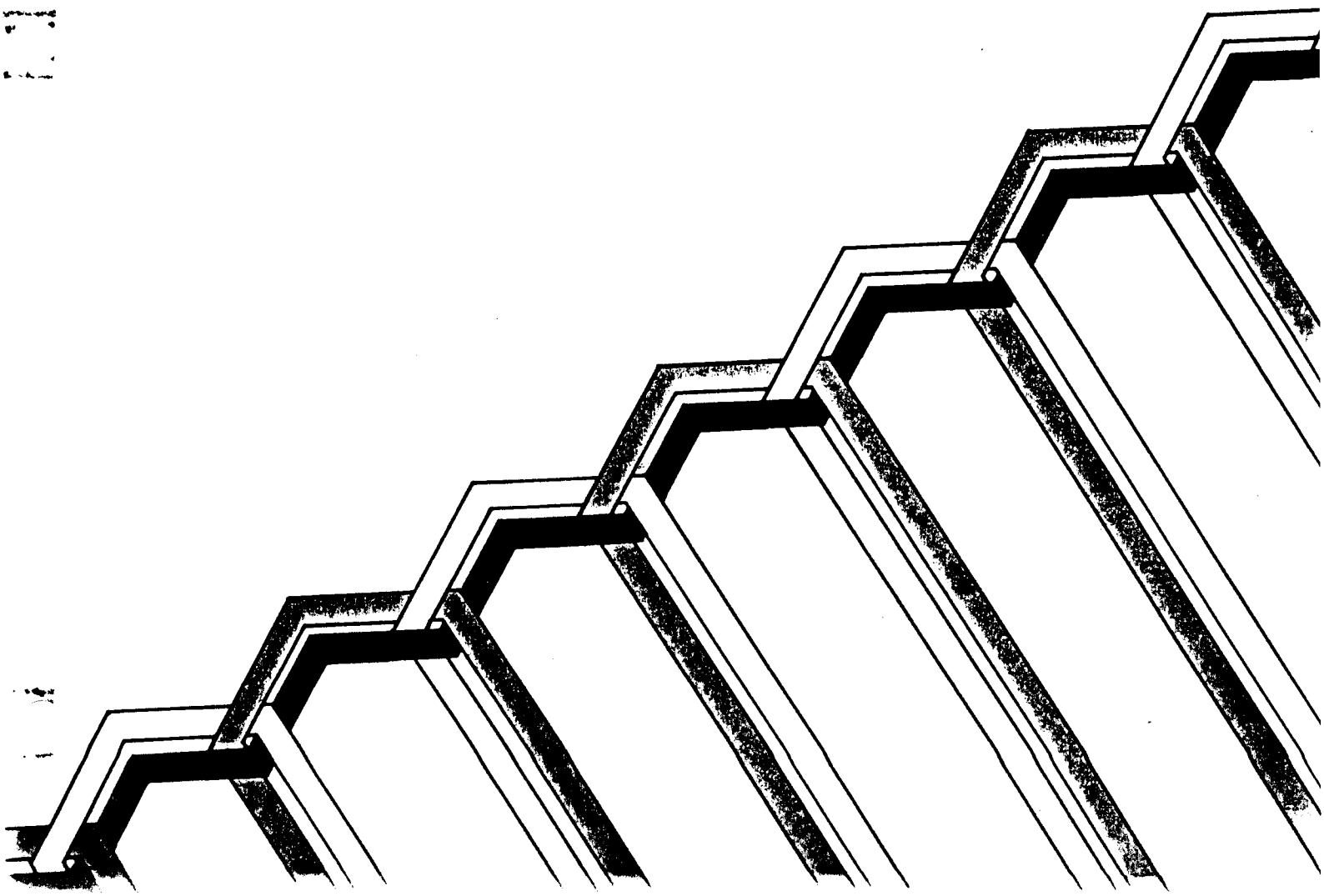
AVL LOOMS

AHRENS & VIOLETTE LOOMS, INC

BUILDERS OF FINE HANDLOOMS
& PRODUCTION WEAVING EQUIPMENT

Weaving Instructions



INTRODUCTION

In many ways, Ahrens & Violette looms are innovative in the weaving field. Jim Ahrens, a mechanical engineer with over forty years of professional hand and power loom weaving experience, designed the looms. His search for a hand loom that would function more efficiently than those presently available led him to years of research. He studied old, and in many cases, nearly forgotten loom designs and weaving techniques, especially those of the guild masters of Europe. Jim's design is made up of the most workable features of the numerous hand and power operated looms that he has worked on and studied over the years. The result is a uniquely engineered hand loom. Each feature of the Ahrens & Violette loom has been chosen to reduce time and effort and maximize professional results.

Learning to warp and weave on an AVL Loom will mean learning some new procedures and techniques even for the experienced weaver. Since the looms will not function to their full capacity unless care is taken to dress and operate them properly, it is greatly worth your while to study the following instructions in detail. The time taken to make these procedures your own will result in increasing your weaving speed and efficiency which will lead to a greater enjoyment of the entire weaving experience.

The information presented in the following pages represents what I have learned directly from Jim Ahrens coupled with my own experience working on the looms over the past eight years.

Sincerely,

Robin Violette

12 HARNESS DOBBY LOOM

TABLE OF CONTENTS

PAGE

WINDING ON THE WARP 1

- Unfolding the loom
- Planning the warp length
- Preparing the warp
- Installing auxiliary warp roller
- Using the raddle
- Using the groove in the warp beam
- Preparing paper for winding on
- Winding warp onto warp beam

THREADING, SLEYING, AND TYING ON..... 13

- Folding the loom
- Preparing for threading
- Raising the harnesses
- Sleying
- Using the temporary apron
- Tying on

SETTING THE TENSION DEVICE..... 17

PEGGING THE DOBBY UNIT..... 19

- Pegging and inserting a tabby chain
- Drawing up a peg plan
- pegging a pattern chain

ADJUSTING THE SPRING LEVERS..... 28

WEAVING PROCEDURES..... 30

- Using the treadles
- Advancing the cloth
- Weaving in the heading and lease sticks
- Changing the dobby chain
- Using a long length of chain
- Moving the chain backwards
- Removing the temporary apron
- Removing part of the weaving from loom
- Extending the end of the warp

TROUBLE SHOOTING..... 36

BOOK LIST..... 37

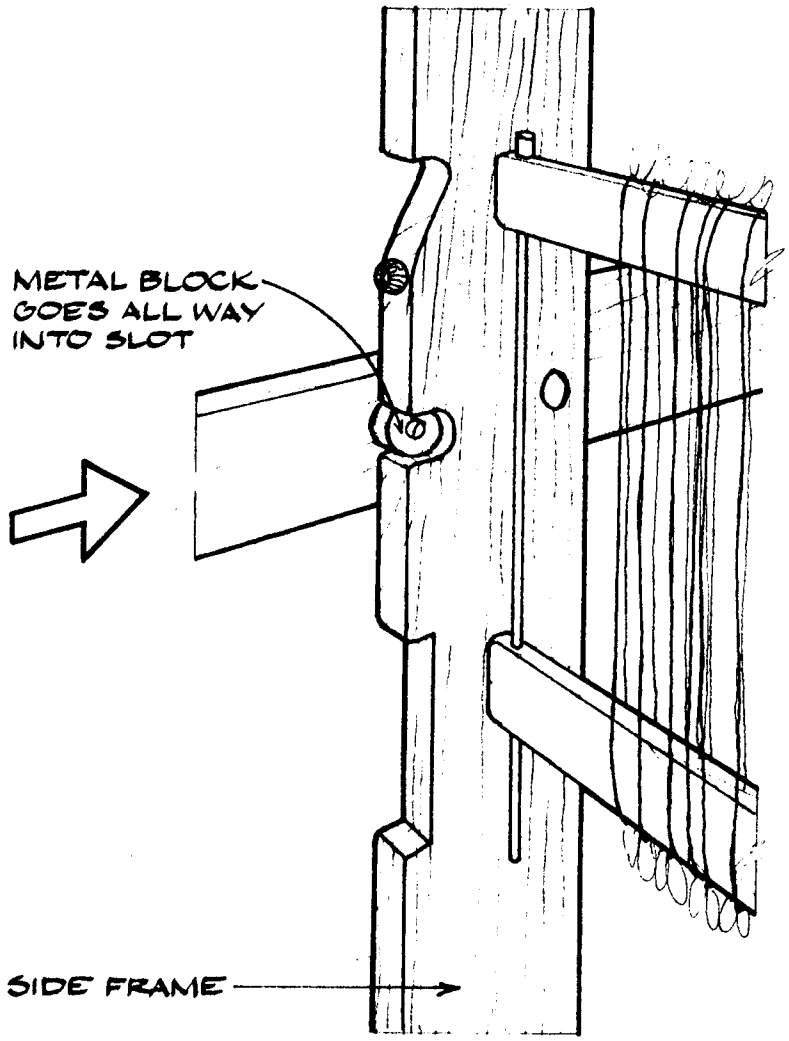
WINDING ON THE WARP

1. Your new Dobby Loom comes boxed fully assembled in its folded position. After removing the loom from its container it can be opened up to the weaving position by first loosening the two aluminum handles at the side of the loom. These handles secure the side arms that hold the cloth and warp beam. Now with the handles loose the arms can be lifted up into a horizontal position. Notice that bolted onto the inside of each arm is a round metal bushing. These bushings are going to fit into the two corresponding slots in the front edge of the loom sides. See drawing on next page. So now push forward on the cloth beam so that the loom arms slide forward; keep pushing until the bushings are all the way into their slots. Check to make sure that the front edges of the bushings are touching the back of the slots. Good; now simply retighten the two handles.

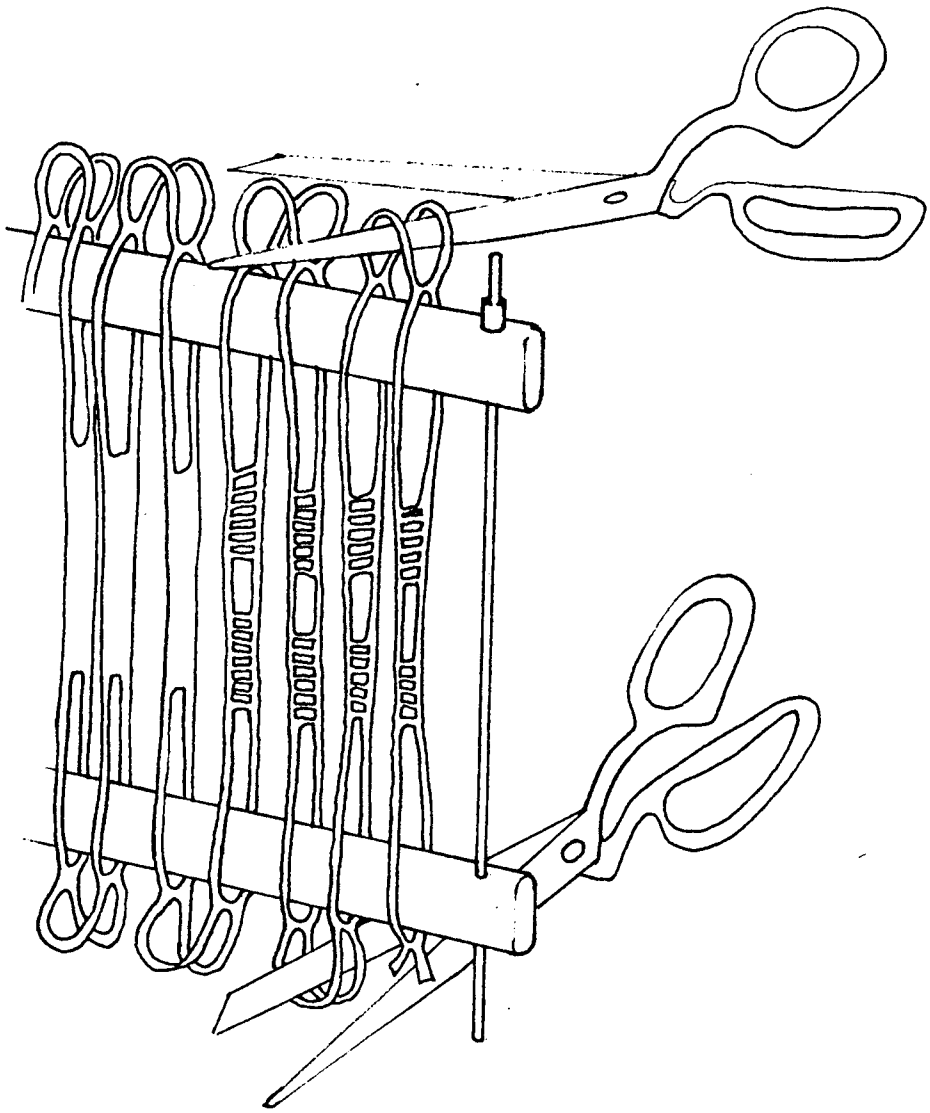
   The next step is to distribute the heddles over the harnesses. The looms are shipped from the factory with two bunches of heddles on each harness. Simply distribute the heddles evenly over the length of the harness, and then cut the top and bottom eyes (see diagram, page 3) freeing the heddles from each other.

   The last thing you must do to prepare the loom is to install the warp beam handle which came packed loose. Simply bolt the handle to the right end of the warp beam with the bolt and nut provided. The loom is now ready to be warped.

2. First, plan your warp width and length. Avoid having a warp that is too long as this would make the wound-on warp so fat that it would change the shed angle, thus creating tension problems in the weaving. Here are some guidelines to use in determining your warp length: Use up to 40 yards for a very fine warp material, up to 30 yards for a medium fine warp material, up to 20 yards for a medium thick material, and up to 10 yards for a thick warp material. Also keep in mind that

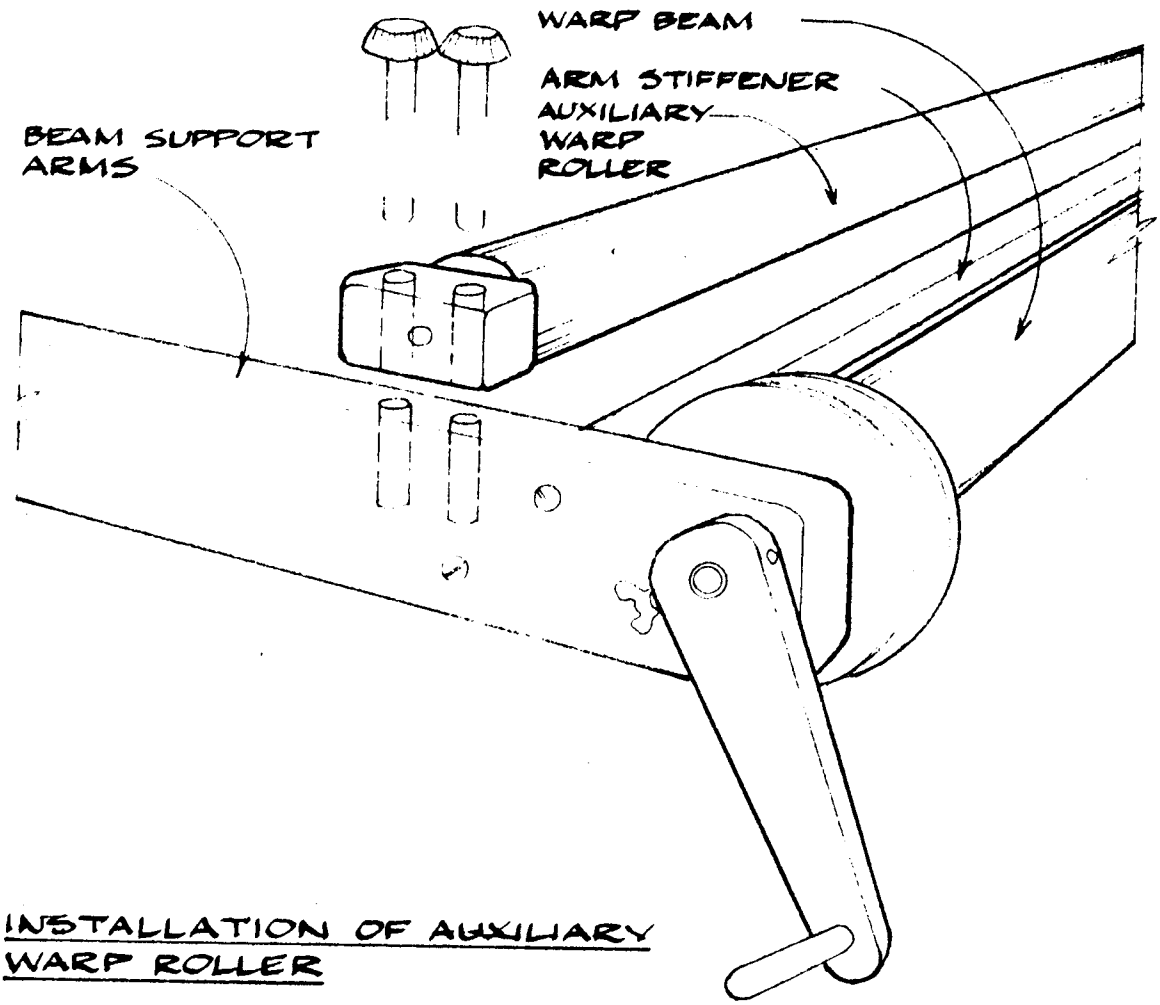


UNFOLDING 12 HARNESS LOOM



you can use somewhat more with a stretchy material like wool than you can with a taut material like linen.

If you want to put on warps longer than those specified here, you should order an AVL auxiliary warp roller. The auxiliary warp roller allows long warps to be put on the loom without adversely affecting shed geometry. Production handweavers will probably be most interested in this option. See Diagram, page 4.

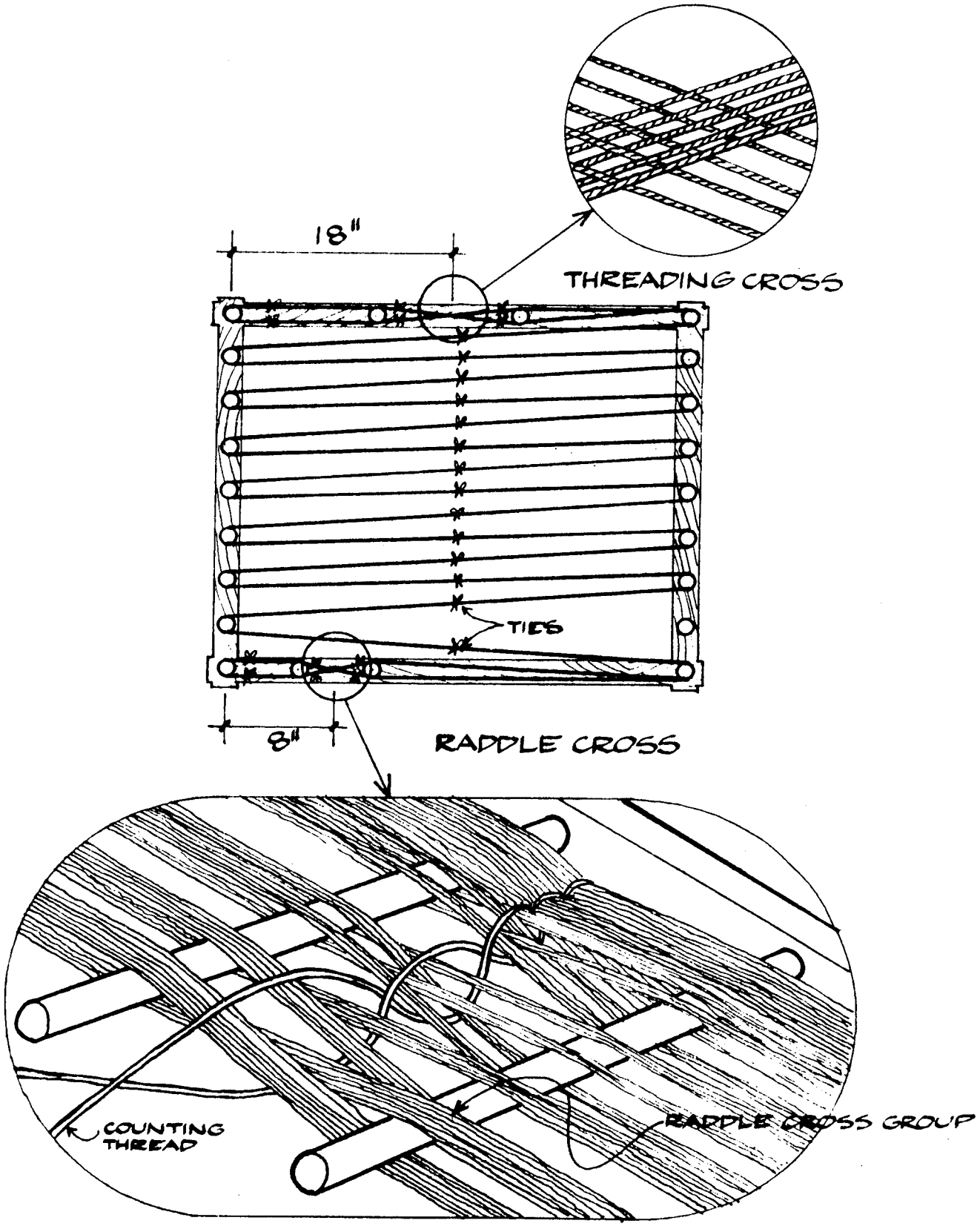


INSTALLATION OF AUXILIARY WARP ROLLER

3. Various warping methods can be adapted to the AVL looms. However, we recommend the following method in which the warp is wound on from the back of the loom with use of a raddle. Please study this method and try it. We have found that it aids in getting a uniform warp tension, especially when dealing with long warps of 20 yards or more.

To begin, first wind the warp on a warping board or reel (refer to diagram on next page). Make sure you put in two crosses, the threading cross, about 18" in from the first peg, and a raddle cross, about 8" in from the last peg. In the threading cross, each thread crosses the next thread in opposite directions. In the raddle cross, groups of threads cross each other. The number of threads in a raddle cross group is determined by the number of ends to be placed in each section of the raddle. Since this will vary with each warp, take a minute before starting to wind your warp on to your warping board or reel to figure out how many threads will be in each raddle cross group. To determine this you must first know the number of ends per inch in your planned weaving and the number of divisions per inch in your raddle. Sometimes this will be merely a matter of division as with 12 EPI and a 4 dent raddle; there will be three threads in each raddle cross group. Other times you may have to fool with it more and have different number of threads in each raddle cross group, as with 15 EPI and a 4 dent raddle, us the sequence 3,4,4,4, in the raddle cross groups.

A still more satisfactory possibility is to plan on threading the raddle a few inches wider than the warp will be sleyed. For 15 EPI and a 4 dent raddle, use three threads in each raddle cross group. This will mean your warp will be threaded through the raddle at 12 EPI even though it will be sleyed through the reed at 15 EPI. As long as the warp is no more than 2 or 3 inches wider on either side of the raddle than it is through the reed, this actually creates an ideal angle for the selvedge threads traveling across the loom as they won't



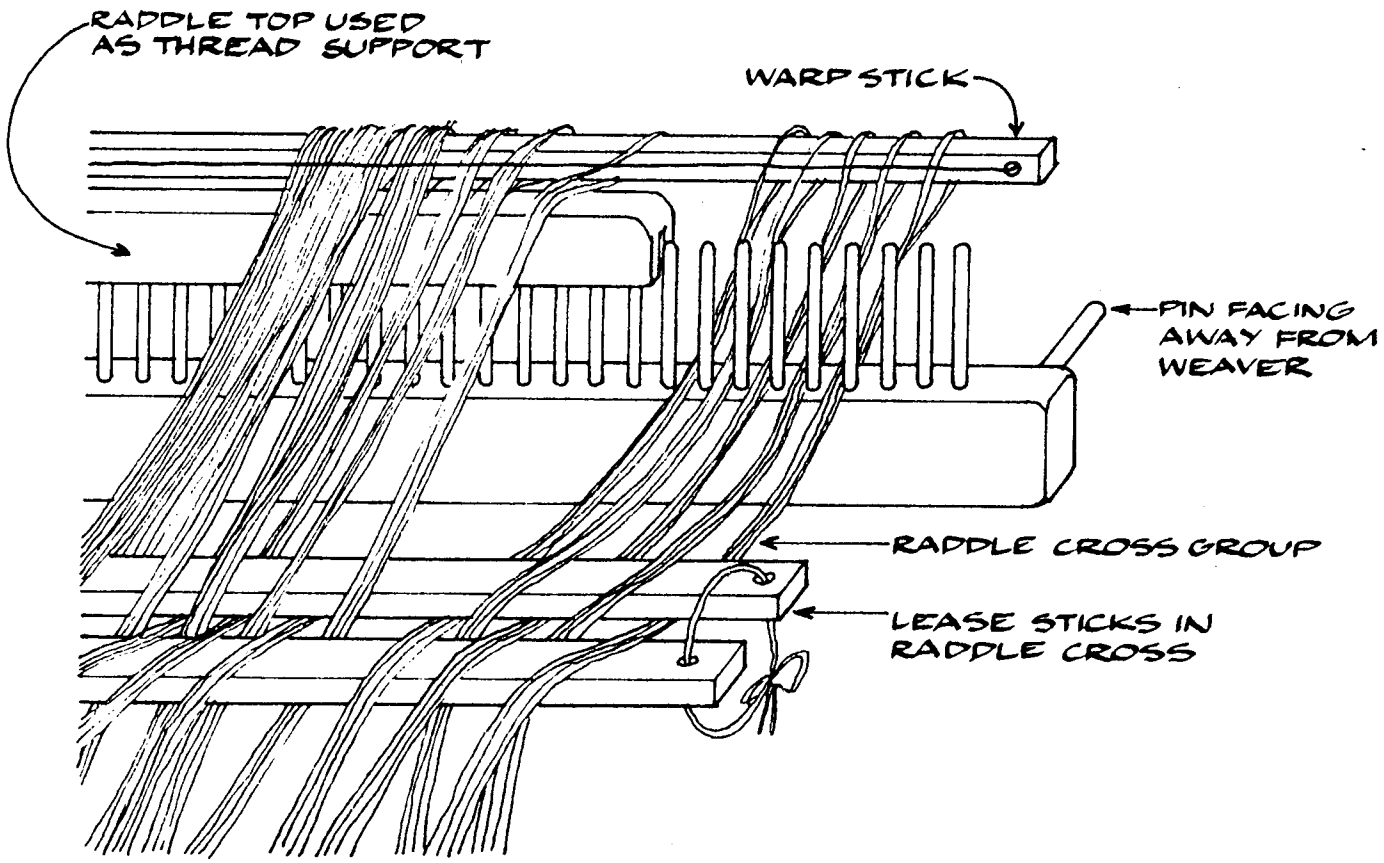
WARP ON WARPING BOARD WITH TWO CROSSES

be bent by the draw-in at the web of the fabric. Never plan on threading the raddle thinner than the warp will be sleyed or the selvedge threads will be very bent and poor tension will result.

4. As you are winding your warp onto the warping board or reel, it is a good idea to use a counting thread at the raddle cross to keep count of your warp threads. If you are using 4 threads in each raddle cross group, you know you will have 16 threads when four raddle groups intersect. As the winding process proceeds keep the raddle cross groups somewhat spaced apart and forward on the pegs so that you can see them easily, until 4 raddle cross groups are complete. Then twine the counting thread once around all 4 groups making a bundle and push it together and back on the pegs. Continuing in this manner it should be easy to count the number of bundles, (in our example, we have 16 threads in each bundle). Divide the number of threads in each bundle into the total warp ends needed to find out how many bundles will be needed. When you are sure you have the correct number of warp threads, remove the counting thread.

5. Now secure both crosses and make TIGHT choke ties. Do NOT cut the end loops; instead secure them firmly with two or three ties so that the loops can not fall apart. This will save you time later. Then remove the warp from the warping board by chaining (or better still using a drum or other device for keeping the warp taut) from the treading cross to the raddle cross.

6. Place two thin 3/16" lease sticks in the raddle cross and secure together with string through the holes in the ends of the sticks. Then place one of the fatter 7/16" warp sticks in the end of the loop of the warp closest to the raddle cross. If you secured the loop properly this only takes a second, otherwise you have a mess.



THREADING THE RADDLE

Take a long piece of string and run it across the warp stick, through the holes in both ends, around the other side and tie it together, forming a security cord so the loops can not slide off. Now remove the original ties from the ends loop and raddle cross and spread the warp out on the sticks.

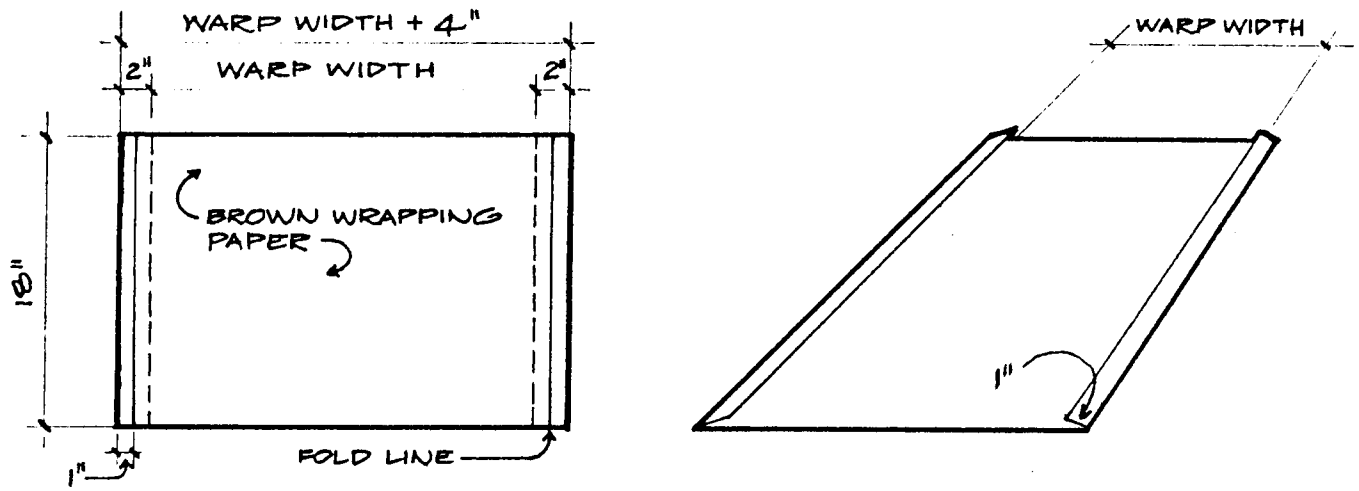
7. Working at a table, distribute yarns through the raddle by dropping each raddle cross group into a dent in the raddle as in the diagram. Make sure the warp is centered and secure. If you are using a sliding raddle cover, secure it with 2 or three cord ties so it can't come off. Now remove the raddle cross sticks when this is completed.

8. Now secure the raddle to the back of the loom. If you have an Ahrens & Violette raddle, simply slip it into the set of holes that are underneath the warp beam. If you are using some other raddle, you will need two 1/4" pieces of doweling six inches long. Insert these into the same holes and then tie your raddle to these.

9. Making sure the loops in the end of the warp are distributed evenly along the warp stick, place the stick into the groove in the warp beam. If an unusually thick warp is used, apply pressure or even a hammer if necessary. Secure the stick in the groove by binding on either side of the warp with string. Note here, that the purpose of the grooved warp beam is not only to eliminate the time spent either lashing sticks together, or cutting and tying ends at the back of the loom, but more importantly, to create a warp roll which is smooth and free of lumps and bumps. This feature is a great aid in creating an even tension in the weaving and creating professional results, especially with longer and finer warps. (A special system will be described later for extending the last few feet of the warp so that there is very little warp waste).

10. Next prepare paper for winding between warp layers. Again, for the most professional results, and few tension problems, we suggest that the warp be as smooth, tight, and compact as possible. This would mean not using corrugated paper or sticks as they will make the wound on warp too fat and/or lumpy. Corrugated paper is just too soft and the warp can never be wound tight enough with it. A heavy wrapping paper works well, 70 lb Kraft paper is good. It is not necessary to add to the bulk of the wound on warp by winding paper throughout, as a tightly wound warp eliminates any cutting of one layer of warp into another. Actually with a tightly wound warp the papers' only purpose is to support the edge yarns so they will not fall off themselves and create a poor selvedge tension. An 18" long length of paper wound in about every 1 1/2 yards of the warp is sufficient for this. So cut lengths of paper 18" long and at least 3 or 4 inches wider than the

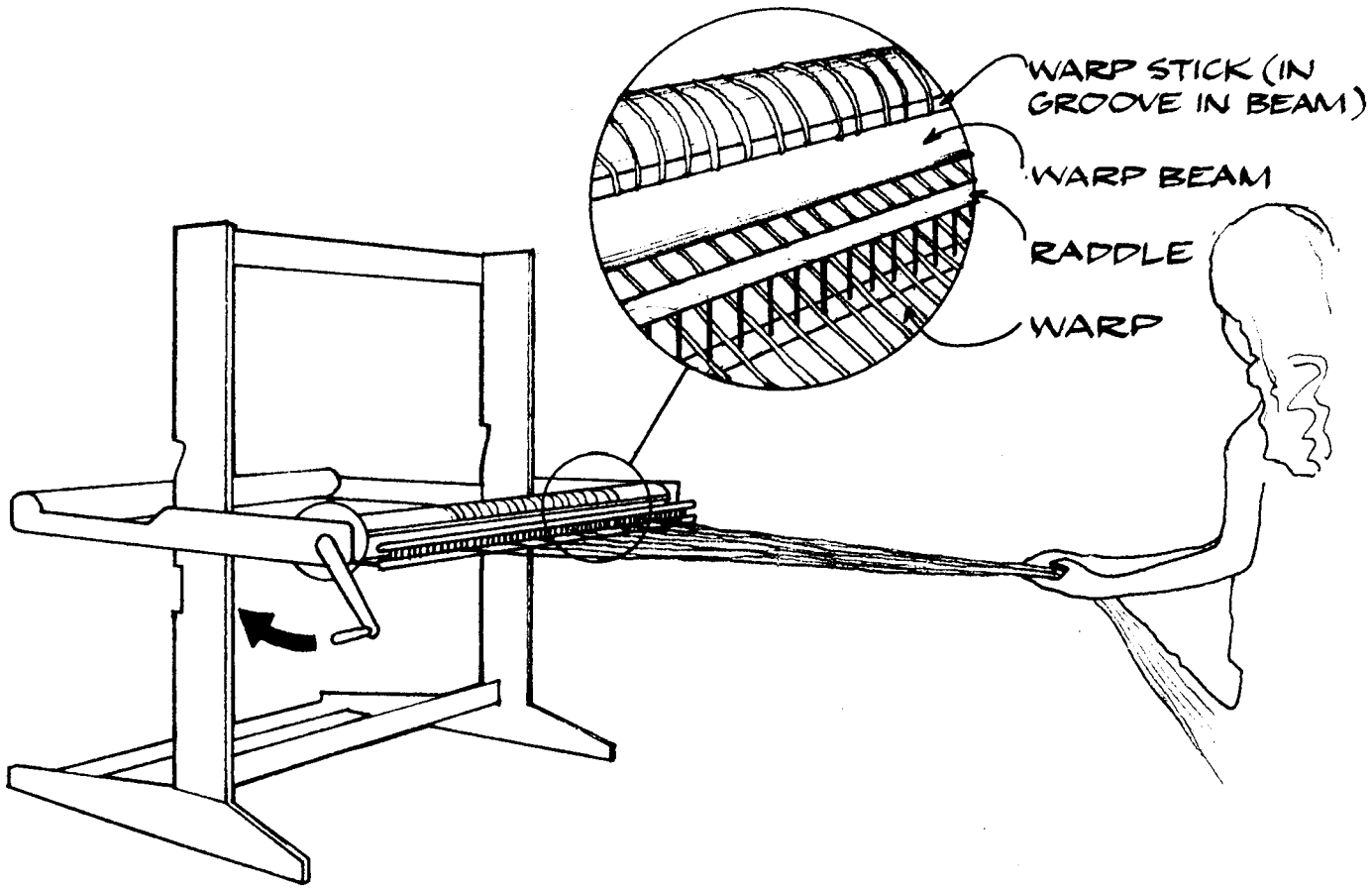
warp width, and enough to have one about every yard and a half of the warp. If you are going to be using smooth slippery warp yarns like fine linens or perle cottons, the edge yarns are going to need extra help in order not to slip off themselves. To do this, cut your paper 4 inches wider than the warp width and then fold over the edges an inch on each side. Be sure the warp is wound between the two folded edges, but not overlapping them.



PREPARED PAPER WITH FOLDED EDGE

11. When winding the warp on from the back, that is with the warp spread out in back of the loom turn the crank in a clockwise direction so that the warp comes in from the bottom.

I will say it again because it is so important--wind the warp on TIGHTLY under a lot of tension. This will vary with each warp material, but a good rule to remember is that the tension of the wound on warp must be greater than that put on it during the weaving operation. For a wide heavy warp several helpers can be required. If the choke ties are very tight, and enough tension is applied to the warp most of the combing should be unnecessary. Watch the edge yarns, and wind in a layer of paper when they have built up to the point where they will no longer support themselves.



WINDING ON THE WARP

12. If your warp has wound on nice and even without a lot of combing, try this method for winding on the last two or three yards of warp: Put a square warp stick through the loop in the end and put in the two thin lease sticks in the threading cross. Tie all sticks so they can't fall out and put a heavier stick through the loop to pull on. Then remove all the ties and spread the warp out. Continue winding until the threading cross will just reach the rear of the harnesses. This technique is used especially with wide warps to eliminate the acute angle which is formed as the end of the warp comes close to the warp beam. With thin warps it is not necessary.

13. When the warping is completed, free the warp from the raddle. If you have an AVL raddle first untie the security strings, lift the raddle top off, and remove the warp from the raddle. Afterwards replace the top on the raddle and leave it in its place on the back of the loom if so desired, it will not interfere with the weaving process.

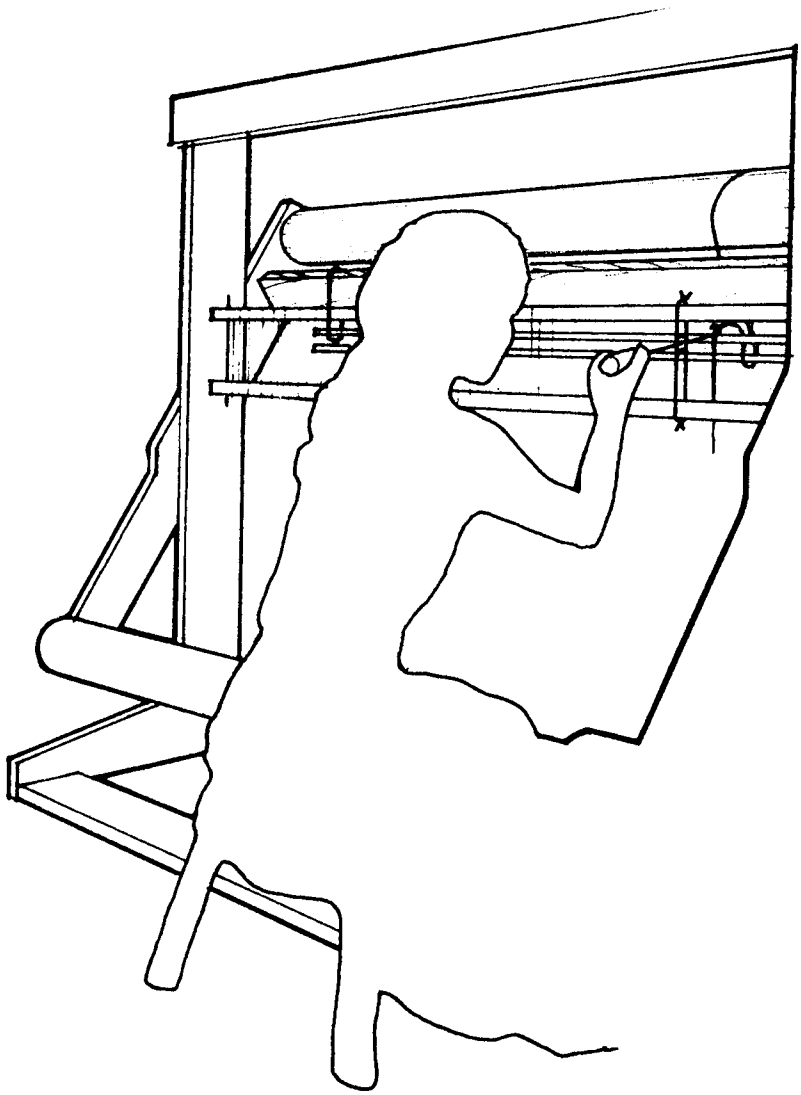
THREADING, SLEYING, AND TYING ON

1. To prepare for threading, first lift out the beater, then place the loom in its folded position by first loosening the two aluminum handles at the side of the loom. Pull forward on the cloth beam until the round metal bushings which are bolted onto the inside of each arm move out of their corresponding slots in the front edges of the loom sides. Then push down on the cloth beam until the aluminum handles at the side of the loom slide all the way to the end of their slots nearer the back of the loom retighten the handles.

2. With lengths of string, tie the threading cross sticks to the cross bar near the warp beam, so that the cross is even with the eyes of the heddles. Remove the square stick from the end loop and cut the warp ends so they will be ready for threading. Then unfasten the chains from the bottom of the lower harness sticks so that the heddles will move easily.

3. Place a small stool in front of the loom to be sat on for threading. The threading seat should be just the right size so that the heddle eyes are at just your eye level or a little higher. They should never be lower, or you will have a difficult time threading. For taller people, it may be necessary to raise the harnesses. To accomplish this, first make sure there is no chain in the dobby unit. Then simply press down on the right treadle and the harnesses will raise. Use a block of wood as a brace between the treadle and the bottom cross piece, so as to keep the harnesses raised. By the way, with the harnesses raised it may not be necessary to unhook the chains from the bottom of the harness sticks, as there will be less pressure holding the heddles tight. See diagram of Threading Position on next page.

4. After the heddles are threaded, open the loom up to its weaving position. Replace the beater, and secure it in a middle position



THREADING POSITION

AMENDMENT

Paragraph 5, page 15, is incorrect. Please replace with the following paragraph.

5. Now take up the cloth apron that comes with the loom. We call this a temporary apron because it is not attached to the loom and it will be removed early on in the weaving process. Notice that it has two hemmed ends. One is a hem with openings in it and the opposite end a plain hem. Take the two square wooden sticks and slide one into each of the hemmed ends. Place the end without openings, with its stick, into the groove in the warp beam. Then you simply wrap the apron around the beam, as in the diagram, until the stick in the end with openings can be extended over the top of the beam to within 6" of the beater in its rearward position (see diagram next page).

You may cut this paragraph out and affix it over the incorrect paragraph in the manual if you wish.

using binding cords. The top of the beater is then removed and the reed slanted forward providing an excellent position for sleying. Other sleying positions are possible depending on what works best for you.

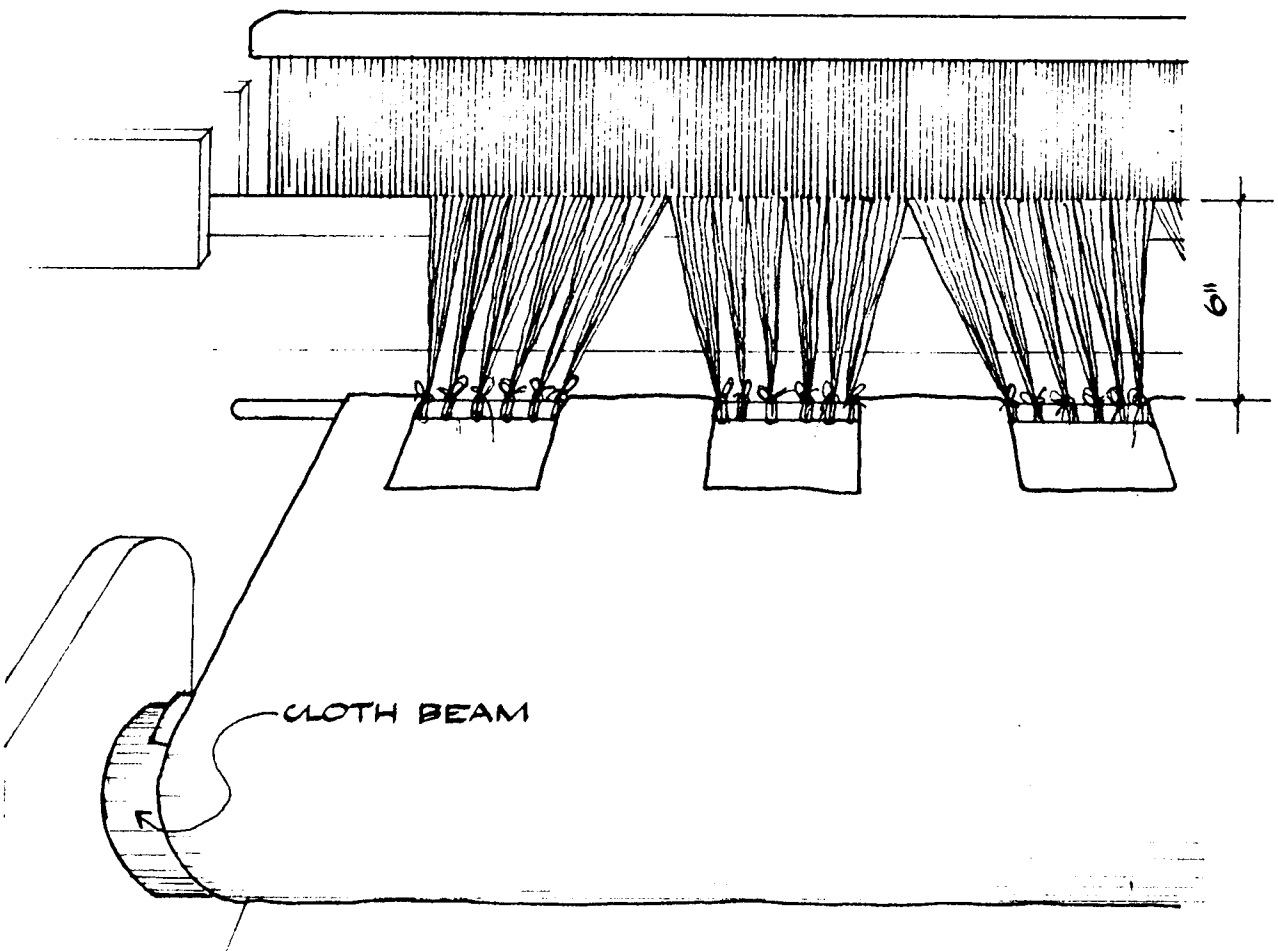
After sleying is completed, make sure that the harnesses are in their lowered position and/or all the chains are attached to the bottom eyelets of the harnesses before continuing with tying on. Make sure that the chains are attached to the right harnesses or the loom won't work properly.

5. Now take up the cloth apron that comes with the loom. We call this a temporary apron because it is not attached to the loom and it will be removed early on in the weaving process. Notice that it has two hemmed ends. One is a hem with openings in it and the opposite end a plain hem. Take one of the metal rods and slide it into the hem with openings. Place the opposite end of the apron flat along the cloth beam and wrap it around the cloth beam as in the diagram until the metal rod can be extended over the top of the beam to within 6" of the beater in its rearward position (see diagram next page).

6. The warp is now tied on to the metal rod inside the openings. Tie the yarns on evenly and tautly, but you need not spend a long time fussing with them as once you have set the tension device and woven in two flat sticks (instructions for all this is coming up next) your warp threads will automatically have a completely even and perfect tension.

7. At this point make sure that the unused heddles are all pushed to the far sides of the harness sticks between the hooks and the ends of the harness sticks. For balance there should be near to equal numbered groups of unused heddles on both sides of each harness. In some cases, as when you have a very wide warp with a lot of unused heddles on the ends of the harnesses, you may need to tie each group of unused heddles into a tight bundle with tie-tapes or string, to keep them

from falling off the ends of the harness sticks. Or you may need to take heddles off the loom. If you do this make sure to mark each bundle of heddles with its harness number, so it can be put back on the same harness. Once the heddles have been on the loom for awhile it is not a good idea to switch heddles to different harnesses as the heddles on each harness get stretched out to different sizes. Mixing them up once they have been stretched out would effect the evenness of the shed.

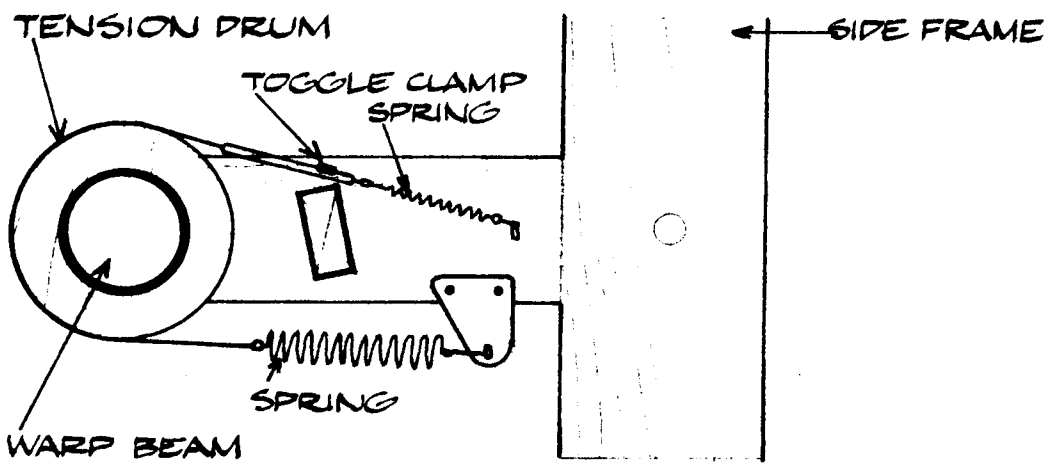


TYING ONTO APRON

SETTING THE TENSION DEVICE

Warp tension is controlled by a special spring-actuated tension drum which insures a constant tension at all times. The tension is easily adjusted, and the warp beam is released automatically as the cloth is advanced.

1. First familiarize yourself with the tension device which is located on the right end of the warp beam as you are looking at it seated at the front of the loom. Notice that it consists of a wooden drum around which a rope is wrapped three times, one end of the rope being attached to a large spring underneath and the other end attached to a smaller spring on top. Further note that between the end of the rope and the small spring on top is a small adjusting cord held in position by a plastic clamp. See diagram below.



TENSION DEVICE

2. Now move the warp forward three or four inches using the front ratchet handle, and then feel your warp for tension. If it is too loose, increase tension by pulling the two ends of the adjusting cord attached to the small upper spring. If the warp tension is too tight, decrease tension by letting the adjusting cord out by pressing in on the plastic clamp. Then move the warp forward another three or four inches and check again to see if the tension is what you want. Continue this process until the desired tension is achieved. Notice that each time a new tension adjustment is made the warp must be moved forward before the tension is set. Once the correct tension adjustment is made, however, it will be maintained automatically as the weaving is advanced. You will find that you can weave with less warp tension with an automatic tension system than with a conventional ratchet system.

3. In making these adjustments at times the warp will be wound too far forward. To wind it back on the warp beam unlock the front ratchet handle so that the front tension is released, then go to the back of the loom and turn the back roller clockwise so that the warp is wound back onto the warp beam. Check to make sure the rope has not become crossed on the drum. Then wind the warp forward again with the front ratchet handle until the warp tightens and is in the correct position.

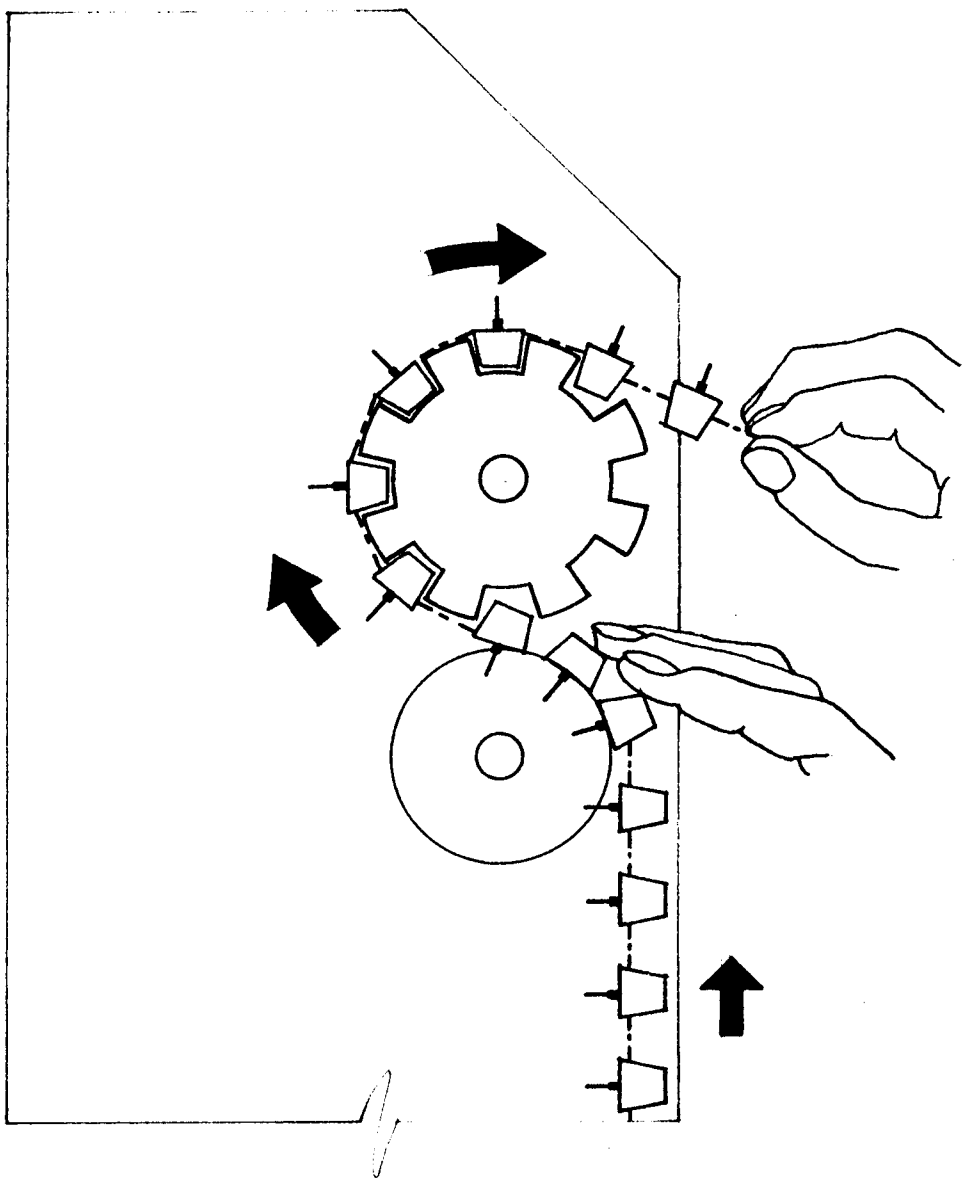
PEGGING THE DOBBY UNIT

The dobby loom provides the means for quickly and easily raising any number of harnesses in any combination by the alternate use of only two treadles. This is accomplished by the use of a chain of wooden bars which are placed in the dobby mechanism, or "head," in which short metal pegs can be easily inserted. Each wooden bar has a row of 12 holes in it. The first hole on the left corresponds to the first harness, the second hole to the second harness, and so on. Now the way the dobby works is that each wooden dobby bar controls one shed, and when a peg is inserted into a hole in a bar it causes the corresponding harness to raise when that bar comes around into position by pressing on the treadles.

1. The first pattern you need to peg up on the dobby bars is a tabby weave. Tabby weave will always be used for the first inch of each new warp as a heading. Take one of the chains of 20 dobby bars and lay it flat on a table with the larger surfaces face up. In the first bar (start at the bottom of the chain and work upward) place pegs in holes 1,3,5,7,9, and 11 using the special wrench provided. First place the smooth end of the peg in the wrench. Then holding the wrench handle, screw the peg into its hole firmly, but not too tightly. (Use the wrench again when removing pegs). In the second bar place pegs in holes 2,4,6,8,10, and 12. Continue repeating these two sequences until all the bars are pegged.

2. Now place the pegged up chain in the dobby unit. Note that in the dobby unit are two rollers--a large grooved upper roller and a smaller lower roller with a metal rod. Further note that the large roller turns only in a clockwise (assuming you are at the front of the loom) direction. Never try to force it to turn counterclockwise. Hold the chain so that the larger pegged surfaces are facing away from you and carefully feed the chain over the top of the bottom roller and up

behind and over the top of the upper roller using your fingers to gently roll the upper roller clockwise as you do so. See Diagram. The small side of the chain will fit into the grooves in the upper roller. When a few bars have come out over the top of the upper



FEEDING DOBBY CHAIN INTO DOBBY HEAD

roller, give them a pull to make more chain available. Fasten the chain together to form a continuous circle using plastic tie tapes, jewelry hooks, or string. Make two ties similar in size to the metal connecting loops between the bars. If using string make sure it is strong and wind it around two times making a tight square knot after each turn.

3. Next you will probably want to peg up another chain with a more complex weave structure. (A 12 harness point twill is an easy one to try first.) The first step is to draw up a "peg plan" which is a graph that shows the order in which the pegs are inserted into the dobby bars. The peg plan takes the place of the tie-up and treadling plans used with conventional treadle type looms. Use the following procedure for determining your peg plan:

    a. First determine the tie-up and treadling plan for the weave structure you will by using as you would for a conventional treadle loom. Diagram (a) on page 23 is an example showing a typical pattern with its tie-up on top, and its treadling plan below; the threading plan is not shown. In the tie-up each vertical column represents one treadle (numbered 1-12 from left to right), and each horizontal row represents a harness (numbered 1-12 from bottom to top). Squares are filled in showing which harnesses are to be tied to each treadle. Please note that the filled in squares represent <u>raised</u> harnesses.

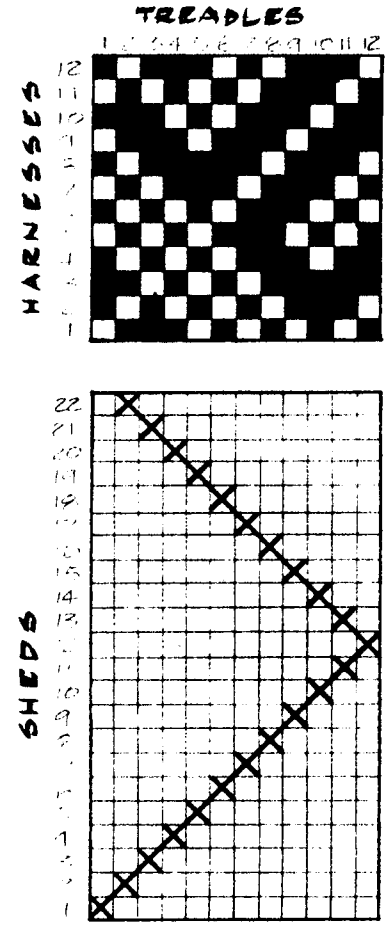
    In the treadling plan below each horizontal row represents one shed and they are numbered from bottom to top in the order they will be used when weaving. At each shed an X is placed in a vertical column representing the treadle which is to be used. Make sure your treadling plan represents one complete repeat of all the sheds needed to weave your pattern.

b. Now on graph paper you will construct a peg plan. In your peg plan each horizontal row will represent one dobby bar and they will be ordered from bottom to top to correspond to the way the dobby chain feeds into the dobby head; and each vertical column represents the holes in the dobby bars and their corresponding harnesses. If you are using all 12 of the harnesses on the loom, there will be 12 vertical columns numbered from left to right. The number of horizontal rows (or dobby bars) needed will be the same as the number of sheds in the treadling plan. Refer to sample peg plan (b) and notice that there are 22 dobby bars used since there are 22 sheds in treadling plan (a).

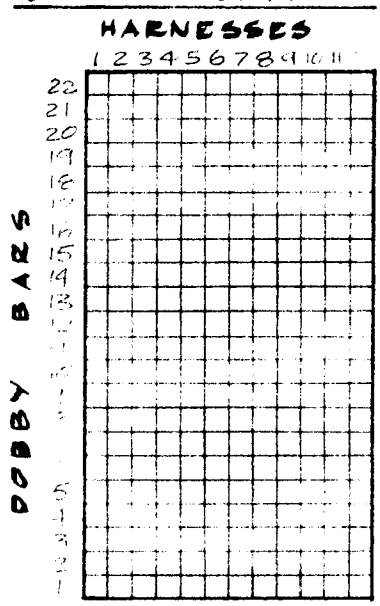
c. Now you are ready to start filling in squares in your peg plan. First look at the first shed (1) in your treadling plan. Then look above to its corresponding vertical column in the tie-up and note which harnesses are to be raised. In diagram (a) that would be harnesses 2,3,4,6,8,10, and 12. Now since the way the dobby unit works is that harnesses are raised where pegs are <u>not</u> inserted into corresponding holes in the dobby chain, go to the first (bottom) horizontal row of your peg plan and fill in all the squares corresponding to the <u>opposite</u> harnesses noted in the tie-up as in diagram (c). Notice how <u>horizontal</u> rows of the peg plan correspond to <u>vertical</u> columns of the tie-up. Actually, if you had a tie-up plan based on harnesses lowering (as for a counter balance loom), then you could just fill in those same corresponding squares in your peg plan.

d. Next look at the second shed (2) of your treadling plan and note which harnesses will be raised. In diagram (a) that would be harnesses 1,3,5,7,9,10 and 11. Then proceed to the second horizontal row of your peg plan and fill in the

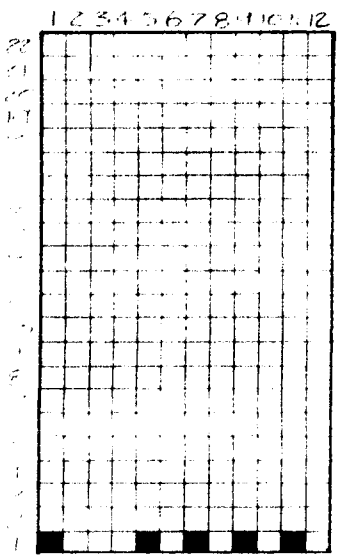
a TIE-UP AND TREADLING PLAN



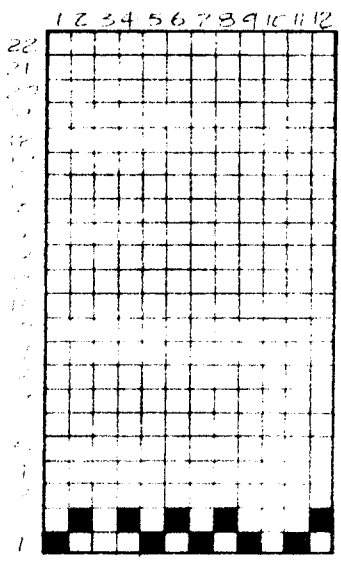
b PEG PLAN



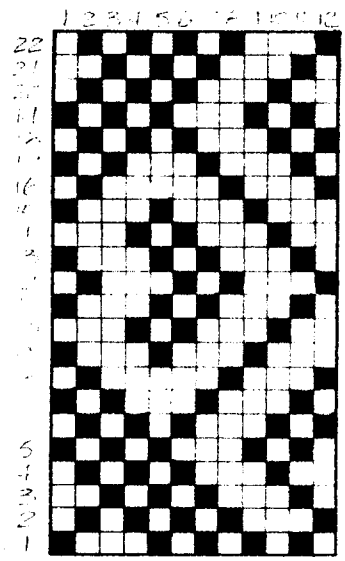
c PEG PLAN



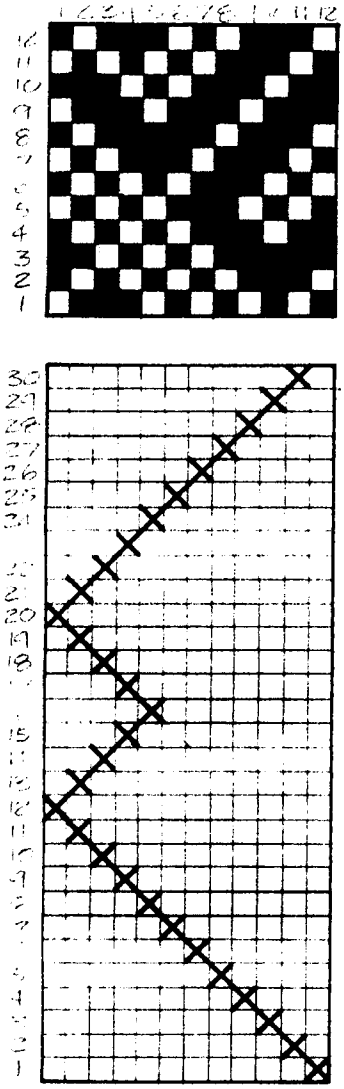
d PEG PLAN



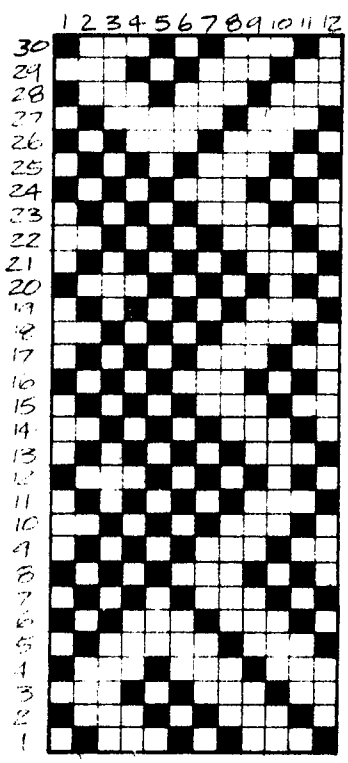
e PEG PLAN



f TIE-UP AND TREADLING PLAN



PEG PLAN



squares corresponding to these harnesses as we have done in diagram (d).

e. Continue in this same manner until all the sheds of your treadling plan have been recorded on the peg plan as we have done in diagram (e). Diagram (f) on page 24 shows the same tie-up as in diagram (a) with a different treadling plan and its corresponding peg plan.

4. Here are some additional points to keep in mind when making up your peg plan:

a. At least <u>twenty dobby bars</u> must be used at once in order for the dobby unit to function properly, so if the number of dobby bars or sheds in the treadling plan is less than twenty, they should be repeated several times. As an example, for a tabby weave which has only two sheds, repeat the pegging ten times so that you will be using twenty bars.

b. When the dobby chain is placed in the dobby unit it will form a continuous loop, so visualize your peg plan as circular. Check your peg plan to see that if the first shed follows the last shed the weaving pattern will turn out correctly. If you make the mistake of making the first shed and the last shed the same, then when the chain is placed in the dobby unit two sheds exactly the same will follow each other.

c. There are times when you will find it helpful to use a completely pegged-in dobby bar to mark your place in your pattern, for instance, if you need to know where the beginning of a pattern is. If all the holes in a bar are pegged in, then at that shed no harnesses will rise. If you are going to use this technique, make sure to fill in a whole row on your peg plan.

d. When using two shuttle weaves where there is a tabby shed in between each pattern shed, the tabby sheds are often not included on conventional treadle plans. Don't forget that on the peg plan for such a weave, a tabby shed must be filled in between every pattern shed.

e. Remember that with a dobby loom the number of combinations of raised harnesses is limited only by how many dobby bars you wish to use. On treadle type looms the number of combinations available is limited by how many treadles the loom has. As you gain more experience working with peg plans try designing right on the peg plan itself, adding raised harnesses wherever it suits the needs of your design.

5. Now peg your pattern up on dobby bars. The number of bars needed is determined by the number of rows in your peg plan. If you need to take off bars from the chain, unfasten the metal connecting loops with a long nosed plier. If you need to add bars to the chain use a long nosed plier to reconnect the metal loops; it is easiest, however, to fasten them together with plastic tie tapes, jewelry hooks, or string. Again, if using string, make sure it is strong and wrapped around twice with two knots.

   Always start pegging the bottom bar first corresponding to the bottom row of your peg plan and work upwards. It is a good idea to mark the left end of the bottom bar with an "X" since it will be placed toward the front of the loom when placed in the dobby unit, otherwise it is easy to get the chain turned around backwards which would make your weaving pattern turn out all wrong. Keep this pegged-up chain aside until it is time to place it in the dobby unit.

6. Here are some tips for handling your dobby chains. First of all, keep one length of chain pegged with tabby weave in a handy location. This way you can quickly do tabby weave whenever necessary without having

to repeg it each time. As you develop a repertoire of weaving patterns which you will be using over again, keep a notebook of their peg plans as well as other weaving information and give each weaving pattern a number. If you have lots of dobby chain, you can just leave the chain pegged-up ready to be used at any time; and each will be easy to identify if you write its number on a tag which is tied to the first dobby bar. Keep your pegged-up chain in a box, or hang them on the wall. If you do not have a lot of extra chain, here is a little trick that saves time if you are going to be repegging a pattern over again. Cut cardboard strips about the same length and width of the dobby bars. Make a guide by punching 12 holes in one strip, so that when that strip is held over a dobby bar the holes in the strip are aligned with the holes in the dobby bar. Use the guide to punch holes in the other strips corresponding to the way the dobby bars are pegged. Use them to quickly and easily repeg the dobby bars.

ADJUSTING THE SPRING LEVERS

1. The springs of the spring lever return system should be adjusted so that there is positive harness return, i.e. the harnesses are staying all the way down in their bottom position, with the least amount of effort needed to raise the harness. This will vary according to the weight of the warp. In general, lightweight, less dense, looser tensioned warps with a smaller weaving width will need very little spring tension to assure positive harness return; whereas heavier, denser, tighter tensioned, and wider warps will need more spring tension. To tell if the harnesses are returning all the way, open several sheds by working the treadles. To open the shed press down on the right treadle. When closing the shed, make sure the left treadle goes all the way down. Watch the unlifted harnesses and if the tops of their heddles become loose and tend to move around, then spring tension should be increased, but just enough to get the harnesses to stay down and no more or your treadling effort will be made greater than it has to be.

2. To adjust the spring tension, simply unhook the spring and then rehook it one chain link shorter. This tightens the spring and makes it pull down harder on that particular harness. Test the warp again by doing some more treadling and if more spring tension is still needed, try one or more chain links less. With a medium tight warp it may be necessary to remove the chain links and use only the spring. Under unusual conditions (perhaps a very tight rug warp) two springs on some or all of the harnesses may be necessary. If all the springs are set the same, the back harnesses will have a looser tension than the front. This is because the back spring levers and their hooks are longer since the back harnesses travel farther when a shed is made. Accordingly the back spring levers might have to be adjusted shorter to give the same tension as the front ones. It may even be necessary to cut springs down if you need extra tension back there. The

important thing to remember is that the system is designed so that it can be "fine tuned" for each particular warp, so experiment with it. The loom comes with sixteen chains and sixteen springs. If extra springs are needed you can use 10" screen door springs which can be purchased in almost any hardware store; you can also get extra chain there.

WEAVING PROCEDURES

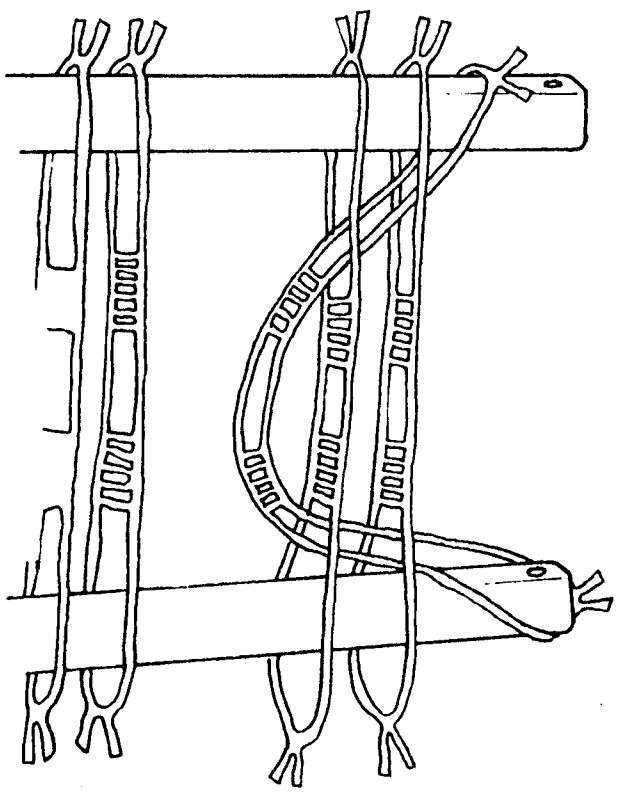
1. With everything properly adjusted, weaving is an easy and enjoyable process. Sit up straight and comfortably at the loom so that your body remains stationary while your arms and legs work the loom. Start by pushing downward on the right treadle so that a shed is open and throw the shuttle. Pull the beater forward with a quick wrist movement, then close the shed and open a new one by first pressing downward on the left treadle then the right treadle again in rapid succession. The left treadle not only closes the shed, but advances the bars in the dobby unit. Even though it seems as if the left treadle goes down almost on its own, it is very important to press it all the way down with the left foot, otherwise the next dobby bar may not advance completely in the dobby box and this will cause errors.

2. To advance the cloth you simply wind it forward by using the ratchet handle while the beater is in its forward position. Make sure the fell of the cloth does not go beyond the beater in order not to have to wind it backwards (see number 5 of SETTING THE TENSION DEVICE if this occurs). This easy, rapid method of advancing the cloth makes it practical to wind the cloth up about every two inches of weaving. By maintaining this two inch weaving space the swing of the beater and the shed angle are kept more nearly constant, and this makes it much easier to weave a uniform fabric.

3. At the onset of weaving, first weave in 1" of a strong, medium weight, weft with a tabby weave. Check the tabby weave for errors. Any errors in the threading or sleying will show up here and it is an excellent time to make corrections. In case of threading error, use the following method for insertion of a new heddle:

a. Slip the top loop of the new heddle around the top harness stick and bring it through the top loops of all the heddles until it reaches the place needed.

b. Take the bottom loop of the new heddle through the bottom loop of all the heddles, around the bottom harness stick, and back through the bottom loops of all the heddles until it reaches its place. (See Diagram below.)



INSERTION OF NEW HEDDLE

4. Next weave in two thin lease sticks on alternate sheds, followed by another 1/2" of tabby weave. Cloth strips are unnecessary, as the two woven-in lease sticks will even out the warp for you.

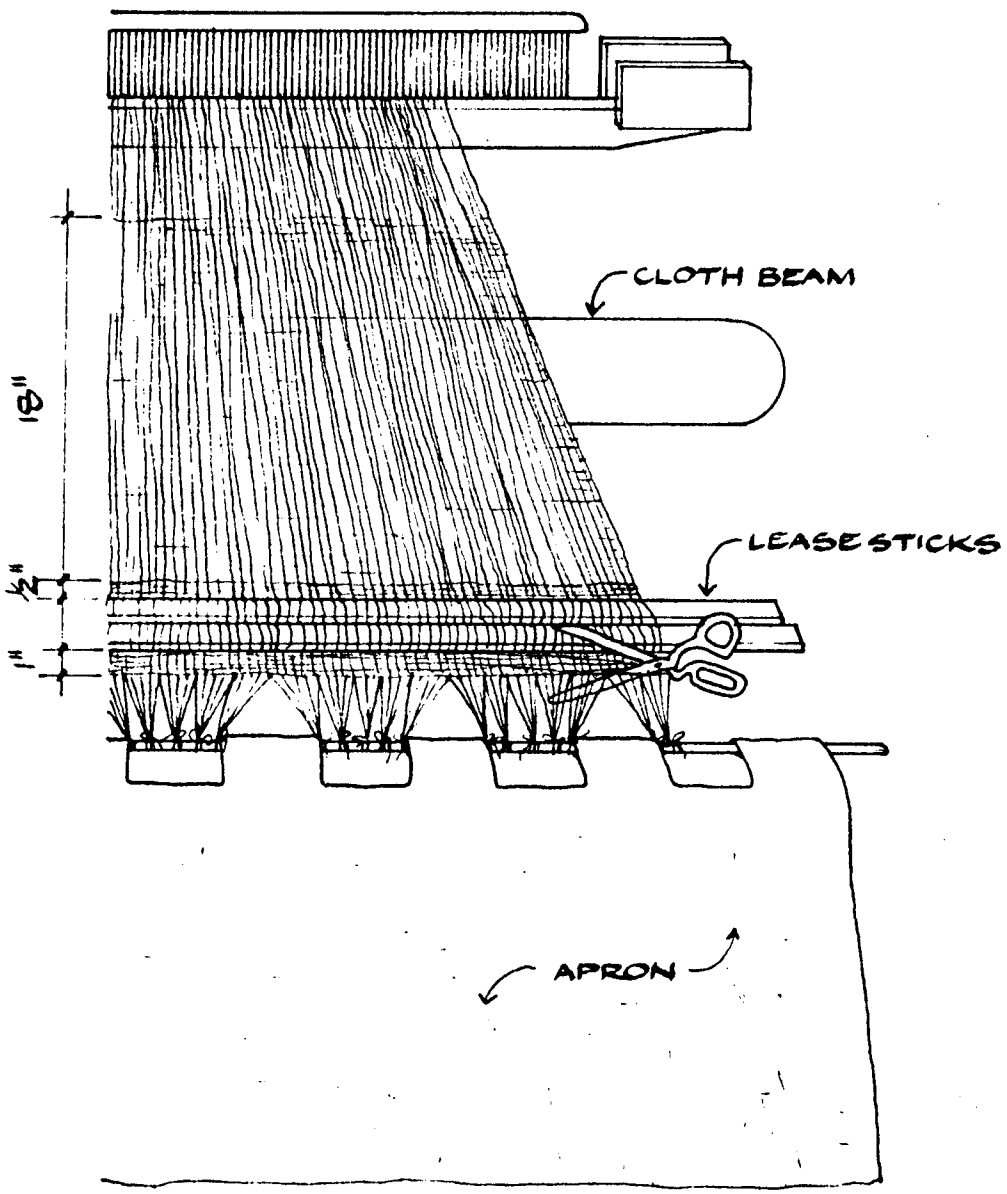
5. Now remove the tabby chain from the dobby box. To do this simply untie the tietapes or string, then gently pull downward on the chain until it all rolls out of the box. Place your pattern chain into the box by feeding it between the two rollers and behind and over the top roller making sure the bar containing the first shed goes into the box first with the hole corresponding to harness one placed toward the front of the loom.

6. Now proceed with your planned weaving until the woven-in lease sticks have wound around the roller about 1 1/4 times, in other words, until the woven cloth overlaps the lease sticks on the roller.

7. Then release the ratchet on the cloth beam and unwind the weaving back to the beginning. Unwind the weaving and apron from the front roll. Then remove the apron by cutting off the knots which tied the warp to the metal bar, but do NOT cut off the tabby hem or the woven-in lease sticks from the end of the warp (see diagram next page).

8. Fold the two thin woven-in lease sticks together and place them in the groove in the front cloth beam making sure the cloth is centered in the loom. Wind the weaving back on the cloth beam holding the lease sticks in place until the weaving is wound back over itself and holds itself in place. Take up the tension by using the ratchet handle until the warp tightens and continue weaving.

9. If you are using 60 bars or more, the weight of this chain may cause the dobby head to skip a bar as it is advanced. If you are using a long length of dobby chain and you experience this skipping, you'll



REMOVING THE APRON

need to suspend an auxiliary roller (a rolling pin suspended between two chair backs works) so that it will support some of the weight of the bars.

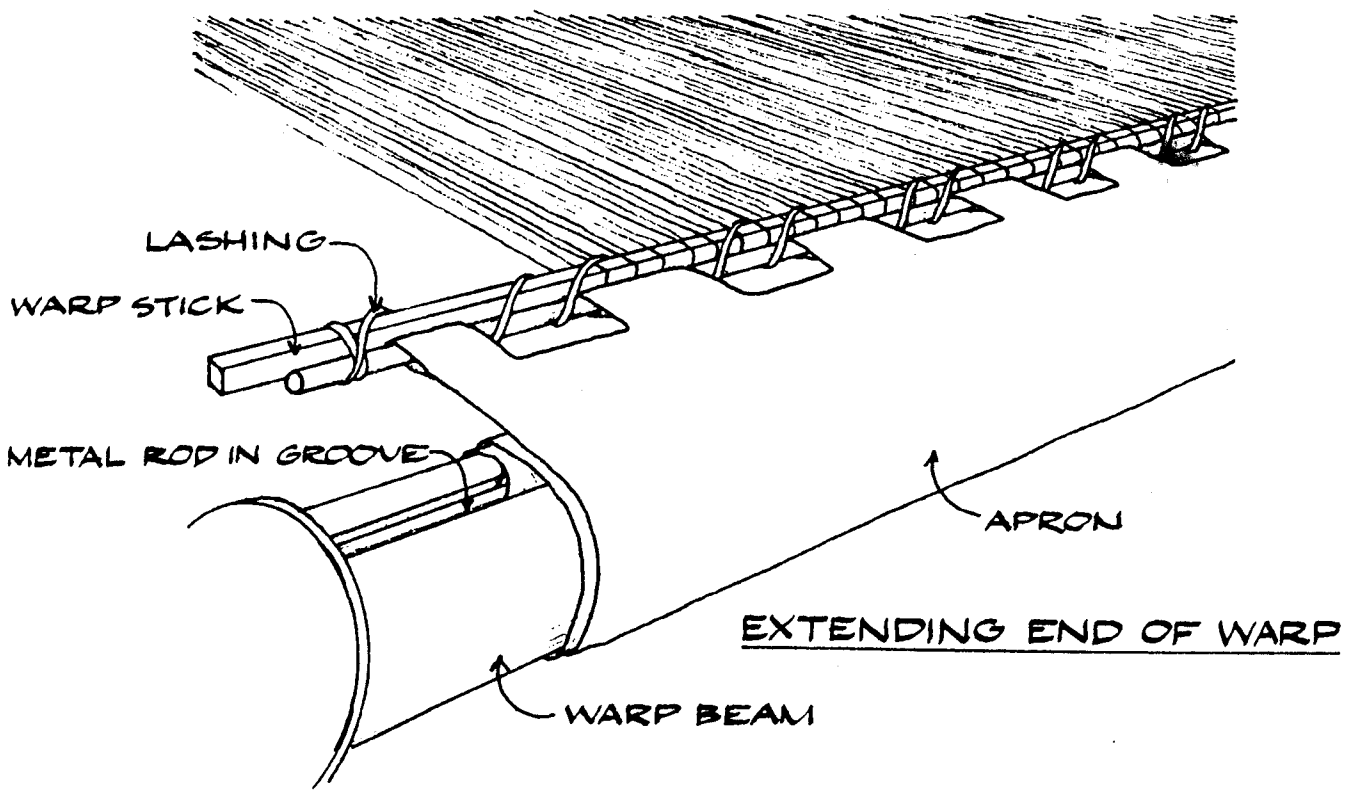
10. If for some reason you should make a mistake or have some need to turn the chain backwards, this is possible. Notice that on the left side of the dobby box is an index wheel which is actuated by a hooked metal arm. If you pull gently on the metal arm, it will disengage from the wheel and you can turn the upper grooved roller a counterclockwise direction. If you turn the roller counterclockwise slowly, you will hear a click as the last bar slips back into place. This way you can go backwards as many sheds or bars as necessary. Remember, do not try to force the chain to move backwards unless the arm is disengaged from the wheel.

11. If you want to remove part of the weaving from the loom before the warp is woven off, use the following procedure:

    a. When the piece to be removed has been woven, weave one inch of tabby.
    b. Weave in two lease sticks followed by 1/2" of tabby as in 4 above.
    c. Start new weaving.
    d. Weave until the lease sticks are wound 1 1/4 times around the front cloth beam.
    e. Unwind and cut off the piece to be removed just below the tabby hem and woven-in lease sticks as above.
    f. Follow step 8 above.

This method takes very little time, there is practically no waste, and a uniform warp tension is maintained.

12. Near the very end of the weaving the temporary apron will be used again to extend the end of the warp beyond the warp beam, thus decreasing yarn waste. You should already have binding cords around the warp beam so that the warp stick will be held in its groove just before it makes its last turn. Just when the warp stick is ready to fall out of the groove, remove bindings, wind the warp backwards a little to relieve tension and lift the stick with warp ends out of the groove. Take your apron which should already have a metal rod inserted in the hemmed end with the openings and insert a second metal rod in the plain hem at the opposite end. Place this second metal rod enclosed in the apron hem into the groove in the warp beam and wrap the apron around the beam, in the same direction as the warp is wound onto the beam, until the first metal rod is only a few inches away from the beam (see diagram). Take a strong cord and lash the wooden warp stick, with the warp ends on it, onto the metal rod in the end of the apron. Wind the warp forward from the front of the loom until the tension arm rises and continue weaving until the warp end is just behind the harnesses.



TROUBLE SHOOTING

The Problem	The Cause	The Remedy
Dobby skips	Too many dobby bars in dobby head	Reduce number of bars or support bars with an auxiliary roller to take some of the weight off the dobby head
Dobby head doesn't advance	Round detent wheel on dobby head loose	Tighten allen screws on ratchet wheel
One or more harnesses that are supposed to raise, don't	Left treadle isn't being pressed all the way down.	Concentrate on getting both treadles all the way through their travel
Harnesses don't raise properly	Harness cables have been hooked to wrong harness	Rearrange cables
	Chains from spring levers have been hooked to wrong harnesses	Rearrange chains
	Copper hooks on spring levers have been bent	Straighten hooks with pliers
	A harness cable has slipped off its pulley	Put cable back on pulley
	A treadle cable has slipped off its pulley	Put cable back on pulley
Harneseses jam up on each other	Heddles not distributed evenly over harness sticks	Redistribute heddles evenly on both sides from the center of the harness sticks
Squeaking noise when harnesses are raised	Probably either in the dobby arm or treadle or harness pulleys	Isolate where the squeak is coming from, then either rub with paraffin or lubricate with a light machine oil

BOOKLIST

Here are some books containing information on multi-harness weaves and/or dobby looms. If you want to order any of them write to Ken Colwell, The Looms at the Brewery, Far End Shake Rag Street, Mineral Point, Wisconsin 53565 and ask about their availability and for a current price list.

Sixteen Harness Twills by Irene Wood about $5

Robin & Russ Handweaver, 533 N. Adams St. McMinnwille, OR 97128

Lots of 16 harness twills, some 12 harness twills, showing tie-ups and photos of samples, information for designing your own twills.

Weaving with Foot-Power Looms by Edward R. Worst about $4.50

Dover Publications, Inc., 180 Varisk St., N.Y., NY 10014

Some 10-12 harness twills, also one of few books with explanation of compound double weave.

Anstadt Designs by Ruth Holroyd about $40

Bond Press, Inc., Hartford, CT

Facsimile of original book, second volume moderates, beautifully done, many 16 and more harness twills plus many block designs.

Shuttlecraft Book of American Hand-Weaving by Atwater about $15

Macmillan

Older book with older weaves, mostly four harness, but has 4, 5, and 6 block twills, summer-and-winter, and double weaves.

Keep Me Warm One Night by Burnham & Burnham about $30

University of Toronto Press

Beautiful book, mostly coverlets, explanation of various weaves, many examples, drafts given. Few point twills, overshot, summer-and-winter, double weaves, chapter on multiple shafts includes star and diamond and other things worth exploring.

Manual of Swedish Handweaving by Cyrus-Zetterstrom about $15

Chas. T. Branford Co., Newton Centre, MA 02159

Explanation of dobby, a few drafts, etc., good explanation of various weaves.d

Designing of the Loom by Mary Kirby about $6

Select Books, 5969 Wilbur Ave., Tarzana, CA 91356

Chapter of 16 harness looms, a few drafts specifically for dobby. Many things not seen elsewhere.

A Handbook of Weaves by Oelsner about $5

Dover Publications

All multiple shaft work. 1875 illustrations of drawdowns many appropriate for dobby. I think originally published in 1875 for the industry.

Weaving Techniques for The Multiple-Harness Loom by Pierre Ryall about $10

Van Nostrand Reinhold Co., 135 W. 50th St. N.Y., NY 10020

Original French, Like Oelsner with mostly drawdowns, no drafts as such.

More Than Four by Laughlin about $10

Nothing specifically for dobby but a variety of complex weaves explained.

Hand Weaving and Cloth Design by Marianne Straub about $15

Viking Press

Very concise information from dressing the loom through a wide variety of weaves. Chapter on the dobby.

Handloom Weaving Technology by Allen A. Fannin about $30

Available from Van Nostrand Reinhold Co., 135 W. 50th St., N.Y., NY 10020

The best book we've found that covers the operating principles of dobby looms.