BELL SYSTEM PRACTICES
Outside Plant Construction and Maintenance

SECTION G52.172
Issue 1, June, 1932
Provisional Standard

AERIAL CABLE

LONG SPAN CONSTRUCTION SPANS LONGER THAN 250 FEET

Contents **Page**

1. STANDARD NAMES OF SUPPLIES

1.01 No materials other than those listed in the Outside Plant Construction and Maintenance Practices covering Aerial Cable, Open Wire and Guying are required for use under these instructions except the following items:

Crossarms: **SPECIAL STEEL ANGLE IRON CROSS-ARMS** (For use on H fixtures)

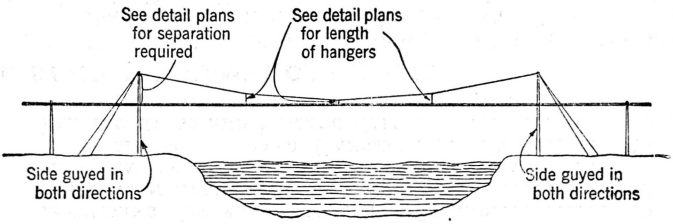
Thimbles: **1/2 IN. GALVANIZED THIMBLES**

2. GENERAL

2.01 These practices cover standard methods and materials for use in connection with the construction of spans longer than 250 feet in cable lines.

3. AERIAL CABLE SPANS LONGER THAN 250 FEET

3.01 The general arrangement of long span cable crossings over 250 feet in length is indicated below. The weight of the cable in the long span is carried by one or more catenary suspension strands, as required, to which the cable suspension strand is attached by vertical hangers. The catenary suspension strands are dead-ended at the crossing poles which are head guyed to take the tension in the catenary suspension strands and are side guyed against storms. The crossing poles may be either single poles or poles arranged as H fixtures, the detail plans showing which type of construction is to be used.



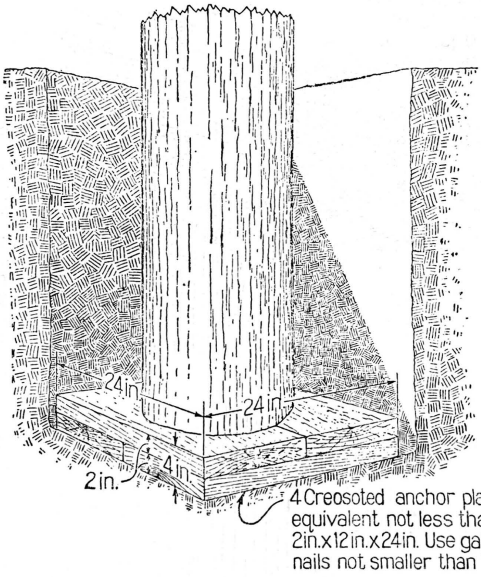
4. SETTING POLES

4.01 Set the long span crossing poles to the standard depth for the length of pole involved.

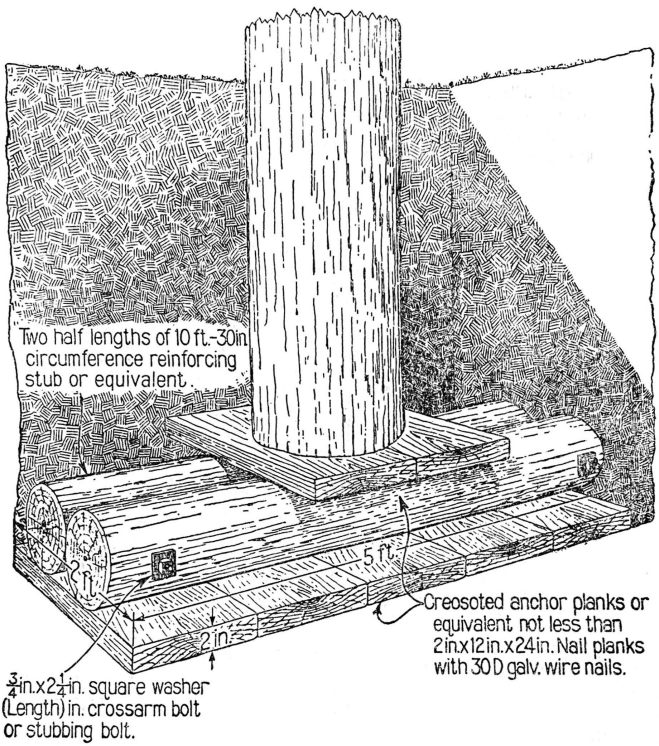
4.02 Where the detail plans do not specify the type of footing to be used under the butts of the crossing poles, install footings as called for in the following table:

TYPE OF FOOTING FOR LONG SPAN CROSSING POLES

Size and Number of Catenary Suspension Strands Per Pole	Firm Footing Including Compact Gravel or Sand	Pure Clay
1-16M	None	Type A
1-25M	None	Type A
2-25M	Type A	Type B



TYPE A



TYPE B

4.03 Where the bottom of the hole is rocky throw a few inches of sand or fine dirt in the bottom of the hole before setting the pole so that an even footing will be provided for the butt of the pole.

4.04 When setting poles for H fixtures and before backfilling the holes see that the poles are 6 feet 8 inches apart center to center.

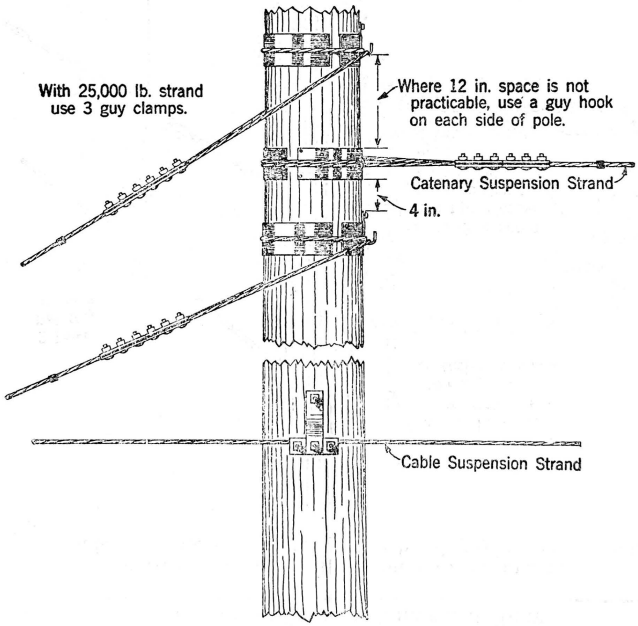
5. HEAD GUYING

5.01 Install the necessary head and side guys before placing either the catenary suspension strand or the cable suspension strand.

5.02 Head guy each crossing pole away from the long span as follows:

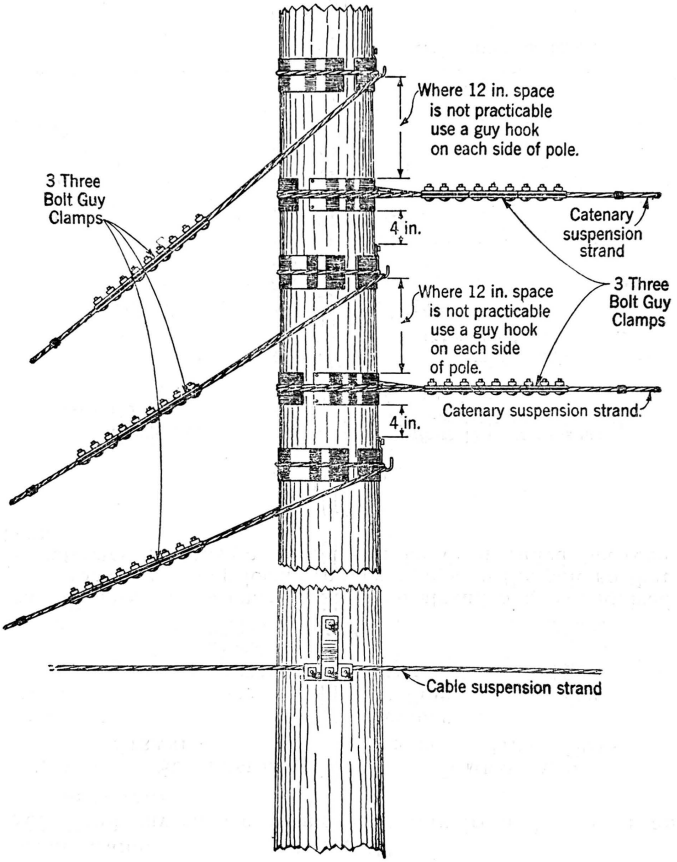
Catenary Suspension Strands		Number and Size of Head Guys	
Number Per Pole	Size	Number Per Pole	Size
1	16,000	2	16,000
1	25,000	2	25,000
2	25,000	3	25,000

5.03 Where one catenary suspension strand only is required for the crossing locate the head guys on the pole so that the catenary suspension strand can be dead ended between them.

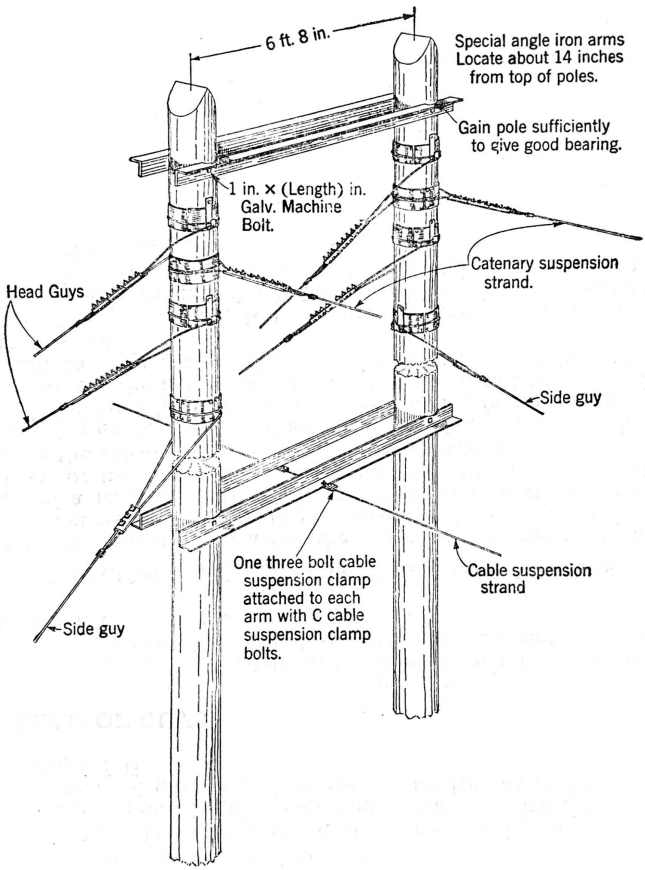


Long Span Const.—Spans Longer Than 250 Feet

5.04 Where two catenary suspension strands are to be dead ended on one pole arrange the head guying as indicated below:



5.05 Where one catenary suspension strand is to be dead ended on each of the two poles of an H fixture, use the following arrangement:



6. SIDE GUYING

6.01 For single poles place a 6000-pound side guy in both directions on each of the crossing poles attaching the guy directly below the bottom head guy.

6.02 Where H fixtures are used at the crossing instead of single poles install a 6000-pound side guy directly below the lower head guy on each of the fixture legs as indicated in paragraph 5.05.

7. LEAD OF GUYS

7.01 Make the lead of the head guys as nearly as practicable 1-1/4 times the height of the guy and not less than the height of the guy. Make the lead of the side guys not less than the height of the guys.

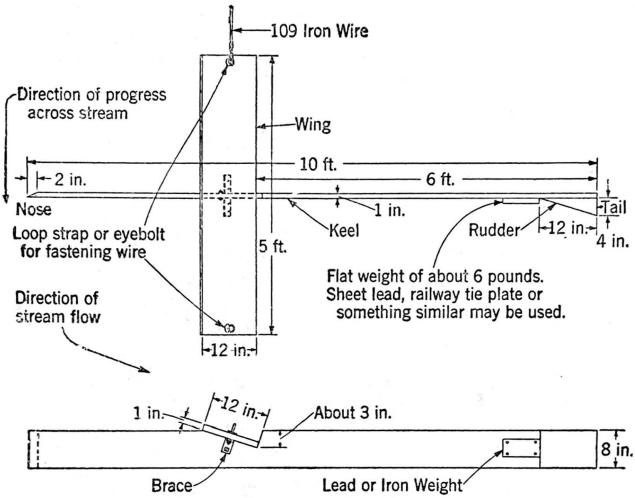
8. ESTABLISHING CONNECTION ACROSS STREAMS

8.01 Preliminary to placing the catenary suspension strand across a stream, a line, consisting of either a 3/4 inch rope of a length of 109 or 134 iron wire, must first be gotten across for use in pulling the catenary suspension strand over. Unless the stream is too swift a boat may be used.

8.02 To avoid the difficulties encountered in dragging a line behind a boat, make the end of the line fast on the bank and pay out the line from the boat. If the flow of the water is enough to cause an appreciable drag on the rope, use a 109 or 134 wire instead.

8.03 If a motor boat is to be used to drag a line across a stream, the line should be made fast to the boat approximately half way between bow and stern and on the upstream side of the boat.

8.04 Where a line cannot be gotten across a stream having a rapid current flow, by ordinary means, as for instance when a stream is in flood the device shown below may be used.



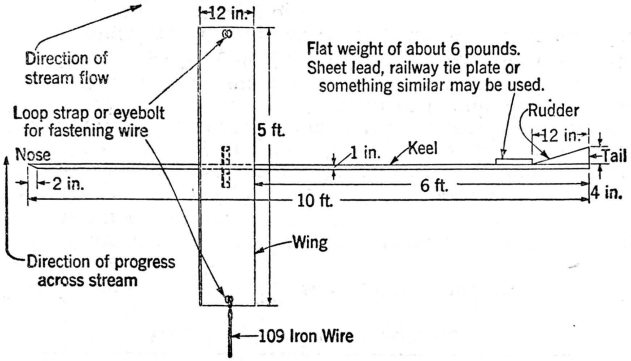
This device operates on the same general principle as a kite. To operate:

(1) Place the apparatus in the current of the stream with the nose pointing upstream.

(2) Pay out the wire from a reel in order to prevent fouling. Keep steady strain on the wire and pay out no faster than will keep the wire taut. In the case of a stream flowing with appreciable speed the strain on the wire will be too much for one man to handle and some arrangement for snubbing the wire should be used.

(3) Keep the wire out of the water. If the bank is not high enough, set a pole temporarily on the bank and feed the wire over the pole.

8.05 The apparatus as set up above is designed for crossing a stream in the direction indicated by the arrow. To make it suitable for crossing in the opposite direction reverse the keel, rudder and point of attachment of the wire as shown:



8.06 If a 109 or 134 iron wire is used to establish connection across the stream, the wire should be used to pull across a 3/4 inch rope to be employed, in turn, to pull over the catenary suspension strand.

9. INSTALLING CATENARY SUSPENSION STRAND

9.01 Place a snatch block at the top of each of the crossing poles or, if H fixtures are used at the crossing, on one pole of each of the H fixtures. Using the rope as a pulling line, pull the catenary suspension strand across the long span by pulling over the snatch blocks.

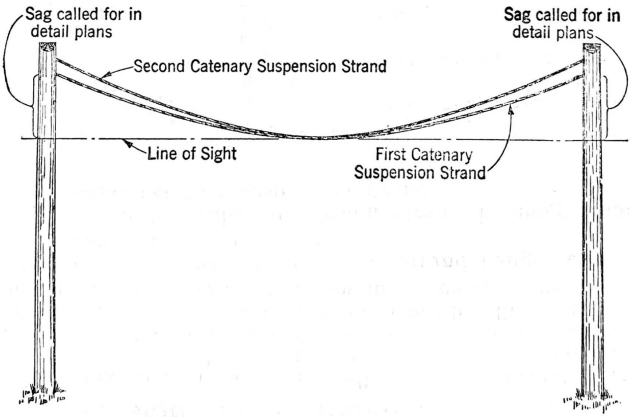
9.02 At the reel side of the crossing, cut the catenary suspension strand and permanently dead end it as shown in paragraphs 5.03, 5.04 and 5.05. Where two catenary suspension strands are to be installed on one pole dead end the strand in the lower position. At the pulling end, pull the catenary suspension strand up to the sag and tension called for in the detail plans for the temperature at which the work is being done and permanently dead end it.

9.03 The sag in the catenary suspension strand should be measured by sighting in the usual way, or the tension should be measured with the strand dynamometer. Either method may be used as desired while pulling the catenary sus-

pension strand up to the proper tension. In making the final check before clamping the suspension strand, however, the strand dynamometer should be used in cases where the sag is small and the tension high. Where the sag is great and the tension is low, the sighting method should be used. The dynamometer method is the more accurate where the strand tensions are high and the sags small while the sighting method is the more accurate with large sags and low tensions.

9.04 If a second catenary suspension strand is required, it will be necessary, as in the case of the first strand, to have a pulling in line across the span. The line may be taken across in the same way as the first one or it may be gotten over by riding the first catenary suspension strand. A convenient way of getting a line across by riding is for a lineman to ride out from each crossing pole to the center of the span in a cable car to which a light line is attached. At the center of the span the two cable cars should be tied together and pulled back to one or the other of the crossing poles. The light line should be used to pull across a 3/4 inch rope for use in pulling over the second strand.

9.05 Install the second strand in the same manner as the first except where two catenary suspension strands are attached to the same pole. Under these conditions pull up or slack off on the second catenary suspension strand until it sags down to the same sight line as the first catenary suspension strand when the sag of the first strand is sighted in the usual way.

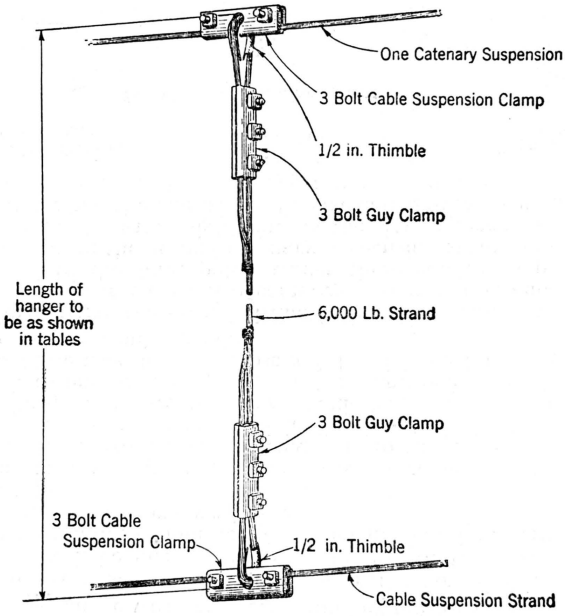


10. SUSPENSION STRAND HANGERS

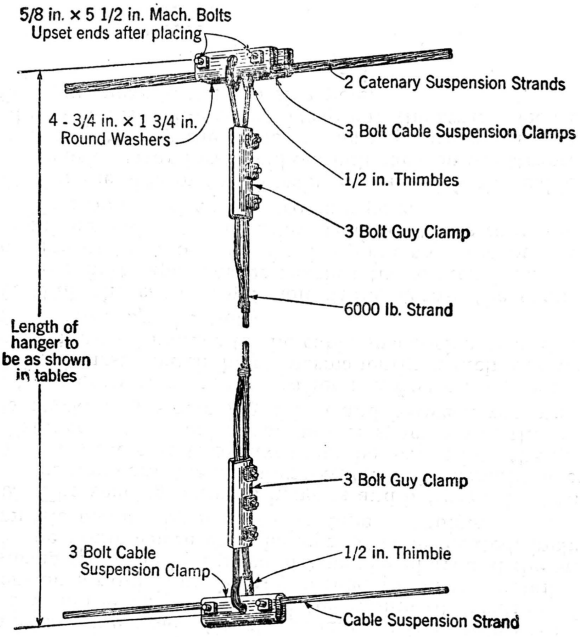
10.01 Make up, on the ground, all suspension strand hangers complete with clamps, bolts, thimbles, etc., but do not tighten the bolts on the guy clamps any more than is necessary to hold the assembly together while being handled. Make the length of the hangers as called for in the detail plans.

10.02 The two types of suspension strand hanger assembly used are shown below:

(a) When the cable suspension strand is hung from a single catenary suspension strand.



(b) When the cable suspension strand is hung from two catenary suspension strands.



11. INSTALLATION OF CABLE SUSPENSION STRAND AND SUSPENSION STRAND HANGERS

11.01 After the catenary suspension strand or strands, as the case may be, have been pulled up to the proper sag and tension and permanently dead ended, place a snatch block on each crossing pole at the point where the catenary suspension strand is dead ended.

11.02 In installing the cable suspension strand run it out into the long span over one snatch block and carry it over the snatch block on the other crossing pole. Before pulling in the cable suspension strand, start at the pulling end and measure off about 225 feet of it. At about the 225 foot point wrap a piece of tape around the strand to mark the point at which the strand should be stopped as it passes over the snatch block at the far crossing pole. On the ground as the cable suspension strand is unreeled, measure off the points of location of the suspension strand hangers as provided for in the detail plans, measuring from the first piece of tape placed around the strand. Mark the point where each hanger is to be located, including the middle pickup, by means of a tape wrapping.

11.03 The spacing between hangers and between the two end hangers and the crossing fixtures will normally be equal. When this is the case two stakes may be driven into the ground at a distance apart equal to the hanger spacing and the hanger points marked by stretching the strand between the stakes.

11.04 As each piece of tape (after the first one) passes over the first snatch block permanently attach the proper suspension strand hanger to the cable suspension strand at the point indicated by the tape.

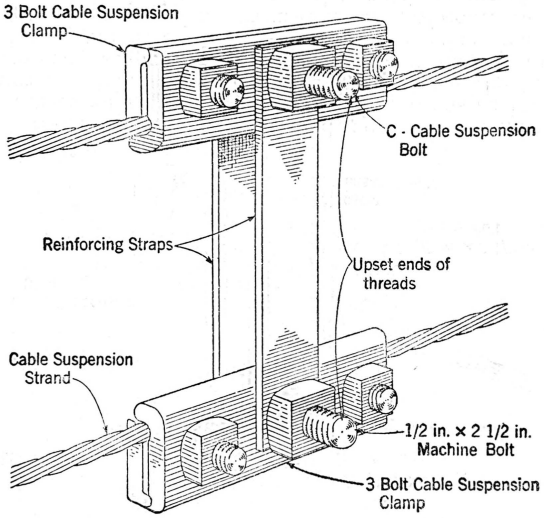
11.05 Pull the cable suspension strand across the span until the first tape marker reaches the snatch block at the pulling end of the crossing. At this point stop the pulling and at the pulling end of the crossing dead end the strand securely on the first pole next to the crossing pole.

11.06 On the side of the crossing from which the cable suspension strand was paid out pull back on the strand until it has approximately the same sag as the catenary suspension strand or strands in the span. Dead end the strand securely at the first pole next to the crossing pole.

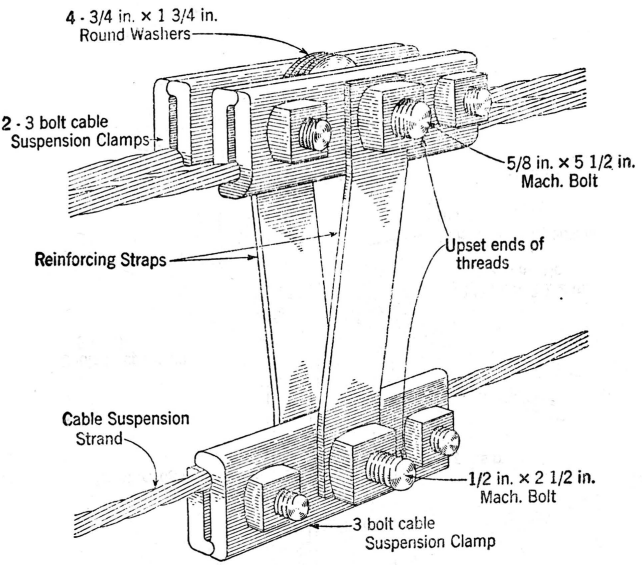
11.07 Attach the cable suspension strand to the catenary suspension strands at the middle suspension point as shown below. To reach the mid point of the span, ride the **catenary suspension strand or strands*** in a cable car.

*Note: Do not ride the cable suspension strand yet, since it is receiving no support from the catenary suspension strand and may or may not have the desired strength for it to be used for riding purposes, depending on the size of strand and the particular crossing being built.

(a) Where one catenary suspension strand is used.

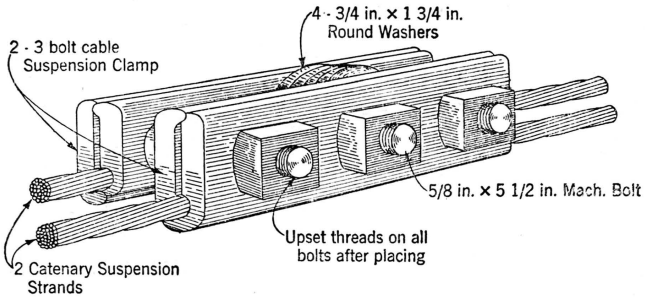


(b) Where there are two catenary suspension strands.



11.08 Attach the suspension strand hangers permanently to the catenary suspension strand or strands as indicated in paragraph 10.02. The point of attachment of the hangers to the catenary suspension strand should be directly above the point of attachment of the hangers to the cable suspension strand. At this stage of the work there will, of course, be considerable slack in the hangers since the cable suspension strand is not yet in its final location on the crossing poles. Ride the catenary suspension strand and not the cable suspension strand in doing this work.

11.09 Where there are two catenary suspension strands also clamp the two catenary suspension strands together about half way between each two hangers and between the two end hangers and the crossing poles as indicated below:



11.10 After completing the clamping of the suspension strand hangers to the catenary suspension strand slack off the cable suspension strand at both ends, remove the snatch blocks and lower the cable suspension strand to the cable suspension clamp in which it is to be carried permanently. With the cable suspension strand in the clamps but with the clamp bolts loose pull it up to the proper tension as required by the instructions covering aerial cable construction, using a strand dynamometer to determine the tension. To avoid pulling the span out of shape it will be necessary to apply tension at both ends of the span. If all slack is pulled out at one end of the span the suspension strand hangers will not hang vertically.

11.11 After pulling the cable suspension strand up to the proper tension, splice it through, with strand connectors, to the cable suspension strand on the line on each side of the crossing span. If for any reason the strand cannot be spliced through, dead end it securely so that there will be no danger of slippage in case the cable suspension strand in the long span should be ridden before it is spliced through.

11.12 At this stage and before the cable is placed in the long span the cable suspension strand will have a considerable upward arch across the span. If the proper sag and tension has been placed in the catenary suspension strand, however, the weight of the cable when it is pulled in will reduce the upward arch to an amount just sufficient to give the span a good appearance.

11.13 In riding the cable suspension strand it will be necessary to pass the cable car around the suspension strand hangers. In doing this the lineman's safety strap should first be snapped on the cable suspension strand after which his weight should be transferred to the safety strap while one wheel of the cable car at a time is transferred around the hanger.

12. PLACING RINGS AND PULLING CABLE

12.01 In placing cable rings and pulling cable use the same methods as provided for in the practices covering Aerial Cable Construction. In pulling in the cable, however, avoid locating splices in the long span unless conditions are such that the cable, at the point where it is to be spliced, can be readily reached by a ladder from the ground.