

Section IV. ROPE LADDERS

2-26. Use of Ropes

Ropes may be used in the construction of hanging ladders and standoff ladders. Hanging ladders are made of wire or fiber rope anchored at the top and suspended vertically. They are difficult to ascend and descend, particularly for a man carrying a pack or load, and should be used only when necessary. Standoff ladders are easier to climb because they have two wood or metal uprights which hold them rigid, and they are placed at an angle. Both types of ladders can be prefabricated and transported easily. One or two standoff ladders are adequate for most purposes, but three or four hanging ladders must be provided for the same purpose because they are more difficult to use.

2-27. Hanging Ladders

The uprights of hanging ladders may be made of wire or fiber rope and anchored at the top and bottom. Wire rope uprights with pipe rungs make the most satisfactory hanging ladders because they are more rigid and do not sag as much as hanging ladders made of other material. Wire rope uprights with wire rope rungs are usable. Fiber rope uprights with wood or fiber rope rungs are difficult to use because of their greater flexibility which causes them to twist when they are being used. A log should be placed at the break of the ladder at the top to hold the uprights and rungs away from a rock face so that better handholds and footholds are provided. A single rock anchor is usually sufficient at the bottom of the ladder, or a pile of rocks can be used as bottom anchor for fiber rope hanging ladders.

a. Wire Rope Ladder With Pipe Rungs. A wire rope ladder can be made using either 1-inch or $\frac{3}{4}$ -inch pipe rungs. The 1-inch pipe rungs are more satisfactory. For such ladders the standard pipe stanchion is used. The pipe stanchions are spaced 12 inches apart in the ladder (fig. 2-57) and the $\frac{3}{4}$ -inch wire rope clips are inserted in the stanchion over $\frac{3}{4}$ -inch wire rope uprights. If $\frac{3}{8}$ -inch wire rope uprights are used, $\frac{3}{8}$ -inch wire rope clips are inserted in the pipe over the wire rope uprights. When $\frac{3}{4}$ -inch pipe rungs are used, the rungs are also spaced 12 inches apart in the ladder but uprights should not be spaced more than

12 inches apart because of the weaker pipe used. The rungs may be fastened in place by two different methods. In one method a $\frac{7}{16}$ -inch diameter hole is drilled at each end of each pipe rung and $\frac{3}{8}$ -inch wire rope uprights are threaded through the holes. To hold each rung in place a $\frac{3}{8}$ -inch wire rope clip is fastened about the wire rope upright at each end of each rung after the rung is in final position. In the other method the pipe rungs are cut 12 inches long and the U-bolt of a $\frac{3}{8}$ -inch rope clip is welded to each end. The rungs are spaced 12 inches apart on the $\frac{3}{8}$ -inch wire rope uprights. The saddle of the wire rope clips and the nuts are placed on the U-bolts, then the nuts are tightened to hold the rungs in place.

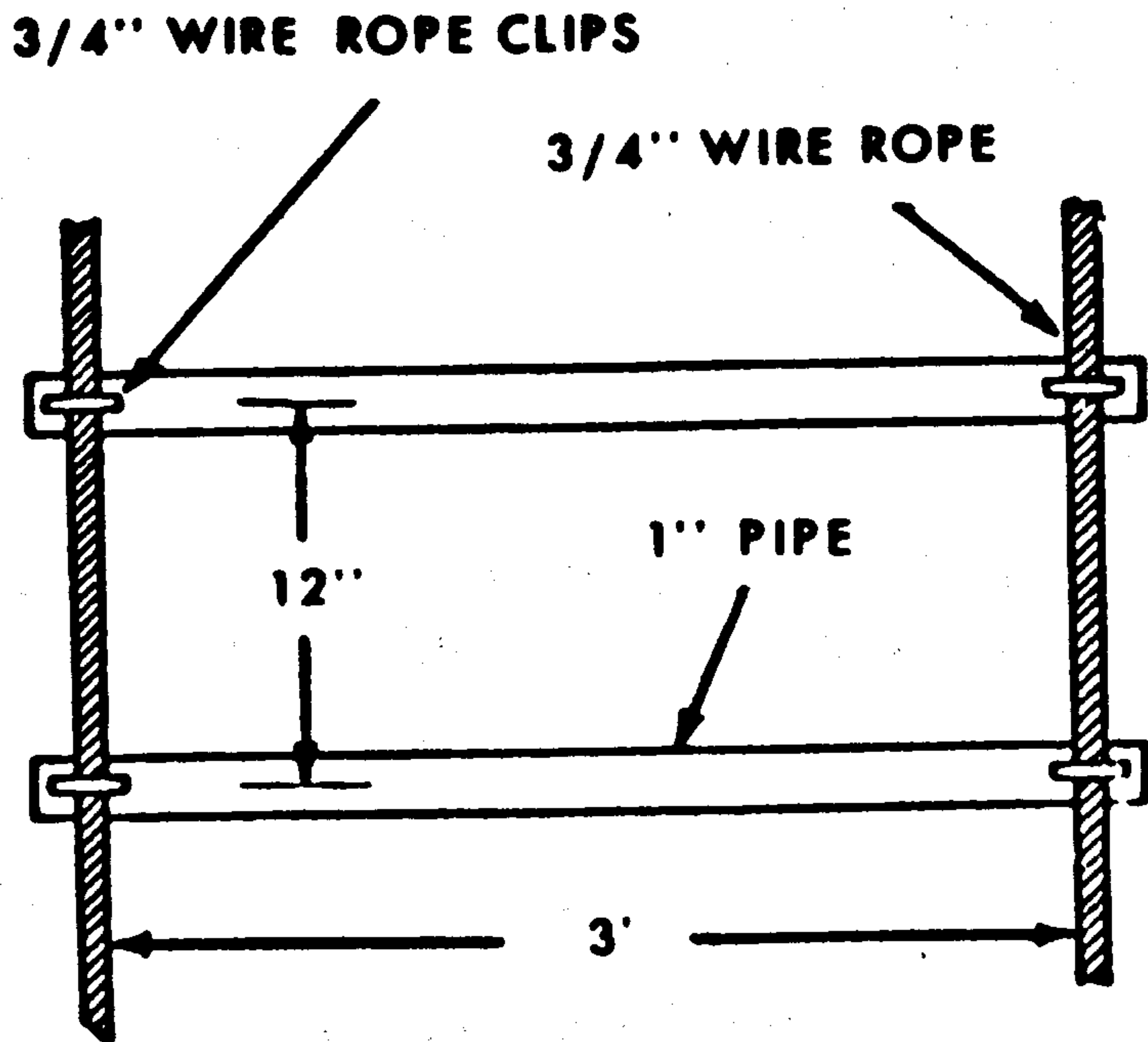
b. Wire Rope Ladder With Wire Rope Rungs. A wire rope ladder with wire rope rungs is made by laying the $\frac{3}{8}$ -inch diameter wire rope uprights on the ground. The first length is laid out in a series of U-shaped bends. The second length is laid out in a similar manner (fig. 2-58) with the U-shaped bends in the opposite direction from those in the first series, and the horizontal rung portions overlapping. A $\frac{3}{8}$ -inch wire rope clip is fastened on the overlapping rung portions at each end of each rung to hold them firm.

c. Fiber Rope Ladder With Fiber Rope Rungs. Fiber rope ladders with fiber rope rungs can be made by using two or three uprights. When three uprights (fig. 2-59) are used, a loop is made in the center upright at the position of each rung. The two outside uprights are spaced 20 inches apart. A loop and a single splice hold each end of each rung to the outside upright. A loop in the center of the rung passes through the loop in the center upright. If only two uprights are used, the rungs are held in place by a loop and a rolling hitch or a single splice at each upright. The two uprights must be closer together, with shorter rungs, to stiffen the ladder. Ladders of either type are very flexible and difficult to climb.

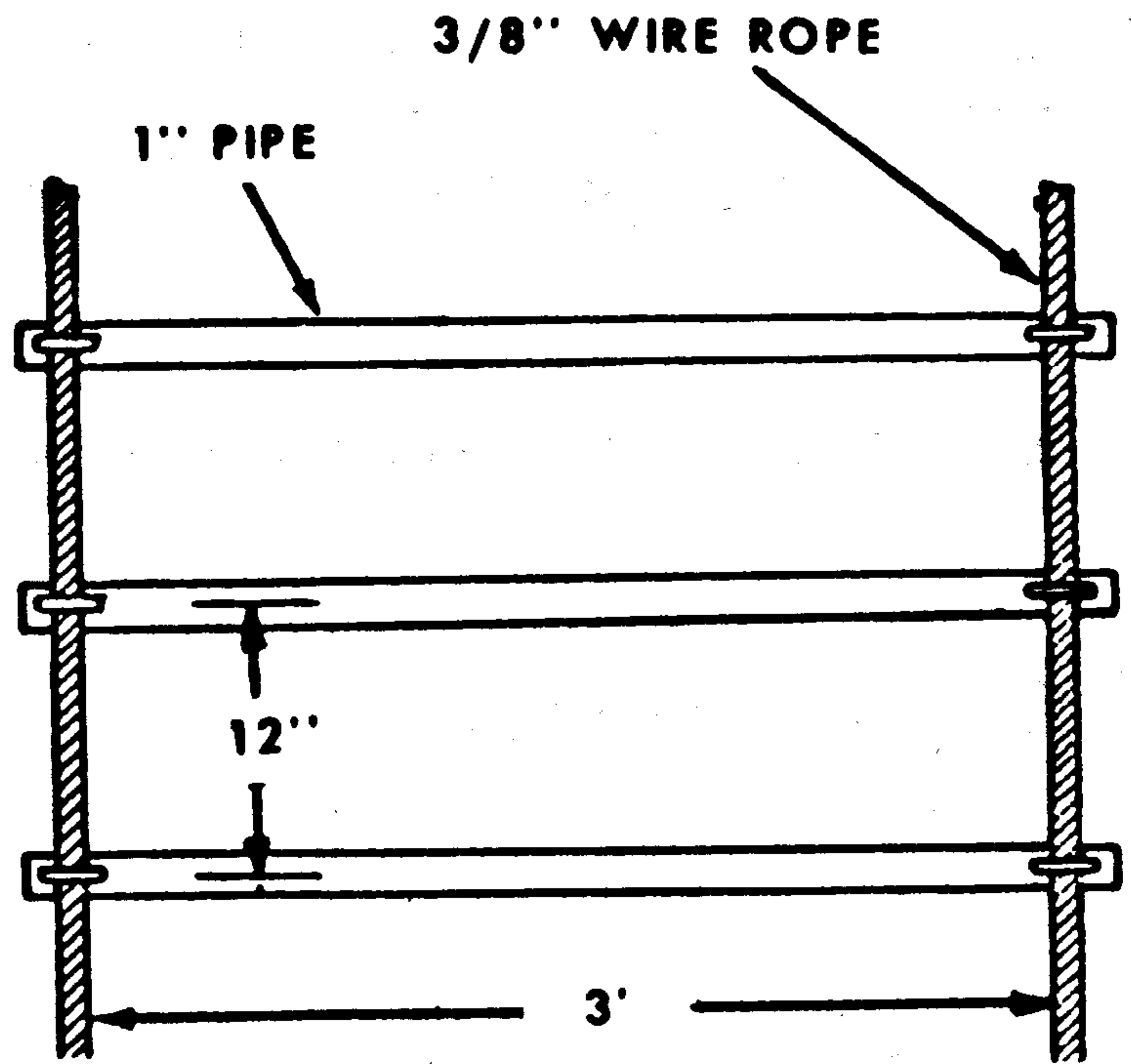
d. Fiber Rope Ladder With Wood Rungs. Fiber rope ladders with wood rungs (fig. 2-60) can be made by using finished lumber or native material for rungs. When native material is

1-INCH PIPE STANCHIONS FOR RUNGS

METHOD 1

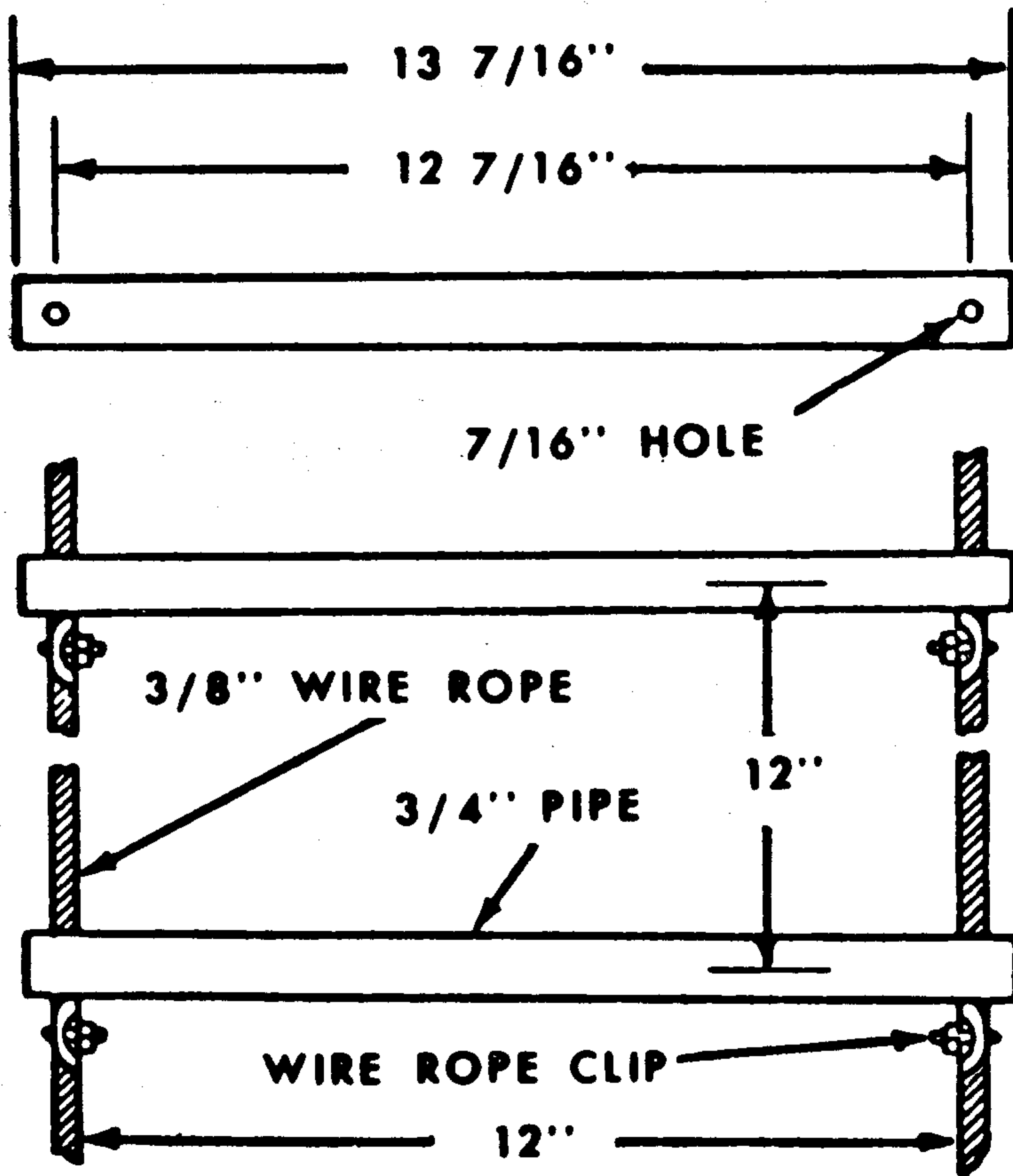


METHOD 2



3/4 - INCH PIPE FOR RUNGS

METHOD 1



METHOD 2

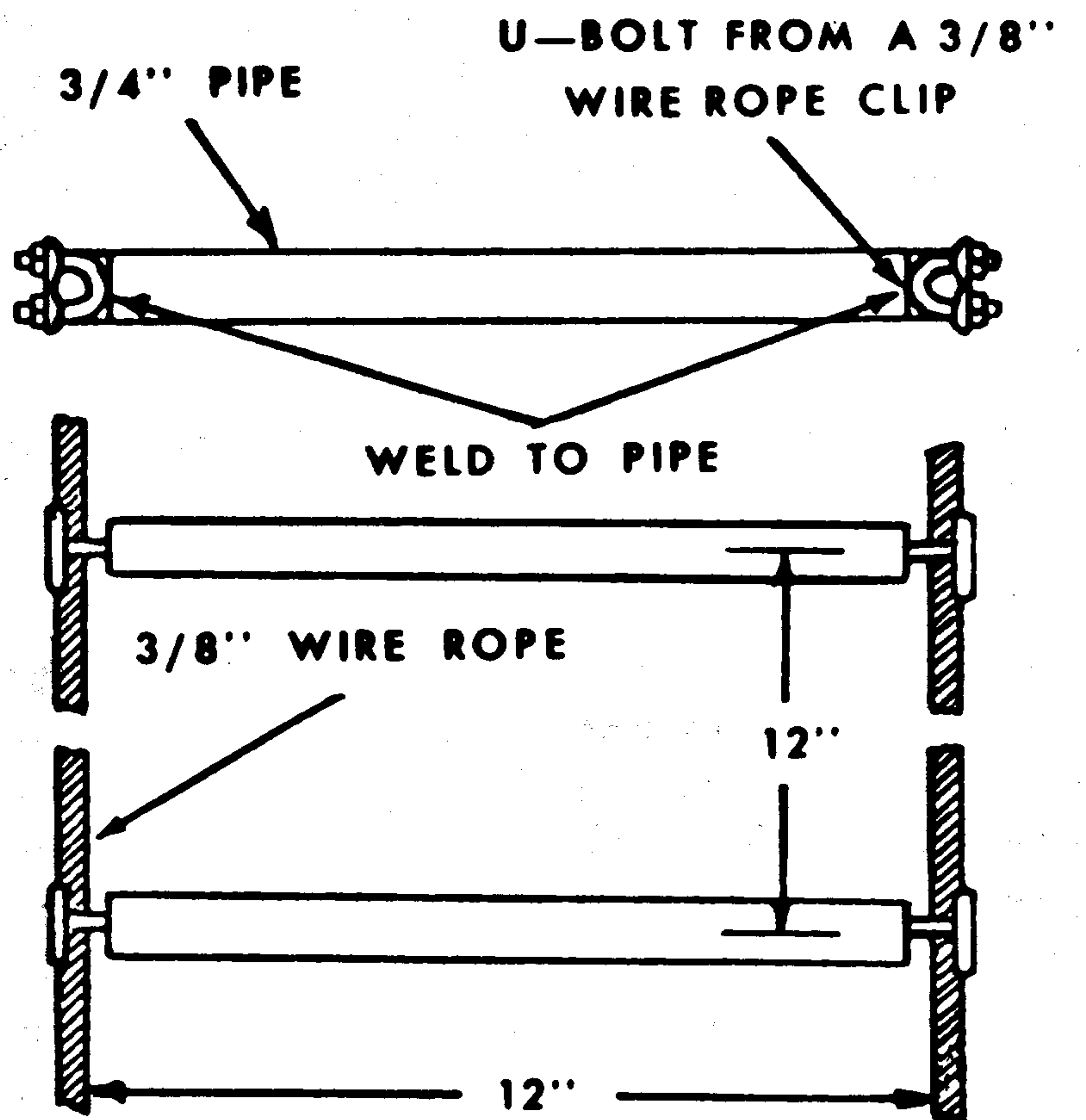


Figure 2-57. Pipe rungs.

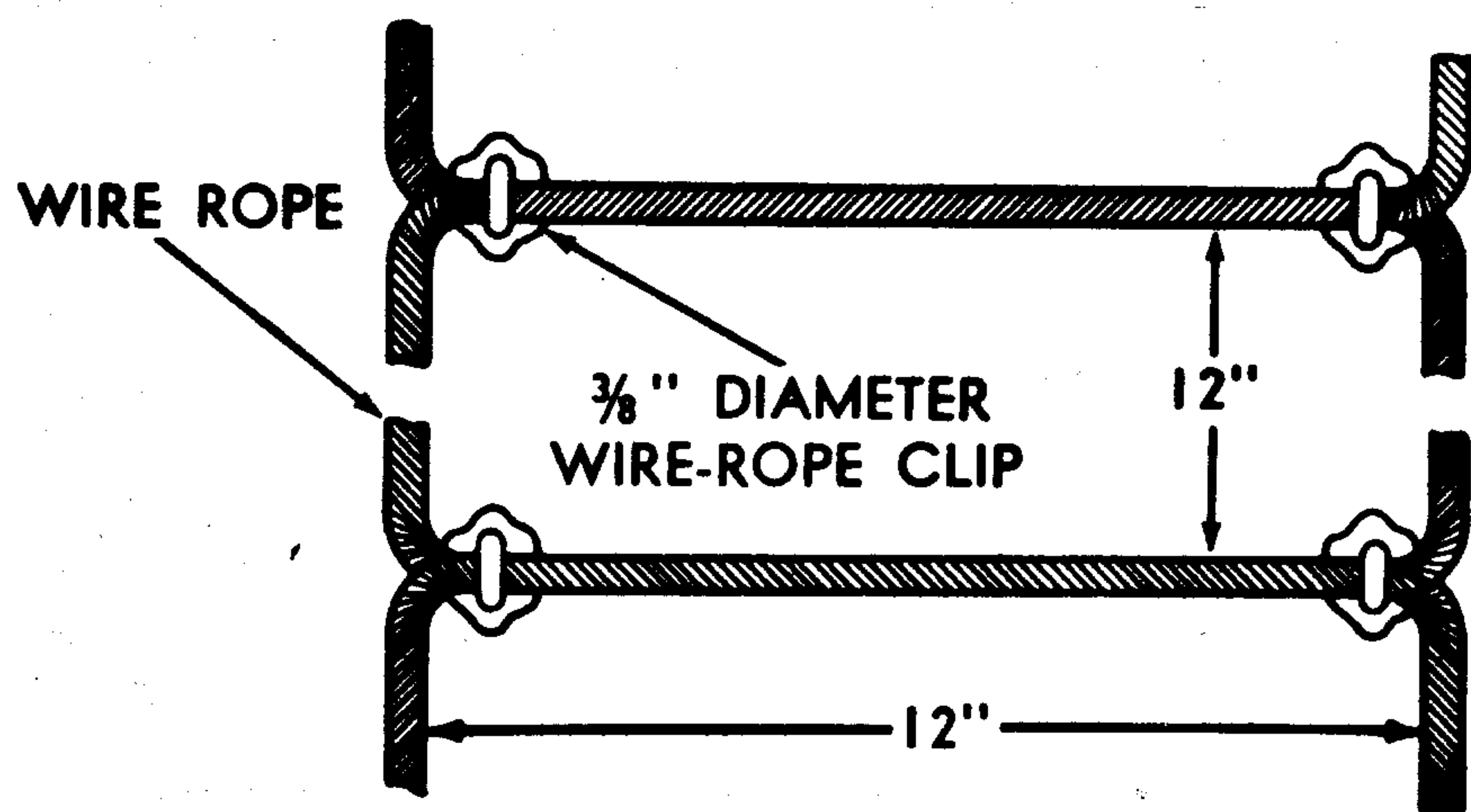


Figure 2-58. Wire rope rungs.

used, the rungs are cut from 2-inch diameter material about 15 inches long. The ends of each rung are notched and the rung is fastened to the fiber rope upright with a clove hitch. The rungs are spaced 12 inches apart. A piece of seizing wire is twisted about the back of the clove hitch to make it more secure, and in a manner which will not snag the clothing of persons climbing the ladder. If rungs are to be made of finished lumber the rungs are cut to size and a $\frac{3}{4}$ -inch hole is drilled at each end. Oak lumber is best for this purpose. A $\frac{1}{4}$ -inch

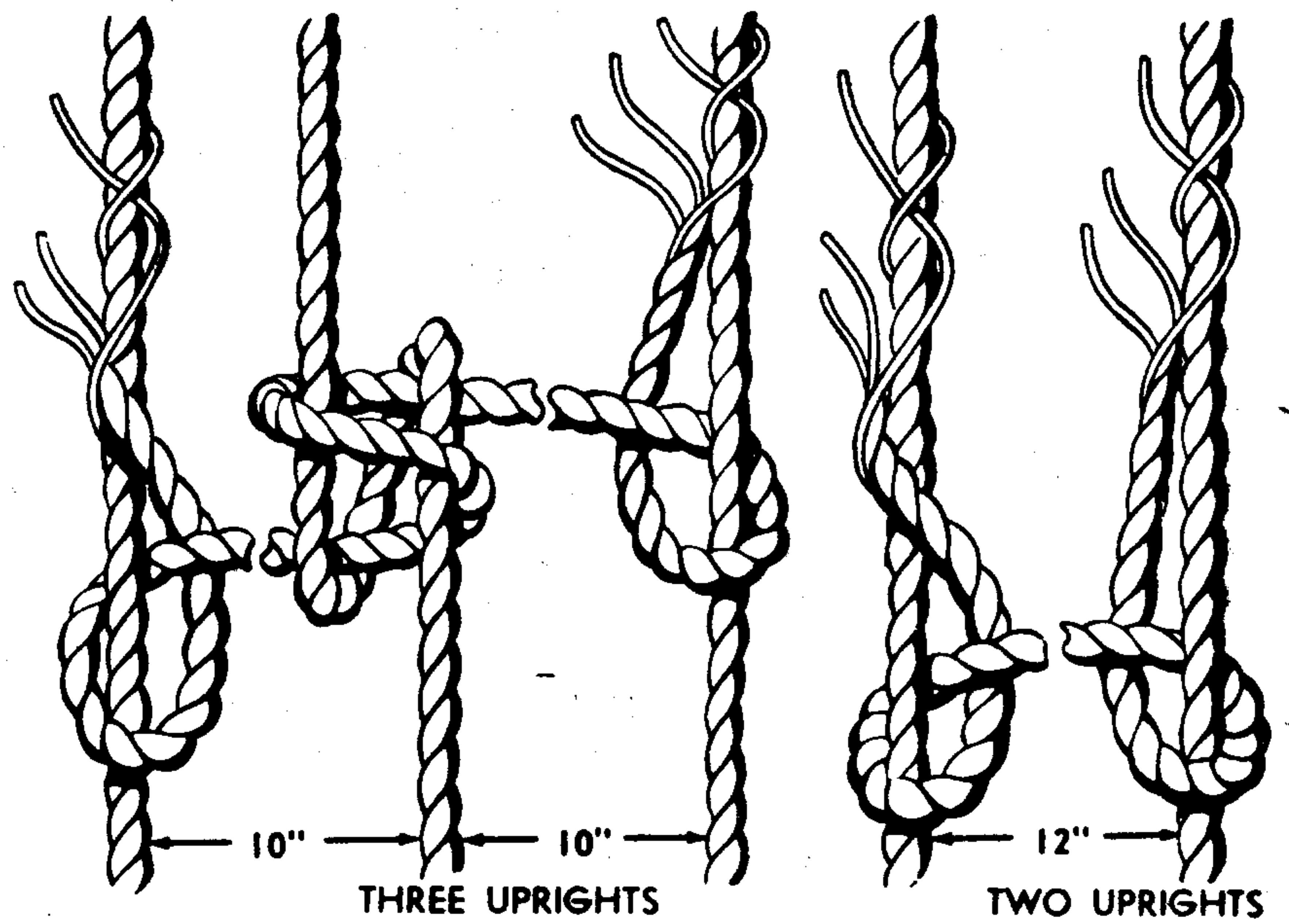
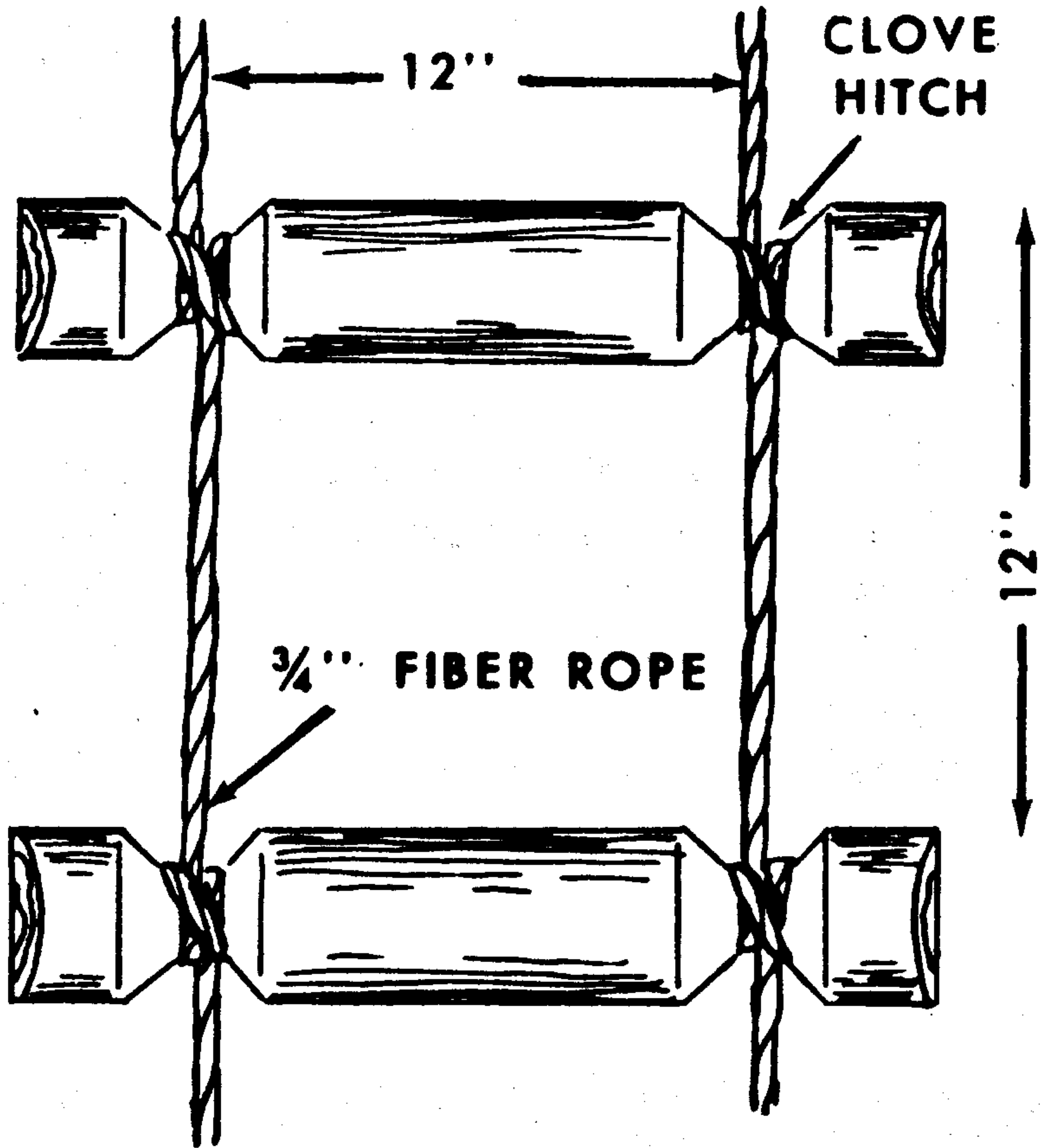


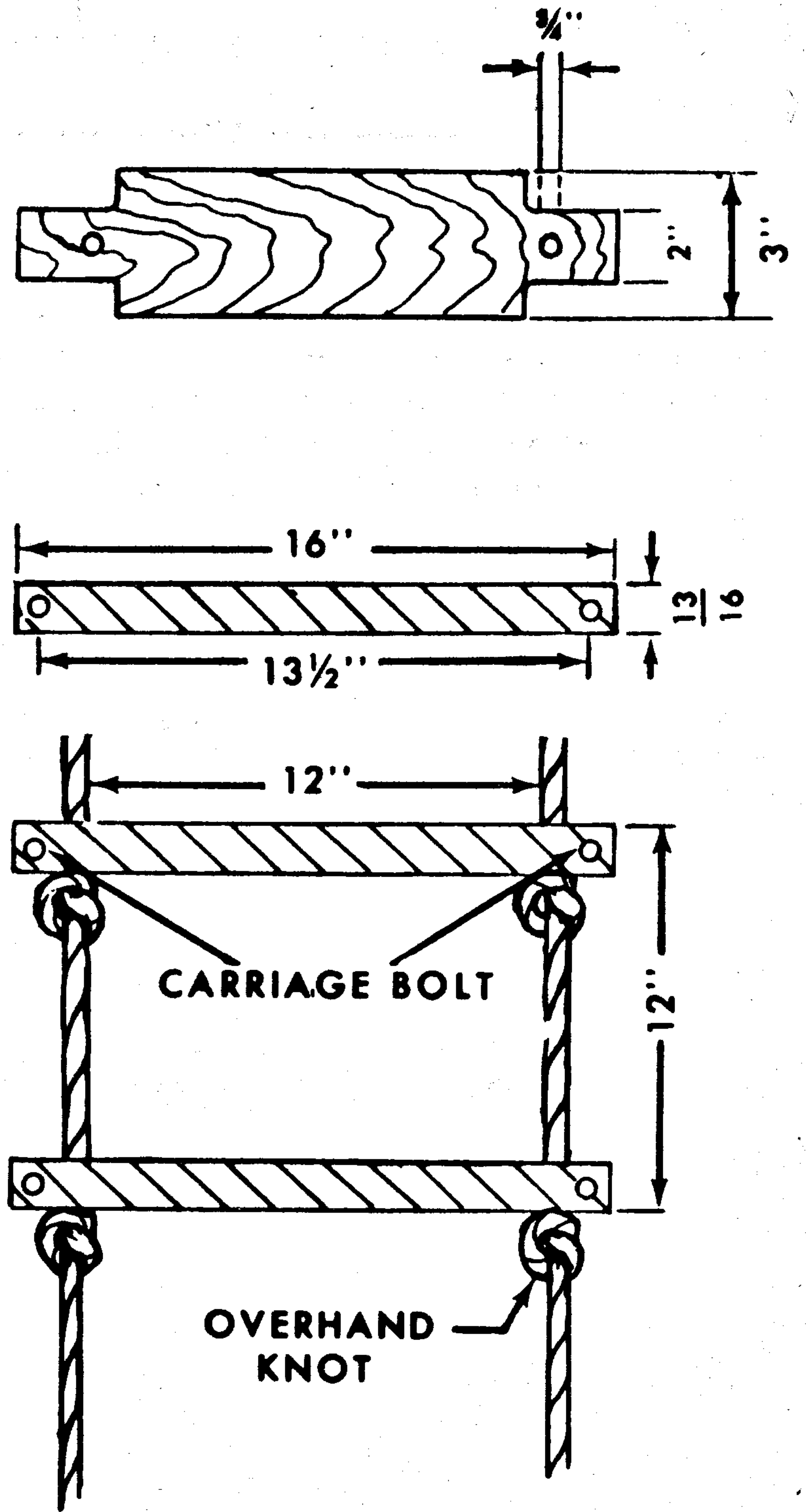
Figure 2-59. Fiber rope rungs.

by $2\frac{1}{2}$ -inch carriage bolt is put horizontally through each end near the vertical hole to prevent splitting. An overhand knot is tied in the upright to support the rung. Then the upright is threaded through the $\frac{3}{4}$ -inch hole in the rung. A second overhand knot is tied in the upright before it is threaded through the next rung. This procedure is continued until the desired length of the ladder is reached.

NATIVE MATERIAL



FINISHED MATERIAL



SEIZING WIRE TO HOLD

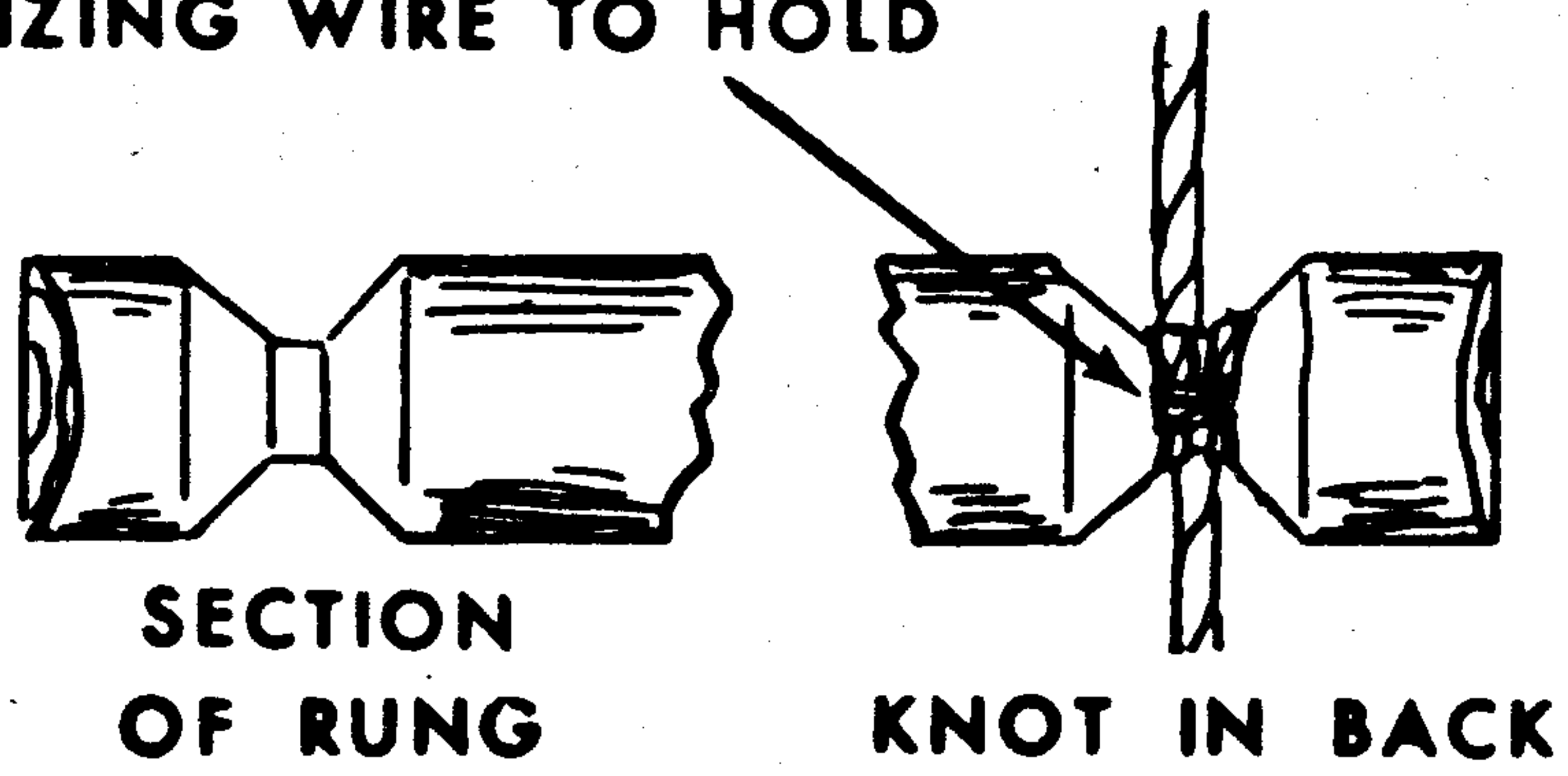


Figure 2-60. Wood rungs.