California Vocational Agriculture Curriculum Guidelines Instructional Unit

FENCING

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FENCING

Unit Goal

The goal of this unit is to develop in the student a system of analyzing and solving fencing problems.

Unit Performance Objectives

Upon completion of this unit the student will be able to:

1. List and use land considerations for developing a fencing plan.
2. Identify types of fencing and list advantages and disadvantages of the types for different uses.
3. Discuss fencing materials and their uses (i.e., wire, wood, posts, gates and fasteners).
4. Identify and use appropriate tools for a given fencing assignment.
5. Discuss in a given fencing assignment the procedure for establishing line, setting posts and attaching fencing.

Teaching Outline

I. Planning and Layout

A. Considerations

1. Capability of the land
2. Fit fields to cropping plan
3. Fit fences to soil conservation practices
4. Arrange fields and passageways for convenience and labor saving
5. Where to justify permanent fences and movable fences
6. What order to build permanent fences

B. Planning (TM - 1)

1. Sketch layout of farm
2. Plot capabilities of land
3. Divide each area into the number and size of fields needed for your cropping system and land capability
4. Proposed lane(s) to connect farm buildings with permanent pasture
5. Indicate gates and other passageways

II. Determining the Kinds of Fence

A. Considerations

1. Kind of livestock you are fencing
2. Whether different kinds of livestock kept in same field
3. How often you inspect your animals for pests or injury
4. Need to fence out dogs or predators
5. How closely the animals will be confined
6. Money available for fencing
7. How long fence is to last

B. Types of fence

1. Wire - general (gage - wire sizes) (TM - 2)
2. Woven wire

a. Design or style (ex. 1047 - 10 line wires, 47" high) (TM - 3)
b. Line wires: those that run lengthwise
c. Stay wires: vertical wires that tie the line wires together
d. Filler wires: those wires between the top and bottom wires, include remaining line wires and all stay wires.
e. Protective coating
   1) Galvanizing
   2) Aluminum-coated

	Suggested Learning Activities	Suggested Resource Materials
I.	1. Have students map area to be fenced, showing gates, lanes, etc. TM-1	1. FILMSTRIP AAVIM Fence Construction
	2. Discuss what fence is to be used for, type of animals.	2. Keystone wire - film pamphlet.
	3. TM - 2, bring samples of different gage wire to class.	3. Feed store.

II. B. 2. f. Types of joints (TM - 4)
1) Hinge joint: allows fence to fold when livestock mash the fence
2) Stiff-stay joint: stay wires bend when livestock mash the fence

3. Barbed wire

a. Protective coating
1) Zinc
2) Aluminum
b. Gauges of barbed wire (TM - 5)

4. Smooth wire

a. Used as brace wire and electric fencing
b. Types
1) Galvanized steel
2) Copper-coated steel
3) Aluminum

5. Wooden rail (TM - 6)

a. Requirements
1) Moderate bending strength
2) Medium decay and weather resistance
3) High nail-holding power
4) Freedom from warp
b. Wood types
c. Wood grades
d. Size and thickness
1) Most farm fences - 1" thick, 6" wide, 16' long
2) Corral or barn lot - 2" thick, 6" wide, 10' long
e. Treated - preservatives
1) Fences and gates - treat with wood preservative
2) Fences not to be painted - preservative - creosote, penta, copper napthenate in heavy oil
3) Fence to be painted - clear preservative - penta, cooper napthenate in light oil
4) Commercially-treated lumber
5) Wood posts should be treated from bottom to just above ground level

C. Line posts

1. Considerations

a. How closely your livestock is confined
b. What kind of fence you plan to use
c. How long it will last
d. How much it costs
e. Kinds of posts available
f. Lightning protection needed
g. Height of fence

2. Number of posts to use

a. Woven-wire: 12'-14' apart
b. Barbed-wire: 10'-12' apart
c. Board: open field - 8' apart, barn lot - 5-6' apart
d. Suspension: 80-100 ft. apart

3. Length of posts

a. Permanent field fences: 7 foot line posts, set 2 1/2' in the ground
b. Corral fence: 7-9 foot line posts, set 3' in the ground (refer to TM - 6)

Suggested Learning Activities	Suggested Resource Materials
II. 1. TM - 4, perform an experiment trying to bend joints.	1. Fencing from local farmers, TM - 4
2. TM - 5, begin a barbed wire collection.	2. Hardware store, feed stores, farmers with old fences. TM - 5
3. Review grades of lumber, importance of quality in fencing.	3. Talk with local lumber yard for sources of samples.
4. Discussion on preservatives extending life of posts, etc.	4. Pamphlets from the paint or feed store.

II. C. 4. Size and type of posts (TM - 7)

a. Straight, open-field: standard steel posts, standard 4" concrete posts, or 2 1/2" or larger wood posts
b. Fencing on contour: 4" or 5" wood or concrete posts
c. Sandy or wet soils: 4" or 5" posts
d. Barnlots or corrals: 4" posts (or larger)
e. Board fence: 4" flat face wood posts

D. Gates (TM - 8)

1. Size

a. Livestock: 10-12' wide, 52-54" high
b. Equipment: 14-16' wide, 52-54" high

2. Durability-type

a. Wood
b. Aluminum
c. Steel (most durable)

E. Fasteners (TM - 9)

1. Staples - fasten wire to wood

a. U shaped: most popular, lengths of 7/8" to 2"
b. L shaped: used for soft wood, lengths of 1 1/4" to 2"

2. Wire

a. Galvanized wire fasteners used to connect wire to steel posts
b. Same gauge as the fence wire

3. Nails: used on board fences

a. Types
1) Plain shank
2) Fluted shank: 50 times greater holding power than plain shank nail
3) Annularly shank
4) Helically threaded shank
b. Aluminum coated nails are more durable than galvanized and uncoated
c. Nail sizes range from 10d (penny) to 20d.

III. Tools Needed for Fence Construction (TM - 10) (additional references - see VEP I.D. of hand tools)

See TM-10A for list of tools.

IV. Fence Construction (TM - 11a and b)

A. Determining fence line

1. Determining fence lines on open, level and rolling areas

a. Set a stake at each end of the line and sight from one of the end stakes to the other as stakes are set in line with the original stakes about 100 ft. apart
b. To set a fence line on a hilly area, locate each end of the line in the valley on each side of the hill. Sight from each valley stake and place one stake on each slope of the hill.

Suggested Learning Activities	Suggested Resource Materials
III.1. Figure cost of fencing materials. Check on prices from local supplier.	1. Mechanics in Ag. Phipp.
2. Discussion on post spacing.	2. AAVIM. FENCING.
3. Show difference between good gates and poor gates.	3. Field trip and pictures from farm magazines.

IV. A. 2. Determining fence lines in undergrowth

a. Set a post and mount a pole on it long enough that it may be seen from a stake in a clear area. Use a level to check the pole, making sure it is vertical.
b. Set a center stake above the brush line, sighting from the open area (short stake) stake to the other end stake that projects above the undergrowth.
c. Clear the area between the short and middle stake.
d. Set the fourth stake in the same manner as the middle stake and clear another area.

3. Determining fence lines on the contour (TM - 12)

a. Set stakes along the curve about 16 1/2' apart.
b. To determine whether posts will be set closer than 16 1/2' apart, set three stakes in the curve and stretch a line from the first to the third stake. If the distance is less than 4", posts may be spaced 16 1/2 feet apart.
c. If the distance is over four inches, space the post as follows:

Distance from Center Stake to String (Inches)	Post Spacing (Feet)
4-5	15
5-6	14
6-8	12
8-14	10
14-20	8

B. Setting end, brace, gate, and corner posts (TM - 13a and b)

1. Wood posts

a. Set anchor posts in 3 1/2'-4' holes.
b. Replace soil around posts, tamp firmly; a plumb bob or carpenters level will aid setting the posts vertical. Bottom of post must be set right, tamp around bottom most important.
c. Use brace to determine distance between anchor and the first brace post. Brace should be about 8 feet long.
d. Dig the brace post hole about 3 feet 6 inches deep.
e. Mark anchor poles about 10 inches from top.
f. Drill a hole in the center of the brace and a hole about halfway through the anchor post on the brace side.
g. Drive the dowels in the posts. Place the brace in the proper position by inserting the dowels in the brace dowel holes.
h. Tamp soil around the brace post.
i. Drive staples, one 4" from the ground on the anchor post and 4" above the brace on the brace post, to hold brace wire in place while the wire is being tightened.
j. Make two complete loops with the wire around the post; place wire above the staple on the brace post and below the staple on the anchor post.
k. Pull the slack from the wire and make a wire splice, twist the wire with a stick or steel rod until the post assembly is tight.
l. The line-post brace assembly has two brace wires between each span.

2. Steel posts (TM-14)

a. Mount all steel corner, end, gate and brace posts in concrete.
b. Mount post braces in concrete.
c. The braces are set in piers 20" square at top and bottom and 18" deep.

Suggested Learning Activities	Suggested Resource Materials
IV. 1. Go over tools needed and their purposes. (TM - 10)	1. VEP Tool I.D.
2. Quiz students on tool I.D.	2. T.M. 10

IV. C. Setting line posts (TM - 14).

1. Wood posts

   a. Dig holes with a power hole digger or by hand. Dig holes at same depth (see IIC3) and spacing (see IIC2).
   b. Posts may be set at the same height by sighting from the top and either adding or removing soil to set the posts at the proper height.
   c. Align by using an aligning wire or cord as soil is being replaced and tamped.

2. Steel or small wood posts

   a. May be driven into the soil with a power or hand operated driver.
   b. Steel posts must be set so that the wire holding studs are on the wire side.

D. Stretching woven wire (TM - 15)

1. Place close mesh end next to the post and unroll the distance of about three line posts. The wire should be on the livestock side of the fence.

2. Staple line wires to anchor posts, wrap wires around the post, and tie with a splicing tool or pliers. Unroll wire to next anchor post.

3. If more than one roll of wire is needed, splice the line wires with the two stay wires pulled together. Wrap the two line wires at each mesh section in the opposite direction (TM - 16).

4. Set up a dummy post to attach fence stretcher. If a single jack stretcher is used, place jack about 1" below center line. If double jack is used, place at an equal distance from top and bottom wire (TM - 17)

5. Stretch wire until tension curves are about 1/4 straightened out.

6. Staple (wood) or wire (metal) the fence to posts on ridges and low places before fastening on level ground. Start at tight edge of the fence to fasten line wires.

7. Cut wire allowing five inches for wrap. Remove stay wires and fasten line wires around post working from the center.

E. Stretching barbed wire (TM - 17)

1. Fasten barbed wire to posts in the same manner as woven wire.

2. Start wires at top of posts and work downward.

3. Unroll wire down fence line to brace post.

4. Attach block and tackle wire stretcher to wire at the same height as the attachment before unrolling wire. Stretch wire.

5. Mark or notch a stick to use as a spacer for additional wire.

6. Drive staples in wood posts by slanting point downward at an angle on wire leaving wire loose on head of staple.

7. Spacing of wire

   a. Six-wire: 52" high, 1st (ground) wire 12", each additional wire 8".
   b. Five-wire: 52" high, 1st (ground) wire 12", each additional wire 10".
   c. Four-wire: 46" high, 1st (ground) wire 16", each additional wire 10".

8. Tie the wire around the post and remove the wire stretcher.

Suggested Learning Activities	Suggested Resource Materials
IV. 1. Have students set steel posts in line-sight method.	1. TM - 11a & 11b U.S.D.A. Farm Fencing
2. TM - 12, determine fence lines on a contour.	2. Texas Voc. Ag. Publications.
3. Have students set corner brace.	3. TM - 13a & 13b
4. Have students layout square corner using 3,4,5 method (A + B = C)	4. Shopwork on the Farm Jones
5. I.D. of types of steel post.	5. TM - 7, 14

IV. F. Installing an electric fence

1. If fence cannot be tied to posts or a permanent fence, set two posts with a brace between to serve as a corner or end post.

2. Drive steel posts or sharpened stakes into ground 30-40' apart.

3. Attach spacer insulators to posts.

   a. Horses and cattle: 2 1/2 - 3 feet high.
   b. Hogs: 1/2 - 1 1/2 feet high.

4. Attach wire to insulators, make sure that it touches nothing else. Barbed wire usually make a better fence than smooth wire, but it is more difficult to handle.

5. Install a gate using an insulated handle attached to loops in the wire. Be sure current is allowed to flow.

6. Attach the fence to a controller that is well grounded.

G. Erecting a board fence

1. If the fence is straight, drive a stake at each corner and stretch a cord between the stakes.

2. If the fence is curved, set additional stakes in curve. An angular fence will require additional stakes at the corners.

3. Locate all posts on 8-foot centers except the distance between the first and last two posts, which should be 7' 10".

4. If the posts are in a straight line, place posts in every fourth or fifth hole and tamp soil around them and check the vertical position with a carpenters level. Adjust the height of the remaining posts by using a stretched string.

5. On an angular fence, set the posts in the corners and stretch the string then set the other posts.

6. For posts that are 8-foot centers: (TM - 6)

   a. Top board is 16 feet long.

   b. First section second board is 8 feet long, followed by 16 feet lengths in all other sections.

   c. First section third board is 16 feet long, followed by 16 feet lengths.

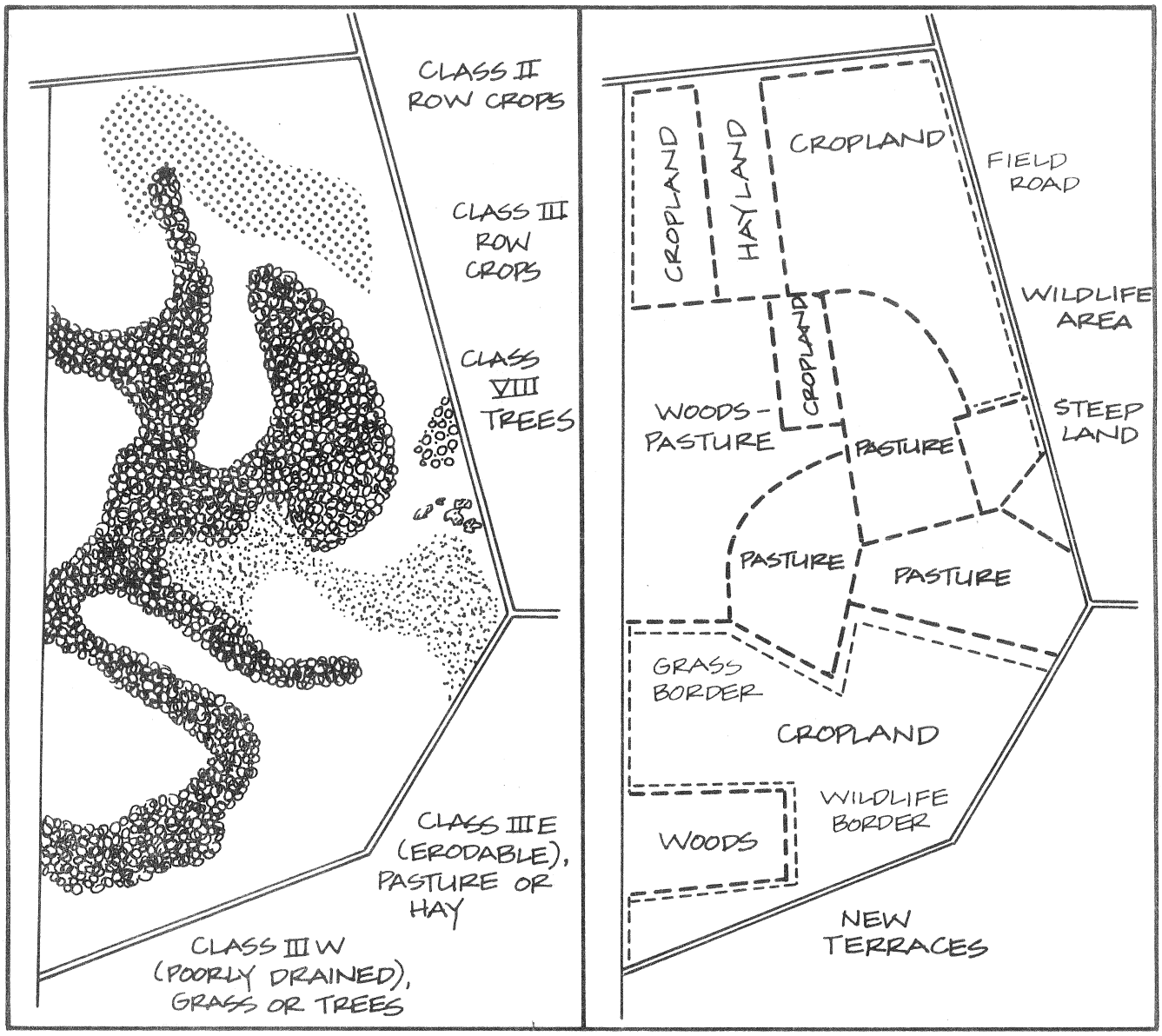
   (This system causes alternating joints.)

Suggested Learning Activities	Suggested Resource Materials
IV. 1. Discussion of wire spacing.	1. Keystone wire.
2. Uses of electric fence.	2. AAVIM FENCING
3. Show students how to figure a bill of materials for fencing materials.	3. U.S.D.A. Farm Fences Shopwork on the Farm, Jones.

Student Evaluation

1. Identify fencing tools and materials.
2. Demonstrate the use of fencing tools on a given fencing assignment.
3. Develop a bill of materials for a given fencing assignment.

FARM FENCE LAYOUT



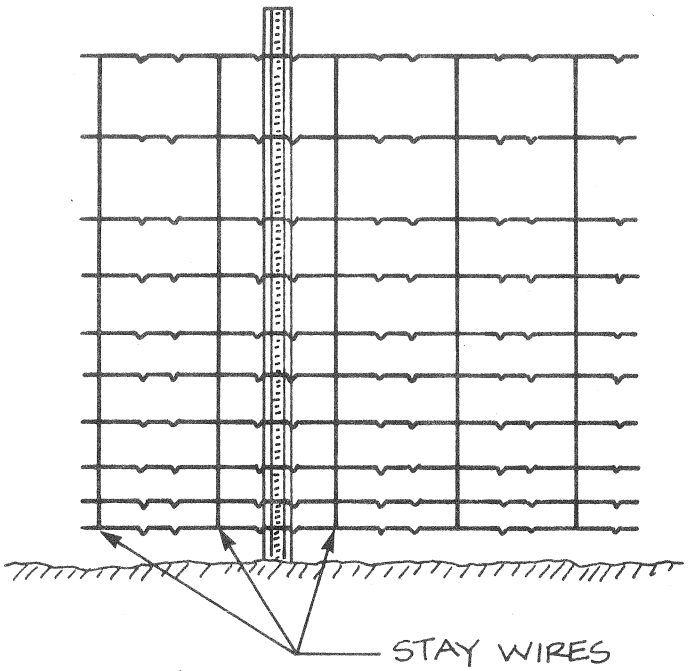
LAND CAPABILITY MAP

FENCE LAYOUT FOLLOWS LAND CAPABILITY

WIRE SIZES AND GAGES FOR FENCES

GAGE		DIAM. (IN.)	USE
9		.1483	
10		.1350	
11		.1205	
12 1/2		.0990	
14		.0800	
14 1/2		.0760	
18		.0475	

WOVEN WIRE DESIGNATIONS



DESIGN NO. 10 47-12-11

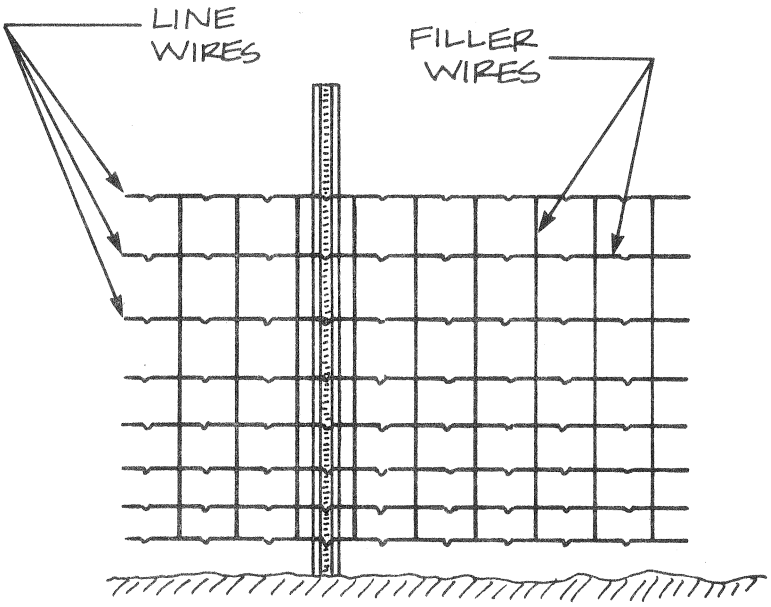
10 = NUMBER OF LINEWIRES

47 = HEIGHT OF FENCE (INCHES)

12 = STAY SPACING (INCH)

11 = FILLER WIRE GAGE

TOP AND BOTTOM WIRES
= 9 ga.



DESIGN NO. 8 32-6-12½

8 = NUMBER OF LINEWIRES

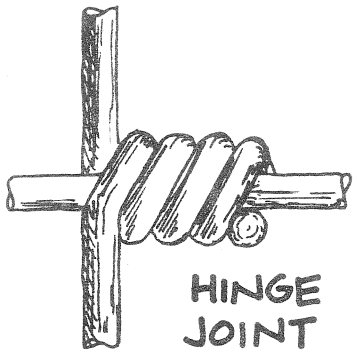
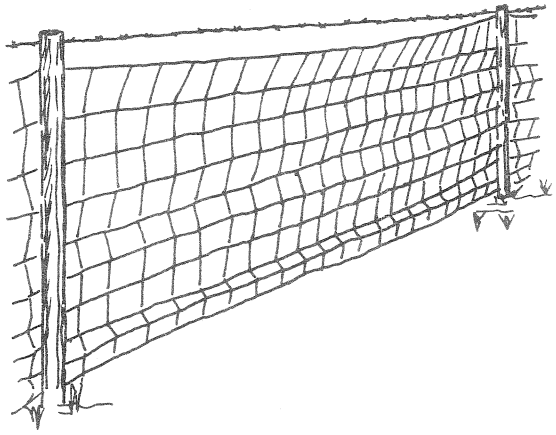
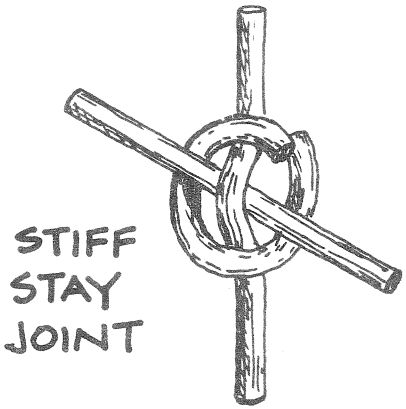
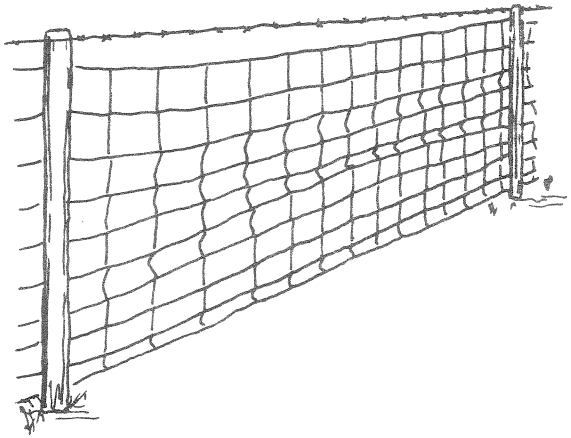
32 = HEIGHT OF FENCE (INCHES)

6 = STAY SPACING (INCH)

12½ = FILLER WIRE GAGE

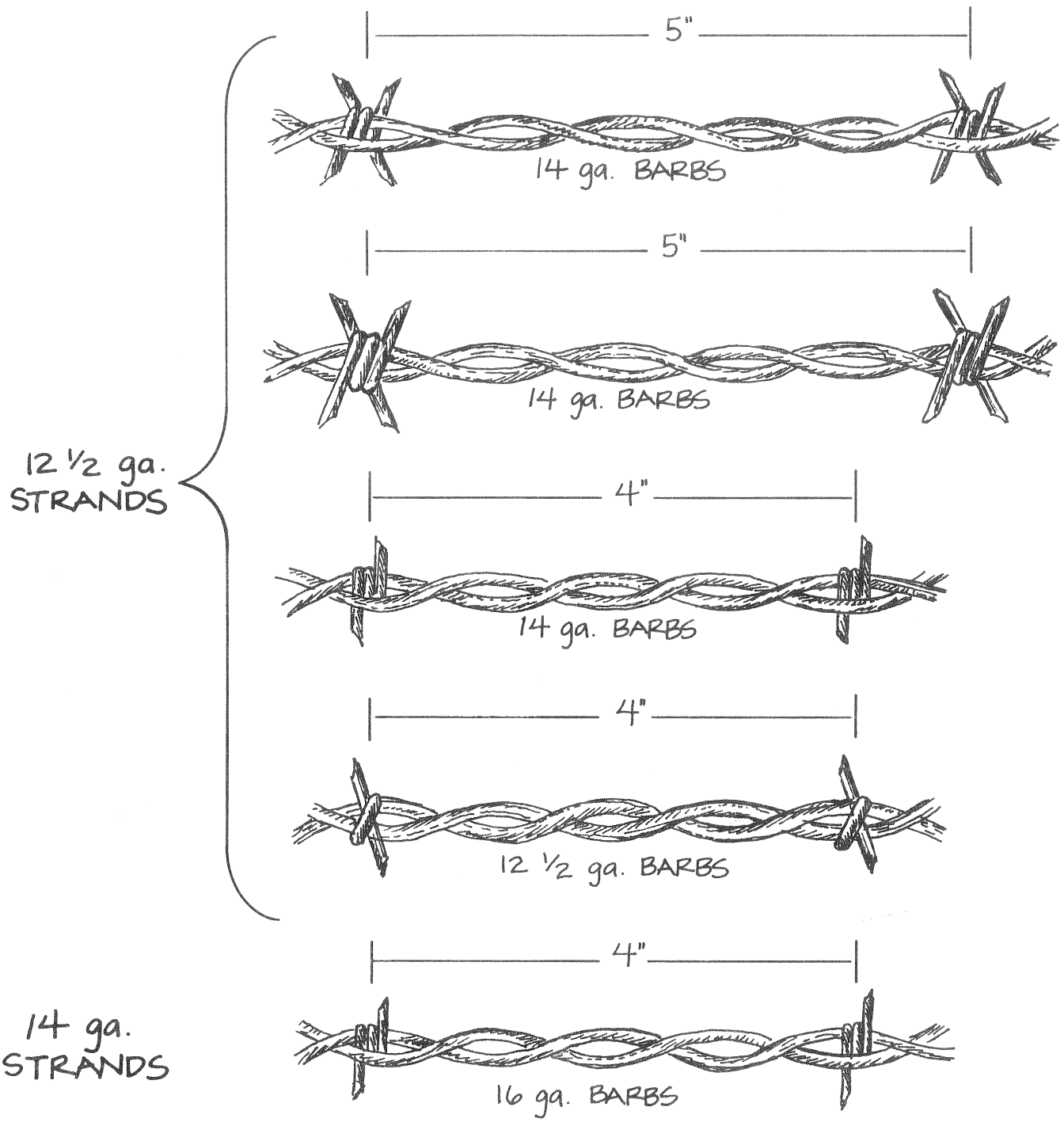
TOP AND BOTTOM WIRES
= 10 ga.

TYPES OF JOINTS

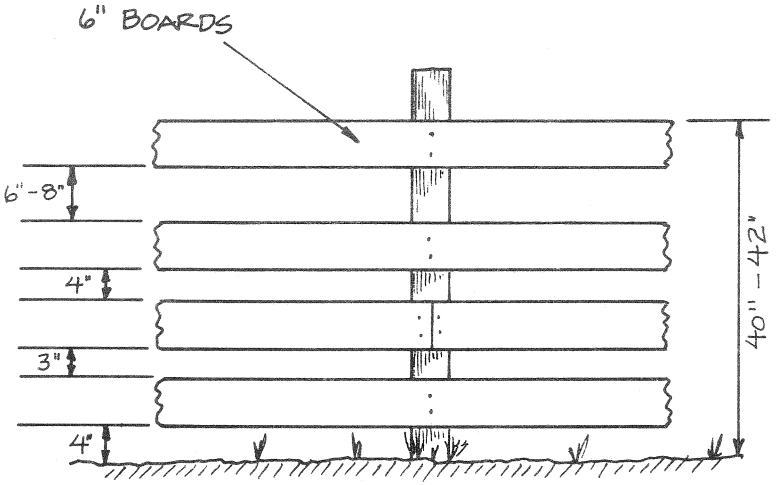
JOINT		RESPONSE TO LIVESTOCK MASHING
 HINGE JOINT		FLEXES AT STAY-WIRE JOINTS WIRE BENDS LITTLE EASILY STRAIGHTENED STAY-WIRES CAN BE SPREAD APART.
 STIFF STAY JOINT		BENDS THE STAY WIRES STAYS MUST BE BENT BACK INTO POSITION

BARBED WIRE

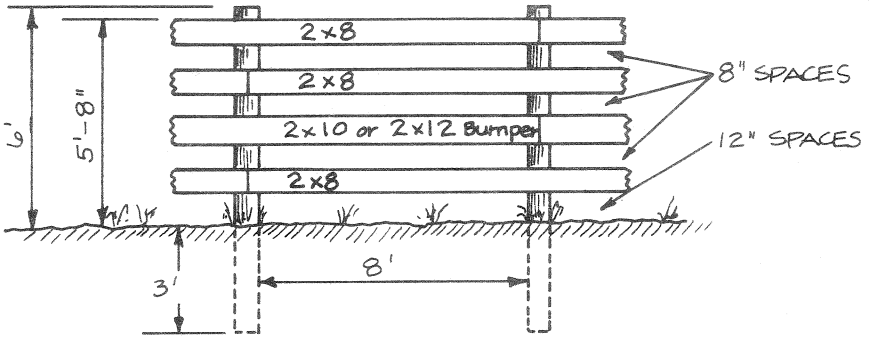
TM-5



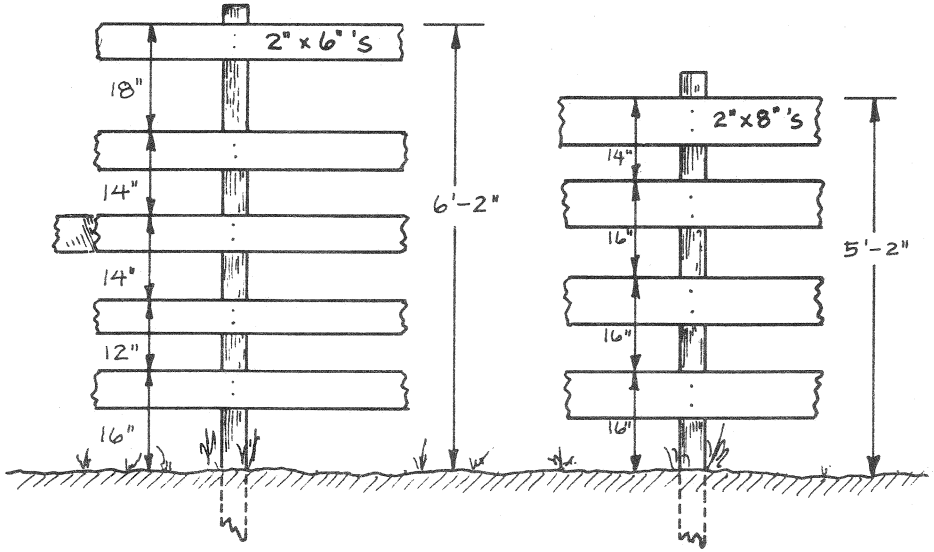
BOARD FENCE STYLES



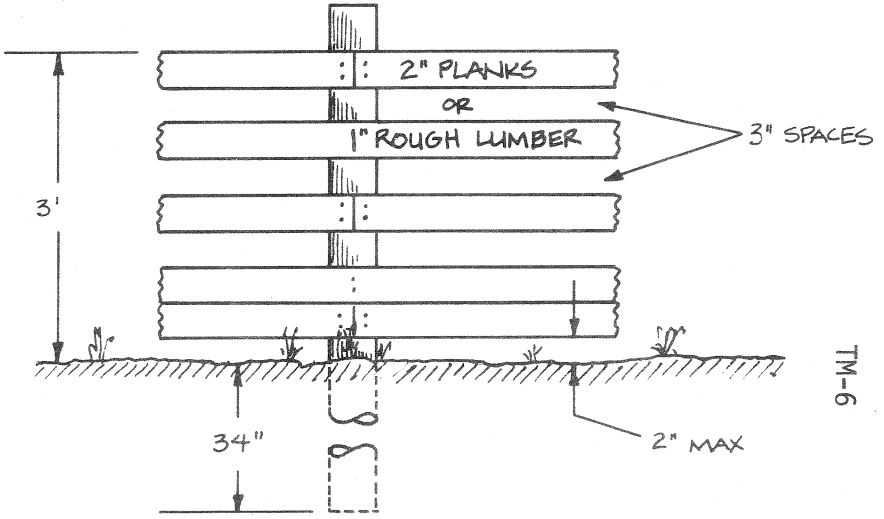
FOR SHEEP



FOR HORSES



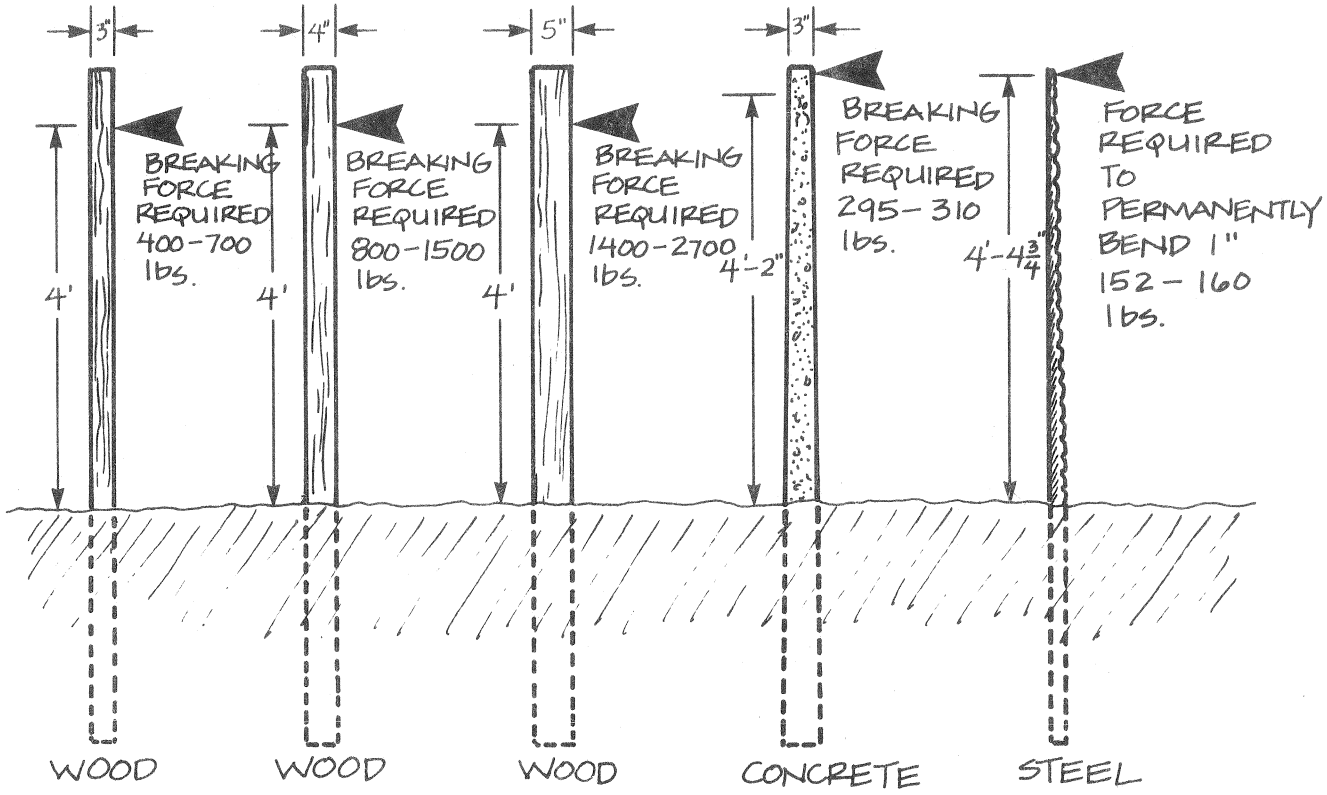
FOR CATTLE



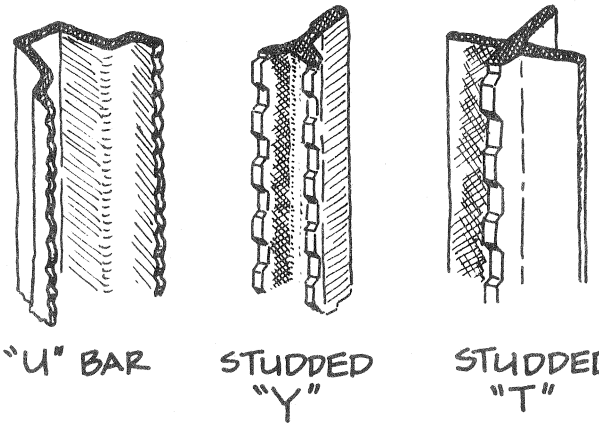
FOR HOGS

TM-6

SIZE AND TYPE OF POSTS TO USE



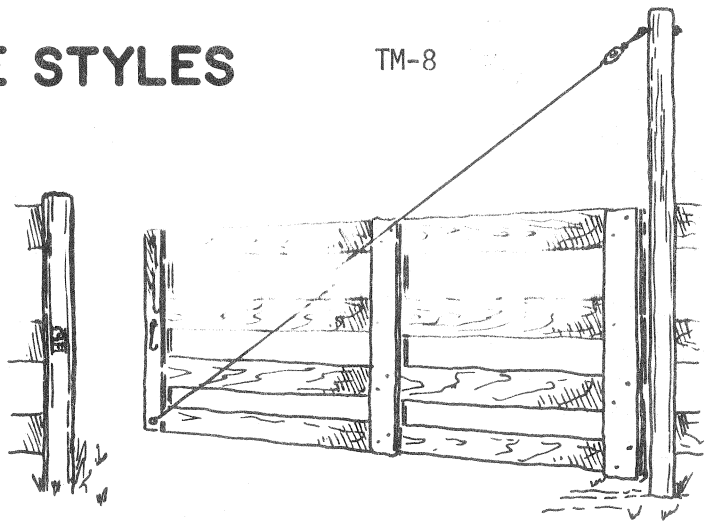
COMMON KINDS OF STEEL POSTS



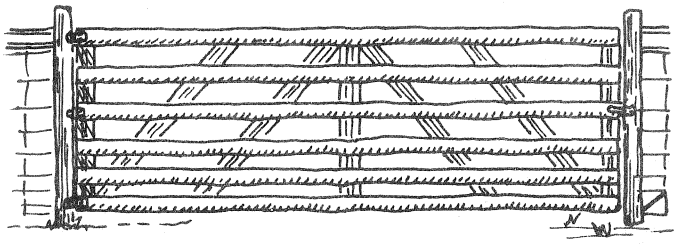
GATE STYLES

TM-8

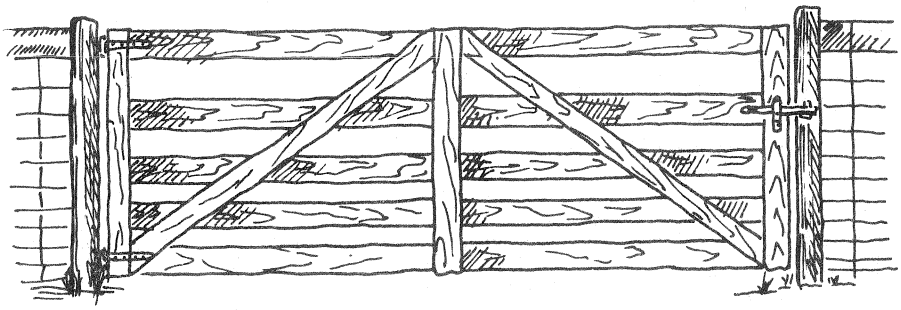
HEAVY DUTY ALL WOOD GATE



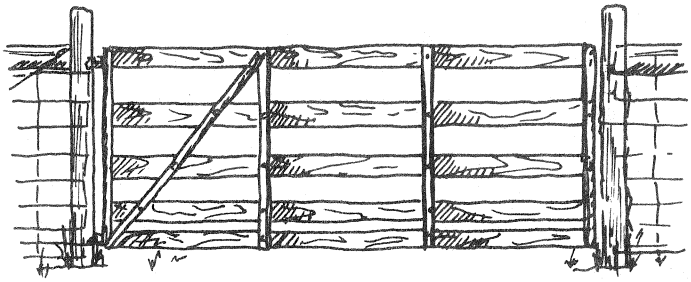
ALUMINUM GATE



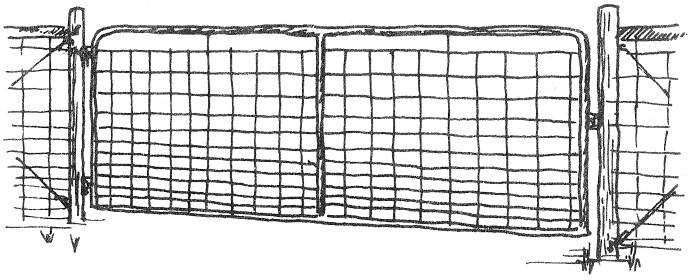
DOUBLE BRACED, ALL-WOOD GATE



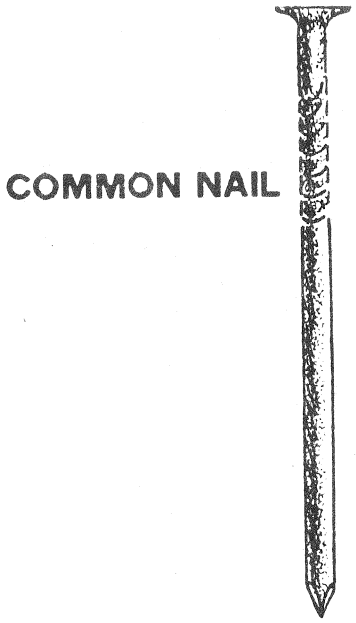
WOOD GATE WITH STEEL BRACING

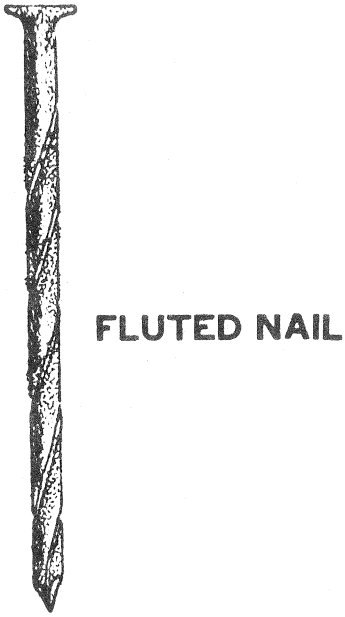


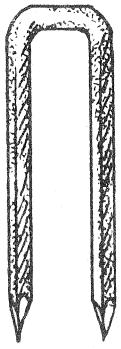
STEEL GATE WITH FENCE FILLER



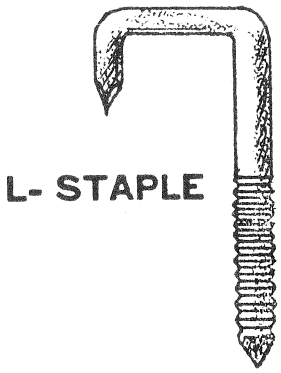
WOVEN WIRE AND FASTENERS

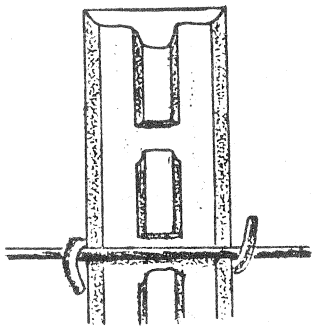






U-STAPLE

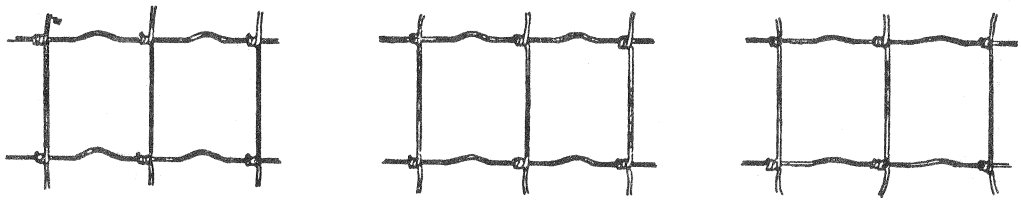




WIRE FASTENER

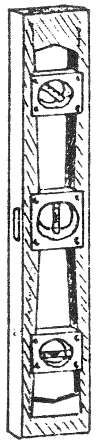
BEFORE STRETCHING

STRETCHED TOO TIGHT

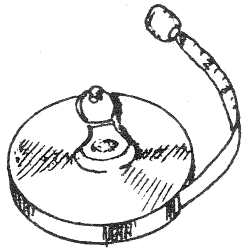


AFTER STRETCHING

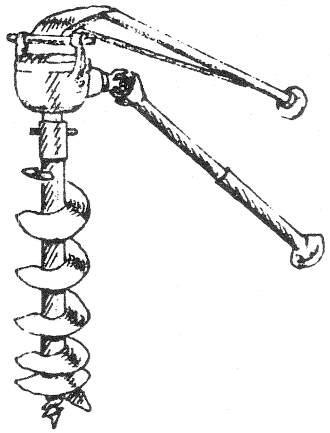
FENCING TOOLS



CARPENTER'S LEVEL

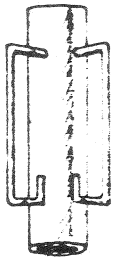


STEEL TAPE

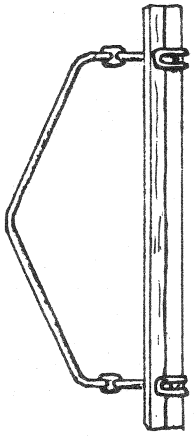


POWER DIGGER

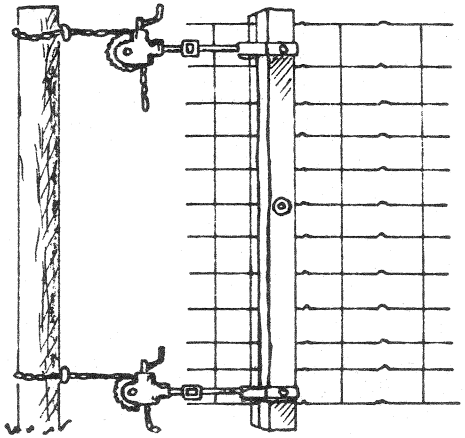
HAND DIGGER



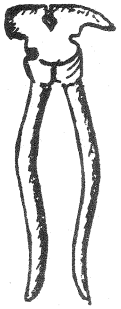
STEEL POST DRIVER



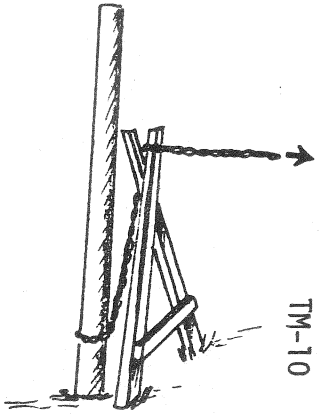
STRETCHING CLAMP



DOUBLE JACK STRETCHER



FENCING PLIERS



POST PULLER

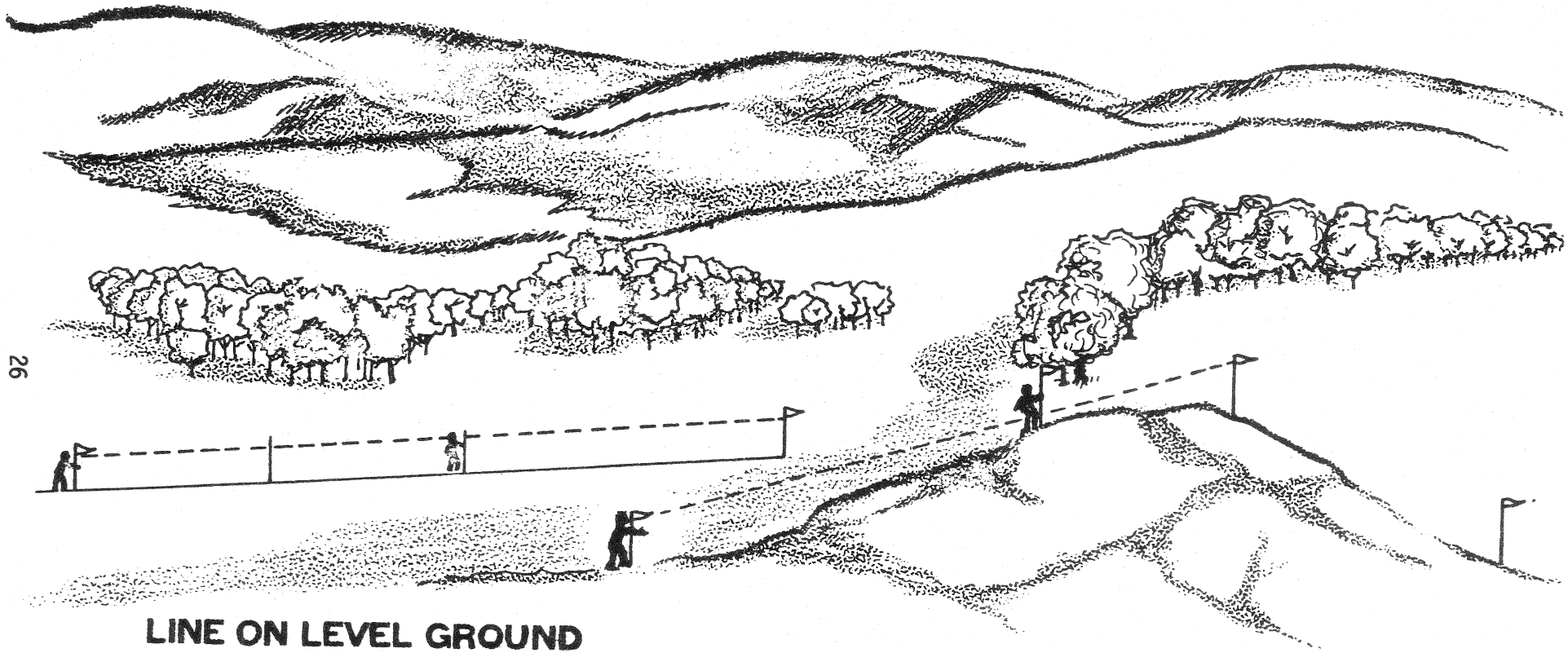
TM-10

TOOLS NEEDED FOR FENCE CONSTRUCTION

TM-10A

A. Carpenter's Level
B. Stakes
C. Steel tape
D. Six foot rule
E. Heavy cord
F. Power digger
G. Hand digger
H. Tamper
I. Crowbar
J. Post puller
K. Post driver
L. Stretching clamp
M. Hand saw
N. Brace and bit
O. Wire stretcher
P. Fencing pliers
Q. Wrecking bar
R. Hammer
S. Axe
T. Wire winder
U. Shovel
V. Wire tightening rod
W. Gauge pole

DETERMINING FENCE LINE

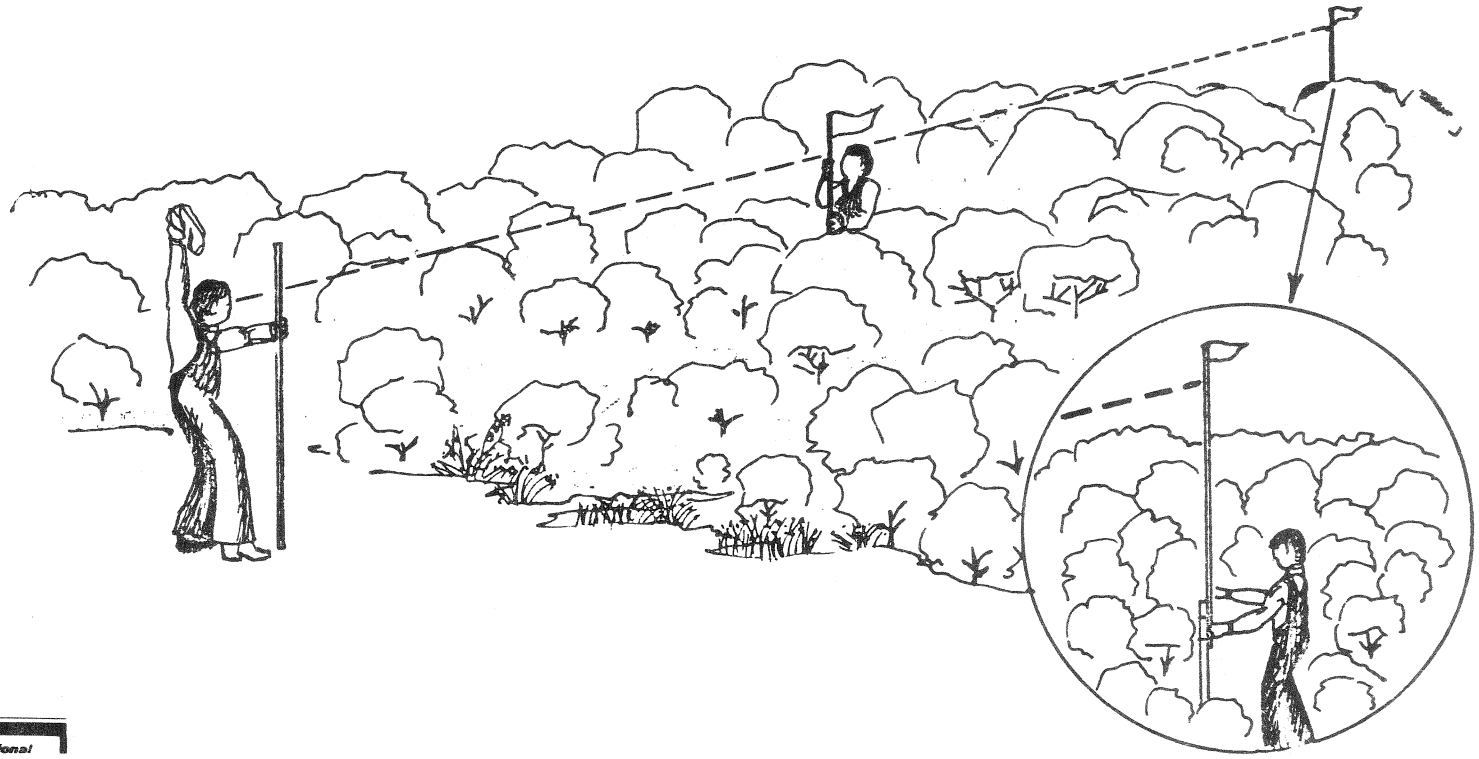


LINE ON LEVEL GROUND

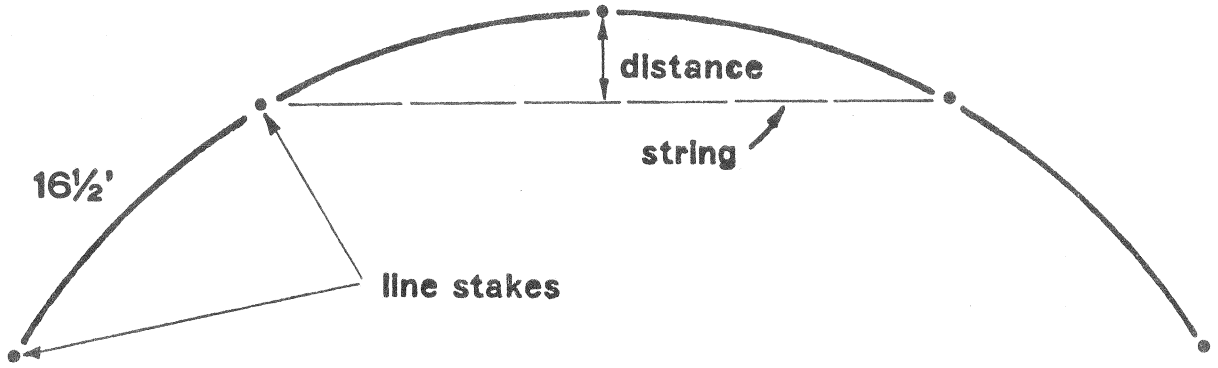
LINE ON HILLY GROUND

DETERMINING FENCE LINE

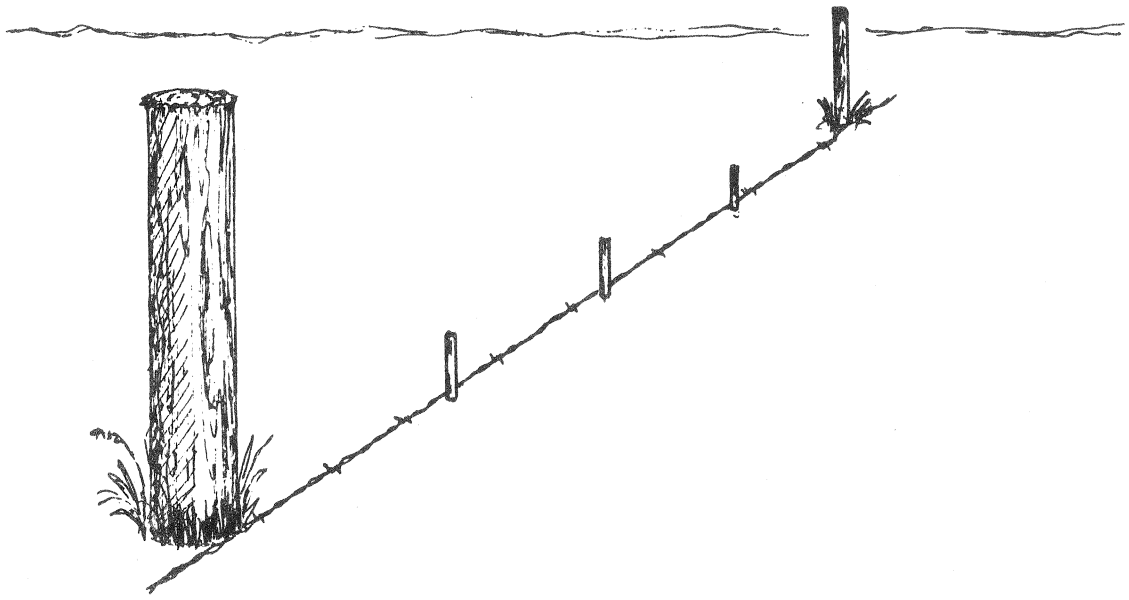
LINE IN BRUSH



DETERMINING FENCE LINE

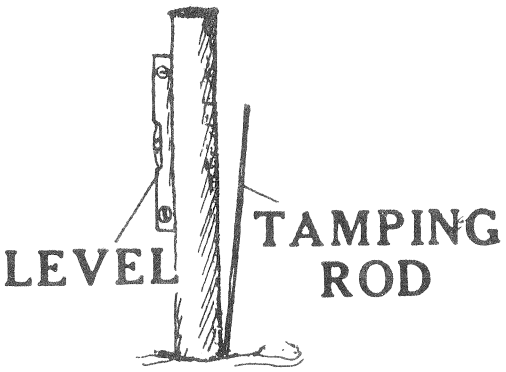


LINE ON CONTOUR

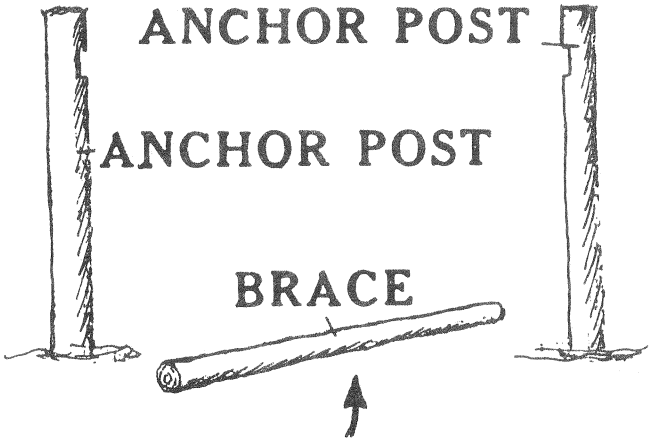


ALIGNING POST WITH WIRE

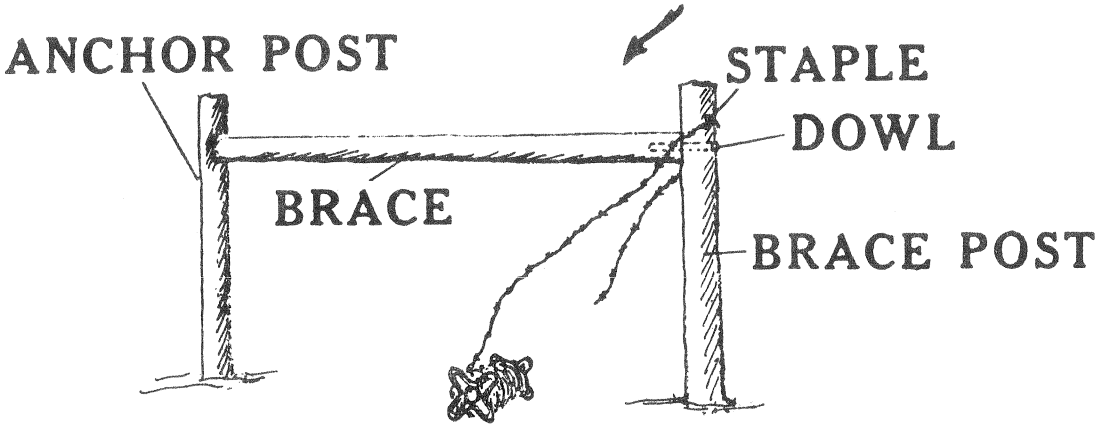
SETTING POSTS

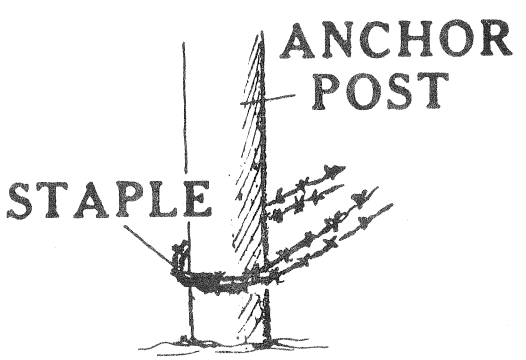


ANCHOR POST

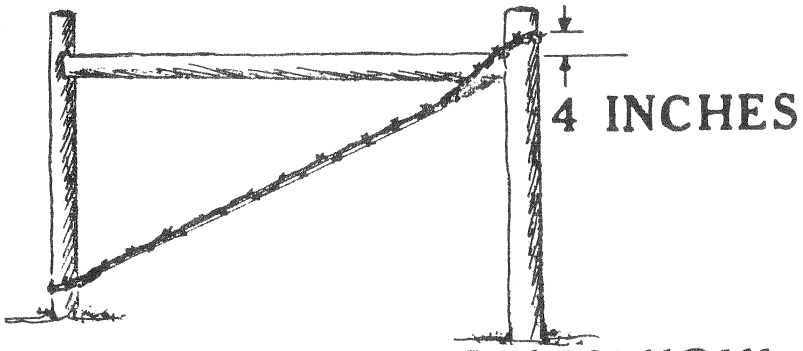


FIRST BRACE SPAN





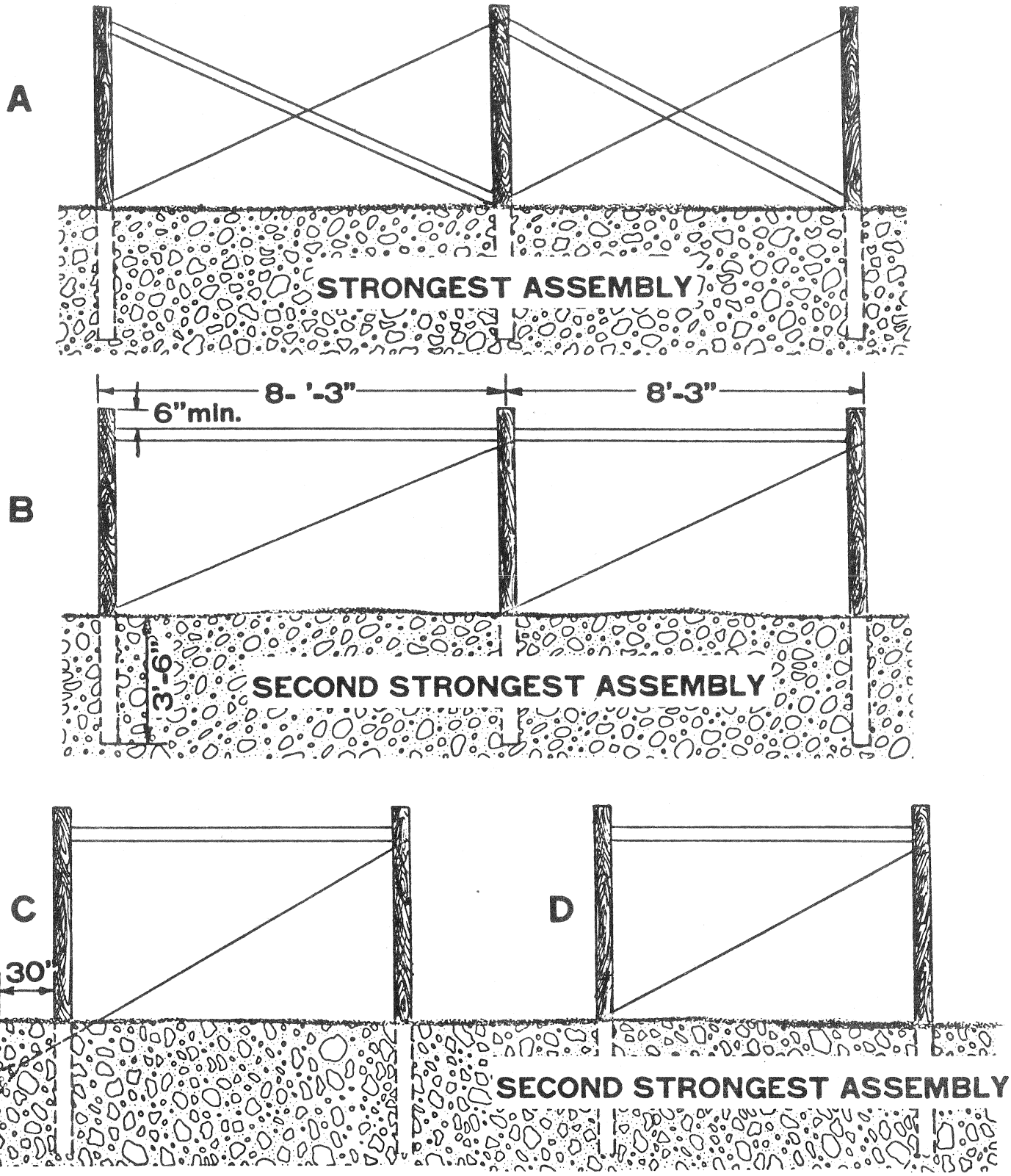
ANCHOR ASSEMBLY



ANCHOR ASSEMBLY COMPLETED

ANCHOR ASSEMBLIES

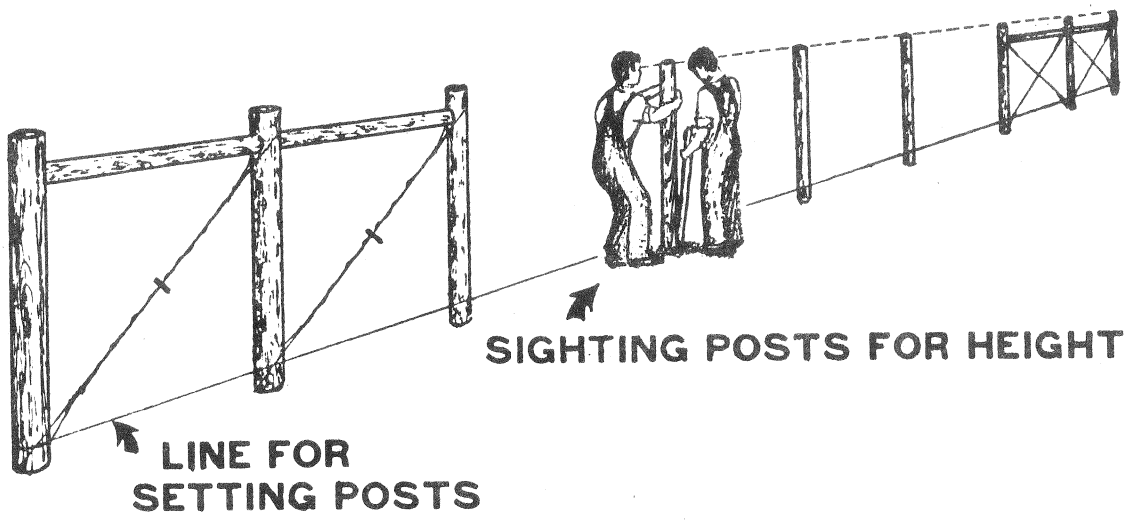
TM-13B



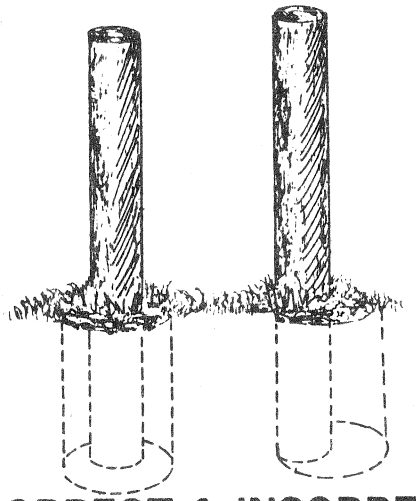
STRONGEST SINGLE ASSEMBLY

SETTING LINE POSTS AND CORNER STEEL POSTS

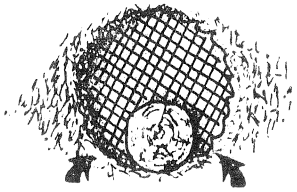
TM-14



METHOD OF SETTING POSTS

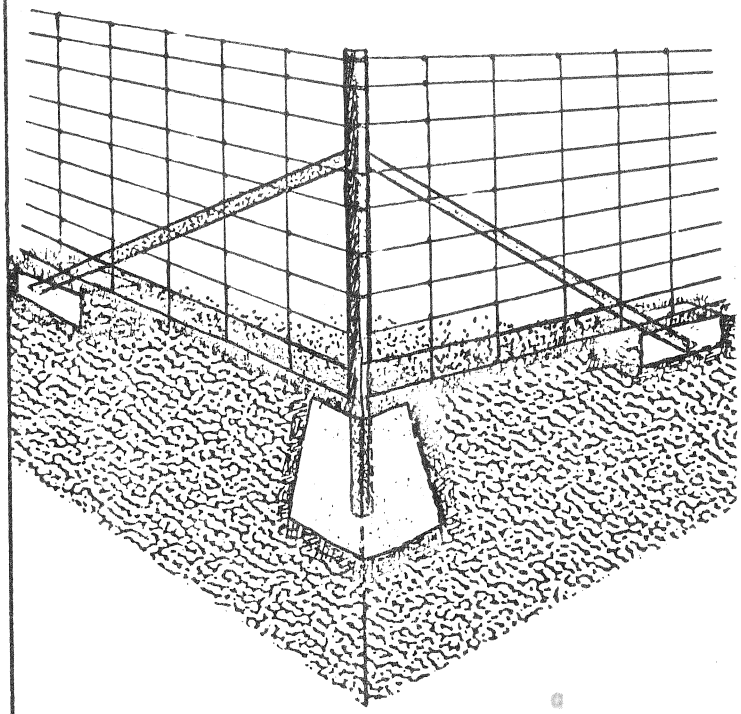


CORRECT & INCORRECT



these areas difficult to tamp

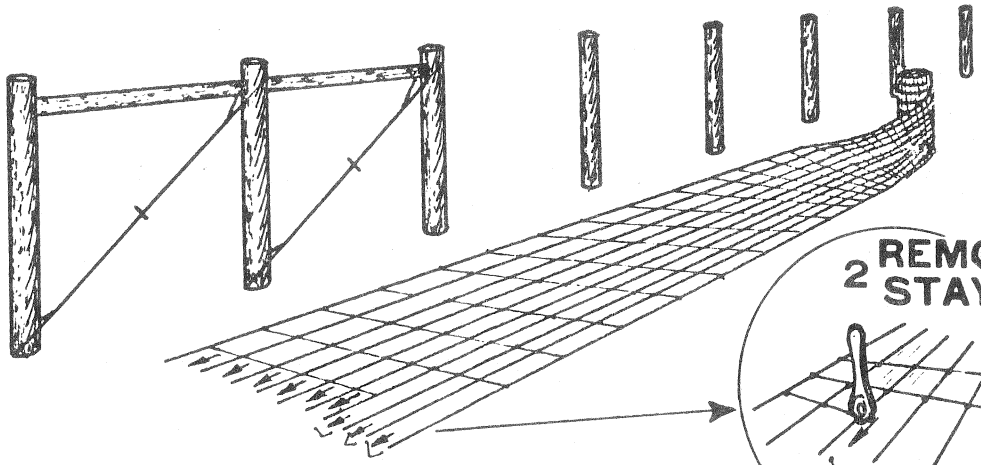
STEEL CORNER POSTS SET IN CONCRETE



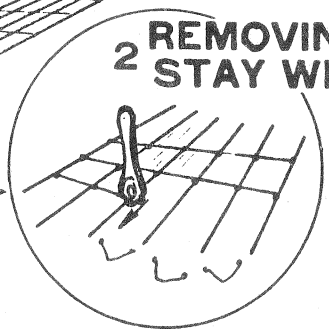
STRETCHING WIRE

TM-15

1

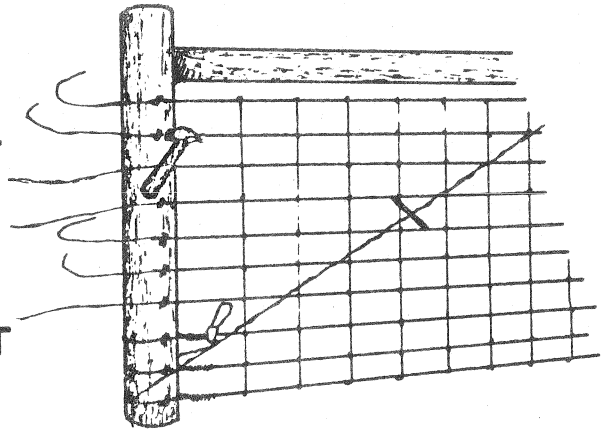


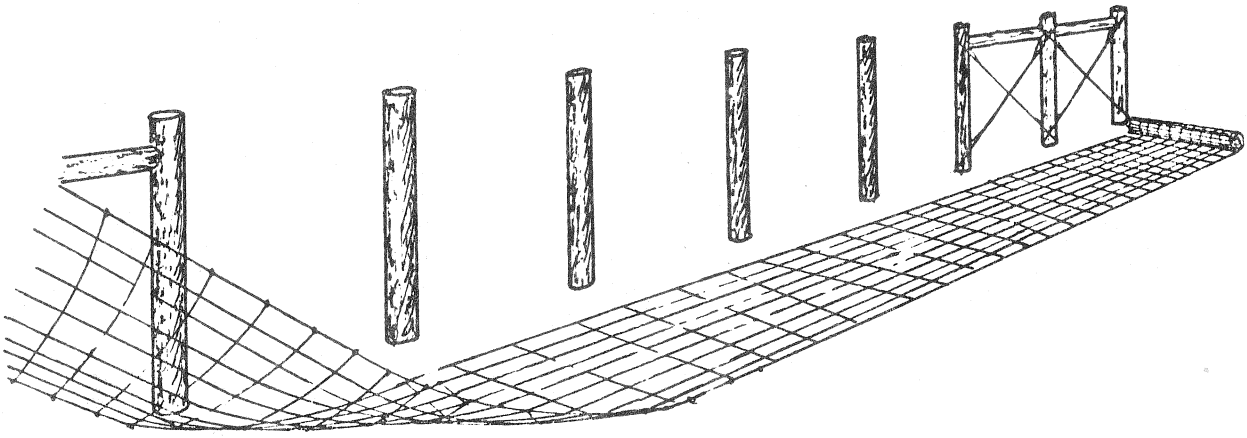
2 REMOVING STAY WIRE



3
STAPLING TO ANCHOR POST

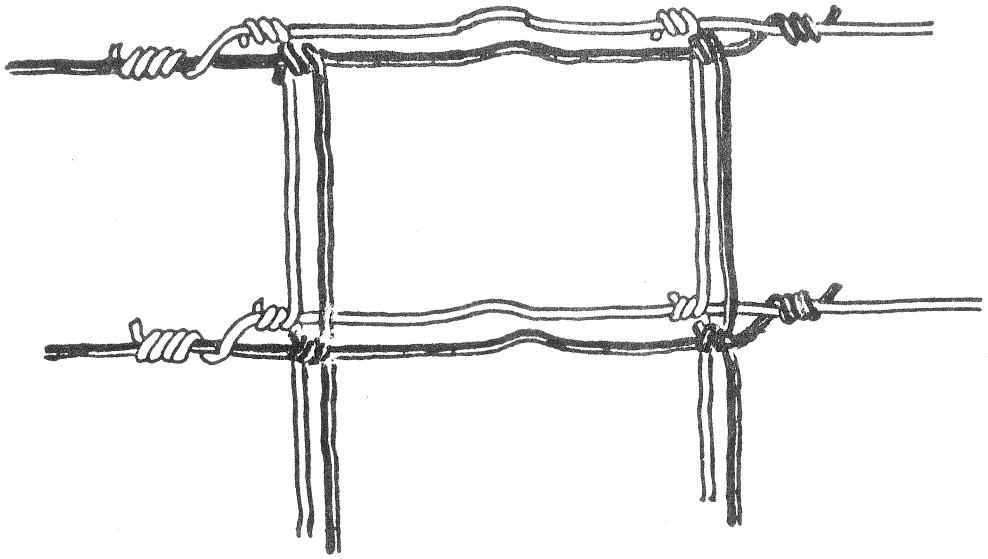
4
TIEING WIRE AROUND POST



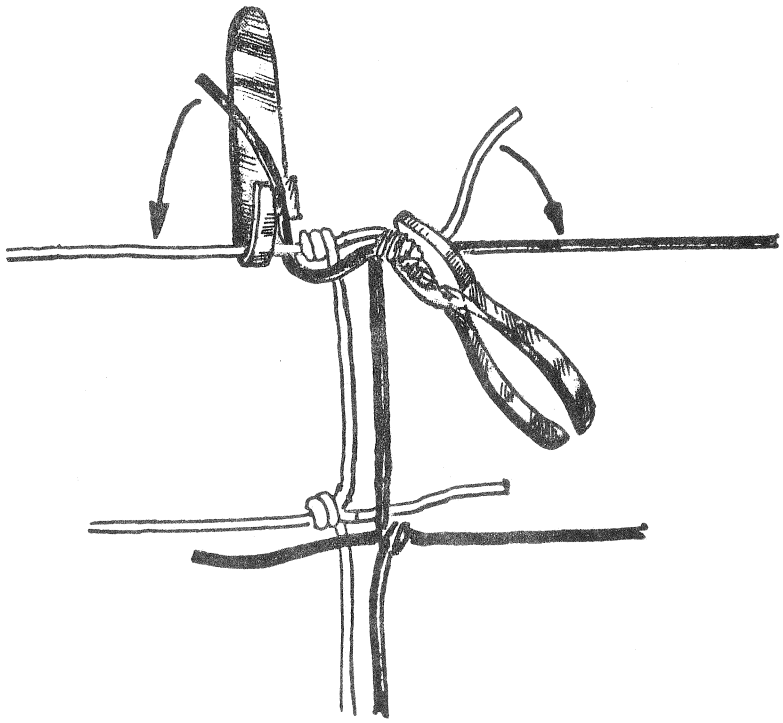


5
UNROLL TO ANCHOR POST

SPLICING WIRE

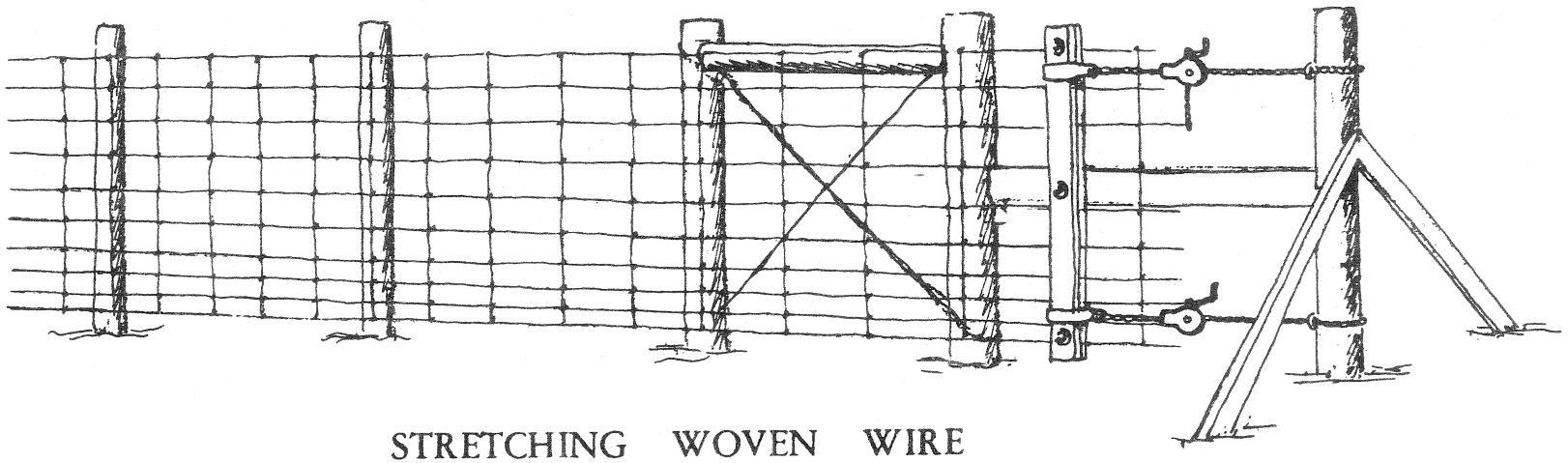


MESH OVERLAP WOVEN WIRE



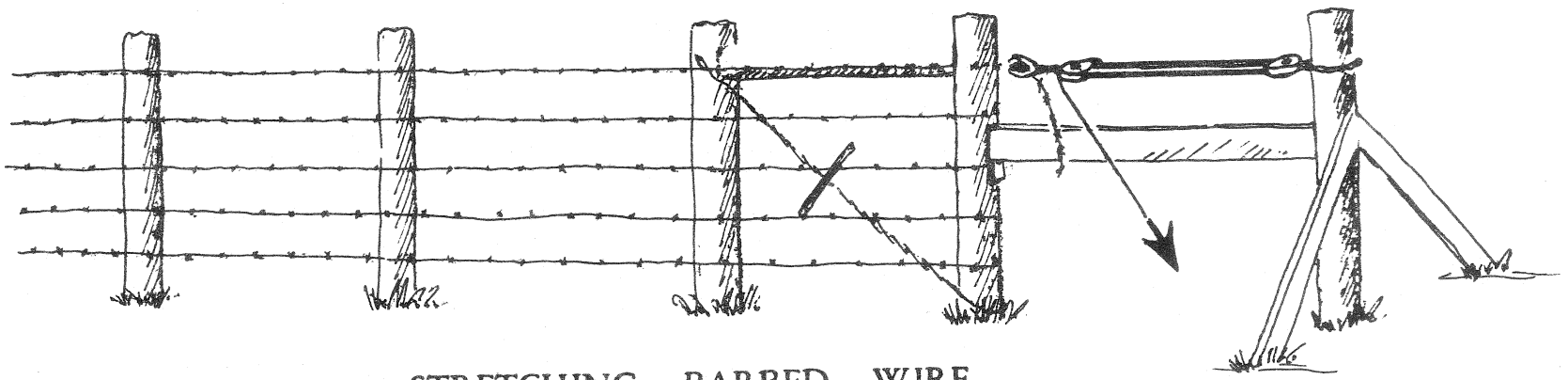
NO OVERLAP SPLICE

STRETCHING WIRE



STRETCHING WOVEN WIRE

DUMMY POST



STRETCHING BARBED WIRE

DUMMY POST

General References

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