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ROPE AND ITS USES
ON THE FARM

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COOPERATIVE EXTENSION SERVICE IN AGRICULTURE
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BOYS' AND GIRLS' CLUB WORK

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The cuts in this bulletin were lent by the Agricultural Extension Department of the University of Iowa. The drawings were made by A. B. Burger and were used in his work entitled "Rope and Its Uses."

The Junior Farm Bureau Boys' and Girls' Clubs are greatly indebted to Mr. Burger and to the Extension Department of the University of Iowa for the cuts and for valuable suggestions which Mr. Niece has used in this bulletin for the boys and girls of the State of Idaho.

W. T. McCALL,
State Club Leader.

ROPE AND ITS USES ON THE FARM

By H. T. NIECE
Ada County Club Leader

BOYS AND GIRLS can save a good deal of time, labor and material on the farm by knowing a few simple things about rope. They can prevent accidents, avoid delays and keep the ropes from wearing out. They should know, for instance, how to tie a manger knot, how to make a rope halter and how to make a splice that will go through a pulley. They should know how to take care of a rope, how to coil it and uncoil it so that it will not twist, how to find the strength of a rope of given size, and the way to tell how large a pulley should be for any rope, to prevent the rope's wearing. These are the things that this bulletin tells.

THINGS TO KNOW ABOUT ROPE

Kinds of Rope—Rope is made from hemp, jute, cotton and wire. The kind chiefly used at present is made from sisal, which is the whiter and cheaper hemp fiber. It comes from Yucatan, while the manila comes from the Philippine Islands and takes its name from the town of Manila. Cotton rope is used chiefly in clothes lines, wrapping twine, etc. Wire rope is made chiefly into cables and used for very heavy work.

How Rope Is Made—In making a rope, the fibers or other material are twisted together to form what is known as a "yarn". When two or more yarns are twisted together they form a "strand". Three or more strands form a rope and three ropes form a cable. To form a strand the yarns are twisted in the opposite direction from that in which the original fibers were twisted; to form a rope the strands are twisted in the opposite direction from the yarns, and to form a cable each rope is twisted the opposite way from the twist of the strands. The reason fibers are twisted is to hold the strands when a strain is applied. A twist also compacts the fibers and prevents to some extent the penetration of moisture. The proper degree of twist in ropes is generally such that the rope is from three-fourths to two-thirds the length of the yarn composing it. Hence when a weight is hung on the end of a rope there is a tendency for it to

untwist and become longer. In making rope the aim is to make the tension on the strands and on the yarns composing the strand equal.

Coil It "With the Sun"—Ropes are made with the twist of the strands to the right and hence when coiled into rolls should always be coiled in the same direction, or "with the sun." When the rope is uncoiled the end first laid down should be drawn up through the center. Whenever the rope is unwound from the end last laid down there is always a tendency for it to twist. The same is true of binder twine and for this reason if it is unwrapped from the outside it will twist and snarl.

How to Take Kinks Out—In case a new rope is inclined to be "kinky" so that it cannot be used, the twist may be removed by tying it to a wagon and dragging it about on the ground.

Keep Ropes Dry—The life of an ordinary rope is materially increased when it can be kept in the dry. Ropes which have become wet should always be thoroughly dried out in the sun before they are coiled up and hay ropes which are used inside of barns where they may absorb moisture from the drying hay should be removed when not in use. The alternate drying and wetting is very detrimental to the rope fiber.

Strength of Rope—The strength of a jute or hemp rope depends largely upon the strength and length of the fibers from which it is made, but also upon the extent to which each yarn and strand is twisted, as well as the method used in bleaching or preparing the fibers.

The strength of a rope may be calculated by multiplying the circumference of the rope in inches by itself, and dividing by five, which will give the number of tons the rope will sustain. For example, a five-eighths inch rope measures two inches in circumference. Two times two gives four. One-fifth of four is four-fifths, which is the number of tons which can be carried safely on a five-eighths inch rope—1600 pounds.

Size of Pulleys—In running ropes over pulleys there is a constant bending and straightening. Hence, to avoid serious wear on a hoisting rope, it should be run over a pulley of a diameter not less than eight times the diameter of the rope in inches. For example, a three-fourths inch hay rope requires a six-inch pulley, a one-inch rope an eight-inch pulley. Ropes used for transmitting power, as is required

in the case of belts, should not be run over pulleys less than forty times the diameter of the rope. On the other hand there is considerable wear from friction where a very small rope is run in a large pulley with a big groove, allowing much play.

USEFUL FACTS ABOUT THREE-STRAND MANILA ROPE

Diameter (inches)	Circumference (inches)	Weight of 100 ft. of rope (lbs.)	Length of each lb of rope (ft.-in.)	Breaking load (lbs.)	Diameter of pulley (inches)	Safe load (pounds.)
1-4	3-4	3	33 4	400	2	55
3-8	11-9	5	20 0	900	3	130
1-2	11-2	7 2-3	13 0	1620	4	230
5-8	2	13 1-3	7 6	2880	5	410
3-4	21-4	16 1-3	6 1	3640	6	520
7-8	23-4	23 2-3	4 3	5440	7	775
1	31-8	28 1-3	3 6	6480	8	925
11-8	31-2	38	2 7	8820	9	1260
11-4	33-4	45	2 2	10120	10	1445
2	6	113	0 10	25200	16	3600

DEFINITIONS

Yarn—Fibers twisted together.

Thread—Two or more small yarns twisted together.

String—The same as thread but with yarns that are a little longer.

Strand—Two or more large yarns twisted together.

Cord—Several threads twisted together.

Rope—Several strands twisted together.

Hawser—A rope of three strands.

Cable—Three hawsers twisted together.

Yarns are laid up left-handed into strands.

Strands are laid up right-handed into rope.

Hawsers are laid up left-handed into a cable.

A rope is:

Laid—By twisting strands together.

Spliced—By joining to another rope by interweaving the strands.

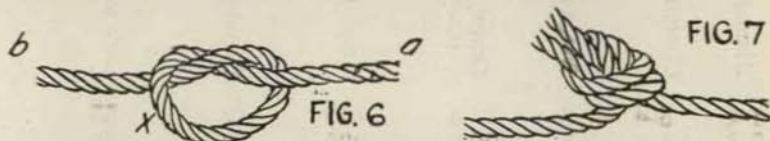
Whipped—By winding a string around the end to prevent untwisting.

Seized—When two parts are bound together by a yarn, thread or string.

Payed—When painted, tarred or greased to resist wet.

KNOTS

Overhand Knots—The simplest of all knots known is the overhand knot, as shown in Fig. 6. This knot is very important for it is used frequently in fastening the ends of yarns and strands, and in connection with other knots.



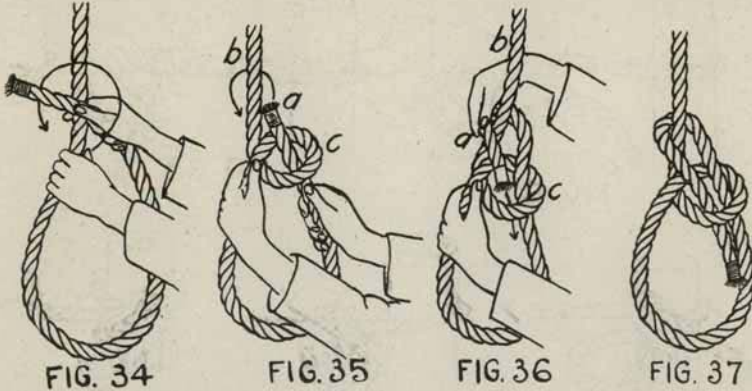
Binder Knot—The binder knot is made by placing the two rope ends side by side and tying an overhand knot (Fig. 7.)

Blood Knot—When tying the overhand knot, if the end is passed thru the loop two, three or four times and pulled tight it makes a knot known as the blood knot. It is used principally on the ends of whip lashes.

Square Knot—The square or reef knot is probably the knot that is most useful and widely used, especially for joining the ends of two ropes. To make a square knot, take the ends of the rope and pass the left end over and under the right and then the right over and under the left. If you once learn the simple formula of "leftover," "rightover," you will never make the despised "Granny Knot."

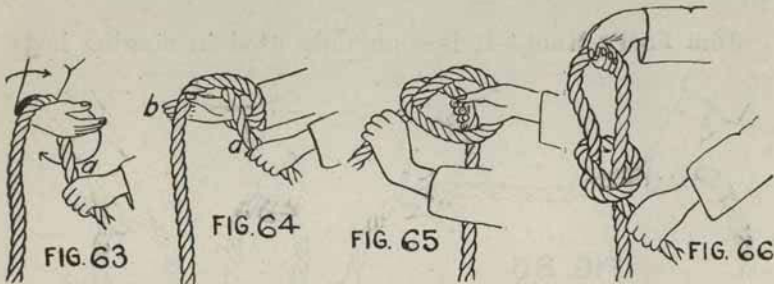
Bowline—(Overhand method)—With the right hand on the end of the rope and the left on the bight in the position as shown in Fig. 34, make a loop by bringing the left hand around the end of the rope as indicated by the direction of the arrow in Fig. 34 and shown in Fig. 35. Now, with the left hand hold the loop in place. Grasping the end of the rope "a" with the right hand, bring it around beneath the

standing part (b. Fig 36) and back through the loop "c" as



in Fig. 37. This is the quickest and easiest method of making the bowline knot.

Slip Knot—The slip knot is one of the common knots. It can be easily and quickly made by catching the bight of the rope with the right hand, as in Fig. 63 and then by giving



the hand a turn in the direction indicated by the arrow in such a manner as to catch the end "a" over the wrist as in Fig. 64. Grasp the bight of the rope at "b", Fig. 64, and pull it through the loop as in Fig. 65. Fig. 66 shows the completed knot.

Manger Knot—The manger knot, as the name implies, is most commonly used in tying halter ropes to a ring or post. It is made by a simple jerk of the hand. To make the knot, pass the rope around the post so that the short end will be in the right hand. Grasp both ropes with the left hand (Fig. 67) and with the right throw the short end across both ropes in front of the left hand as indicated by the direction of the arrow (Fig. 67). Now with the right hand reach through the loop or bight "x" thus formed (Fig. 68) and

pull the rope through, tightening it and forming another

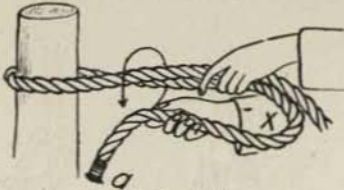


FIG. 67

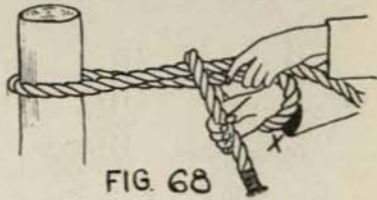


FIG. 68

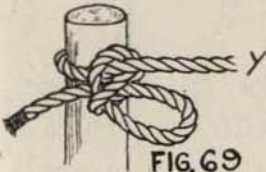


FIG. 69

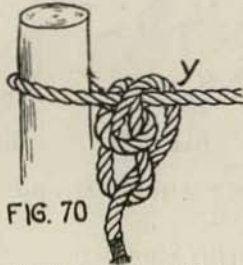


FIG. 70

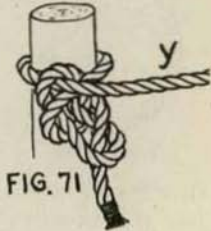


FIG. 71

loop (Fig. 69). The end of the rope is now thrown over the standing part and passed through the loop as shown in Fig. 70.

Tom Fool's Knot—It is commonly used in ringing hogs,

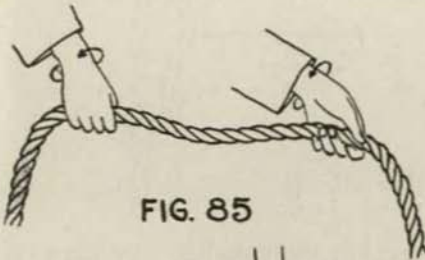


FIG. 85

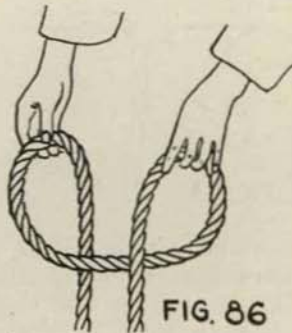


FIG. 86



FIG. 87

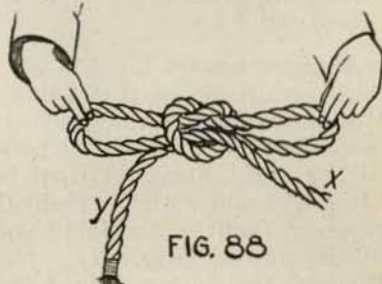


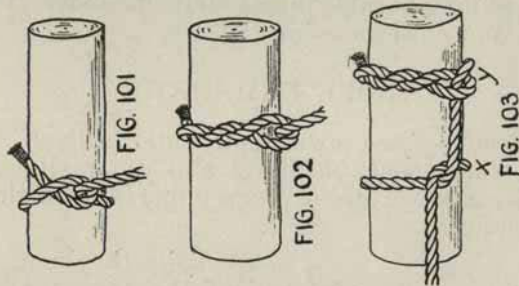
FIG. 88

one of the loops being placed around the upper jaw. It is tightened on the jaw by pulling the standing part of the rope "x" and untied by pulling the end of "y" (Fig. 88).

To tie the knot hold the rope with the palm of the left hand up and the palm of the right hand down (Fig. 85). Now turn both hands toward the right as indicated by the arrows in Fig. 85 and shown in Fig. 86 so that the palms will face each other. Holding the hands firmly in that position, bring the two loops together as shown in Fig. 87 so that they may be drawn through from opposite sides in the direction of the arrows. Releasing the hold upon the rope at "x" with the left hand, reach through the loop formed by "x" and grasp the rope at "y" and releasing the strand "y" with the right hand reach through the second loop formed by "y" and grasp the rope "x"; then pull the rope through in opposite directions forming a double loop. Fig. 88 shows the complete knot.

HITCHES

Half Hitch—For temporarily fastening ropes when there is a steady pull, the half hitch is often used. Its chief use, however, is in connection with other knots or hitches. The half hitch is made by passing the end of the rope around the standing part and pinching it between the rope and the object to which it is attached (Fig. 101.)



Timber Hitch—The timber hitch is much more secure than the half hitch and is often used by carpenters, foresters and lumbermen in moving logs or timbers. It is, in part, a repetition of the half hitch, since the end, instead of being simply tucked under the rope, is wrapped about it once or more (Fig. 102.)

Timber Hitch and Half Hitch—As the name implies, this hitch is a combination of the timber and the half hitch. The two, when thus used together, make a more secure hitch than either alone. (Fig. 103.)

Blackwall Hitch—This is a simple, though satisfactory, temporary hitch that may be used with either a rope or chain when the pull is continuous. A bight is made in the rope and is passed behind the hook. (Fig. 140.) The free end "a" is then passed thru the hook and the standing part "b" passed over it from the opposite side (Fig. 141.)



FIG. 140



FIG. 141

Tent Lashing—A regulating lashing is very convenient on ropes where the tension needs frequent changing. It is often used on tent ropes but may be used on any sort of guy rope where the tension is not too great. The rope is tightened by slipping the wooden block "x" in the direction of the pull (Fig. 144.)

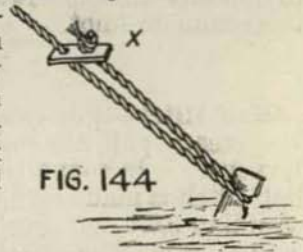


FIG. 144

There are innumerable hitches but the above, if mastered, will suffice in most cases on the farm.

ROPE END KNOTS

Crown Knot—The crown knot, while in itself not a complete and permanent fastening and of small value when used alone, is nevertheless very important as the basis of rope end splices.

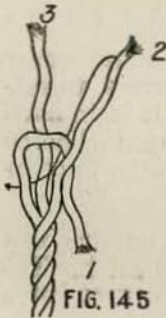


FIG. 145

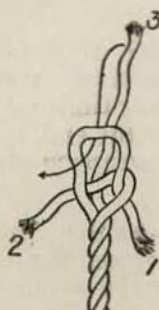


FIG. 146

To make the knot, unlay the end of the rope far enough so that the knot or splice, if a splice is to be made, may be completed, then bring strand

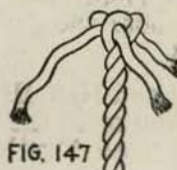


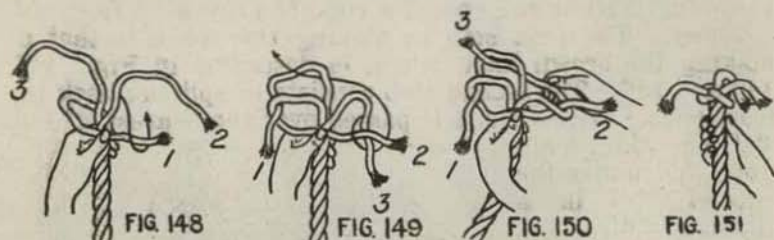
FIG. 147

No. 1 down between strands Nos. 2 and 3, forming a loop as shown in Fig. 145.

Pass strand No. 2 across the loop thus formed, as shown by the arrows in Fig. 145, so that it will lie between the loop and strand No. 3. Strand No. 3 is now passed through the first loop, as indicated in Fig. 146 and shown in Fig. 147. Pull the crown down tightly by pulling gradually on each of the strands.

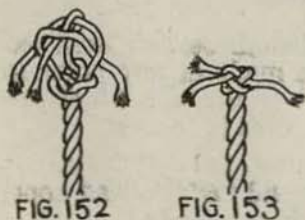
Wall Knot—Among the different forms of rope end fastenings that are easily and quickly made, the wall knot is the most commonly used.

For a small rope, unlay the strands about three inches. Hold the rope in the left hand, with the loose strands up-



ward. With the right hand grasp the end of strand No. 1 and bring it across the rope, forming a loop and allowing the end to hang free as shown in Fig. 148. Hold the loose end in position with the thumb of the left hand. Grasp strand No. 2, pass it under strand No. 1, as indicated by the arrow in Fig. 148, and hold it against the rope with the thumb of the left hand (Fig. 149.) Again with the right hand, grasp strand No. 3, pass it under strand No. 2 and up through the first loop formed, as indicated by the arrow in Fig. 149 and shown in Fig. 150. Draw each of the strands gradually until the knot is tight (Fig. 151.)

Wall and Crown Knot—A more secure fastening than the



wall knot, is made by first making the wall knot (see description of wall knot, Figs. 148, 149, 150 and 151) then finishing with the crown as shown in Fig. 152. (See description of crown knot, Figs. 145, 146 and 147.) The two knots then are drawn together as shown in Fig. 153.

Manrope Knot—This knot is just the reverse of the wall and crown knot. The crown knot is made first (Fig. 154) and the wall knot drawn down over it (Fig. 155). See description of the wall knot, Figs. 148, 149, 150, 151, and also of the crown knot illustrated in Figs. 145, 146 and 147.



FIG. 154



FIG. 155

SPLICES

End or Crown Splice—The end splice is a permanent fastening used on the end of a rope to prevent it from unraveling. The first step in making the splice is that of making the crown knot, which is described in Figs. 145, 146 and 147. The second step consists in splicing back the loose ends. Strand No. 1 is passed over the nearest strand, "a" on the main rope and under the second "b" in a diagonal direction, almost at right angles to the twist of the strands (Fig. 160). Strands No. 2 and No. 3, in turn, are in like manner spliced back, No. 2

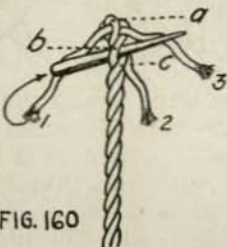


FIG. 161

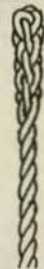


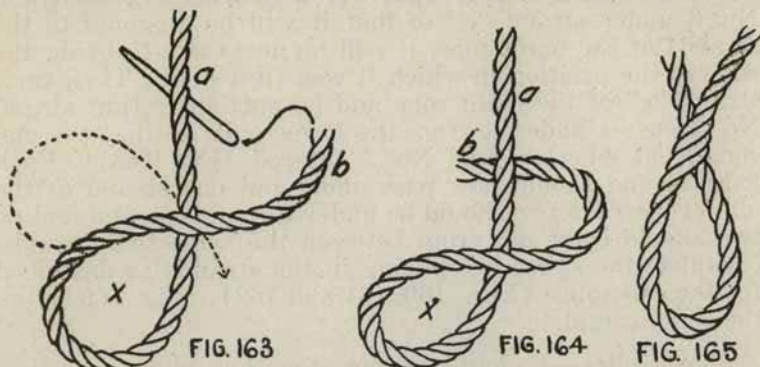
FIG. 162

over "b" and under "c", and No. 3 over "c" and under "a". Each strand is tucked under but one strand of the main rope at a time (Fig. 161). To make a smooth, tapering splice, cut out a portion of the fibers after each tuck and when finished pound the splice lightly with a short stick or hammer and roll it on the floor under the foot (Fig. 162). In splicing ropes a smooth, pointed, hardwood stick or marlinspike is very convenient in raising the strands.

Loop Splice—The loop splice, although seldom used except in making rope halters, may be made at any point in the rope. It is simply a permanent loop through which another rope or some part of the same rope is to pass.

In making the loop splice for a halter, raise two strands as shown in Fig. 163; pass the long end "a", or lead rope, under the strands thus raised in such a manner that when the loop "x" is drawn to the desired size the rope "a" will pass through beneath the two strands at right angles to the

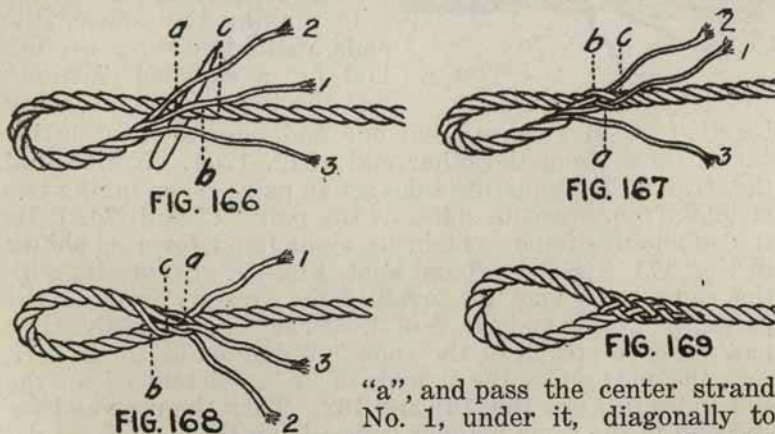
direction in which they are laid. This is very important,



for if the long end "a" is passed under the raised strands in the direction indicated by the dotted line the loop splice when completed cannot be properly drawn up. To complete the splice raise two strands in the long part of the rope, as indicated by the marlinspike (Fig. 163) and pass the short end through (Fig. 164). Draw the ropes closely together as in Fig. 165.

Eye Splice or Side Splice—The eye splice is used both in making halters and in splicing one rope to another.

Untwist the end of the rope and place the strands in position, the two outside strands straddling the main rope and the middle or top strand running along the top of the rope. Now with the marlinspike raise any one of the strands, as



"a", and pass the center strand No. 1, under it, diagonally to the right (Fig. 166). Turn the main rope toward the left and pass strand No. 2 over strand "a" and under the strand

"b" lying next to it (Fig. 167). Now in order to pass strand No. 3 under strand "c" so that it will be diagonal to the strands of the main rope, it will be necessary to bring the rope to the position in which it was first held. Then raise strand "c" of the main rope and be particular that strand No. 3 passes under it from the lower side, so that the end comes out where strand No. 1 entered (Fig. 168). Each loose strand should now pass under but one strand of the main rope. No two should be under the same strand and no two should come out from between the same two strands. Complete the splice by splicing in the strands as described for the end splice (Figs. 160, 161 and 162). Fig. 169 shows the splice complete.

Short Splice—To join two ropes together where there is a straight pull and where they are not required to pass through pulleys, the short splice is often used.

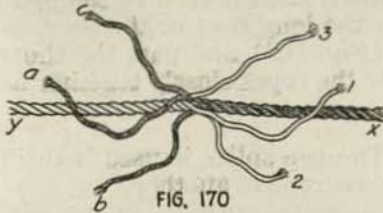


FIG. 170

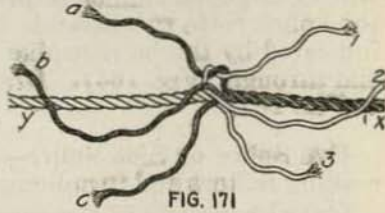


FIG. 171

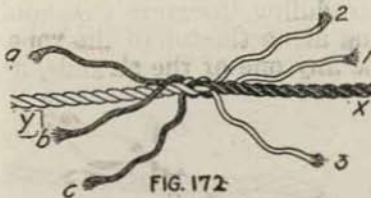


FIG. 172

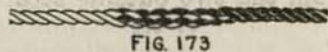


FIG. 173

In making the splice, the ends of the two ropes are unlaid for a sufficient distance and the two ends then locked together so that those from one end pass alternately between those from the other end (Fig. 170). Notice that the strands from opposite sides are in pairs. Then taking two strands from opposite sides, as the pair "a" and No. 1, tie the simple overhand knot in its right hand form as shown in Fig. 171. (See overhand knot, Fig. 6). Similarly, with the right hand knot tie together the strands forming the pairs "b" No. 2 and "c" No. 3. Draw knots tightly, then passing each strand of the rope "x" diagonally to the left, tuck the ends under the strands of "y" as described for the end splice in Figs. 160, 161 and 162. Turn the rope end for end and in the same manner splice down the strands of the rope "y" (Fig. 172). Splice down the strands alternately, and each strand but one place each time. When the splice

is completed each strand from both ropes should be spliced under at least two places (Fig. 173). The length of the splice must depend upon the size of the rope and the load to be placed upon it. This splice may be made without tying the overhand knots by simply splicing under the strands.

ROPE HALTERS

Length and Size—Rope halters are inexpensive yet very convenient and serviceable, especially in handling cattle. For cattle, halters are usually made of $\frac{5}{8}$ -inch rope but for horses, large cows and bulls a $\frac{3}{4}$ -inch rope should be used. An ordinary halter will require about 13 feet of rope. This will allow for a tie rope 6 feet long, a 36-inch headpiece and 14-inch nosepiece.

Double Loop Halter—The double loop halter has the advantage of being adjustable to animals of different sizes but it is not satisfactory for continuous use because there is some danger of its becoming loose and slipping off the head.

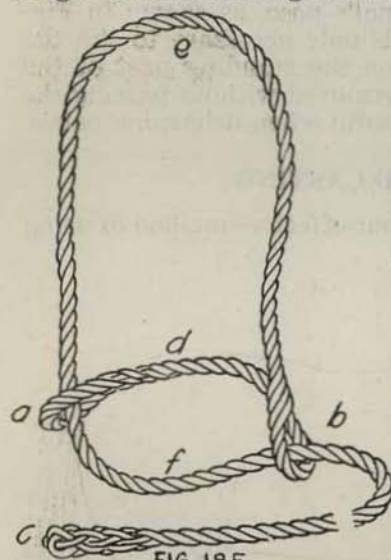


FIG. 185

In beginning the double loop halter first make an eye splice (Figs. 166 to 169) in one end of the rope. The loop of the splice should be just large enough to allow the rope to pass through, otherwise the halter will loosen readily. From the loop of the eye splice measure the distance that will be required to reach nearly around the animal's nose and make a loop splice (Figs. 163, 164 and 165) of the same size as the loop of the eye splice. Finish the end of the rope with the end splice (Figs. 160, 161 and 162, see also crown knot, Figs. 145, 146 and 147) and pass the end through the loops as shown in Fig. 185. In the illustration, "a" is the eye splice, "b" the loop splice, "c" the end splice, "d" the nosepiece, "e" the headpiece and "f" the part passing under the jaw.

Temporary Halter—A very convenient halter for leading or temporarily holding cattle is made by fastening an iron ring or making a loop in the end of a rope. The end with

the ring is first passed around the animal's neck. A loop "a" is then formed in the main rope (Fig. 187), passed through

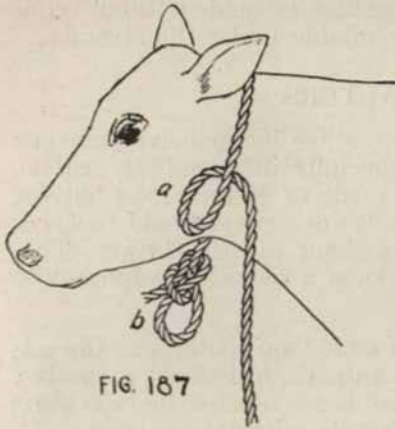


FIG. 187

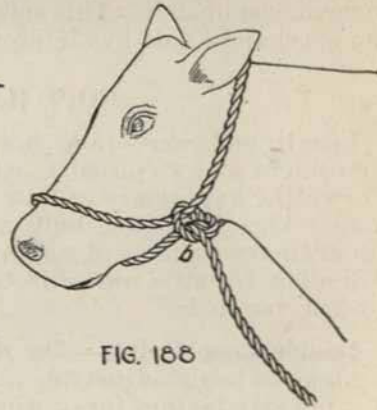


FIG. 188

the loop "b" and over the animal's nose, as shown in Fig. 188. To remove the halter it is only necessary to slip the loop from the nose and draw on the standing part of the rope. Since the halter may be removed without passing the rope over the head, it is very useful when dehorning cattle.

TACKLES AND CASTING

Leading or Tying—A simple but effective method of using

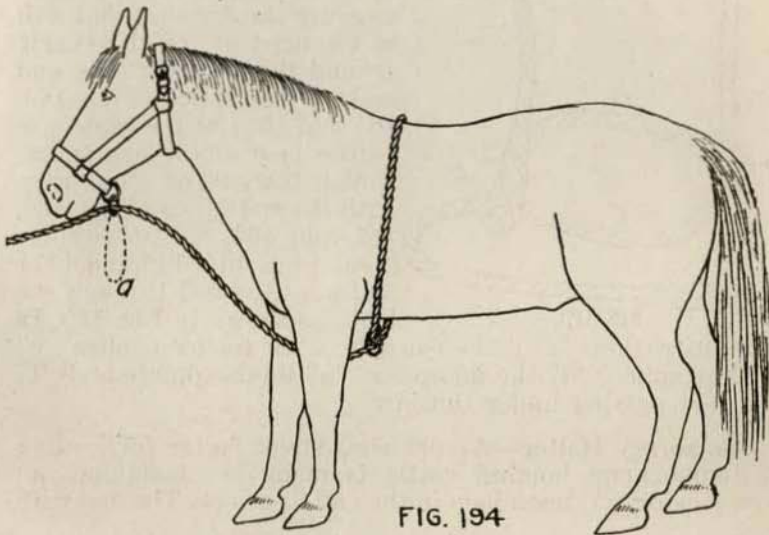


FIG. 194

a rope for breaking a colt to lead is shown in Fig. 194. A strong leather halter is placed on the colt's head. A long rope is procured and one end is passed around the body over the withers and just behind the front legs. It is well to have an iron ring in the end of the rope, or a loop tied with a bowline knot (Figs. 34 to 37) so that the loop which passes around the body will loosen as soon as the tie rope is slacked. (A ring is best). Pass the rope through this ring, or loop, then between the front legs and over the chin piece of the halter. When the rope is tightened the colt will usually lead up with but little resistance, and if he passes the person who is leading him the chin piece of the halter acts as a pulley and his head is drawn around to the side.

This method is also often used for breaking halter-pullers. In this case the long rope is simply tied to the manger. However, if the manger is low the rope should not be passed through the chin piece of the halter but thru a loop or strap loop "a" which is fastened to it. Otherwise there is too great a pull on the top of the head.

Casting Horses—For casting horses a rope not less than thirty-five or forty feet long should be used. The rope is doubled and a bowline-on-the-bight tied in the center. This is placed over the horse's head and adjusted to the size of the neck. The rope is then passed between the fore legs, around the ankles of the hind legs, once around the main rope as

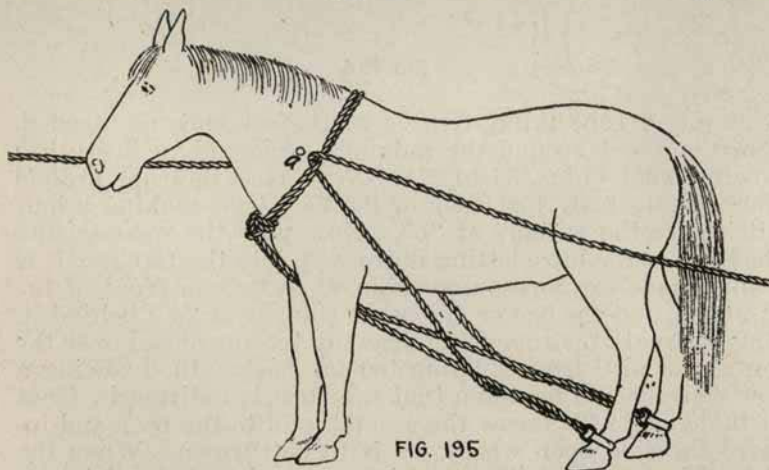


FIG. 195

shown in Fig. 195, and finally through the loop of the bowline-on-the-bight at "a". In order to prevent the rope from burning the hind ankles, ankle straps should be used. Hame

straps with iron rings, placed on the ankles, answer the purpose admirably. The loop around the neck should be loose enough so that it will not choke the animal when thrown. If the horse is to be thrown on the right side the person holding the rope on that side should stand in front and to the right, and the one holding the other rope, to the rear on the left side. The horse is then caused to back and the ropes are pulled thus drawing his hind feet up toward the body. As soon as the horse is down the person at the halter should twist the head, turning the animal's nose upward as far from the ground as possible. This prevents him from getting up.

Casting Cattle—For casting cattle, the method shown in the accompanying illustration (Fig. 196) is simple and ef-

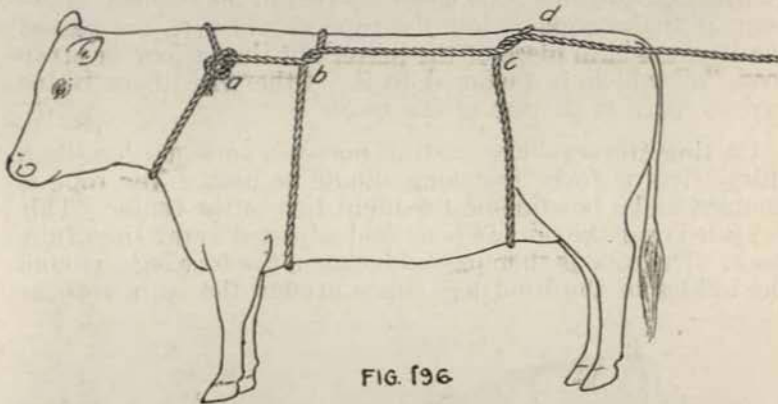


FIG. 196

fective. A rope thirty-five or forty feet long is needed. Place one end around the animal's neck and tie it with a bowline knot (Figs. 34 to 37). Next, pass the rope around the animal's body just back of the fore legs, making a half hitch over the withers at "b". Now pass the rope around the body at the hips, letting it draw up into the flanks. It is well to have the rope on one side, as at "c", in front of the hip bone, and the one on the other side, as at "d", behind it. This prevents the rope from drawing too far ahead over the loin, and also from slipping too far back. In throwing a cow, care should be taken that the rope is entirely in front of the udder. To throw the animal, pull to the rear and toward the side upon which she is to be thrown. When the animal is down turn the head to prevent her from rising.

