CHAPTER 7

PROCESSES OF WEAVING

WEAVING CONSISTS IN INTERLACING a weft or filler yarn with the warp yarns at right angles. There are four operations as follows:

Forming the shed by stepping on the treadles
Throwing the shuttle across through this opening
Changing the shed
Bringing the beater forward to push filling yarn into position

► FORMING THE SHED

In the counterbalanced loom when one pair of harnesses is pulled down by stepping on a treadle, the other pair is automatically raised. The action of the harnesses in the jack-type loom is slightly different. Stepping on a treadle lifts the harnesses tied to that treadle while the other harnesses remain stationary. In either case the odd yarns will be down while the even yarns will be lifted. This separates the yarns into the triangular opening called the shed, as shown in Figure 7.1. The shed should be large enough for the shuttle to slide through easily. All the lower yarns should be of even tension and should offer a smooth, taut surface for the shuttle to pass across.

► WINDING THE BOBBIN

The shuttle carries the bobbin of yarn back and forth across the warp. Properly wound bobbins are absolutely essential to good weaving. Bobbins must be wound so as to be firm, even hard, and must not slip nor snarl at the ends. The various types of bobbins call for different methods of winding. If using the paper quill, begin by building a ridge of yarn

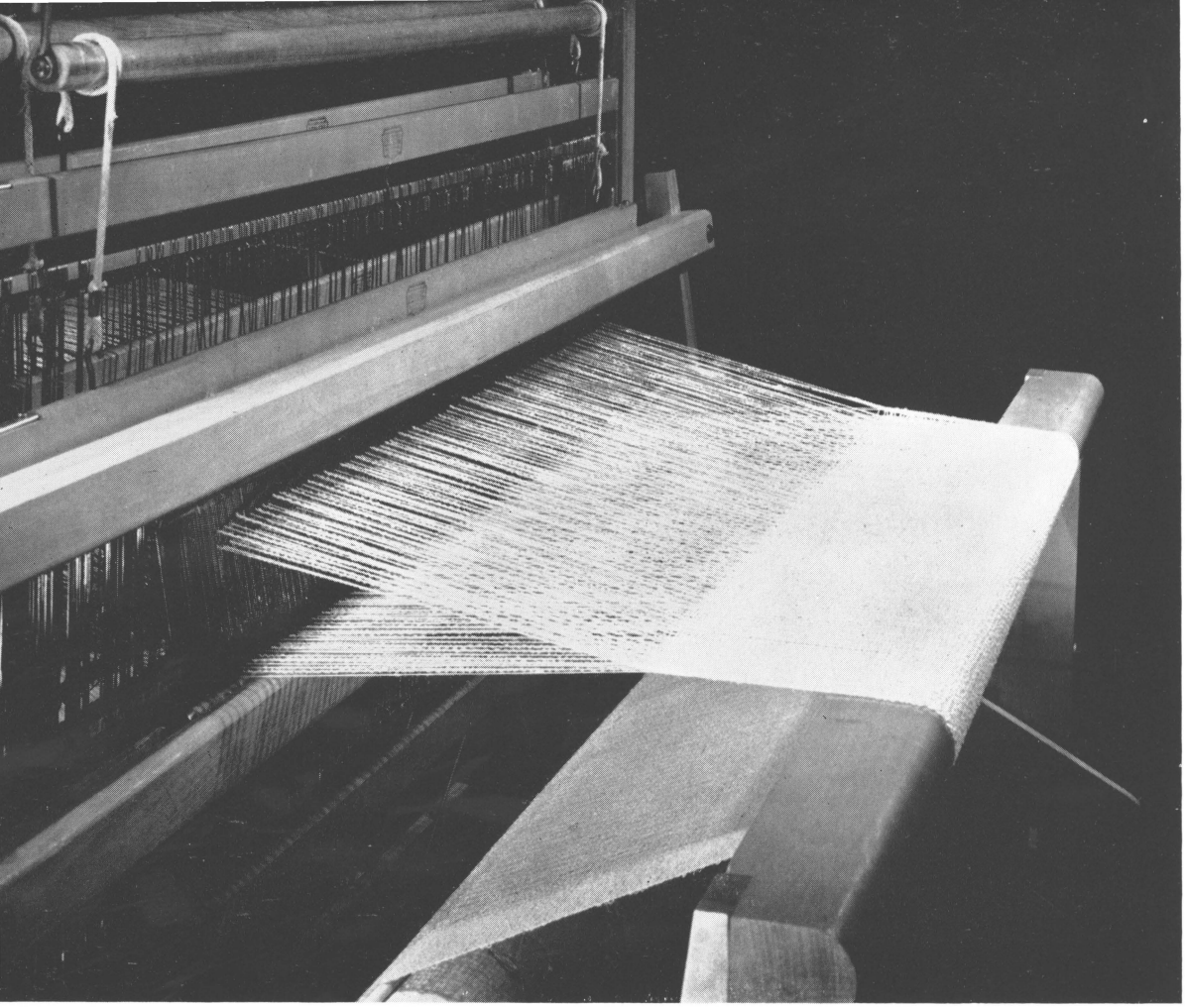

Fig. 7.1—A clean shed. Lower warp yarns lie in a level plane along base of the reed, forming a smooth path for the shuttle to move across.

at each end of the quill, then proceed to fill in the center between these ridges. Leave a small margin of paper at each end. To wind a bobbin which is firm and will not slip off the ends of the quill, hold the hand which is guiding the yarn close to the bobbin and keep it moving from right to left in short quick movements. Figure 7.2 shows these stages of winding. Another factor in securing firmness is to hold the yarn at considerable tension while winding. When the bobbin has been wound, secure the end of the yarn with a slip knot.

When winding bobbins from two or more spools that unwind at different speeds or tensions, the yarn which unwinds more rapidly can be slowed down by threading it in and out of two or more bars of the spool rack (*see* Fig. 5.1) . The same method can be used when making a bob-

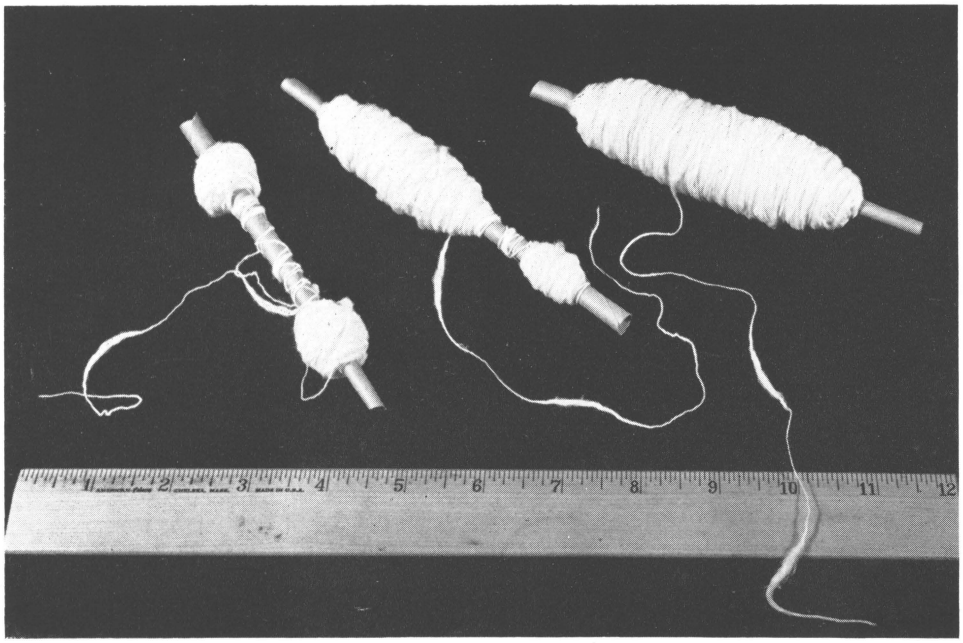

Fig. 7.2—Properly wound bobbins are a necessity for efficient weaving. Bobbins should be hard and should not slip at the ends. Illustrations show how to wind bobbins on a paper quill: at left the ends have been formed; the center illustration shows the middle of the bobbin being filled; completed bobbin is at right. Yarn is a single flake or slub novelty. Rough texture of the bobbin results from the quick right and left movement in guiding the yarn.

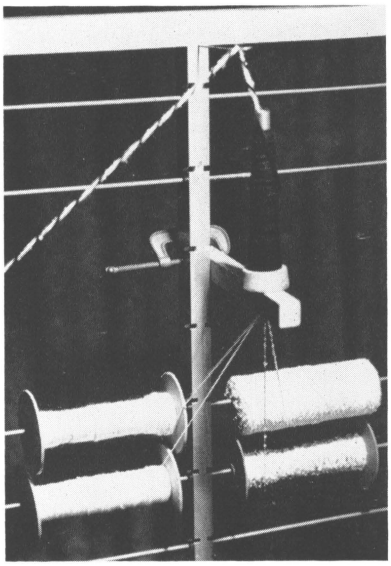

Fig. 7.3—Device used when winding bobbins with two or more yarns. (Courtesy A. J. Underwood.) Hollow, upright shaft on crossbar is treated as a bobbin, and yarn is wound from its base, tapering toward the end. Additional weft yarns are threaded through this shaft, caught with the yarn wound around the outside of the shaft, and guided through a screw eye toward the bobbin winder. Yarn from the outside of the shaft twists around those coming from the inside and prevents variation in length and tension of the individual yarns.

bin of two yarns of different elasticity, such as wool and rayon. Increase the tension of the rayon, the less elastic yarn, by threading it through the bars of the spool rack. Beginners should experiment by winding only one bobbin at a time until the proper tension can be judged. A device such as the one shown in Figure 7.3 may be used to twist the yarns while winding the bobbin, thus eliminating tension difficulty.

► THROWING THE SHUTTLE

For smooth and rapid weaving the shuttle should be thrown through the shed with one movement. In passing the shuttle from right to left, hold it in the right hand with the thumb on top, the first finger curved around the end, and the shuttle resting on the other three fingers. Receive the shuttle with the left hand in the same manner as it emerges from the shed (Fig. 7.4) . The position of the shuttle in the shed should be close to the reed. Shuttles with a straight and a curved side should be thrown across with the straight side next to the reed to avoid catching

Fig. 7.4—Throwing the shuttle. Holding the shuttle as illustrated, it is pointed slightly toward the beater and thrown across close to the beater. Properly thrown in a good shed, the shuttle moves across smoothly and quickly.

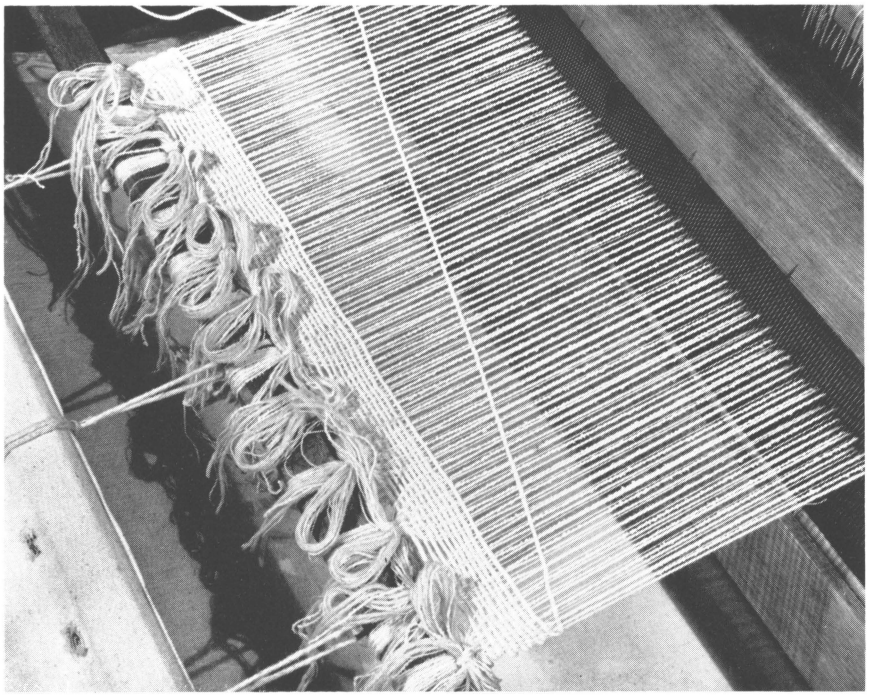

Fig. 7.5A—Securing ease in filler yarns. Preliminary to weaving, a few shots of some heavy filler yarn are woven in to close the spaces which resulted from tying the units, to adjust the tension, and to establish, or start, the web. To prevent drawing the fabric in at the edges as weaving progresses, the yarn must be allowed some ease in the open shed. One method shown here is to have the yarn lie diagonally in the shed before beating. Ease in the filler yarn must be kept in mind throughout the weaving process.

the tip of the shuttle in the warp yarns. In entering the shed the shuttle should be tipped slightly to prevent catching in the warp yarns. Change the treadles as the shuttle leaves the shed, thus changing the shed, and bring the beater forward to push the filling yarn into its proper position. The shuttle is held in the left hand and thrown from left to right in the same manner.

Closeness of beating depends upon the number of warp yarns per inch and the effect desired. In most fabrics there are more warp than filling yarns per inch while weaving. In the finishing process, however, the two sets of yarns become more nearly equal, especially if the yarns are of similar size.

► SECURING EASE OF FILLER

It is very important to secure ease of tension in the filling yarns to prevent narrowing the fabric as weaving progresses. Two methods commonly used are: to let the filling yarn lie at an angle (Fig. 7.5A) ; or to form an arc in the open shed with the filling yarn (Fig. 7.5B) .

If the fabric is pulled in along the sides in the weaving, broken selvage

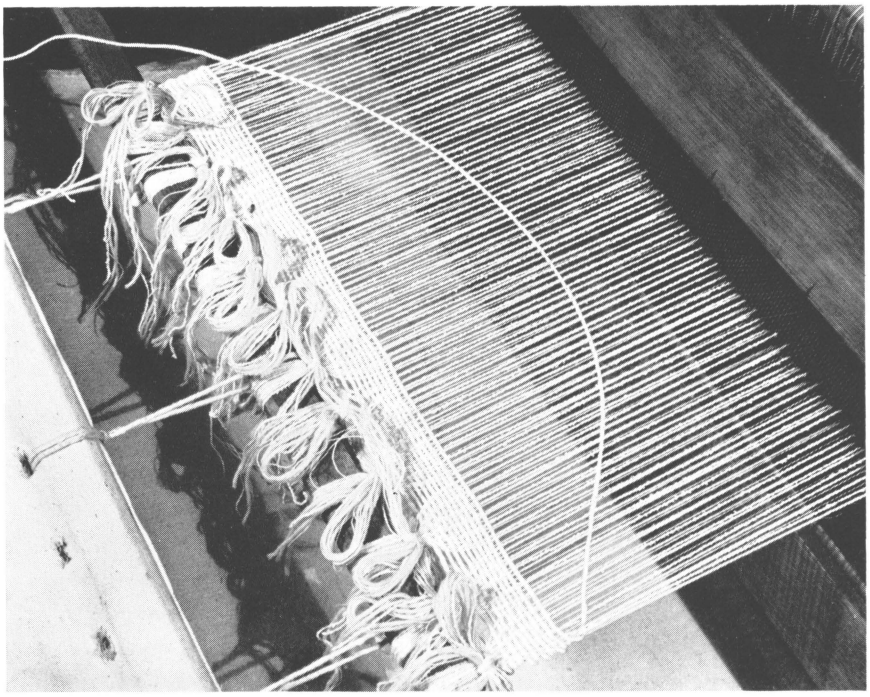

Fig. 7.5B—Filler yarn also may be formed in an arc to secure needed ease and prevent drawing in.

yarns usually result, and an uneven and unsatisfactory fabric will be produced. This is due to the strain put upon these edge yarns and the wear they receive from rubbing against the reed.

In some fabrics, especially in rugs, it may be desired to completely cover the warp. This can be done by exaggerating the ease in the filling yarn by *bubbling*. As Figure 7.6 shows, bubbling is produced by throwing the shuttle through the shed with a generous allowance in ease, then the bubbles, or scallops, are made with the fingers.

► USING THE BEATER

The beater can be used to secure various effects of openness or closeness in the weave. *Beating* is the process of bringing the beater forward to push the filler into place against the woven section, or web. Various degrees of force can be used, from a very gentle pull for a sheer fabric, to a hard beat in heavy fabrics such as rugs.

For upholstery or any material where firmness is desired, use a double beat; first, bring the beater forward with an open shed just after the shuttle has been thrown across, then change the shed and bring the beater forward again, usually with some force.

For sheer or open weave, do not beat. Use the beater in a closed shed and gently pull the filling yarn into the position desired.

Always grasp the beater in the center to insure even beating across the width of the fabric. When the shuttle is thrown from left to right, beat with the left hand; when it is thrown from right to left, beat with the right hand.

To prevent streaking and to secure evenness of weaving in soft materials such as suiting and soft woolens, it is important to roll the warp forward frequently. Experienced weavers tell us that we should weave within a 2-inch area. This area should be at approximately the same position between the breast beam and harnesses throughout the weaving process. Since looms vary in weaving space, the weaver must experiment to find the best place to locate this area. Do not crowd the weaving toward the beater until the angle or arc is diminished. This will result in uneven tension of the filling, and the web will show thick and thin spots. There is also danger of narrowing the fabric.

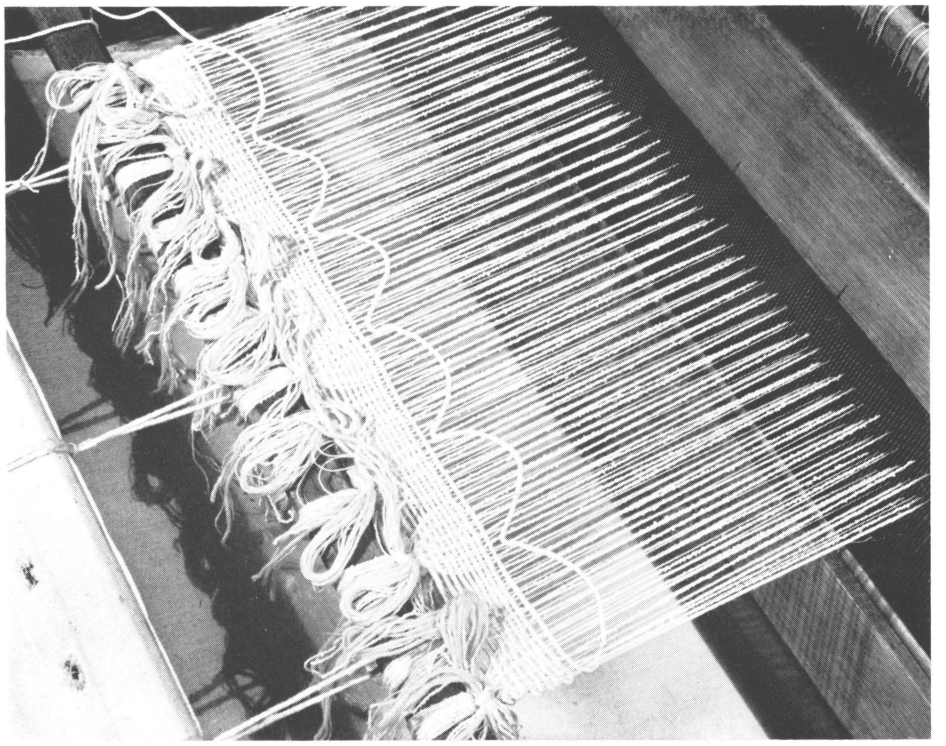

Fig. 7.6—Looping the yarn, scallop fashion, gives extra ease to the filler. This method is used where it is desired to have the filler yarn cover the warp as in rugs. It is sometimes called "bubbling."

► MENDING BROKEN YARNS

When winding the warp, all broken yarns and knots are mended near the beginning or ending pegs. However, if a knot appears in the filler, the yarn is pulled back to the selvage and clipped off. When ending one bobbin and starting a new one, we also end and start at the selvage. This prevents the appearance of a patched spot in the cloth. It is neither necessary nor desirable to bring the clipped ends back into the material.

If a warp yarn should break while weaving, it can be mended as follows: darn one end of a yard length of the same yarn into the section of woven material alongside the broken yarn for about ⅝ of an inch. Thread the other end of the yarn through the proper space in the reed and heddle, and tie in a simple knot to the end of the broken warp yarn at the back of the loom. Back of this knot make a slip knot in the original warp yarn to take up the excess length. Pull forward the warp end, which was darned in at the front, until the tension is the same as the rest of the warp. If the yarn is wool this will be sufficient, but other yarns may need to be held in the proper tension by wrapping the end around a pin until a few inches have been woven. When the weaving has progressed until the knot at the back is near the harnesses, the slip knot can be pulled out, the warp yarn pulled forward, and the spliced warp yarn can be darned into the cloth.

While the hand weaver does not expect to reproduce the precision and evenness of machine weaving, he should be able to produce a good cloth free of faults. Good weaving depends to a very great extent upon good habits of weaving. Take it slowly at first; the manipulation of the loom will become automatic, then speed and rhythm will follow.