

CHAPTER 6

LADDERS AND SCAFFOLDING

Section I. LADDERS

6-1. Introduction

Several types of ladders are available for construction work, including extension ladders, pushup ladders, and straight ladders (fig. 6-1). All three types of ladders are available in both metal and wood. Ladders should always be inspected before they are used. A ladder with parts missing, with bent or cracked sides or rungs, and those made with faulty material should be condemned. Badly worn and weathered ladders and wooden ladders with rotten spots should not be used because they are subject to breaking and can cause a serious accident. Ladders with rough spots, such as protruding metal fastenings, screws, and nails should be repaired or reconstructed to prevent injuries.

6-2. Extension Ladder

Occasionally sections of an extension ladder are used separately. When this is done, the upper section of the ladder must be used upside down so that the rung missing at the locks will be at the top of the ladder where it is less liable to cause an accident. In selecting an extension ladder for a particular job, it should be remembered that this type of ladder is designated by its nominal length, which is the sum of the lengths of the sections. The usable length of the ladder is 3 to 10 feet less than the nominal length due to the overlap of the sections. This overlap is 3 feet on ladders up to and including 36 feet, 4 feet on 40 to 44 feet ladders, and 5 to 10 feet on longer ones. Extension ladders and pushup ladders are placed against the wall in much the same manner with the extension, or pushup, portion lowered. When the lower section of his ladder is nearly in the final position, the upper portion is pulled

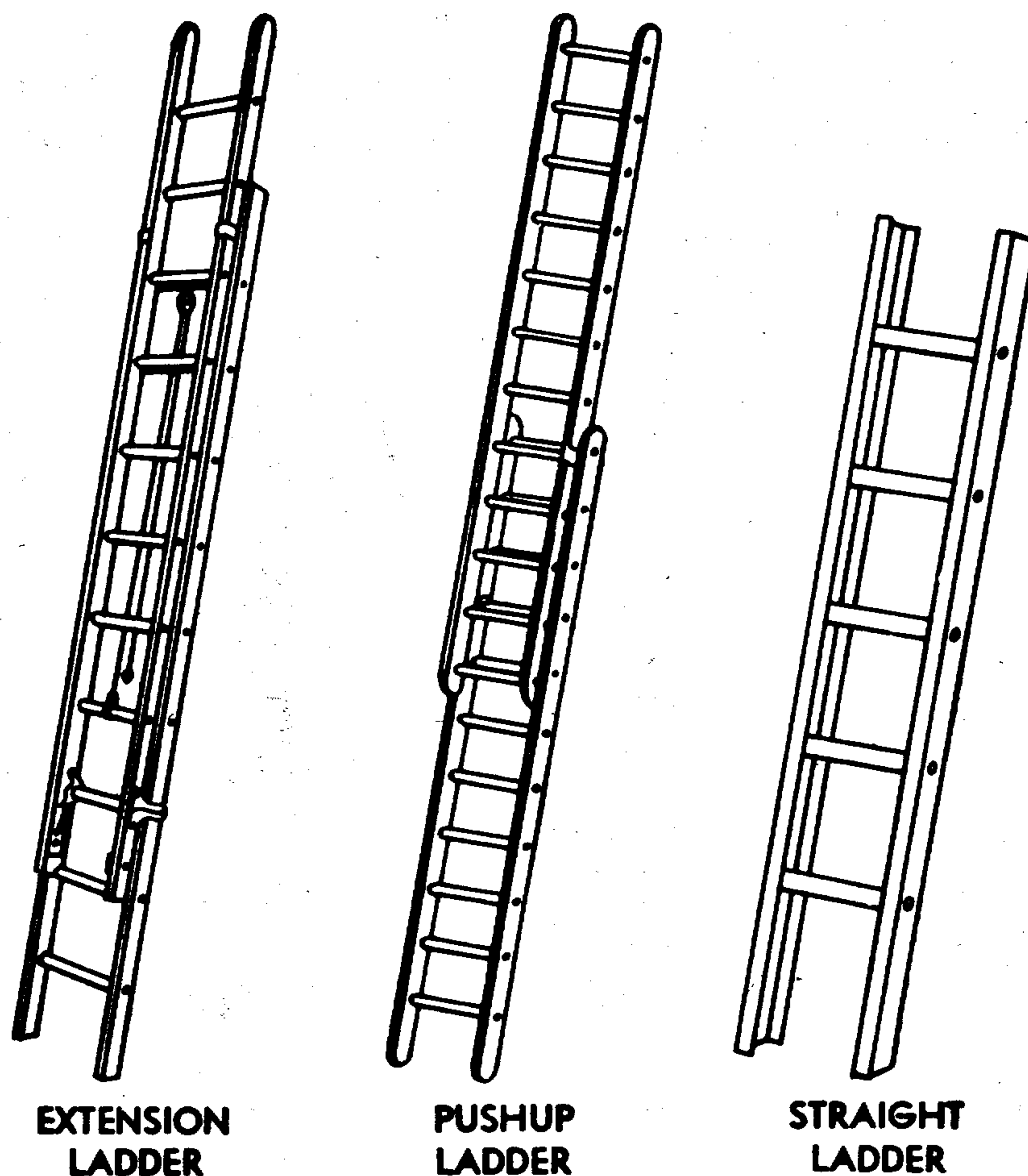


Figure 6-1. Types of ladders.

out away from the building until it stands nearly vertical but leaning slightly toward the building. While the ladder is held in this position, one man hauls down on the rope fastened to the extension section, pulling it upward. No attempt should be made to raise the extension section to its full extension on the first pull. It is less difficult to pull the section up in easy stages, checking the height of the ladder at intervals in order to determine the correct height. The extension section should be on the side of the ladder toward the building to lessen the danger of the user slipping at the point where the two sections join.

6-3. Straight Ladders

Straight ladders are placed on the ground beside the wall which they are intended to scale, and at right angles to the wall. One man should stand at the foot of the ladder to prevent the ladder from kicking backward. A second man (or men) grasp the ladder part way toward the top and raise it from the ground. As the ladder is raised it is "walked" toward the building, and the men keep moving toward the foot of the ladder to grasp new holds. When the ladder is in final position, the bottom of the ladder should be checked to make certain it has a firm footing. If the ground is soft, or if the ladder does not rest squarely on both bottom legs, a board may be placed under the

feet. If the bottom of the ladder has antislip surfaces, these surfaces should be checked before placing the ladder to be certain they are not coated with mud or debris. The ladder should be placed at a safe angle against the wall. A good rule is to place the base of the ladder about one-fourth as far out from the upper support as the length of the ladder (fig. 6-2). The upper end of the ladder should not extend more than 2 feet above the upper support, and not so far below the working area to be dangerous to move from the top of the ladder to the wall. The upper end of a ladder should always be lashed to the structure with wire or fiber rope to prevent it from skidding sideways or overturning while in use.

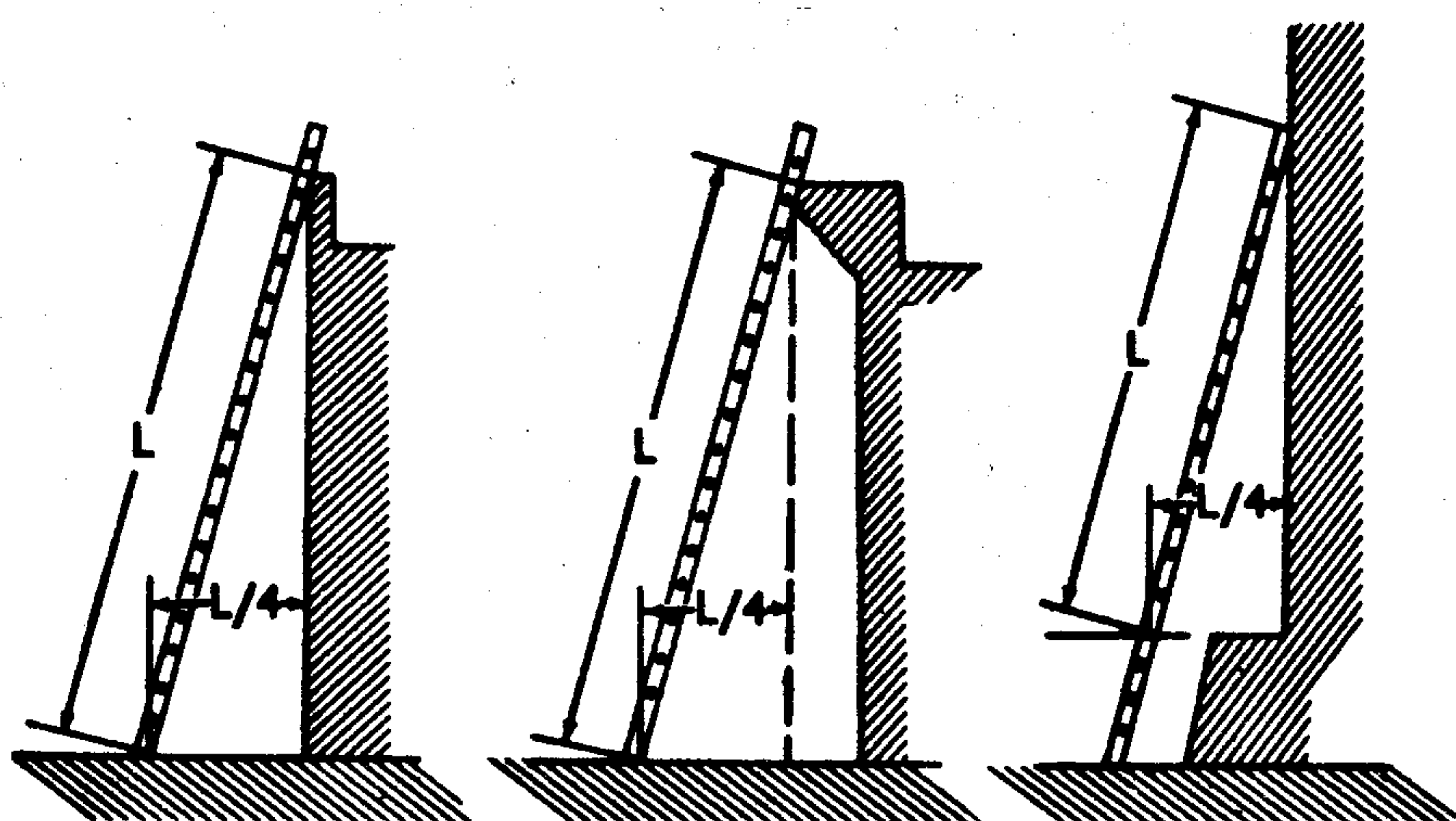


Figure 6-2. Correct angles for ladders.

Section II. SCAFFOLDING

6-4. Introduction

Construction jobs may require the use of several kinds of scaffolds to permit easy working procedures. Scaffolding may range from individual planks placed on structural members of the building to involved patent scaffolding. Scaffold planks are placed as a decking over swinging scaffolds, suspended scaffolds, needle beams, and built-up independent scaffolding. Scaffold planks are of various sizes, including 2 x 9 inches x 13 feet, 2 x 10 inches x 16 feet, and 2 x 12 inches x 16 feet. Scaffold planks 3 inches thick may be needed for platforms that must hold heavy loads or withstand movements. Planks with holes or splits are not suitable for scaffolding if the diameter of the hole is more than 1 inch or the split extends more than 3 inches in from the end. Three-inch planks should be used to build the temporary

floor used for construction of steel buildings because of the possibility that a heavy steel member might be rested temporarily on the planks. Single scaffold planks may be laid across beams of upper floors (fig. 6-3) or roofs to form working areas or runways. Each plank should run from beam to beam, with not more than a few inches of any plank projecting beyond the end of the supporting beam. Overhangs are dangerous because men may step on them and over balance with the scaffold plank. When the planking is laid continuously, as in a runway, the planks should be laid so that their ends overlap. Single plank runs can be staggered so that each plank is offset with reference to the next plank in the run. It is advisable to use two layers of planking on large working areas to increase the freedom of movement.

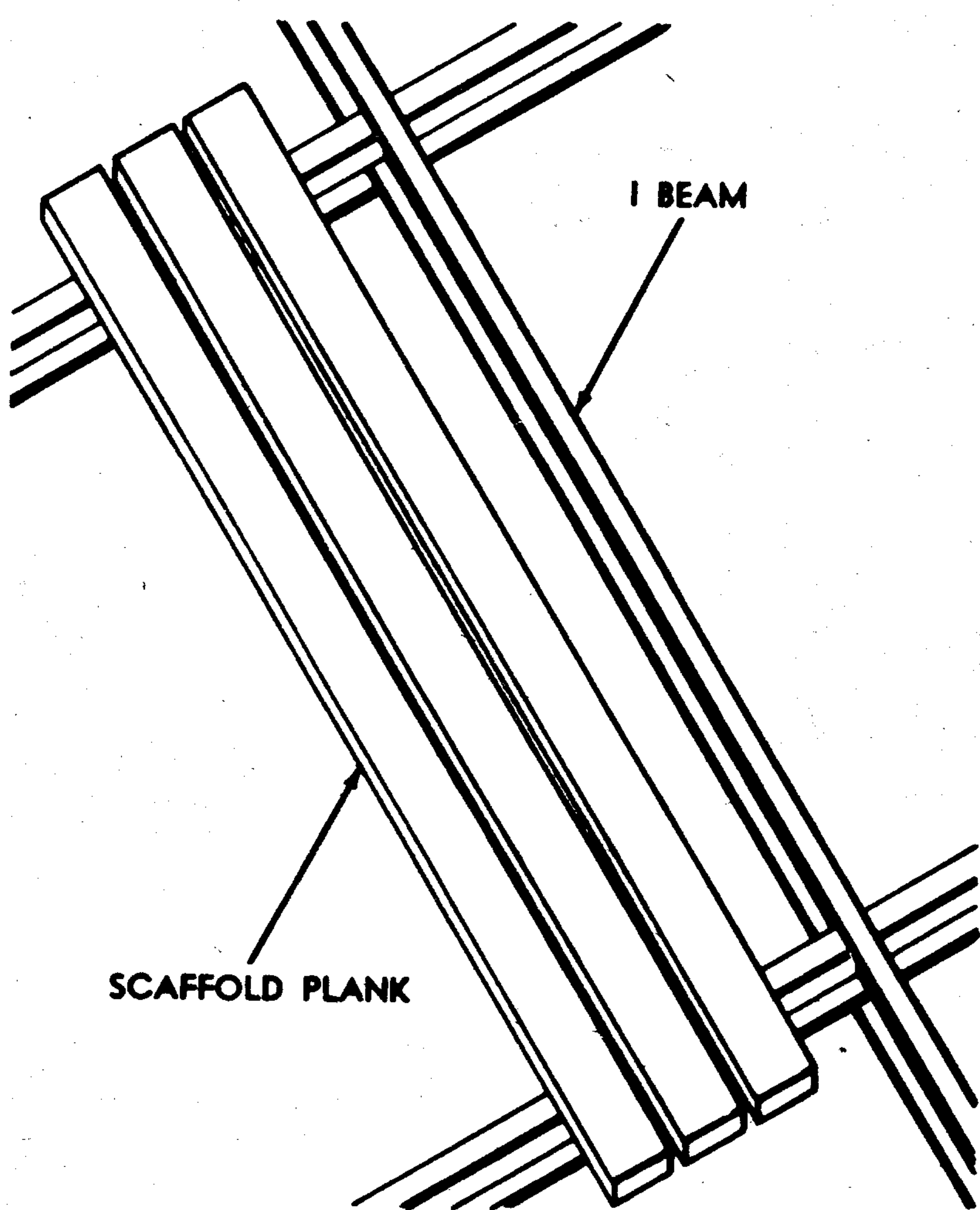


Figure 6-5. Scaffold planks in place.

6-5. Types of Scaffolds

a. Swinging Scaffolds. The swinging, single plank, or platform type of scaffold must always be secured to the building or structure to prevent it from moving away and causing the men to fall. Where swinging scaffolds are suspended adjacent to each other, planks should never be placed so as to form a bridge between them.

(1) *Single plank scaffold.* A single scaffold plank (fig. 6-4) may be swung over the edge of a building with two ropes by using a scaffold hitch (fig. 2-28) at each end. A tackle may be inserted in place of ropes for lowering and hoisting. This type of swinging scaffold is suitable for one man.

(2) *Platform scaffold.* The swinging platform scaffold (fig. 6-5) consists of a frame similar in appearance to a ladder with a decking of wood slats. It is supported near each end by a steel stirrup to which the lower block of a set of manila rope falls is attached. The scaffold is supported by hooks or anchors on the roof of a structure. The fall line of the tackle must be secured to a member of the scaffold when in final position to prevent it from falling.

b. Suspended Scaffolds. Suspended scaffolds usually are supported on outriggers at the roof and are heavier than swinging scaffolds. From each outrigger, cables lead to hand winches on the scaffold. This type of scaffold is raised or lowered by operating the hand winches, which must contain a locking device. The scaffold may be made up in almost any width up to about 6 feet, and may be 12 feet long, depending on the size of the putlogs, or longitudinal supports, under the scaffold. A light roof may be included on this type of scaffold to protect the men from falling debris.

c. Needle Beam Scaffold. This type of scaffold is used only for temporary jobs. No material should be stored on this scaffold. In needle beam scaffolding, two 4- x 6-inch, or similar size, timbers are suspended by ropes. A decking of 2-inch scaffold plank is placed across the needle beams, which should be placed about 10 feet apart. Needle beam scaffolding (fig. 6-6) is used frequently by riveting gangs working on steel structures because of the frequent changes of location necessary and its adaptability to different situations. A scaffold hitch is used in the rope supporting the needle beams to prevent them from rolling or turning over. The hanging lines are usually of 1¼-inch manila rope. The rope is hitched to the needle beam, carried up over a structural beam or other support, and then down again under the needle beam so the latter has a complete loop of rope under it. The rope is then passed over the support again and fastened around itself by two half hitches.

d. Double Pole Built-Up Scaffold. The double pole built-up scaffold (steel or wood), sometimes called the independent scaffold, is completely independent of the main structure. Several types of patent independent scaffolding are available for simple and rapid erection (fig. 6-7). The scaffolding can be built up from wood members if necessary. The scaffold uprights are braced with diagonal members and the working level is covered with a platform of planks. All bracing must form triangles and the base of each column requires adequate footing plates for the bearing area on the ground. The patented steel scaffolding is usually erected by placing the two uprights on the ground and inserting the diagonal members.

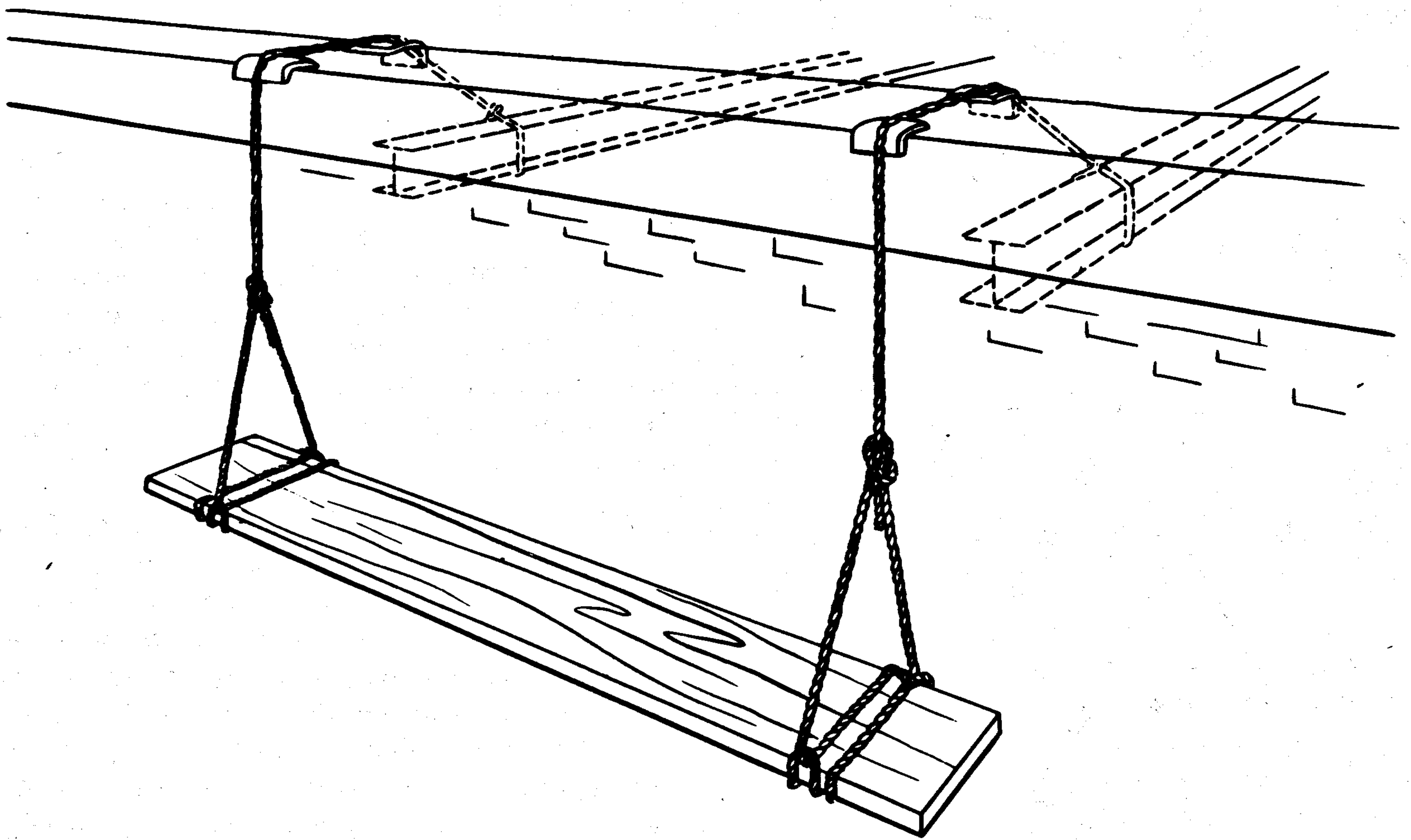


Figure 6-4. Single swinging plank scaffold.

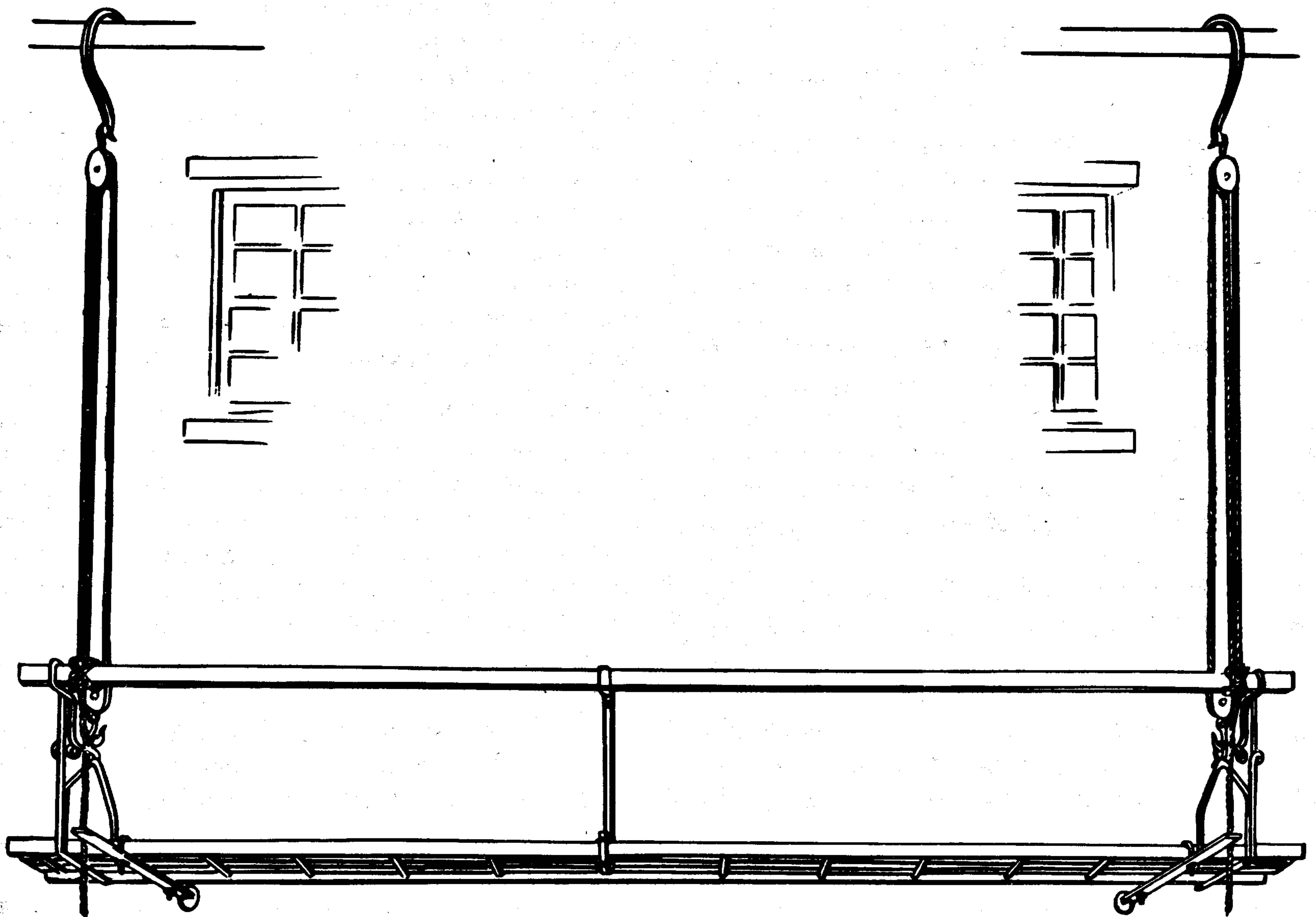


Figure 6-5. Swinging platform scaffold.

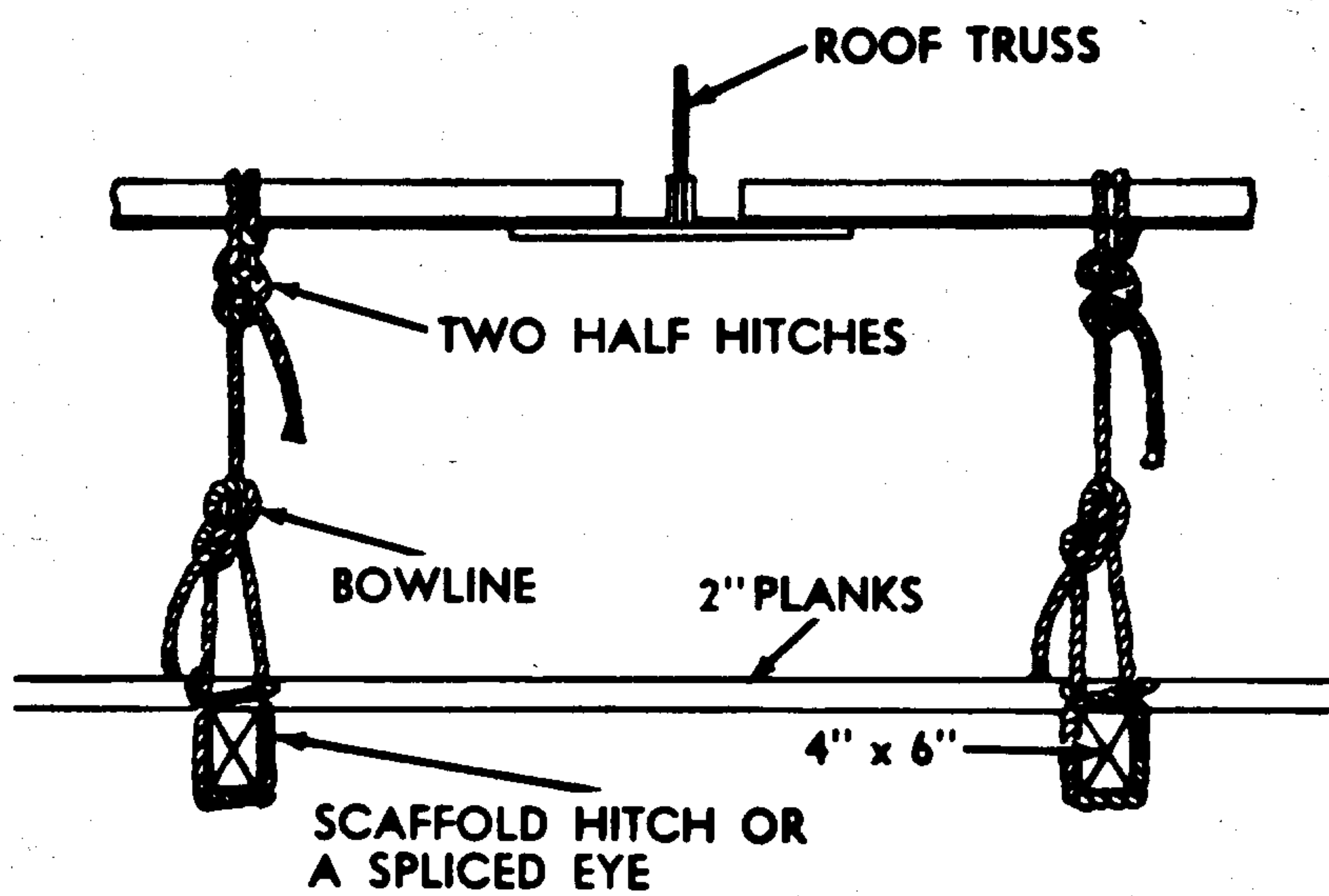


Figure 6-6. Needle beam scaffold.

The diagonal members have end fittings which permit rapid locking in position. The first tier is set on steel bases on the ground. A second tier is placed in the same manner on the first tier, with the bottom of each upright locked to the top of the lower tier. A third and fourth upright can be placed on the ground level and locked to the first set with diagonal bracing. The scaffolding can be built as high as desired, but high scaffolding should be tied in to the main structure.

6-6. Boatswain's Chair

The boatswain's chair can be made up in several forms, but it generally consists of a sling for supporting one man.

a. Rope Chair. A rope boatswain's chair (fig. 6-8) can be made up by using a double bowline and a rolling hitch. One man can operate the rope seat to lower himself by releasing the grip of the rolling hitch. A slight twist with the hand on the hitch permits the suspension line to slip through it, but when the hand pressure on the hitch is released, the hitch will hold firmly.

b. Rope Chair With Seat. If the rope boatswain's chair must be used to support a man at work for some time, the rope may cause considerable discomfort. A notched board (fig. 6-9) inserted through the two leg loops will provide a comfortable seat. The loop formed as the running end to make the double bowline will still provide a back support, and the rolling hitch can still be used to lower the boatswain's chair.

c. Boatswain's Chair With Tackle. The boatswain's chair is supported by a four part rope tackle (fig. 6-10), two double blocks. One man can raise or lower himself, or be assisted by a man on the ground. When working alone the fall line is attached to the lines between the seat and the traveling block with a rolling hitch. As a safety precaution, a figure eight knot should be tied after the rolling hitch to prevent accidental untying.

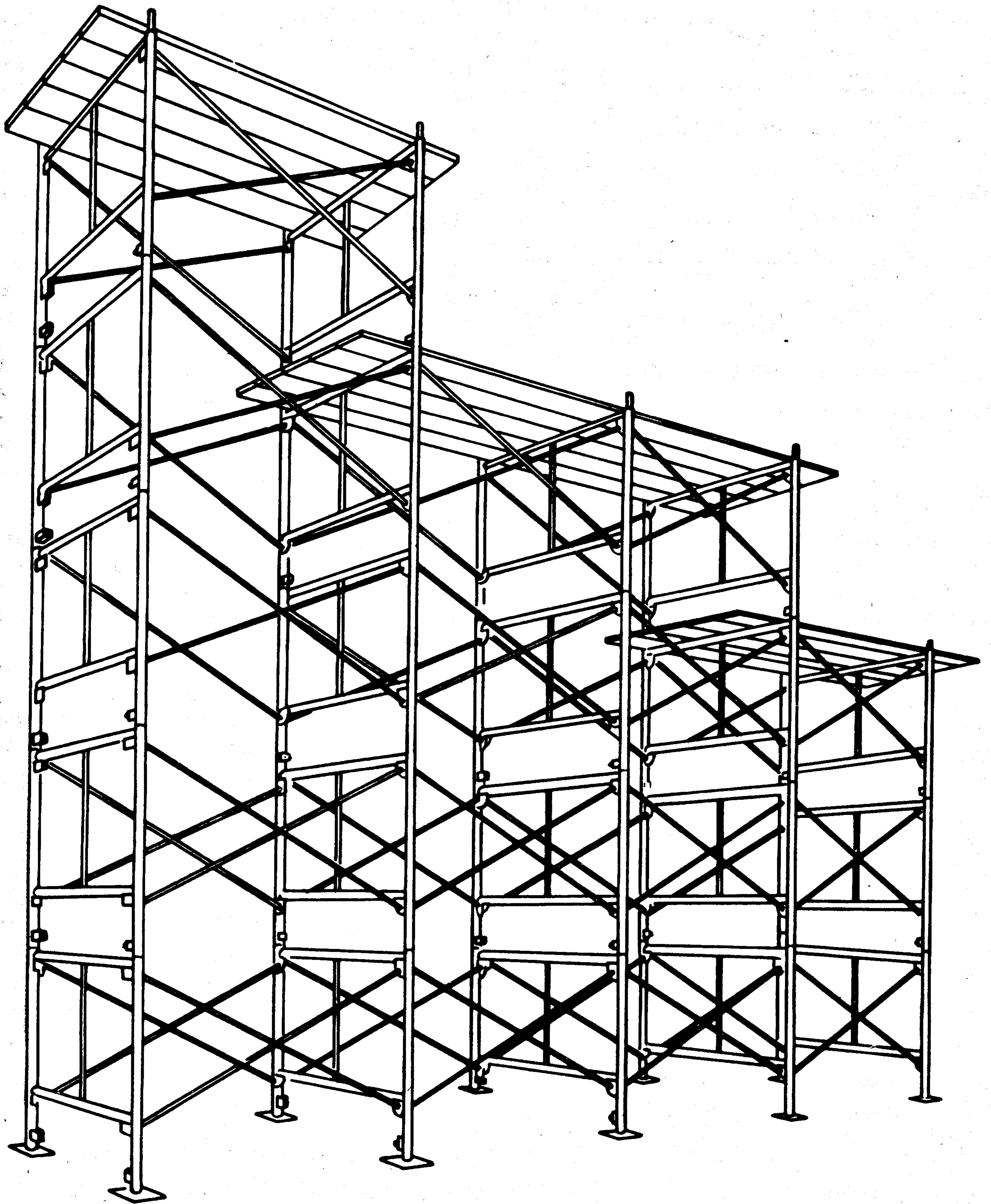


Figure 6-7. Independent scaffolding.

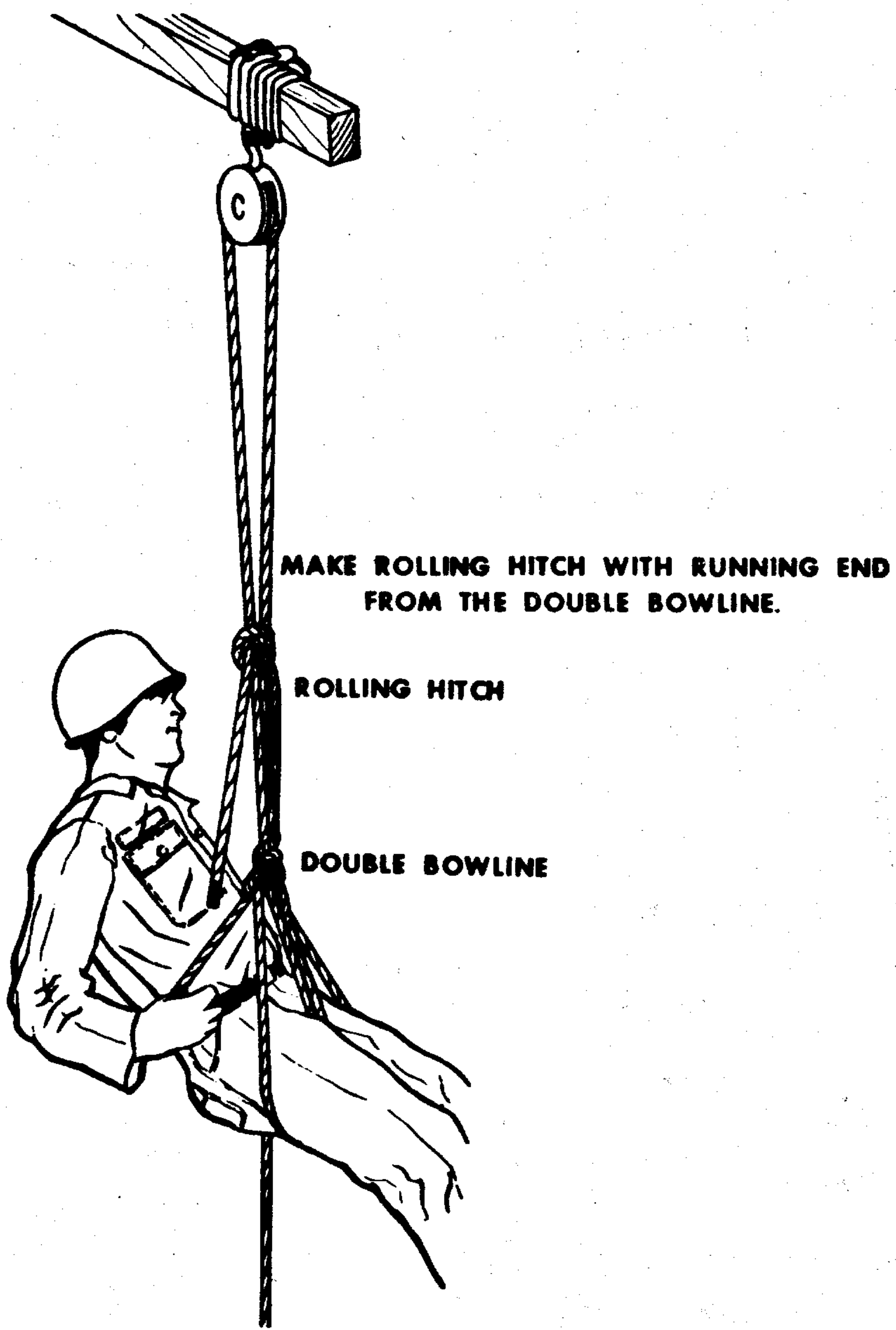


Figure 6-8. Boatswain's chair.

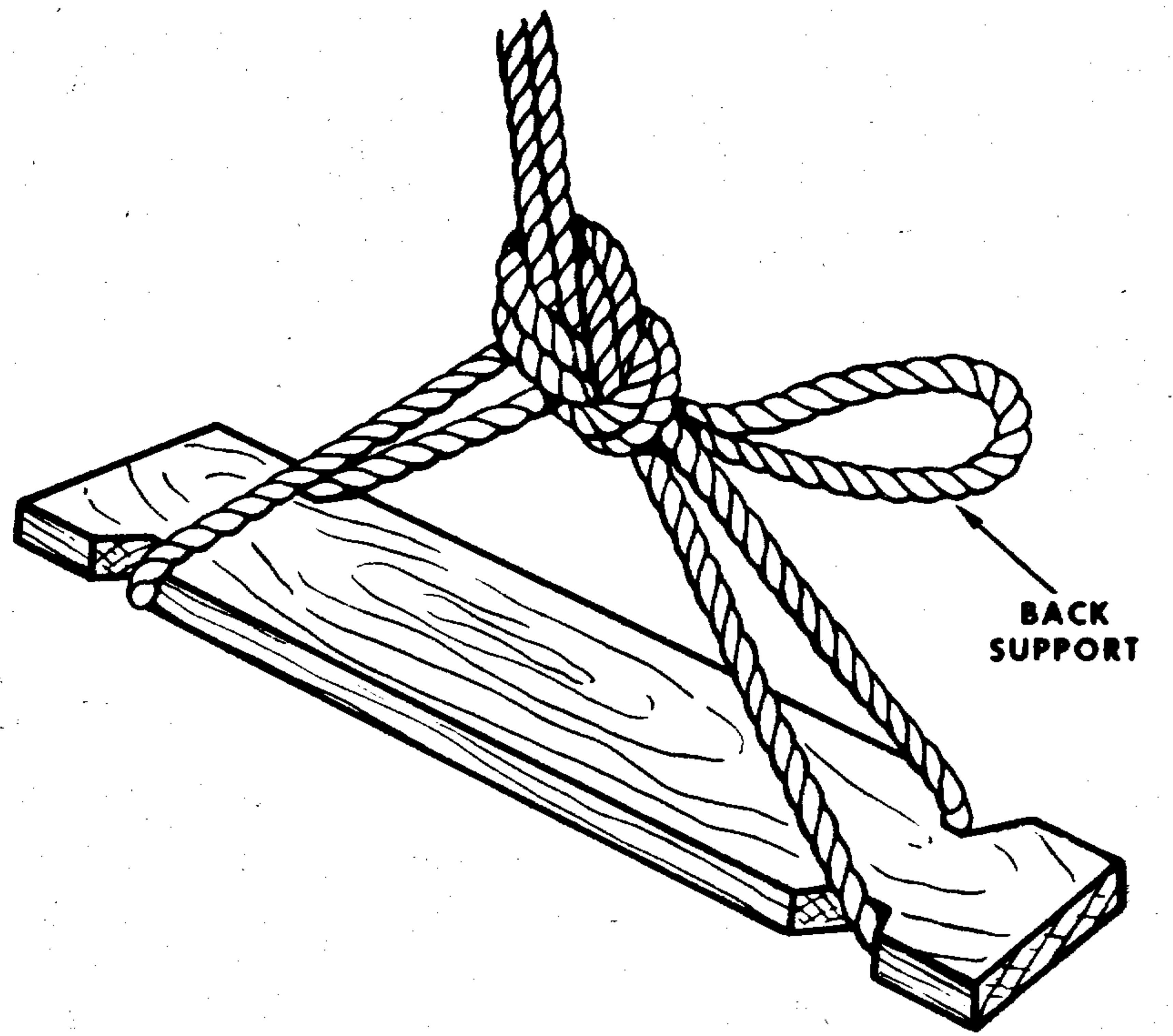


Figure 6-9. Boatswain's chair with seat.

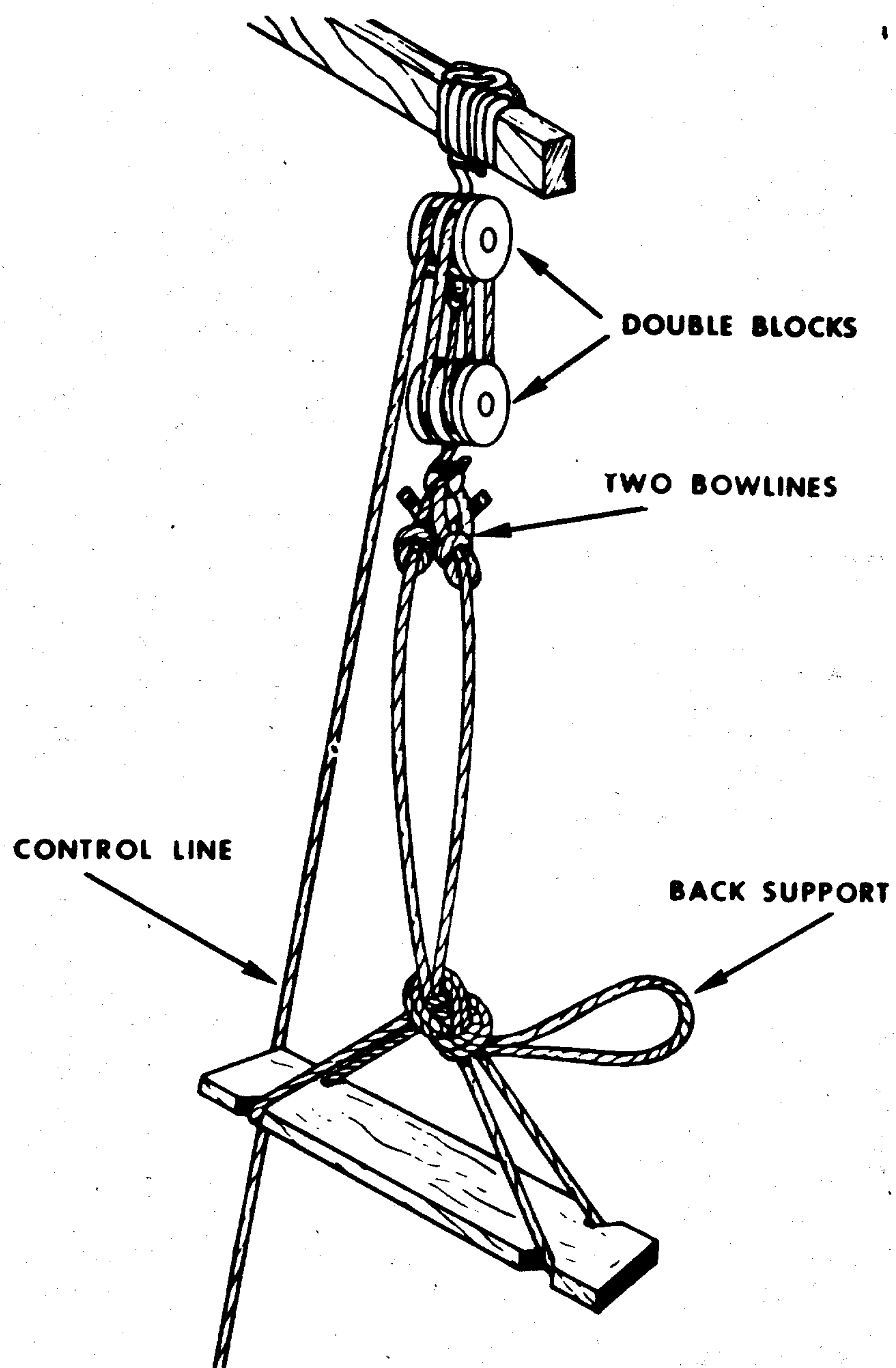


Figure 6-10. Boatswain's chair with tackle.