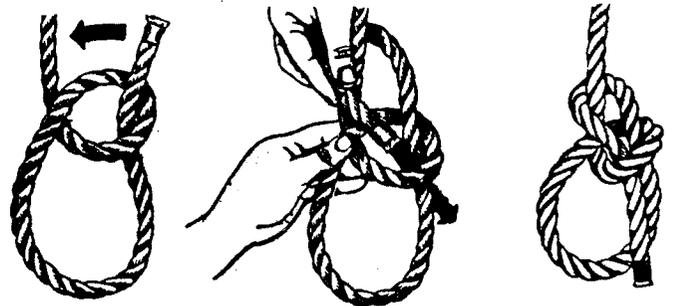
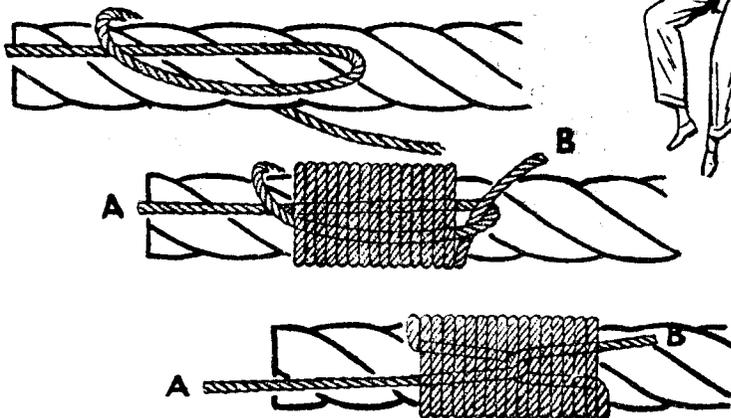


THE FIGURE EIGHT KNOT

BOWLINE on BIGHT
TO LIFT AN INJURED MAN

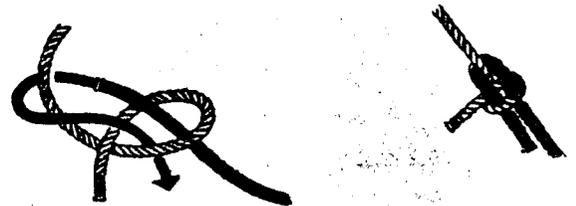


KEEPS ROPE ENDS FROM UNRAVELLING

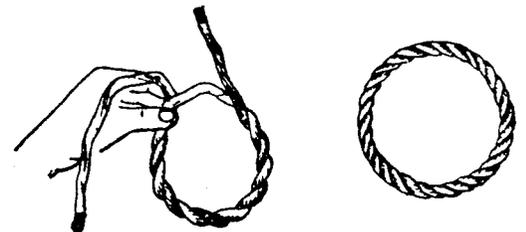


THE BOWLINE—USED FOR MOORING, HITCHING, LIFTING, AND JOINING

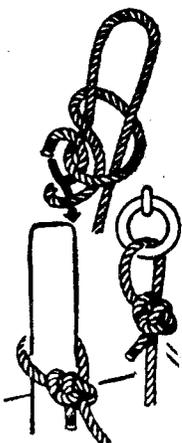
USE THE SHEET BEND TO JOIN LIGHT AND MEDIUM ROPES



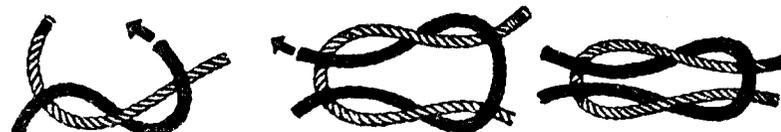
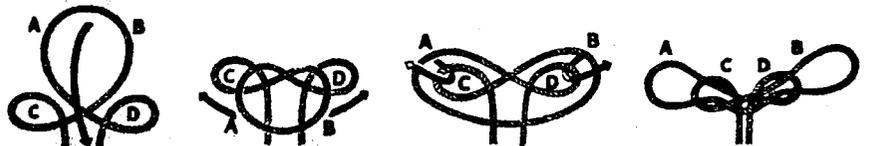
A ROPE RING FOR A BLOCK STRAP OR PLAYING QUOITS



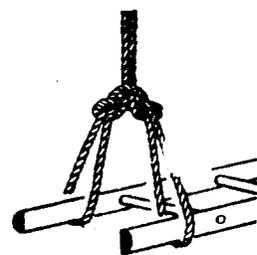
THE NOOSE OR HALTER HITCH
USED ON POST OR RING



THE SPANISH BOWLINE
LIFTS A MAN OR SLINGS A LADDER



THE SQUARE OR REEF KNOT



Aerial Runways are potentially dangerous and remain so even when all reasonable precautions, both in their construction and use, have been taken. Indeed, without some apparent element of hazard, they would cease to be adventurous and half their appeal and training value would be lost. The aim should be, therefore, to eliminate all avoidable risk and thereafter to exercise the highest degree of responsibility in the use of the apparatus.

Recent claims for insurance compensation have drawn attention once more to the inherent dangers and have highlighted the need for a Code of guidance in the safe construction and operation of runways. Because of the wide variety of situations and circumstances in which runways are built no detailed and inflexible set of rules is possible but *Policy, Organisation and Rules*, requires that leaders must comply with the Code when building and using structures of this kind.

No part of an aerial runway can be said to be more important than another and all require an equal amount of attention. Failure of one part of the system will almost inevitably create a chain-reaction and might well bring about the collapse of the whole.

Nevertheless, experience has taught us that in almost every case where serious mishaps have occurred—and some have been very serious indeed—the fault lay in the seat itself and in the method of attachment to the travelling block. At the outset, therefore, let it be clearly understood that:—

(a) Only blocks with eyes or rings may be used. Hooked blocks, however carefully moused or 'doctored', are completely unacceptable for this purpose.

(b) The seat must be constructed and fitted so that it is incapable of slipping or tilting, and must be secured to the eye or ring of the travelling block by the approved method described later in this Code. A purpose-built seat should be readily available.

The Code is based on long experience at Gilwell and elsewhere and should provide leaders with useful guide-lines for the training of their Scouts. No such Code, however, stands in the place of commonsense and responsible adult leadership, and the need for adult control will always be present when risk to the person is involved.

The illustration overleaf shows the most popular (aerial flight) type of runway, but the points raised apply equally to the horizontal manually operated runway or, indeed, to runways of any other kind.

1. SUPERVISION

The planning, construction and use of an aerial runway must be under the direct and constant supervision of a responsible and competent adult.

2. EQUIPMENT

All equipment should be inspected before, during and after use. Apart from the important matter of security, this is in itself a valuable exercise in training in responsibility. Ideally it should be carried out by the boy-leader and the adult leader, together.

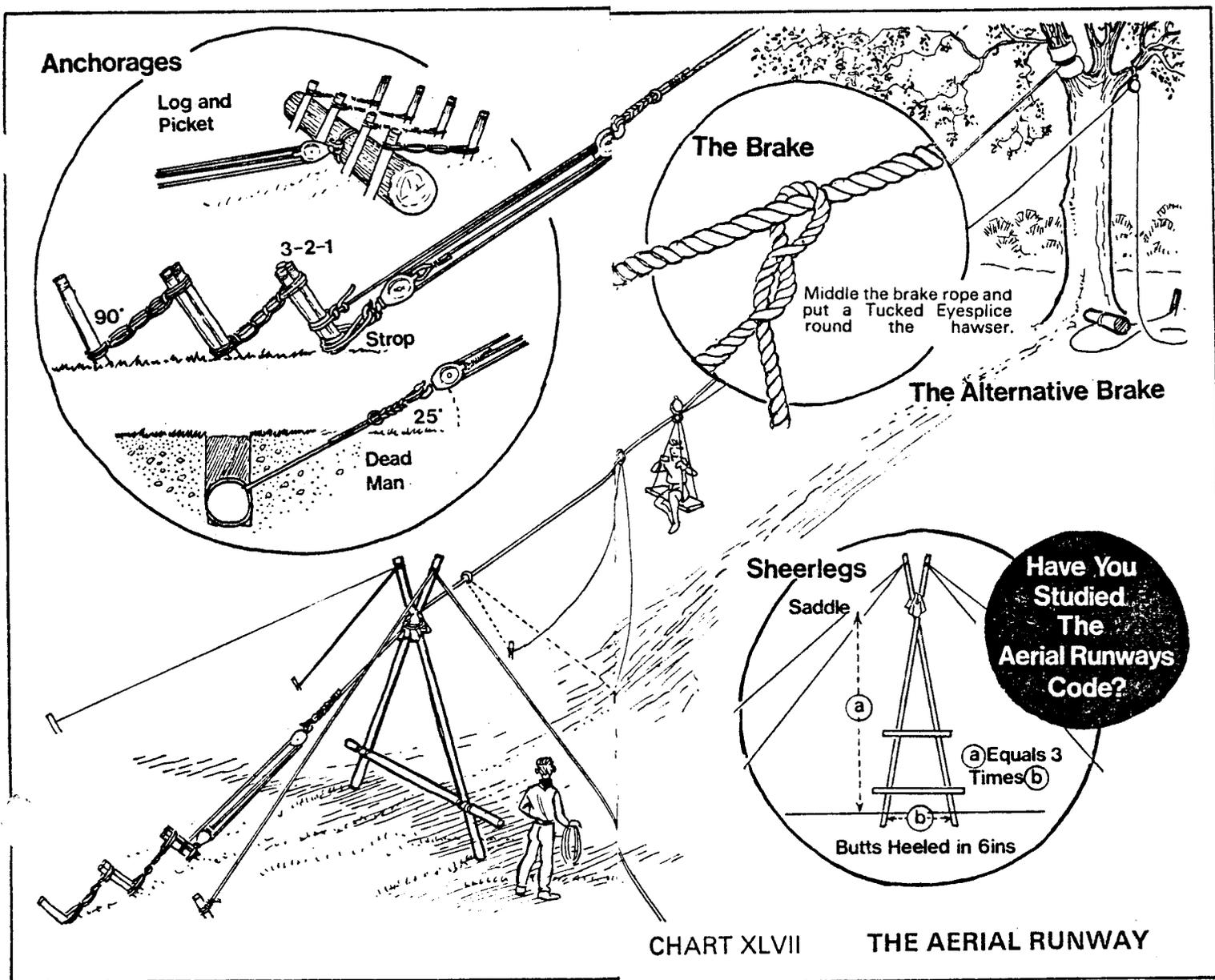


CHART XLVII

THE AERIAL RUNWAY

(a) Main Hawser

This should be hemp (manila or sisal) or polypropylene (under no circumstances should a wire hawser be used as this is considered unsafe). The recommended size is 3 in. circumference (24 mm. diameter) and in no case should a rope under 2½ in. be used. If the hawser has been out of use for any length of time—even when stored in ideal conditions in an even (cool) temperature—it should be checked for wear and tear along its entire length, and, if hemp rope is used, a spot check carried out by opening the lay at intervals to make sure that the fibres are free from mildew. This usually occurs in the heart of the rope and is not always immediately detectable. A suspect rope should *not* be used in this or any other pioneering activity where some element of risk is unavoidable.

(b) Other Cordage

This will include lashings (18 ft. to 24 ft.), guy lines for the sheerlegs, a strop loop of 2 in. circumference (minimum) of sufficient length to secure the tackle to the anchorage, lighter hauling brake lines, twine for mousing the blocks in the tackle, etc., sisal-twine for general use, and rope of adequate length and size to suit your blocks (see also 'Blocks and Tackle' below). A safe working rule is to use nothing under 1½ in. circumference in the main structure. All should be of good quality and subject to inspection before use. If you are using a spliced strop, the splicing should receive special attention. A strop is best made by forming the length of rope into a loop with a Fisherman's knot with the tails tucked in.

(c) Blocks and Tackle

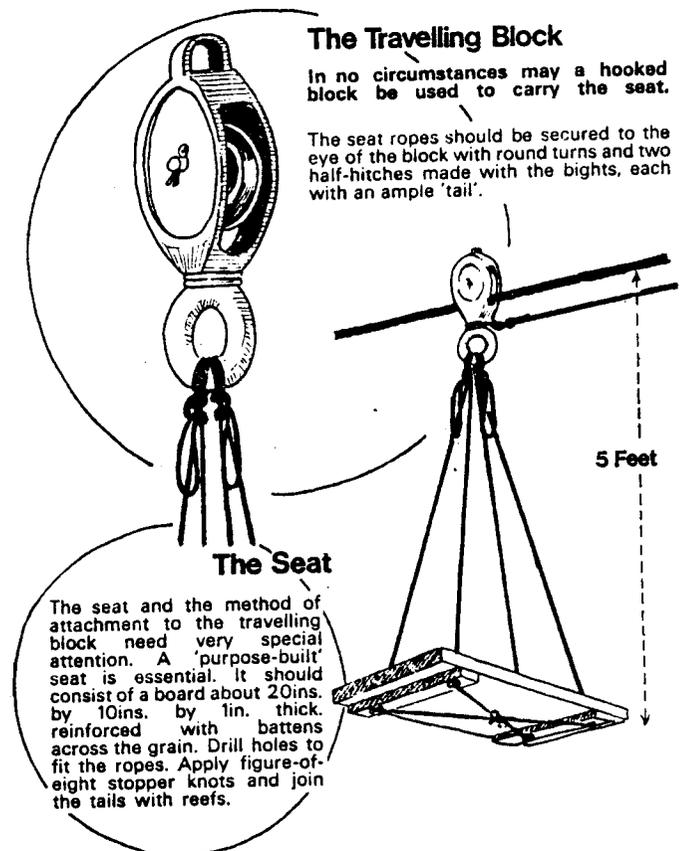
A luff tackle, comprising one single and one double metal block (minimum size 6 in.) reeved up with a 2 in. circumference rope, will provide a purchase of four to one. (A block is designated by the length of the shell, which is roughly three times the circumference of the rope it will accommodate.) The travelling metal block must be a single-sheave block, *not* a 'snatch' block which could open, to suit the size of the hawser (i.e. for a 3 in. rope a 9 in. block will be needed) and—of the greatest importance—it must have a fixed or swivel eye or ring, *never a hook*. If no such block is available the project must be abandoned. (In plain truth, it should not have been allowed to get beyond the discussion stage in the first place!) In recent years several attempts have been made to 'convert' hooked blocks with brazed metal straps and jubilee clips, of various kinds, but none has been any more reliable than the conventional and unsafe 'mousing'. At least one other single eye-block will be needed to carry the towing line (note: not a hook because of the movement and strain imposed). Suitable tested blocks should be used and are available from Scout Shops Ltd.

All blocks should be free running, in good condition, oiled before use, and the correct size for the rope being used. All hooks must be firmly moused—preferably with tarred hemp spunyarn. It will be found that not all blocks have sufficient lip on the hook to hold the mousing and, in any case, it is always sound practice to make a small file cut near the lip to prevent it slipping off the end. A good method of mousing is to make a clove hitch in the middle of the yarn round the neck of the hook. Separate the ends and take a number of turns in opposite directions to close the mouth of the hook; trap with overhand knots and secure with a reef.

(d) Pickets and Spars

Where wooden pickets are used they must be in good condition, free from shakes and rot, and of adequate length and thickness. A good deal depends on the nature of the ground and the anchorage selected (see 4 below) but pickets of 3 ft. by 3 ins. butt should be regarded as a minimum. In use they should be driven with a maul (not a sledge hammer) for two thirds their length at right-angles to the strain, which for obvious reasons should be secured close to the ground. (Note that if the strain is allowed to ride up the picket, it will be subject to leverage.)

Spars should be equally sound, free from shakes and be regularly tested by gripping the tip and 'ringing' the butt on any hard surface. 'Shakes' in timber are not always visible, but the false note of a faulty spar is easily detectable. 5 in. butts should be regarded as a minimum, irrespective of length.



The Travelling Block

In no circumstances may a hooked block be used to carry the seat.

The seat ropes should be secured to the eye of the block with round turns and two half-hitches made with the bights, each with an ample 'tail'.

The Seat

The seat and the method of attachment to the travelling block need very special attention. A 'purpose-built' seat is essential. It should consist of a board about 20ins. by 10ins. by 1in. thick, reinforced with battens across the grain. Drill holes to fit the ropes. Apply figure-of-eight stopper knots and join the tails with reefs.

Fig. 40

(e) The Seat

Great care should be taken in the preparation of the passenger carrying seat. A stout board of about 24 ins. by 10 ins. by 1 in. thick will be needed, reinforced with bracing battens across the grain. Holes should be bored through the board to take the suspension ropes. The distance between the seat and hawser should be at least 5 ft. to avoid the possibility of a hand being placed on the hawser in front of the pulley.

(f) Tools and Accessories

Sacking or old canvas will be needed to act as a saddle in the crutch of the sheerlegs and for the protection of trees. Tools will include a heavy maul, a spade or entrenching tool, a clasp knife, plus—depending on circumstances—an extending ladder, or rope ladder and throwing line, to facilitate tree climbing.

3. LOCATION

The actual site of your runway will depend largely on whatever natural features can be used to advantage, e.g. trees, slopes, etc. Where a tree is available, make sure that it is 'up to the job' and that, with adequate protection, it will suffer no ill effects. At the head of the run use the main trunk in preference to a branch, but if a branch is used, select the strongest within reach, and make fast with a round turn and two half-hitches and a long 'tail' close to the trunk. If the hawser is passed over a suitable high fork and the end secured to a lower branch this makes it easier to examine the knot during use. Secure the padding (sacking or canvas) with sisal before making fast.

Ropework at ground level is one thing; handling a 3 in. hawser while sitting astride a branch some 25 ft. up a tree is another matter. In such circumstances it might be as well if the man in the tree belayed himself to a convenient branch with another rope. He should certainly be well drilled in ropework before being entrusted with this difficult and responsible task. If a rope ladder is used to

get him into the lowermost branches from which he can start climbing, a lobster with a light line attached will be found useful to draw it up into the tree, with a stronger rope attached to the top of the ladder so that it can be drawn over the branch and secured at ground-level.

If no suitable tree can be found when operating on flat ground, your pioneers will have to be content with a manually-operated fore-and-aft runway between two sets of sheerlegs, which can be excellent fun.

Full advantage should be taken of natural slopes to reduce the height hazard and/or increase the length of the run. Due allowance should be made for the inevitable sag in the hawser, which might be as much as 6 ft. It will be necessary to take up the slack from time to time, though some slack is necessary to control the rate of descent.

4. ANCHORAGES

A well grown tree makes an excellent anchorage, but is seldom to be found in just the right spot to suit your runway. There are three other standard holdfasts, and boys should be trained to select the type best suited to the nature of the ground.

In all anchorages, their precise position in relation to the main structure is of the first importance, so that the hawser runs in a true line from end to end. The slightest deviation from true will impose an increasing strain on the sheerlegs and might well cause them to topple.

If a tree is used, make sure that it is secure, protect it near the base with a good pad of sacking, and prepare your tackle ready for use. Take in most—but not all—of the slack in the hawser and pass it through the hook of the fore block. Lay the sheerlegs on the ground with the butts at the correct distance from the anchorage (see diagram) and with the hawser lying over the crutch. Raise the sheerlegs and hold them in place while the slack is taken up on the hawser. Adjust the position of the sheerlegs as necessary to ensure a true line. Mark the position of the butts with tent pegs, so that foot-holes can be dug in exactly the right place. The sheerlegs can then be erected and the necessary strain applied on the tackle.

A different procedure is recommended when other types of anchorages are used.

The sheerlegs should be erected *first*, so that the hawser can be drawn over the crutch and hand-strained to pin-point the position of the anchorage, which will always be twice the height of the sheers away and, depending on the type, in line with, or at right-angles to, the line of the strain.

(a) 3-2-1 Anchorage

This consists of a line of six pickets in the order of three, two and one, running true to the line of the main hawser. It is usually first choice with most Patrol Leaders and is ideal in heavy, stone-free ground. The three groups of pickets should be so spaced that the lashings between them run at right-angles from the top of the forward to the base of the next in line. Lashings 24 ft. long will be needed. Start with a clove-hitch round one set, follow with a number of tight turns and frap with over-hand knots. No attempt should be made to 'firm up' the pickets with a few extra blows from the maul after the lashings are in position. This will merely loosen the turns and defeat the object of the exercise. It need hardly be said that this, and all other types of holdfast, should be kept under close observation when the strain is first applied and thereafter inspected at frequent intervals when the runway is in use.

(b) Log and Picket Anchorage

For this use eight pickets and a log of not less than 6 ins. in diameter and 3 ft. in length. The log must lie at right-angles to the line of the strain, and care must be taken to see that it bears equally on each of the forward pickets, and that the angle between the hawser and the ground is not more than 25 degrees.

(c) 'Dead Man' Anchorage

This is most suitable in lighter ground or where the presence of trees would make the driving of pickets difficult. The log should be not less than 6 ins. in diameter by 3 ft. in length and should lie at right-angles to the strain in a trench at least three times its own diameter in depth. A strop is secured to the exact middle of the log (or, where no strop is available, a rope equal in strength to the main hawser) and brought up a narrow channel cut in the soil in

line with the strain, so that the single block of the tackle can be secured. Again the angle between hawser and ground should be about 25 degrees. Before the earth is returned to the trench, it is as well to complete the job and take up the strain on the tackle so that any undue movement of the 'dead man' (e.g. a tendency to ride up the side of the trench) can be corrected before final burial. The ground should then be trampled to make all firm.

5. STRAINING THE HAWSER

A tackle, mounted to advantage—that is with the single block attached to the anchorage and the double block to the hawser—when operated by four or five Scouts or two or three adults—will give all the strain required. On no account should more forceful methods of straining the hawser be used, for these will drastically overstrain the system. Wherever possible the strain should be secured to the holding part of the anchorage, after which the slack in the free end of the main hawser can be taken up and, as an extra precaution, similarly secured.

In the case of the 'Dead Man', a second strop of equal strength should be secured to the log before it is buried, so that both the tackle and the free end of the hawser can be made fast.

6. ANGLE OF SLOPE OF THE RUNWAY

No exact formula is possible—so much depends on individual circumstances: location, natural slope of ground, materials (e.g. whether the hawser is of natural or synthetic fibres), the degree of tension (which is bound to vary), the performance of the running block, etc. The only safe plan, therefore, is to test your apparatus with considerable severity before it is used, to ensure a high factor of safety.

In no circumstances, however, will a runway be considered acceptable within the terms of this Code if the maximum height of the hawser at any point exceeds 25 ft.

7. FACTOR OF SAFETY: TESTING THE APPARATUS

When ready for use the apparatus must be subjected to a rigorous test along its entire length to ensure a high factor of safety before the first passenger is allowed to embark. In plain English, this means that the test must impose a much higher strain on all parts of the apparatus than it is likely to endure while in use.

A simple way of doing this would be to attach a temporary rope to the (empty) seat, which could then be drawn to the head of the run and subjected to an energetic bouncing strain from ground-level, before being dragged at speed and under strain the full length of the run. This would test the security of the seat, the degree of sag in the hawser (with its desirable braking effect), and the efficiency of the emergency braking system.

This, or any other test, must be carried out conscientiously under adult supervision, with Scout observers posted to watch every part of the apparatus (anchorages, pickets, sheerlegs, the running block and seat, the braking system, etc.) and to report any possible weaknesses.

8. BRAKING DEVICE

As an additional precaution a braking device should be fitted. Two methods of braking are shown in the illustration. The first consists of the pick-up device on the hawser itself—merely a fairly long rope with a running loop on the hawser and the two ends anchored to pickets at either side of the runway. The loop can be made in the middle of the anchor rope by means of a Tucked Eyesplice (sometimes called 'the Dockers Splice') which is in common use round the dollies of the main guy-lines on ridge tents. To make it, simply middle the rope round the hawser, open the lay and pull the free end through to make an eye not more than twice the diameter of the hawser. Now repeat the process by opening the lay below the first tuck and pulling the other end through. The eye should be pulled back up the hawser the full length of the

anchor ropes, so that when the travelling block picks it up, the friction of rope on rope will exercise some braking effect before it is finally pulled up short at sufficient distance from the sheerlegs to allow for the inevitable forward swing of the seat due to momentum. (Passengers should be warned of this when they embark.)

An alternative braking device is provided by attaching a weight, such as a log, to the hauling line so that it is lifted clear of the ground and brings the chair smoothly to a halt a suitable (safe) distance from the sheerlegs. If this latter device is used, care should be taken to ensure that the rising weight is equal to its task, and that it will not be obstructed by branches, etc., before it has taken effect.

9. SHEERLEGS

Spars of 12 ft. are suitable for the sheerlegs. Several 18/24 ft. lashings of 1 1/2 ins. circumference will be needed. The sheer lashing should be applied first about 18 ins. from the tops with the two spars in the 'closed' position. (They can be opened slightly like scissors when the frapping turns are put on.) They should then be opened out with the butts no further apart than one-third the height from the lashing to ground-level, and the third spar square-lashed between them about 12 ins. from the butts. A saddle of hessian or canvas should be lashed in the crutch with sisal-twine, and fore and aft guylines secured to the tips of both spars. To minimise the danger of 'keeling over'—ever present in an apparatus subject to variable stresses and strains—the feet of the two legs should be heeled into the ground to a depth of at least 6 ins. The lower ledger should then still be well clear of the ground. All this work should be done before the hawser is finally positioned. When the tackle is being operated the sheers may tend to move from the vertical position, but this can usually be corrected without difficulty if caught in time. Constant vigilance should be the keynote.

10. THE SEAT

A purpose-built seat must be provided. Such devices as battens or strops which require the passenger to dangle from his hands are not permissible (see also 2 (e)).

Ultimate safety will depend on the method of attachment to the ring or eye of the travelling block. A round turn and two half-hitches made in the bight with an ample 'tail' will meet the need adequately, but for greater safety the knots can be double-locked with west-country whippings. (This whipping is merely a number of over-hand knots made with sisal-twine round the ropes, locked with a final reef.)

The seat and travelling block are to be regarded as 'accident black spots' in any runway. They should be checked and double-checked as a matter of routine before the runway is declared operational and after each run.

And, finally, on this subject, let it be known—once more and for all time—that in no circumstances will a block with a moused hook be regarded as anything other than an indication of foolhardiness.

11. EMBARKING AND DISEMBARKING

When the take off at the head of the run is at some height above ground level (e.g. from the branches of a tree) passengers should embark at the foot of the run, where safety and comfort can easily be checked, before being drawn up by the towline. Additional ledgers on the sheerlegs will facilitate mounting and dismounting, which can be quite hazardous from a free-swinging bosun's chair. If the emergency log braking system is used, the chair should come to rest some 6 ft. from the sheerlegs; the emergency log can be raised or moved so that the seat can be brought down to the sheerlegs. If the braking device involving a pick-up on the hawser itself is used, the brake lines will arrest the seat some 6 ft. from the sheerlegs, but if the two restraining lines are looped with loose bowlines over the pickets, they can easily be slipped off to enable the seat to be brought to the sheerlegs for mounting.

Before each descent passengers should be well briefed, e.g. 'Sit well back in the middle of the seat. Hold on to the front supporting

ropes. Relax and keep still. Remember that when the brake comes on at the bottom of the run, the seat will probably swing forward, so hang on won't you?' If young boys are using the runway a 'safety harness' could be strung at the back and sides to give a feeling of greater security. Only one passenger must use the runway at any one time.

12. TOWING LINES

On a horizontal runway fore and aft towing lines will be needed. If the towing line is tied to the neck of the travelling block below the pulley there should be no tendency for the block to tilt and jam when the seat is being drawn along unloaded. As previously stated, an efficient braking device should be fitted at each end of the run.

On a sloping runway the towing line should be used as the safety rope and attached to arrest the travelling block 6 ft. or so short of the sheerlegs. The towing line should pass through a single block secured immediately below the main hawser.

13. INSURANCE AND ALL THAT

'Accidents will happen' (usually to the other fellow!) but in a Movement which prides itself on being prepared the possibility of accidents must be reduced to the irreducible limit. It is vital that this Code should be studied, understood and implemented by all concerned.

The District Commissioner and his team have the responsibility to ensure that leaders are given adequate training in this matter and that Group Scouters are fully aware of their own special responsibilities in the field.

Runways may only be built and used under adult supervision. Frequent inspection is necessary. Leaders should note the dangers of leaving runways erected for long periods—e.g. at Summer Camp. In such circumstances, the system should be immobilised as far as possible by releasing the strain on the tackle and by removing or tying back the chair, and by whatever other method is appropriate to the conditions.

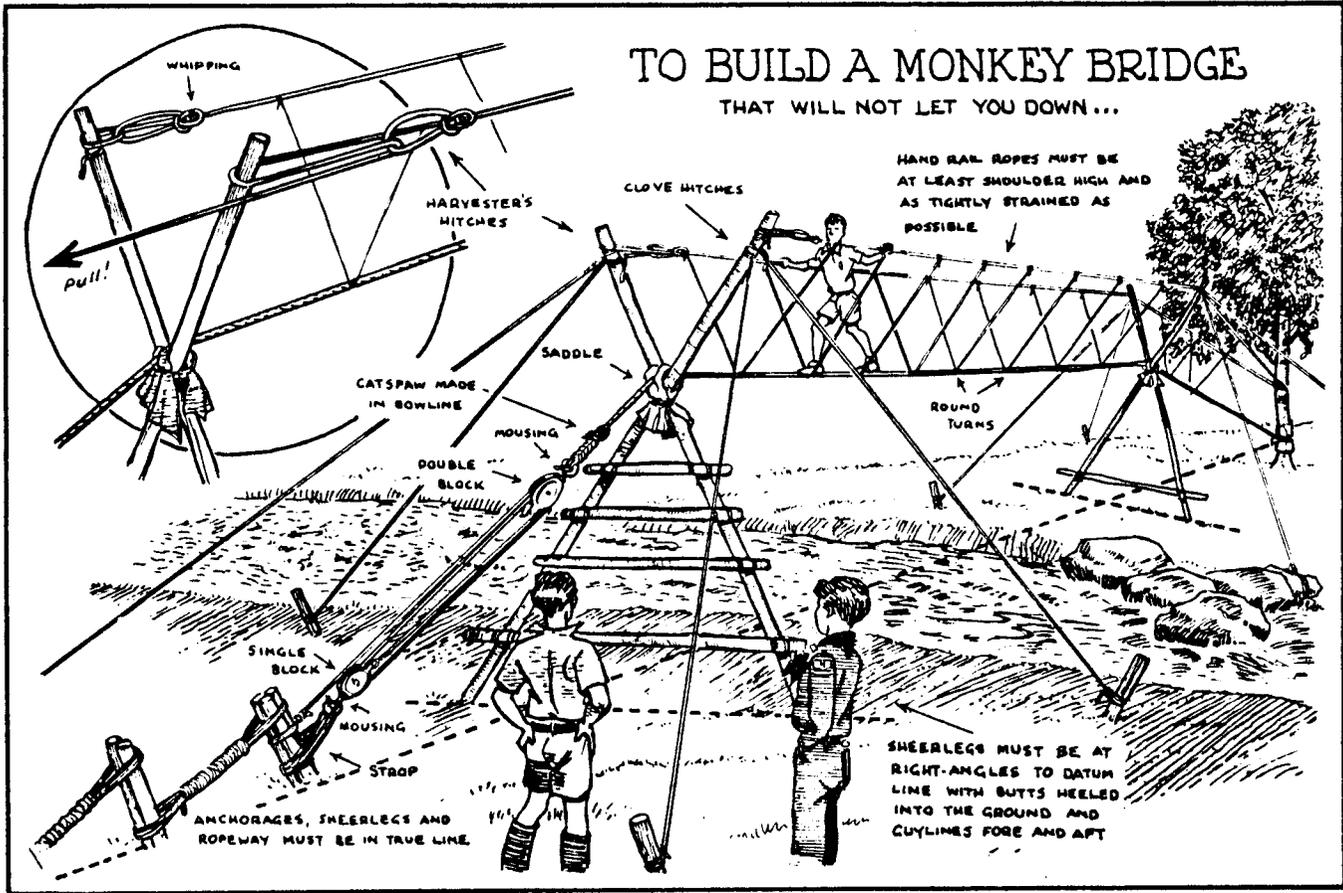
If an aerial runway is to be included as an attraction at a fund-raising event it should be used for purposes of demonstration only by fully-trained Scouts or Venture Scouts under Scouter supervision. On no account may an aerial runway be made available for use by members of the general public. When not in use the runway must be immobilised (as above) and must remain under constant adult supervision.

14. CHECK LIST DURING USE

Even when the provisions of this Code have been closely observed in the erection of the structure, the runway will inevitably suffer severe stresses, strains and shocks while in operation, and constant vigilance will be needed. This is an adult responsibility, but again the boy-leader should be brought into full partnership for purposes of training.

The items in this check list, among others, should receive frequent attention:

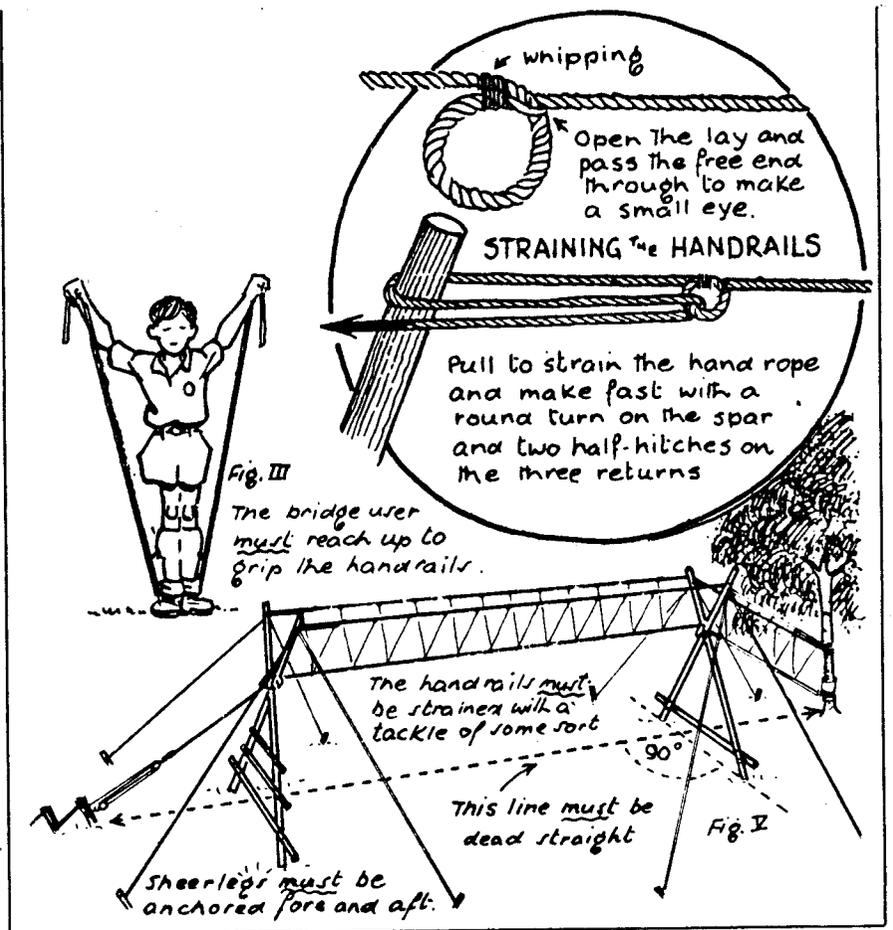
1. All knots and lashings. If any are found in need of attention suspend operations until the work is completed.
2. Pickets and anchorages—have they moved unduly under strain?
3. Blocks and tackle—especially the mousing of hooked blocks.
4. The chair—every part of it, but especially at the point of attachment to the travelling block.
5. The main hawser—is it 100% secure at both ends? Is it time to take up the slack? Alternatively, should the strain be relieved slightly to slow down the rate of descent?
6. The sheerlegs—have they moved from the vertical position, or shown any signs of rocking or tilting?
7. The braking system—is it operating smoothly, with detriment to the hawser?
8. Embarking and Disembarking—can this tricky operation be made easier for the passengers (perhaps by the addition of an extra ledger on the sheerlegs)?
9. Is the briefing of passengers working satisfactorily?



and it should be borne in mind that if the stringers are to do their necessary work, the distance between them and the hawsers must be kept constant throughout.

Now, after all that, anyone who imagines that the building of the simple Monkey Bridge is child's play obviously has another think coming. Neither is it beyond the capability of any trained Scout Patrol, working under trained boy-leadership. Consider the effect on morale within the Patrol when the job is completed and the boys can say with truth—"WE DID IT OURSELVES!"

There will undoubtedly have been times when, from your bird-watching position you have viewed the proceeding with your heart in your mouth and an overpowering desire to rush in and advise or help. All the more credit to you that you denied yourself the luxury of interfering. Let it be said again that this book is written in the conviction that if you train your Patrol Leaders and encourage them to train their own boys, then throw down a challenge—"Off you go and build yourselves a Monkey Bridge across the Taff!"—you may safely leave the rest on trust, confident in the knowledge that your boys will rarely, if ever, let you down.
What more can you ask?



LASHINGS

Lashings should always be related to the size of the spars for which they are intended. For Scout staves, bamboo, and other light spars a 12 ft. length of blind cord or three-strand sisal will suffice. You will remember that for the spars usually employed in mainline pioneering lashing ropes should be at least one inch in circumference with at least 3 ft. of lashing for every inch of the combined diameters of the spars being lashed together. Hence, a five inch spar butt square-lashed to a three inch tip would need twenty-four feet of lashing length.

The Square Lashing is used whenever spars cross and bear upon each other at whatever angle. Start with a clove-hitch on the upright spar immediately below the cross-member and lock the clove-hitch by twisting the tail round the standing part. Carry the lashing over the cross-member, first of all giving it a strong pull to bring the clove-hitch into the angle so that it cannot turn on the upright spar. If this is allowed to happen, the lashing, however tightly applied, will turn into a pudding of slack rope and will be useless, and perhaps dangerous! Now weave the lashing round the two spars to draw them close together, making each turn at right-angles to the other and taking care to maintain the strain on the rope throughout—sometimes by locking the lashing against the spar with the thumb. Follow with three or, at most, four complete turns round both spars then apply two or three frapping turns round the lashing between the two spars to draw them together and finish with another clove-hitch pulled well back into the angle so that it, too, cannot turn back on the spar it embraces. Finally lock your clove-hitch by taking up any loose tail with an extra half-hitch or two (this should not be necessary if you have selected your cordage to suit the job) and then tucking a bight of the end into any convenient crevice between spars and lashing. If you tuck the end itself away in this fashion you will have difficulty in undoing the lashing later, but it is most important that clove-hitches should always be locked.

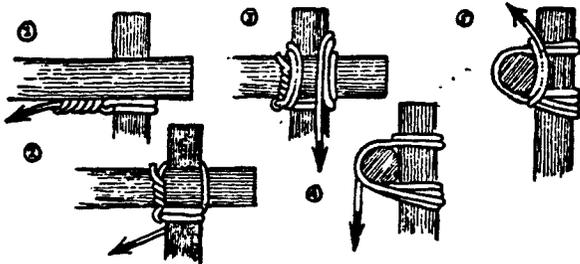


Fig. 30.

The Diagonal Lashing is used when spars cross but do not touch, or where they will tend to spring apart under pressure, e.g. at the centre point of a trestle.

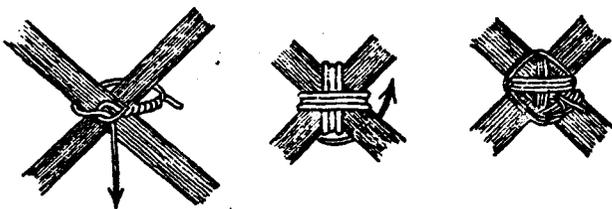


Fig. 31.

Start with a timber-hitch round both spars. This is, of course, a slip-knot which will enable you to exert pressure to draw the spars together. Three or four turns are then taken over the fork at right-angles to the knot (this is to prevent the timber-hitch from turning on the spars) followed by a similar number of turns round the other fork. Apply frapping turns as before, and finish with a locked clove-hitch round any convenient spar.

There are two different forms of Sheer Lashing. The first is used when two spars are lashed together for strength, or lap-jointed to increase length. In this case the lashings should not be allowed to separate the two spars and frapping turns will not be used. Start with a clove-hitch round both spars, lock it, bind tightly with seven or eight turns and finish with another clove-hitch. If need be, small wedges of softwood can be driven in between the lashings and the spars. Two such lashings will be needed, and when a lap-joint is made it should be at least three times as long as the combined diameter of the two spars.

When the two spars are to be opened out like scissors to make a pair of sheerlegs, start with a clove-hitch round one spar the required distance from the tip, depending on the purpose for which the sheers are intended. Lay the spars alongside each other and bind them—not too tightly—together. When it comes to applying the necessary frapping turns you will probably find it convenient to open the 'scissors' slightly by moving the butts of the two spars a foot or two apart. Finish with a locked clove-hitch. The actual construction of the sheerlegs beyond this point is dealt with fully in 'The Aerial Runway Code' which will be found at the Appendix to this book.

When three spars are lashed together the so-called Figure-of-Eight Lashing is used—(I say 'so-called' because 'figure-of-eight' is certainly not a true description.) Some pioneers—and most books on the subject—advocate one method, but our own experience supports another! Their method is to lay out the spars with the tip of one pointing in one direction, and with the other two, one at either side, pointing the opposite way. Our own preference is to lay the three spars alongside each other, butt to butt, tip to tip, and apply the lashing to the three tips a foot or eighteen inches from the end. Whatever method you use, the lashing starts with a clove-hitch round one of the outside spars, followed by six or more loose turns over and under the other spars, topped off with frapping turns between each pair and a final clove-hitch. The three legs are then opened out and erected to make an equilateral triangle at the base. If you find difficulty in achieving this objective your lashings have been put on too tightly—but you are less likely to suffer this frustration if you have followed our own alternative in preference to the orthodox method!

To complete the tripod thus formed, three extra spars should be square-lashed across the butts a foot or so from the base, and for greater security the butts should be heeled into the turf. If it is used for lifting purposes, with a tackle slung from the crutches, it is known as a Gyn.

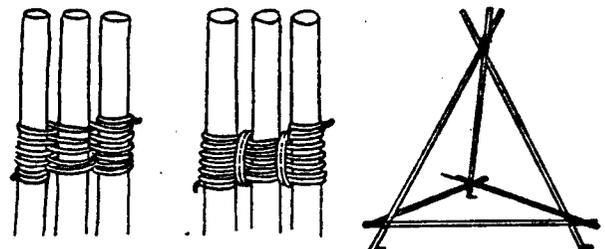


Fig. 32.

When lashing a block to a spar begin with a clove-hitch round the spar above the block, put three or four turns round the spar and the hook or through the eye of the block, and finish with a clove-hitch round the spar below the block. If a hooked block is used, a secure mousing will be absolutely essential.

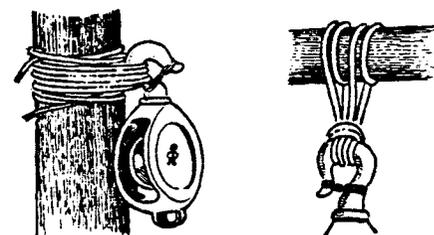


Fig. 33.

If a strop is used, do not be tempted to take the easy way out by putting a larkshead round the spar with a catspaw round the hook. This will impose a severe cutting strain through a single thickness of the strop which might easily break it with disastrous results. The better method is to middle the strop on the spar, take three turns round it in opposite directions to bring the extremities together, make a larkshead in the two bights, and slip them onto the hook. Close the hook with a mousing. Remember that the block will probably carry a considerable strain. If it breaks adrift aloft it will fall like a meteor. A falling block is a potential killer. Be warned.

To 'mouse' the hook of a block, take a length of tarred hemp spunyarn or waxed sailtwine, middle it and put a clovehitch round the back of the hook, then carry four or five very tight turns in opposite directions round the bill and back again. Frap with overhand knots and finish with a reef. Many hooked blocks have insufficient lip to hold the mousing in position, and there is always a danger that it will slip over the tip of the bill. To prevent this, make a shallow file cut near the tip to give your twine something to grip. No mousing, however, can be regarded as 100 per cent secure. They should be used with discretion and inspected frequently when tackle is in use. (See also The Aerial Runway Code.)

At one time sisal twine was in common use for mousings, but experience has taught us that the hard fibres of this type of hemp never have sufficient friction grip on the metal to prevent it from slipping, and it should now be ruled out for this purpose.

After use all rope and cordage should be hanked or coiled and returned to the store more or less as it was received. Heavy ropes should be coiled on the ground in a clockwise direction. If the rope is wet it will need to be dried out slowly before being stowed away, but in any event it should be taken off the job in a properly made coil. This means that it should be coiled with the lay. Stand with your back to the bight and haul the rope between your legs, laying the turns alongside or over each other in a coil of about four feet in diameter. Keep a small strop of sisal twine handy and slip a larkshead knot round the rope in one place only, so that the two free ends hang down without trailing below the bottom of the coil when it is shouldered back to the Q.M.'s store.

Smaller ropes, lines and lashings can most conveniently be hanked in the hand and again this should be done with the lay (clockwise). This means that a right-handed Scout will start with the end of the rope in his left hand, thumb pointing to the bight, while a left-hander will hold it in his right hand with the thumb pointing to the free end of the rope. When the hank is complete, hold it in the left hand with the two ends hanging down the coil, take out any turn other than the last with the right hand, carry it right round the hank and up through the top of the coil. This method will leave a convenient loop at the head of each hank so that they can be strung together with sisal for ease of handling.

2. ANCHORAGES AND HOLDFASTS

The subject of anchorages and holdfasts is dealt with in considerable detail in the official 'Aerial Runway Code' which is given in full at the Appendix to this book. The Code is 'required reading' for all Scout Leaders who plan to build ropeways of any kind, and as the Aerial Runway shares with the Monkey Bridge the distinction of being by far and away the most popular of all pioneering projects, this *diktat* must surely include all readers of this book. Many other technicalities of general application to pioneering are covered by the Code and can easily be found by reference to the index.

3. SETTING UP A STRAIN

The best way of moving or lifting heavy loads, or of increasing pulling power on a rope, is to make use of blocks and tackle.

A block was originally a block of wood with a hole in it through which a rope was reeved. In time it was found that the friction of the rope on the wood could be very much reduced if the hole was enlarged to take a pulley-wheel or sheave. Then the surplus wood was cut away from the outer shell and a groove, or score, made in it to take a rope strop so that the block could be easily mounted as required.

Originally, one must suppose, blocks of this sort were used on ship-board to raise loads from deck-level. This meant that the block was secured aloft, with one end of the hauling rope made fast to the load and the other carried up, reeved through the block, and brought back to deck-level. This would be a matter of convenience only, with no increase of power. If, on the other hand, the same device was used to raise or lower a load over the side of the vessel, the block would need to be secured to the load itself and would therefore move with it. The intelligent seamen operating the rope over the side would at once notice an important difference in the behaviour of the tackle. In order to raise (or lower) the load through a distance of, say, six feet, they would need to haul in (or pay out) twelve feet of rope, but the strain would be considerably reduced—indeed, they would find that one man could now do the work of two! They had, in fact, discovered a new sort of machine, comparable in importance to the discovery of the wheel itself!

And very soon it must have occurred to these same resourceful mariners that if they made use of two blocks instead of one, they could still raise a load aloft from deck-level by fixing one block to the load and the other overhead.

Today small wooden blocks are still in use, but in general they have been superseded by galvanised iron or laminated steel blocks, and friction has been further reduced by introducing roller-bearings between the sheave and its pin.

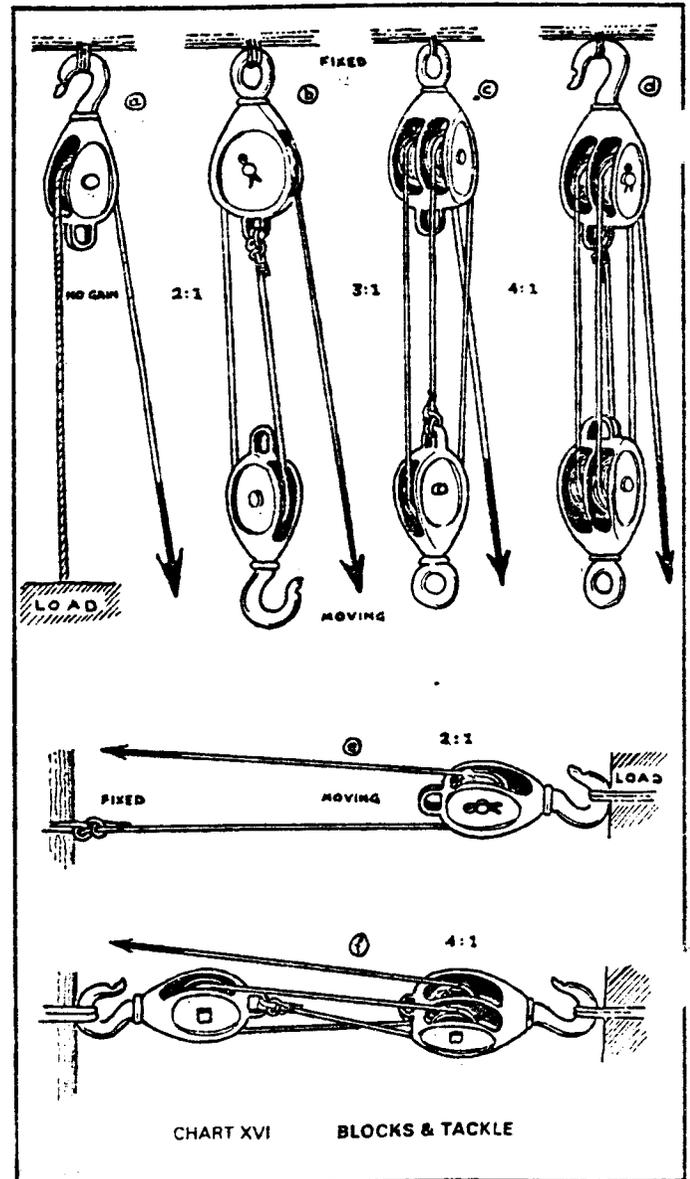


CHART XVI BLOCKS & TACKLE

PURCHASES

In this book the word 'purchase' is taken in its dictionary meaning, which is:—

"(Mech.) advantage gained by the application of any mechanical power, leverage: an appliance furnishing this, as a rope, pulley, etc."

Anyone who has suffered the pangs of O-level physics will know that there is more to 'mechanical advantage' than that, but let us agree to forget about all such abstractions for the time being and follow the experience of those early mariners working from the deck of their ship. We have already discovered, with them, that to gain any advantage from a single block it must move with the load. Otherwise it can only be regarded as a 'block of convenience.' All things being equal, therefore, tackle should be mounted so that you face the load. *The percentage is always in the moving block.*

A *single whip*, in nautical parlance, is a rope reeved through a single (fixed) block overhead to hoist a weight. No power gained. Mounted in reverse (e), purchase two to one.

A *double whip* consists of two single blocks. If the standing part of the fall is secured to the fixed block (b), power gained two to one. If in reverse, three to one.

A *luff tackle* (c) and (f) comprises two large blocks (6 in. or over) one single, one double. Power gained three or four to one.

A *Handy Billy* is a small tackle for general purposes comprising one single and one double block, each with a rope tail. It is so designed that it can be used to strain a rope or move a load, then, when the strain is secured, taken off and moved to another job. This is the one and only tackle which is kept in the reeved up condition. Power gained as for a luff tackle.

Overhaul. A purchase is said to be overhauled when the two blocks are separated to the full extent of the falls.

Round up. The opposite to 'overhaul', when the two blocks are together, or 'chock-a-block'.

REEVING AND MOUNTING A TACKLE

In reeving a tackle lay the two blocks on their sides in line with each other with the hooks or eyes pointing away. Stand between them with the rope on the right hand side of the block with most sheaves. Pass the rope through the lowermost sheave of block Number One from right to left, then turn and reeve it in the same way through block Number Two, then back through the uppermost sheave of Number One block and back to tie off on the becket of the single block with a round turn and two half-hitches. In this instance only a very short tail should be left on the rope so that the tackle will not become chock-a-block too soon. An inch or so of tail whipped to the fall with a few turns of spun yarn will do the trick.

Your Patrol Leaders should be trained to reeve their tackle as close as possible to the job, so that it is moved about as little as may be. Blocks and tackle in the slack condition are awkward to handle. The blocks are apt to turn over in transit, causing the falls to cross, and as often as not the whole tackle has to be taken apart and reeved all over again. At the conclusion of the operation the tackle should be dismantled and returned to the Q.M.'s store with the blocks separated from the coiled rope. The one exception to this rule is the Handy Billy, which is generally stowed away ready for instant use.

The orthodox methods of securing blocks and tackle to an anchorage are dealt with in 'The Aerial Runway Code', but it will be seen that all involve the tackle as an integral part of the structure and therefore immobilise it while the structure remains in situ. The unique feature of the Handy Billy is that it can be used again and again. This is possible because of the non-lock method of attaching it to the ropes under strain. It is, of course, a very light tackle, and would be quite ineffective on, for instance, the main hawser of a Monkey Bridge, although it could well be used to strain the handrail ropes.

As already stated the tackle comprises two small blocks, one single, one double, reeved up together, each having a tail some 6 ft. in length. In use the following procedure should be followed:

1. Hand strain the rope and make it fast temporarily to the anchorage.
2. Secure the tail of the single block of the Handy Billy to the anchorage immediately above the rope.
3. Overhaul the tackle and attach the tail of the double block to the rope by first putting a half-hitch round the rope *against* the lay, then carry the tail *under* the rope and wind it into the lay between the strands.
4. One man should hold the free end of the tail to prevent it from unwinding while one or two others work the Handy Billy.

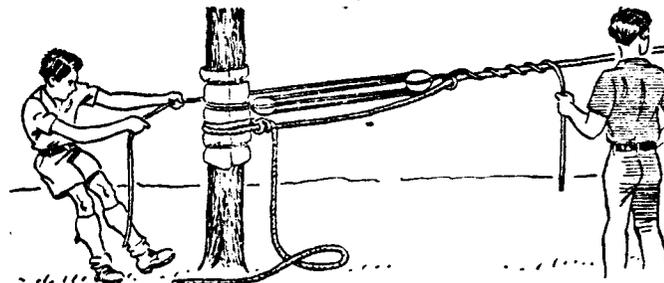


Fig. 34.

5. Maintain full strain on the Handy Billy while the rope is released from the anchorage, then take up the slack in the rope by hand-strain and tie off with a round turn and two half-hitches. The Handy Billy can then be taken off for use elsewhere.

5. 'UP AND OVER'

Inviting Scout Patrols to get themselves across imaginary obstacles such as raging torrents, yawning chasms, and bottomless ice-crevasses has always been a favoured ploy with Scout Leaders who delight in making life difficult but exciting for their boys by organising such things as Obstacle Expeditions, Adventure Journeys, Assault Courses, and the like. Long may it continue. Nowhere but in Scouting—or perhaps on an Outward Bound type course—will their intelligence, powers of imagination, practical ability and teamwork be challenged and exercised in this particular way, and because it provides them with a unique experience, it is surely something of considerable value in a Movement which claims to develop character.

In many situations, the task of crossing a natural obstacle would be much reduced if it were possible to work from both sides at once. The problem usually resolves itself into one of getting the first man across. If the distance is not too great the device known as the Scout Transporter can be used. This is merely a pair of sheerlegs controlled from the take-off side initially by four ropes, two of which are passed to the far bank as soon as the first man has been safely transported. A 'pusher' of some sort will be needed to raise the sheers beyond the perpendicular. This could be a light spar well padded with a sack at the top, or a spar with a forked end. Care should be taken to see that the butts of the sheerlegs have found a firm foundation in the bed of the stream (real or imaginary) and that they are reasonably skid-proof. The passenger sits in the saddle of the sheers, facing in the direction of travel and prepared to leap ashore the moment it is safe to do so.

If the stream is too wide to jump, a simple pole-vault might be attempted. In earlier days this was regarded as one of the standard uses for the Scout staff, but if a soft landfall can be guaranteed, light spars up to 12 ft. in length might well be used, depending on the height of the bank on the take-off side.

In other situations, when the far bank is conveniently furnished with trees with equally convenient branches, it is quite possible to throw a line across and then draw it back again to make a continuous line.

Two light lines will be needed. The middle of the first line should be weighted with a mallet head or noggin of wood so that it can be thrown over the selected branch on the far side. When attempting this feat it is best to keep the free ends of the throwing line as far apart as possible to prevent the bight from winding itself up inextricably. The whole purpose of the exercise is to dangle the weighted bight over the branch in a wide 'V' while the free ends are

retained on the take-off side. A lobstick is then thrown through the 'V' and while one end of the first line is firmly held, the other end released so that the lobstick can draw it back under the branch across the gap. A heavier rope can then be drawn across and back again.

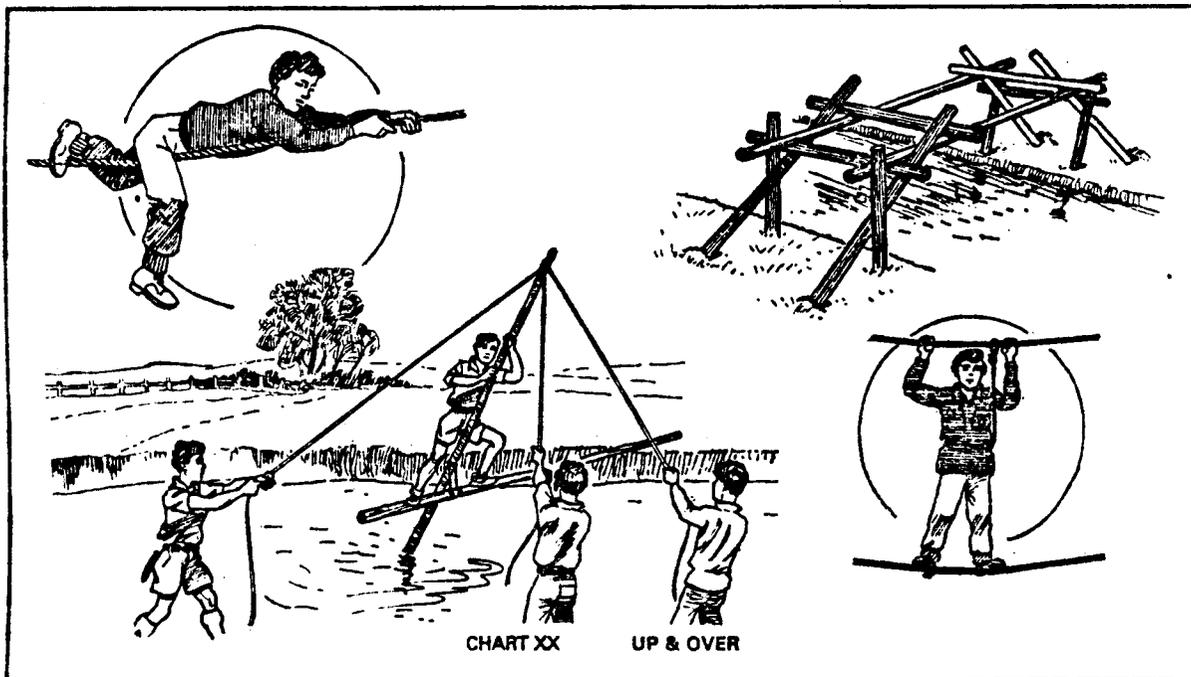
The next problem is to strain the rope so that some hero can venture across by means of the aptly named 'Deadman Crawl'. The Harvester's Hitch can be brought into operation here, and from then on it will be a simple matter to stretch a second rope across to make a Commando Bridge.

It is not suggested that this is a suitable activity for younger Scouts straight up from the Cubs. Indeed, it might test some Venture Scouts well beyond their skill and ability—especially if they have been brought up to regard knotting and ropework as smallboy stuff they have long outgrown. This book is being written at a moment in Scout history when it is fashionable to take this lofty view of many of the traditional skills and activities of Scouting, but no Scout Leader who has himself crawled fearfully along a swaying rope or helped to set up a major pioneering project will share this opinion. Pioneering, admittedly is fun, but it is certainly not kids' stuff.

As for the Deadman Crawl, please remember that it is only possible on ropes of at least 2½ in. circumference (20 mm. diameter) and that it needs considerable rehearsal close to the ground before it goes higher. The method is to lie full-length along the rope with one leg dangling to lower the centre of gravity and maintain balance, and the second leg bent with the foot hooked over the rope. Progression is made in a series of caterpillar loops. Draw the top foot up to the buttocks, raise the trunk clear of the rope and pull forward with outstretched arms.

Your Commando Bridge should be tailored to suit the smallest Scout who will be required to use it. Most of his weight will bear upon the foot-rope, so that the two ropes will be farthest apart at the point of no return. For greater security, and to give him more confidence, a short rope tied round his waist with a bowline, with a second (small) bowline running free on the handrope, should be fitted so that he can push it along with his hand. The footrope will probably stretch under the weight of the passengers, and it may be found necessary to take up the slack with the Harvester's Hitch from time to time.

The self-locking bridge has more spectator appeal as a display item than practical value in the field, but it is splendid fun and might be included in the limbering-up training of your young pioneers.



It is best built with unpeeled spars, where the friction grip of the rough bark is a great advantage. In ideal conditions, in fact, the four retaining pickets can be dispensed with altogether so long as the four spars forming the ramp are well heeled into the ground.

The Gilwell Haymaker Bridge consists of nothing more elaborate than one horizontal spar loosely slung from an upright two or so feet from the butts—depending, so far as the upright is concerned, on the depth of the water at the bottom. The illustration (Chart XX) shows the general idea, and strangely enough it does work! The tricky part about this is, of course, that initially the upright is supported by guylines on the take-off side only. This means that it must be kept at an angle pointing away from the bank with the guylines in full tension while the heroic first-man-over does a quick balancing act along the spar, then levers it round with his feet to make a touchdown on the opposite bank. He then swings the tip of the spar back and takes charge of one of the guylines, after which it is plain sailing until all but the last man have crossed, at which stage the original procedure must be carried out in reverse, with the upright leaning towards the take-off side.

The task of getting a rope over a high branch may be made easier by using a lobster, as suggested, but there remains the problem of making fast to the branch itself. One good way of doing this is to make a man-harness knot in the middle of the rope, slip the free end through the loop, and run it up the rope until it locks against the branch. The free end of the rope containing the man-harness should be drawn aside and tied off, after which your expert rope-climber can swarm up and down the rope in perfect safety. At the conclusion of the exercise, the man-harness can be drawn back and released at ground level.

If the rope is too thin for comfortable climbing, the stirrup-loop technique is recommended. Three strops, each about three feet in length, will be needed. These are bent on to the rope one above the other at intervals of 12 in. with what rock-climbers call the Prussik knot—actually nothing more elaborate than a larkshead with the loop passed twice through the bight. The lowermost strop should hang about 24 in. clear of the ground.

To use it, grip the rope and put your foot into the loop of the *bottom* strop so that you can raise yourself clear of the ground. Slip the loop of the *top* strop round your body under the armpits. Now push the prussik of the *middle* strop up the rope (you will find that it will slide freely) and put your other foot in the loop. Transfer your weight to this leg and push the prussik of the *top* strop up the rope until it engages under your armpits again. You will find that you are now supported by this loop and will have both hands free to raise the prussik of the *bottom* strop which is now in slack rope. Follow the same drill, raising each strop in turn, until you have reached the top of the climb and are in a position to haul yourself on to the branch.

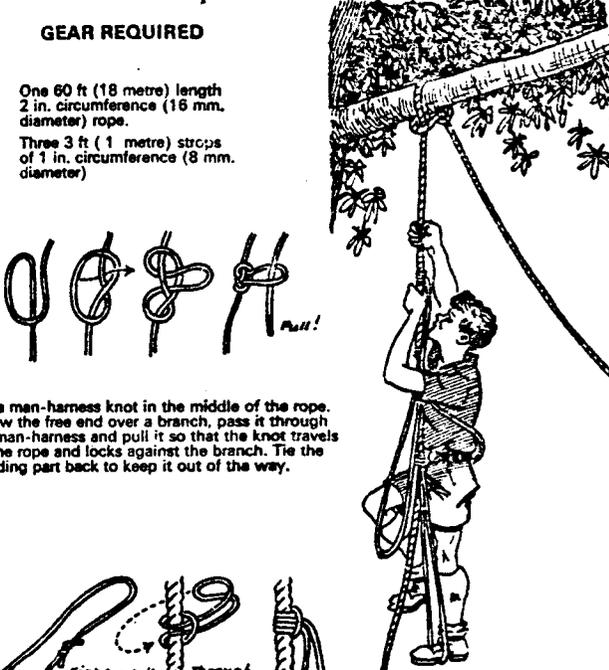
The descent can be made in the same way.

11

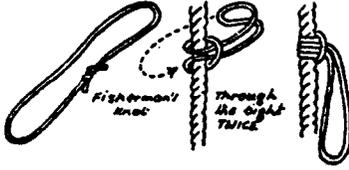
GEAR REQUIRED

One 60 ft (18 metre) length
2 in. circumference (16 mm.
diameter) rope.

Three 3 ft (1 metre) strips
of 1 in. circumference (8 mm.
diameter)



Put a man-harness knot in the middle of the rope. Throw the free end over a branch, pass it through the man-harness and pull it so that the knot travels up the rope and locks against the branch. Tie the standing part back to keep it out of the way.



Bend your three strops on to the rope one above the other at intervals of about 12 inches with Prussik knots. The lowermost strop should hang about 12 ins clear of the ground.



Grip the rope and put your foot into the **BOTTOM** strop so that you can raise yourself clear of the ground. Slip the loop of the **TOP** strop round yourself under the armpits. Now push the **MIDDLE** strop up the rope (you will find that it will slide freely) and put your other foot in the loop. Transfer your weight to this leg, and push the **TOP** strop up until it again grips under the armpits. You will find that you are now supported by this strop and have both hands free to reach down and raise the **BOTTOM** strop, which is now in slack rope. Follow this drill until you have reached the top of the climb.

CHART XXI **ROPE CLIMBING BY THE STROP & STIRRUP LOOP METHOD**

2. INSTANT PIONEERING

The building of a major pioneering structure involves a lot of hard, slow work which can become extremely laborious. Sooner or later your Scouts will discover for themselves the deep satisfaction that comes from a hard job well done, but if in the early stages too great a demand is made upon their ability to persevere, their enthusiasm will melt in the sun as they move from one boring square lashing to another. Workmanship will suffer, and the complete structure, so far from being a source of 'deep satisfaction' might well turn out to be a thing of contempt and ridicule. A monkey bridge which turns turtle is always hilarious—largely depending on who is making use of it at the time—but may equally put a boy off pioneering for life.

We by no means subscribe to the view that in a Movement which claims to develop character, everything should be made easy for the boy, or even that his ration of fun should be provided without an equal ration of conscious effort on his part. On the other hand, at the beginning of any new activity the intelligent boy will have to be convinced that the end result justifies the labour involved, and nothing will do this better than a quick return on his early investment. Start at the point where fun is guaranteed and boredom hardly possible. The Indoor String Burn is always good for a laugh and would give the boys their first experience of applying elastic band lashings. It is more than probable that they will not immediately tumble to the technique of using them to the best advantage, and at the succeeding Patrol Leaders' Council the opportunity might arise to pass on a few tips, which the Patrol Leaders in turn will relay to their Scouts in time for the next bout of mini-pioneering.

In using elastic the thing to remember is that rubber has a powerful friction grip on anything it touches, most of all upon itself. It is therefore quite useless to work with a slack band and imagine that it can be tightened with a good hard stretch at the end. The rule is that from the outset the band should be kept under reasonable strain, with the accent on 'reasonable'.

Use 4 in. x ½ in. bands. They can be bought by the pound from most stationers or any office supplies shop. A single band will be found long enough for most lashings with garden canes, but if greater length is needed two or more bands can be linked together with larkshead knots.

When sheer lashing two canes together in parallel for strength, loop the band over the ends of both canes and follow with a series of similar loops, working towards the end. Lap-joints should have a 15 in. overlap, with a sheer-lashing at each end. If the sheers are to be opened out like scissors, it will be found convenient to make the lashing fairly close to the end of the canes and then push it down to the required position. In this case a slightly different method should be used. Start by looping the band round one cane, follow with a number of turns round both, working towards the end, and lock by slipping the bight over the tip of the other cane. If thought desirable, a single frapping turn can be applied.

For square lashings, loop the band where you would normally put your first clove-hitch, square-lash on the so-called Japanese principle with both parts of the band together, and finish by slipping the bight over any convenient end. Frapping turns are not necessary.

Diagonal lashings are best started with a larkshead knot over the crutch with a matchstick slipped through to provide a small toggle so that the bight can be slipped over-both ends of the stick to give a final lock. It is largely a matter of commonsense, but it never does any harm to get your Patrol Leaders off to a flying start by giving them a preview of what you have in mind for them.

Weaponry of any kind has a natural fascination for boys, and once the technique of using rubber bands has been mastered—plus the even more important lesson of the key role of the simple triangle in the conception of all pioneering structures—no better way could be found to keep their interest alive than by encouraging the fabrication and use of various diabolical, but relatively harmless, devices in which the Patrols find themselves in fierce contention, both indoors and out.

If a suitable location can be found within reach of the headquarters, with lots of open space available, one idea would be to build a small, highly combustible bonfire in the middle of the arena, and invite the

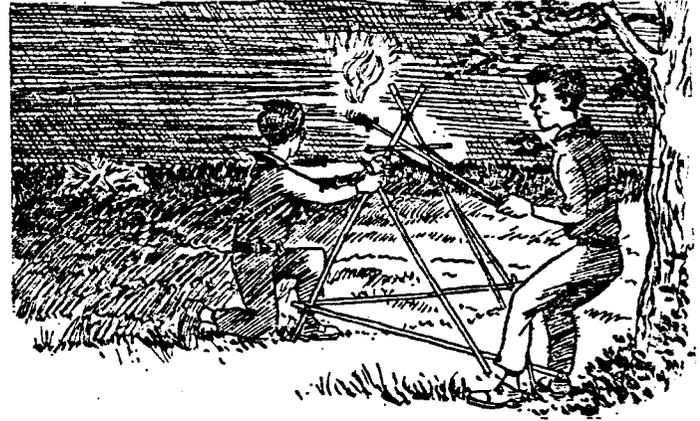


Fig. 2

Patrols, stationed at different points of the compass round the perimeter of a fairly wide circle, to set fire to it by launching flaming bolts into its heart. A certain amount of the impedimenta would have to be prepared in advance at the Patrol Leaders' Council—e.g. the actual firing mechanism, and the so-called 'flaming bolts' (three at least for each Patrol), but the erection of the 'launching pads' will be done on the spot by the boys themselves under the direction, perhaps, of the Assistant Patrol Leader, while the Patrol Leaders themselves stand back and act as 'Fire Control Officers'. Their job will be to see that the bolts are fired in salvos, and that the recovery service after each flight is tightly controlled, so that no one enters the target area while firing is still in progress. The role of the Scouter-in-charge will be to act as 'Safety Officer' to curb over-enthusiasm and minimise the risk of damage to person or property.

A word of caution. In this and all such enterprises, the greater risk is not that damage will be done or someone hurt but that your boys will suffer disappointment and frustration because of the abject failure of some part of their own apparatus. Almost invariably this failure occurs, not in the actual pioneering, but in such things as the pre-fabricated firing devices or in the missile itself. The Scout Leader will always make it his responsibility to inspect and test the work done at the Patrol Leaders' Council before passing it as fit for use. He will impress upon the Council that only the best is good enough for the boys in *his* Troop and *their* Patrols, and to let the side down through careless, shoddy workmanship—with the consequent ruination of a perfectly good Troop Meeting—would be, for them and himself, a crime of the highest degree. Indeed, the situation will present a fine opportunity for practical training in corporate responsibility. No need to lay it on with a tar-brush. Patrol Leaders of whatever age and experience are quite capable of latching on to abstract ideas, and the fact that this one is directly related to forthcoming activity will add greatly to its potency.

The Guided-Missile Launcher can be used in perfect safety both indoors and out. Two 'launching pads' are set up at opposite ends of the field of operation. The launching mechanism consists of a wooden cotton reel with two strings of 4 in. rubber bands secured to its side with insulation tape and attached to the legs of the 'pad' as shown in the diagram (Chart 1). Two of these will be required for each Patrol (another job for the Patrol Leaders' Council!) The missile consists of the top halves of two plastic washing-up liquid bottles, joined firmly together with several turns of insulation tape. (The coloured variety is recommended for the sake of appearance.) Before the joint is made, however, the hinged caps should be removed from the bottle-stoppers, and a line of strong, fine cord threaded through. The missile can then be assembled, and the ends of the cord carried through the cotton-reels at each end and tied off to a straining bar, consisting of yet another 4 ft. garden cane.

The object of the exercise is to shoot the missile the maximum distance along the guide-line in both directions. Out of doors a 'shoot' of some fifty yards is quite possible, but if the activity is confined to the Troop Room it might add to the fun if the contending Patrols worked from opposite corners on the 'crown Green' principle in bowling, with the idea of intercepting each other's missile mid-flight.

As always in these apparently trifling activities, a fair measure of know-how, commonsense, and co-ordination is called for. It will be found for instance, that when firing, the best results are obtained

by gripping the missile with both hands and using it to draw back the firing mechanism as far as it will safely go without snapping the rubber bands. Left to themselves, boys will invariably opt for the impact method, which may seem better fun but is never effective. It is of the greatest importance, also, that the guide-line should be kept at full-stretch while firing is in progress. The role of the linesman is vital in keeping the line running straight and true from end to end. The bombardier will sometimes tend to lift or dip, or deviate from one side to the other, and it will be up to the linesmen to make the necessary adjustment.

'The Bouncing Bazooka' was 'invented' during the first National Cub Scout Leaders' Weekend at Gilwell, and it would be no bad thing to suggest to your Scouts that they should pass the things on to the Pack (if acceptable) when their own interest is exhausted. Initially the bazooka consisted of the barrel only. This was gripped between the knees with the butt resting on the ground and held by the feet. The Mark II version, as shown in the illustration, was produced spontaneously at a Sunday morning get-together of Patrol Leaders at Stoke-on-Trent some years later.

In action this weapon is not nearly so lethal as it may appear, but the parabolic flight of the bolt makes it more suitable for use out of doors, where the risk of damage to roof and ceiling is avoided.

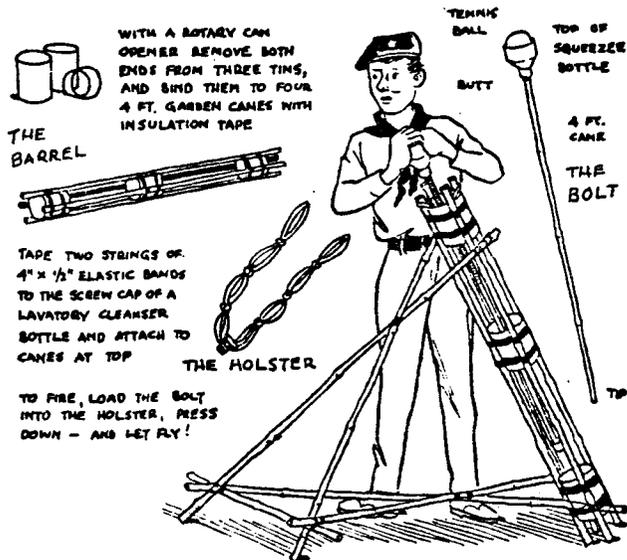
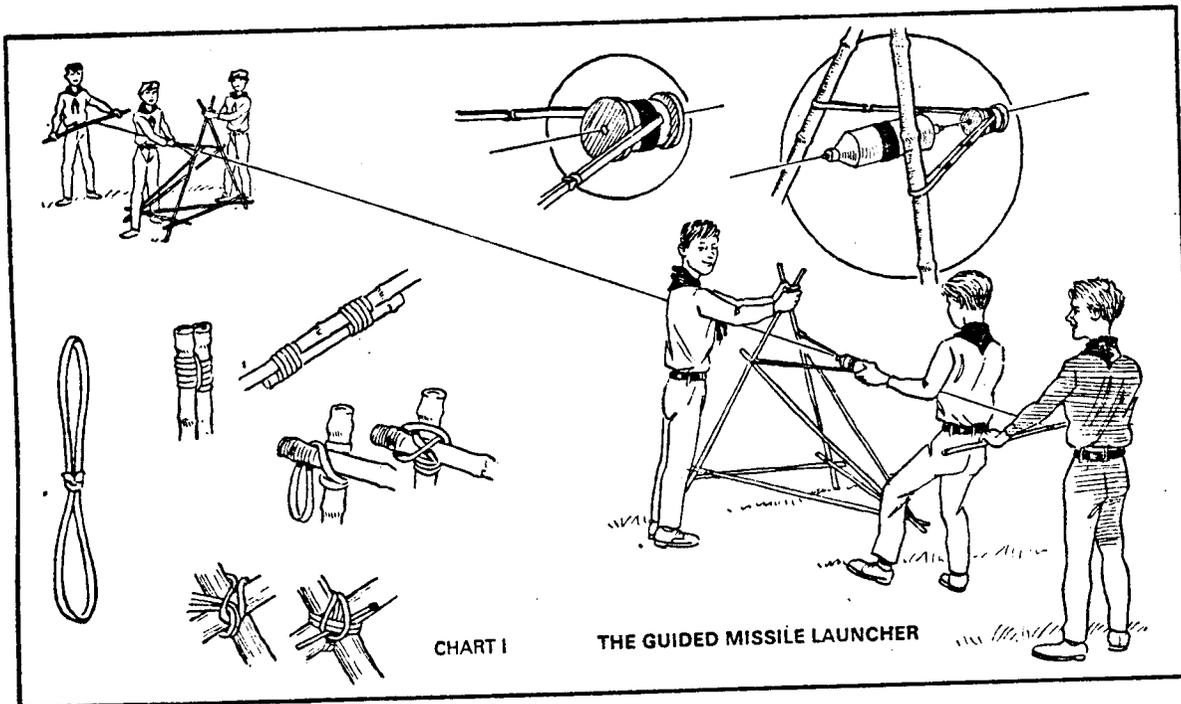


Fig. 3

In all these light-hearted activities fun will obviously be the keynote, but let no one imagine that they are without real training value. This will come through quiet insistence on sound pioneering principles, plus sound workmanship by the individual Scout, and sound team-work under the leadership of the Patrol Leader and his Assistant. Sooner or later, if the Patrol System is to become a reality in your Troop, your boy-leaders must learn that their job is not so much to do the work themselves as to see that it is done, and done well. The building of a pioneering structure provides the perfect opportunity for this. For yourself, the great break-through in your leadership training will come when you see that a young Patrol Leader has put every other member of his Patrol to work before getting down to it himself—and that he has not kept the most interesting job for himself! It need hardly be said that this sort of thing does not 'come natural' to any normal boy. It is all a matter of training. If you take good care to ensure that your Patrol Leaders have their share of fun at the Patrol Leaders' Council—or better still at a pukka Patrol Leader Training Course—they will be quite content to stand back and direct the work of their minions without interfering. It is in small affairs of this sort that leadership and responsibility have their beginning.

It would be a mistake to overdo this (or any other) sideline activity in the Troop Night programme to the detriment of more purposeful training in badge-work etc. But as in all things continuity and progression are important, and if your boys appear to enjoy what we have dubbed 'Instant Pioneering' many other possibilities are open to them—windmills, watermills, flag-bearing spires or wind-vanes, chart racks, miniature kon-tikis with plastic sails, or even man-bearing rafts, in which a number of plastic bags, fully inflated, are pinned between two strong frames of garden canes. In rafts of this sort floatability is never the problem. Stability is another matter—but in suitable conditions this is something that your boys should be allowed to discover for themselves.



25. THE CAMBRIDGE MERRY-GO-ROUND

This is the Mark I model of a light hearted pioneering project which was invented by the Cambridge University Rover Crew while on a visit to Gilwell many years ago, when Rovers were still in fashion. An original idea had been to crown the upright spar with an oil drum, which would certainly have caused its own problems, but would perhaps have eliminated the risk of jumping off the top of the mast when the roundabout was in full swing. However, the men of Cambridge would have none of this, and called upon the Gilwell Q.M. to provide them with the strongest pint-sized enamel mug he had in stock, plus a good dollop of axle grease from the estate tractor. They then middled the two supporting ropes over the top of the mug, opening the lay of one and passing the other through it, before binding the ropes to the sides of the mug by means of a very tight west country whipping. To our great astonishment, it worked like a dream—not just on this one occasion, but on many subsequent occasions. The fact that the whipping passed through the handle of the mug prevented it from slipping, and so long as reasonable care was taken in loading passengers into their seats, the roundabout proved to be self-adjusting and no bones were broken.

As I remember, the Cambridge Rovers found some difficulty in getting their spar to remain upright under the severe strain imposed upon it when the roundabout was in full spin, particularly as guyropes of any kind were, for obvious reasons, out of the question. The only solution to the problem that occurs to us is to drill a couple of holes through the butt of the spar, and push the end of Scout staves, or better still, steel bars or lengths of iron pipe through them, after which the disturbed ground should be well trampled down and a couple of pickets driven home and lashed to the post to give additional support. The spar, of course, should be heeled in for at least three feet.

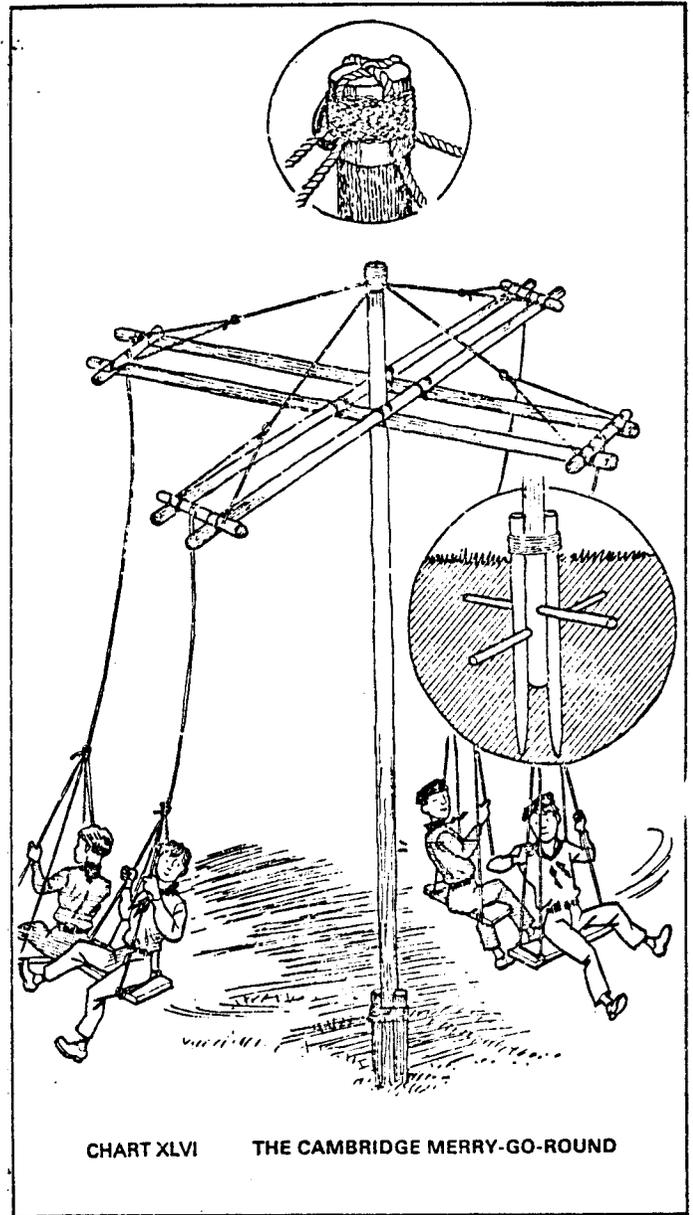


CHART XLVI THE CAMBRIDGE MERRY-GO-ROUND

PIONEERING is FUN

One of the most enjoyable, and yet inexpensive, program items for the troop is pioneering. Pioneering takes the learning of knots, splices and lashings out of the sometimes routine, instructional period and into the practical, "doing it" situation. The Clove Hitch, that many boys have learned over the leg of a chair or the arm of their patrol leader, will mean much more when used as the first step in lashing two spars together. And it will be much more fun!

Your boys will soon come to realize that pioneering, whether it be a simple table model, camp gadget or large spar project, like a signal tower, requires good lashings, and the basis of good lashings is good knotting. And, that the Clove Hitch and other knots really do have a purpose and are important.

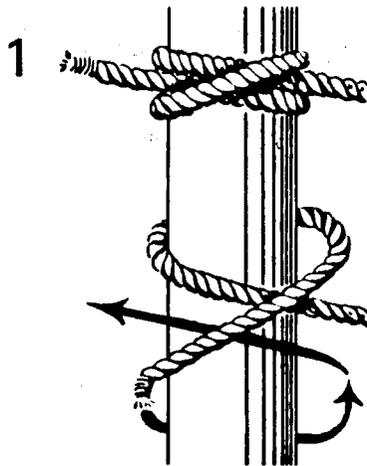
Summer camp is an ideal place to try a few simple pioneering projects and, if your camp is long enough, you may be able to progress to something more difficult. In any case, plan your program so that all may take part.

A pioneering program requires a modest, initial outlay of cash for such things as ropes and pulleys but, once purchased and properly cared for, your equipment should last for many years.

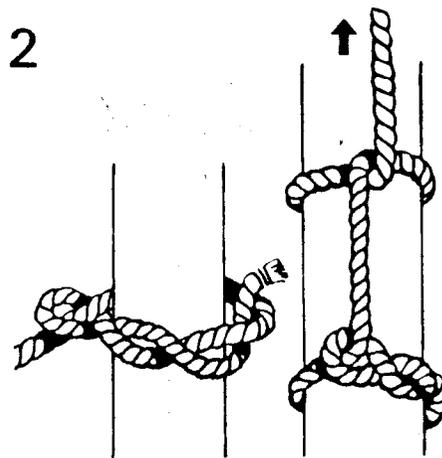
To start you out, here are a few simple projects that everyone can work on. For your basic frames, you will need small spars and strong binder twine. These items can be constructed at a camporee or summer camp and will help your boys to set up a more functional campsite.

Watch for more advanced projects in future issues of *The Canadian Leader*.

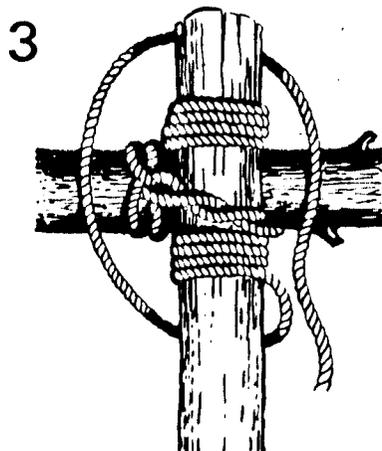
(For full information on knots and lashing, see pages 99 to 111, *Canadian Scout Handbook*.)



The Clove Hitch (1) is one of the most useful knots in pioneering. It is used to secure a rope to a spar. Make sure your boys know the two ways to tie it.



The Timber Hitch (2) is also used to secure a rope to a spar. The heavier the strain on this knot, the tighter it will become but it will never jam.



Square Lashing (3) is the most widely used lashing for securing one spar to another, when they cross at right angles, especially when the strain tends to pull them together.



Diagonal Lashing (4) is used to lash two spars together which tend to spring apart. Begin with a Timber Hitch around both spars, drawing them together and finish with a Clove Hitch.

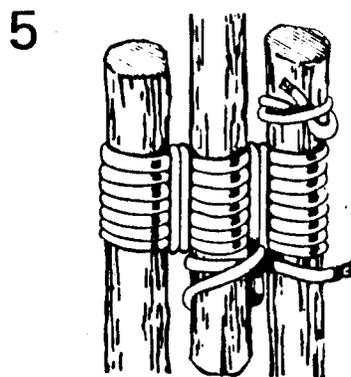
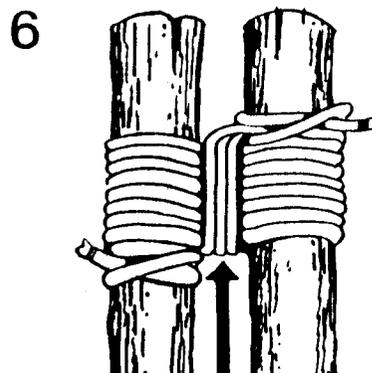


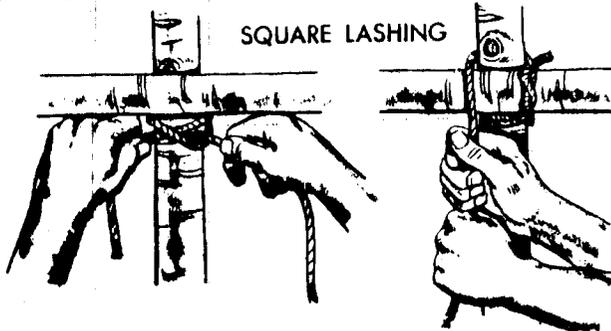
Figure-of-Eight or Tripod Lashing (5) is used to lash the tops of three spars together to make a tripod. Lay spars side by side, two outside spars running one way and the centre one, the opposite way. Start and finish with a Clove Hitch.



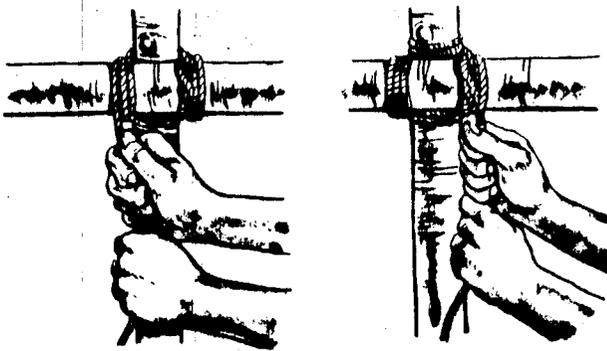
Shear Lashing (6) is used for lashing together two parallel spars, or two spars which will be opened slightly out of the parallel to form shear legs, or for lashing the ends of spars together. Start and finish with a Clove Hitch.

Camp Set-up

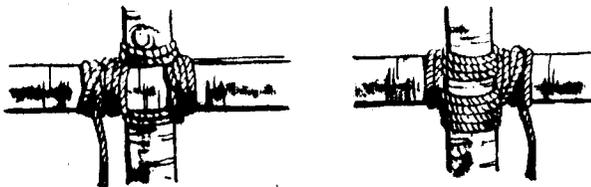
SQUARE LASHING IS THE MOST USEFUL METHOD FOR FASTENING TWO POLES TOGETHER WITH ROPES. YOU CAN USE IT FOR MAKING NUMEROUS CAMP ITEMS.



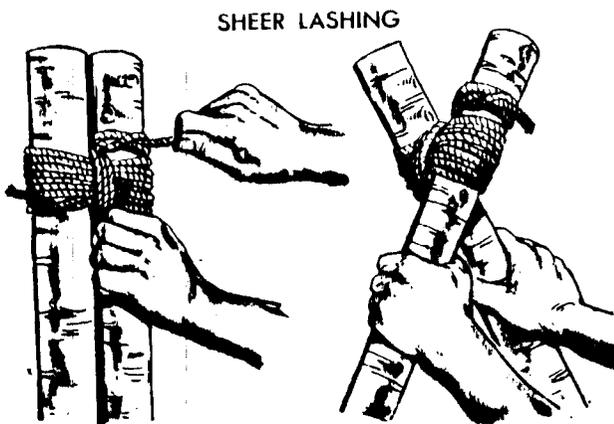
TIE THE ROPE TO THE POLE WITH A CLOVE HITCH. WRAP THE ROPE SEVERAL TIMES AROUND BOTH POLES.



MAKE THREE COMPLETE WRAPPINGS. THEN TIGHTEN BY WINDING ROPE THREE TIMES BETWEEN POLES. THIS IS CALLED FRAPPING. FINISH WITH A CLOVE HITCH.



FINISHED SQUARE LASHING. FRONT (Left) BACK (Right).



SHEER LASHING IS USED FOR MAKING A TWO-LEGGED STAND FOR TENT PITCHING AND PUTTING UP LINES. TIE A CLOVE HITCH AROUND ONE POLE. BIND POLES LOOSELY TOGETHER. FRAP BETWEEN THEM TO TIGHTEN. TIE ROPE WITH CLOVE HITCH. PULL THE LEGS APART.

THE KIND of camp you set up depends on how long you're staying, and your personal inclinations. Some campers say, "Make yourself as comfortable as at home," and they spend lots of time putting up gadgets and puttering around. Others go in the opposite direction: "Do as little as possible," and they don't use any of the tricks an experienced camper knows to make a camp comfortable.

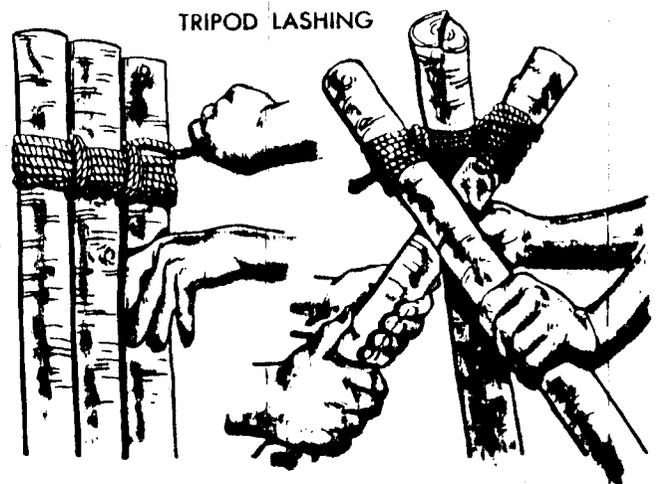
For a one-night camping trip, you probably won't bother with much beyond pitching a tent and building a fireplace.

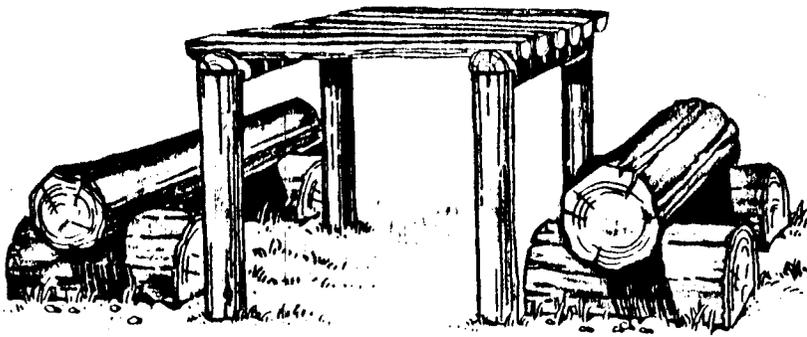
It is different when you spend a week or more in one spot, especially if you are camping with your family or a group of friends. You'll then certainly want to set up table and benches for family-style eating, a kitchen table for easy food preparation, a rack for cooking gear and tools, and some arrangement for hanging your clothes.

For making these things, you should know a couple of simple lashings. Small items can be lashed together with twine; for the larger ones you will need 1/4-inch or 5/16-inch rope.

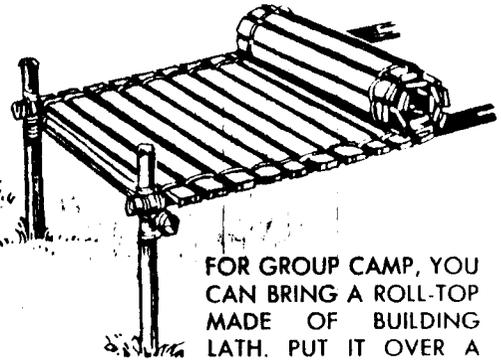
TRIPOD LASHING IS USED WHEN YOU WANT TO MAKE A THREE-LEGGED STRUCTURE THAT CAN STAND ALONE.

TIE ROPE TO ONE POLE WITH CLOVE HITCH. WRAP ROPE LOOSELY AROUND ALL THREE POLES. FRAP BETWEEN THEM. FINISH WITH A CLOVE HITCH. SET UP TRIPOD.





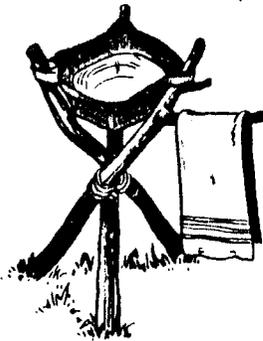
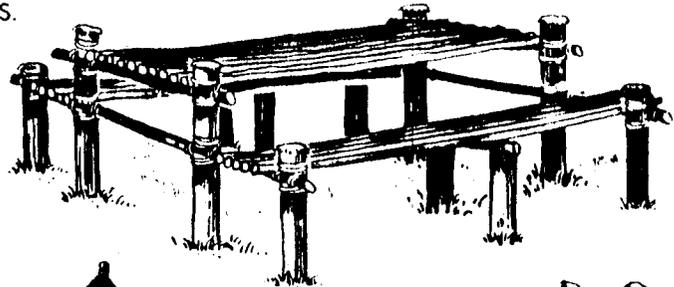
MANY NATIONAL AND STATE PARKS HAVE CAMPSITES WITH TABLES, BENCHES, AND OTHER CAMP FURNITURE. IF NOT, DOWNTIMBER MAY BE USED FOR FURNITURE BUT ONLY WITH PERMISSION OF RANGERS.



FOR GROUP CAMP, YOU CAN BRING A ROLL-TOP MADE OF BUILDING LATH. PUT IT OVER A FRAME FOR A TABLE.



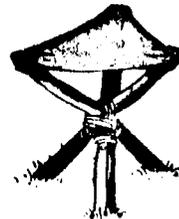
MAKE A COMFORTABLE "DADDY'S CHAIR" FROM PIECE OF HEAVY CANVAS OR A CANVAS HAMMOCK.



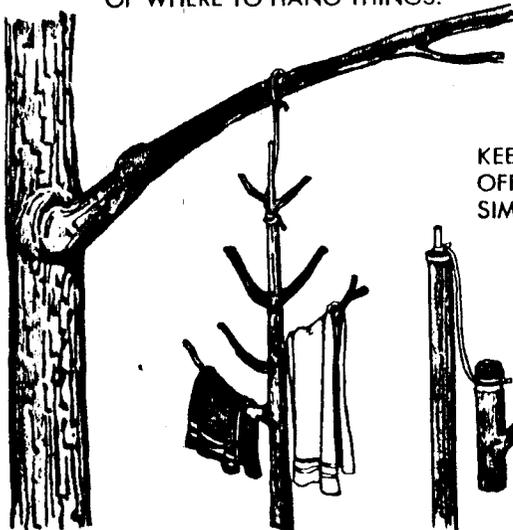
NO ROCKING CHAIR IN CAMP... BUT THIS RUSTIC CHAIR WILL GIVE YOU LOADS OF COMFORT.

BRANCH WITH SHORT SIDE BRANCHES SOLVES PROBLEM OF WHERE TO HANG THINGS.

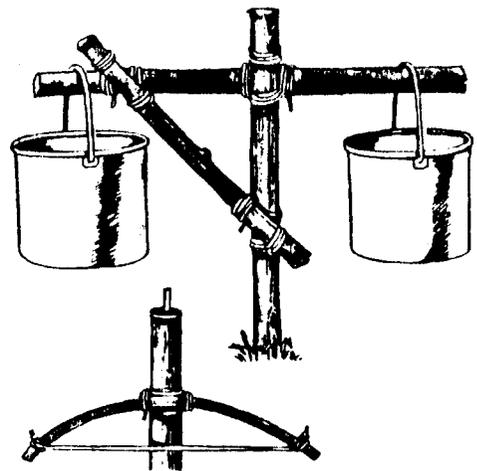
USING TRIPOD LASHINGS, YOU CAN MAKE SUCH CAMP ITEMS AS MOVABLE CHAIRS AND A WASH BASIN STAND.



HAVE WATER ON HAND IN TIN CANS FOR QUICK USE IN CASE OF FIRE.



KEEP SHOES DRY AND OFF THE GROUND ON A SIMPLE SHOE HOLDER.



IT IS EASY TO MAKE CLOTHES HOOK FOR THE TENT POLE AND TO LASH A CLOTHES HANGER.