16 Harness Folding Dobby Loom

User's Manual

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ASSEMBLY SECTION

No doubt you want to get to the business (and the fun) of setting up your loom. Okay, but first a few words of advice. There's probably some of you who don't like to read directions or think that this manual is entirely too thick and you don't have time to read all the way through it. "Please, read through the directions and follow them step-by-step with us. You will spend less time and will end up with the loom looking and working as we have planned it."

There are others of you who have never touched a hex bolt and are not even sure you know what one is. To you, we say, "Try it, if you follow the instructions step-by-step and take your time, you will be surprised at what you can do."

To members of the two above camps, and to all those in between, we say "stick with it and we are certain you will find this to be a good experience and a great way to get to know your loom". Remember, if you are at all serious about weaving, a thorough knowledge of your equipment is vital. So think of this as an opportunity, not as a liability.

PREFACE

The two purposes of this assembly manual are:

1. To assist the loom owner in assembling and getting to know their loom by providing complete and detailed instructions and drawings.

2. To allow the weaver to enjoy a well cared for and properly functioning loom for many years by providing a care and maintenance schedule.

How to Use This Manual

This manual was written to be read and followed from beginning to end. Some of the information is quite basic and there are those of you who will want to skip those sections entirely. Instead of skipping them, we suggest you skim them (there just may be important information hidden right in the middle of a very basic section).

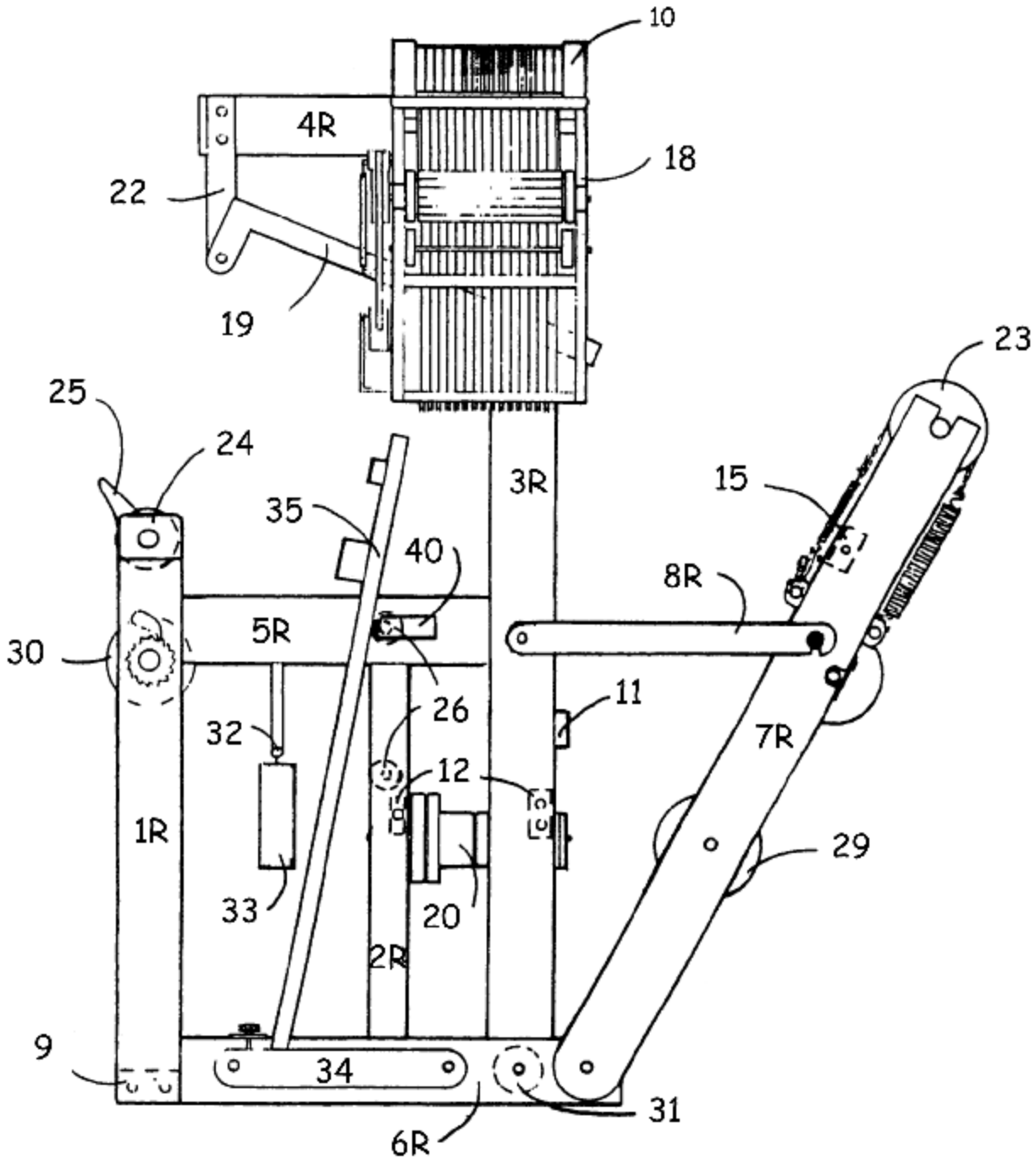
All of the major sections are in the index in case you need to refer back for any reason.

We at AVL know that a picture is, indeed, worth a thousand words and for that reason, have included many detailed drawings to help clarify our instructions. Since all of our parts are not numbered, you can use these drawings to help identify certain parts.

Also included are instructions for options such as Rear Cloth Storage System, Tension Box, Sectional Beam, Second Plain Beam, Raddle, Single, and Double Box Beaters. You need only read the sections for the options you have ordered.

PARTS LIST

Part Number	Part Name
1R	Right Cloth Beam Vertical
1L	Left Cloth Beam Vertical
2R	Right Upright
2L	Left Upright
3R	Right Castle Side
3L	Left Castle Side
4R	Right Upper Horizontal
4L	Left Upper Horizontal
5R	Right Middle Horizontal
5L	Left Middle Horizontal
6R	Right Lower Horizontal or Foot
6L	Left Lower Horizontal or Foot
7R	Right Folding Leg
7L	Left Folding Leg
8R	Right Support Arm
8L	Left Support Arm
9	Lower Front
10	Harness Pulley Support Assembly
11	Spring Lever Assembly
12	Treadle Pulley Assembly
13R	Right Treadle Pulley (not shown)
13L	Left Treadle Pulley (not shown)
14	Vertical Cap (not shown)
15	Folding Leg Stiffner
17	Harness Assembly (not shown)
18	Dobby Head
19	Dobby Arm
20	Dobby Cam and Pulley Assembly
21	Cable Turn Buckle (not shown)
22	Dobby Arm Support
23	Warp Beam, standard
24	Cloth Beam
25	Cloth Beam Advance Handle
26	Upper and Lower Cloth Roller
28	Rear Cloth Storage Roller (not shown)
29	Cloth Storage Drum
30	Cloth Take-Up Drum
31	Cloth Take-Up Pulley (only one shown)
32	Counter Weight Pulley
33	Counter Weight
34	Beater Supports



16 HARNESS FOLDING DOBBY LOOM - FIGURE 1

Before we really get going there are a few things you should know in order to better understand our instructions. First, and very important, is what we mean when we say "the front of the loom". The front of the loom is the end where the bench is. The back of the loom then is where the warp beam is. Everything is oriented as if you were sitting in the weaving position. The right side of the loom is the side of your right as you are sitting at the loom and left side to your left. A piece marked "bottom" would, of course, go toward the floor.

There is a full drawing of the Folding Dobby Loom on the preceding page. This can be referred to as often as necessary to obtain relative placements of assemblies. Following this drawing is a parts numbers list. Since this list includes the names of all parts and assemblies, you may need to refer back to it. Study all of the drawings carefully and make certain that your assembly looks like the one in the drawing before continuing.

The right and left of the dobby is oriented as if you were standing right in front of it.

Tools Needed for Assembly

There are a few tools you'll need before we can get started. These are: a phillips head screwdriver, a light hammer, a pair of pliers, a four or six inch crescent wrench, and a ratchet/socket set.

LOOM ASSEMBLY

Unpacking

The very first thing you need to do is take a nice, deep breath and slowly exhale.

Now you can unpack your boxes being very careful not to throw any parts away with the packing paper. Remove all strapping tape and bubble pack. Lay all of the parts out so that you will be able to identify each one as they are called for.

IDENTIFYING PARTS

Hardware - Identifying and Measuring

Pick up your bag marked cross-member hardware. Empty its contents onto a table top. In the bag are hex bolts, carriage bolts, washers, hex nuts, square nuts, wing nuts, allen wrenches, and two or four black knobs. Hex bolts, for those who don't speak "hardwarese" yet, have a six sided head and are measured for length between the bottom face of the head and the bottom of the bolt threads. The diameter is the thickness of the bolt, measured at the threaded end, and is the distance from one side of the circle to the other. This can be measured with a ruler. Hex bolts always get a washer between the head and the surface of the wood to prevent damage to the wood.

Carriage bolts are the ones with rounded heads. They are measured for length the same as hex bolts. Carriage bolts never get a washer between the head of the bolt and the wood. These bolts are always attached at the end with a washer and either a hex nut (a nut with six sides) or a wing nut (a nut with "wings").

Hex nuts always have a washer between them and the wood, and square nuts always go in "nut access holes" (see Figure 3) and attach with no washer to a hex bolt.

Allen wrenches are little "L" shaped hexagon rods. You'll need these later in assembly.

Finally, the black knobs serve to connect the support arms to the folding legs in both the folded and the weaving position.

Now you know all that you need to know about hardware to set up and maintain your loom.

Bolt and Nut Hints

1. If a bolt is a little tight going in the hole, give it a light friendly tap with a hammer.

2. To start the threads on a nut in a "nut access hole" it is often helpful to hold the nut in place with the end of a screw driver or the tip of your finger.

3. Always have the large "nut access hole" (see Figure 3) facing toward the inside of the loom unless otherwise specified.

4. Remember to put washers under the heads of hex bolts and exposed nuts (nuts that are not in access holes) to prevent damage to the wood.

Identifying Side Frame Parts

The side frames are the parts that came in the biggest box. They are shipped with the insides facing each other just as they will be when the loom is set up. To determine which is the right side and the left, first orient them as they are oriented in Figure 1; i.e. with the castle side in a vertical position. Now look at the topmost horizontal piece. There is a tool holder (made of imported exotic wood) mounted on the inside front section of the right side frame.

JOINING SIDE FRAMES

The easiest way to accomplish the first stages of assembly is with the side frames on their backs so that the castle sides are horizontal to the floor and the left and right sides about three feet apart.

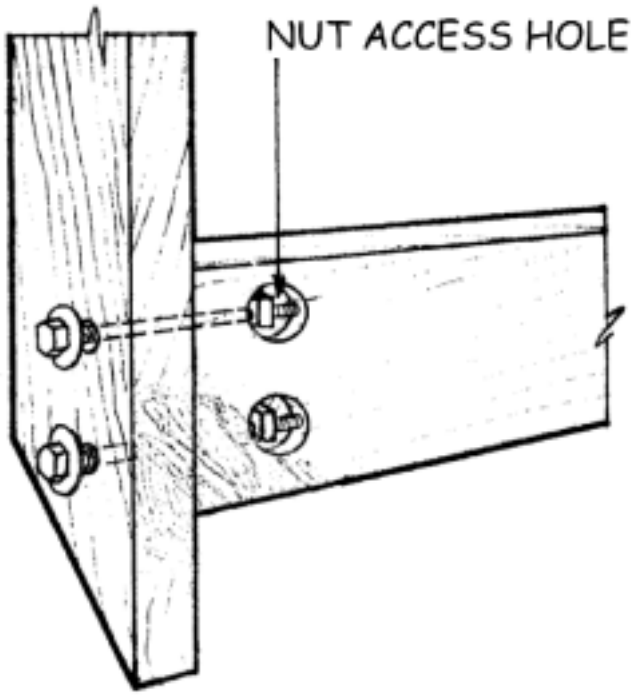
The Treadle Pulley Assembly

Locate four 5/16" x 3 1/4" hex bolts with washers and square nuts and two 1/4" x 3 1/4" hex bolts with washers and square nuts. Remove the nuts from the bolts. Now locate the Treadle Pulley Assembly. This assembly consists of two cross-members of different thickness, with a rod and pulley connecting them. Orient it so that the bigger crosspiece is toward the back of the loom (toward the floor, if you have your loom tipped on its back) and so that the stamp "bottom front", located on the thinner crosspiece, is toward the front of the loom with the stamp facing the ground (facing where the ground will be when the loom gets tipped back up). From the outside insert two 5/16" bolts through the appropriate holes in the left side frame (see Figure 1). Slide the rear cross-member of the treadle pulley support over these two bolts and attach the nuts loosely. Repeat for the right side, tightening the nuts. Now attach the thinner front crosspiece to the side frames using the 1/4" x 3 1/4" hex bolts and nuts.

The Lower Front

A. Attaching the Lower Front to the Loom

Locate the lower front. This is a long wooden bar with metal rods and wooden blocks mounted to the top face. With the loom still on its back, orient the lower front so that the four "nut access holes" face away from the loom.



NUT ACCESS HOLE - FIGURE 2

From the outside insert four 5/16" x 3 1/4" hex bolts into the corresponding holes and secure the lower front to the side frames with the square nuts.

Now bring the loom back up to a "standing" position.

B. Removing Rods and Blocks

Look at your Lower Front and notice that mounted to the top face of this part are three wooden mounting blocks, two 3/8" rods, and two stop collars. Remove all three blocks and separate them from the rods. (Notice that on all three blocks the rod hole is off-set slightly away from the lower front. Remember to reassemble them the same way.) Now loosen the stop collars with an allen wrench and remove them.

C. Attaching the Treadles

Locate your treadles. There are two treadles, one shorter than the other. Kneeling over the lower front, orient them so that the longer one is on the left and the pins are facing away from each other.

Now pick up the rod that you took out of the left side of the lower front. Slip the rod through the horizontal hole at the end of the left treadle, making sure the stop collar is to the *outside* of the treadle. Insert the left end of the same rod into the rod hole in the far left mounting block. Okay, now repeat the steps above for the right side. Slip the right rod through the hole in the right treadle, making sure the stop collar is to the *outside* of the treadle. Insert the right end of the rod into the far right mounting block. Now insert the inside ends of both rods into the rod holes in the center mounting block and re-mount all three blocks to the lower front. The order of parts in the assembly now should be as follows (from left to right): Left mounting block, rod with stop collar, left treadle (the long one), center mounting block, right treadle, stop collar and rod, and finally the right mounting block.

Now bring your stop collars up to within 1/8" from each treadle and tighten them down. (There is, indeed, a reason for all the excess rod. This loom, if it were in it's "Modular" mode, could accommodate up to ten treadles.)

JOINING SIDE FRAMES

The Spring Lever Assembly

Locate the spring lever assembly #11. This assembly consists of two long pieces attached by rods with many short, thin, rectangular "spring levers" between. Orient this assembly so that the stamp "bottom front" is toward the front of the loom and facing the floor. Make certain that the shorter spring levers are to the front. Using the two 1/4" x 2 1/2" hex bolts with washer and square nut, attach the back of the spring lever assembly to the side frames. Attach the front piece to the side frames using the two 1/4" x 3 1/4" hex bolts and square nuts.

The Support Arm

Locate the two support arm assemblies. These each consist of an oblong piece, rounded at each end with a wooden spacer at one end. The left one has a plain wooden spacer and the right one has a wooden spacer with a groove around it.

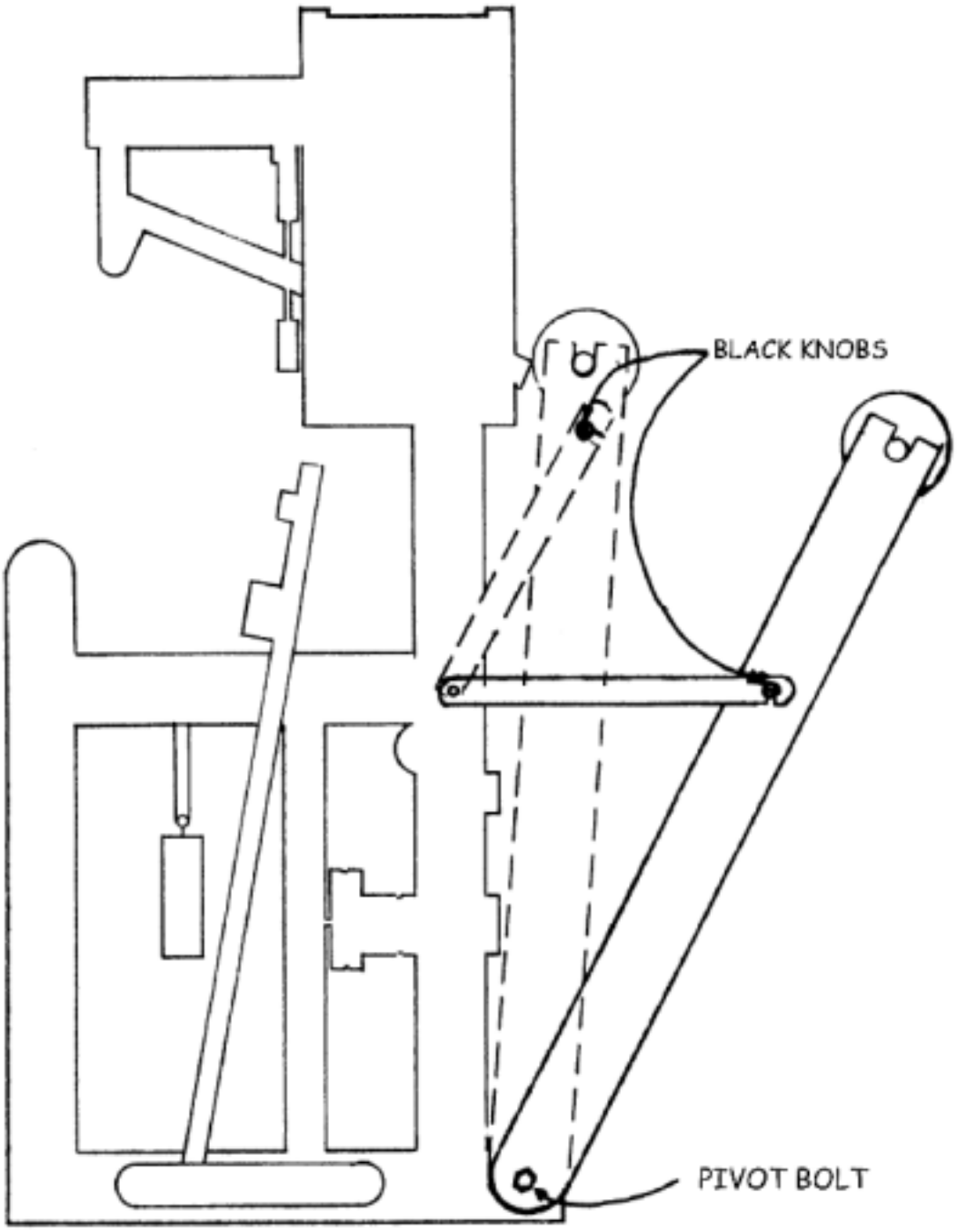
Remove the nut and washer from both the left and right support arms. Notice that on the inside surface of each castle side, about halfway up, is a large counter bored hole. Using a hammer and the head of a bolt, tap the washer into this hole until it hits bottom. Now, keeping the spacers between the castle sides and the support arms, mount each to the outside of its respective castle. Secure with the nuts, making sure to leave them loose enough to be able to pivot.

The Folding Legs

Locate the Folding Legs. These are long pieces, each with an aluminum tension plate attached to the inside. The right side has a tension plate mounted about 1/3 of the way down from the top while the left side has a tension plate mounted about 4" from the top.

Locate the four black knobs from your hardware package. Insert these loosely into the threaded brass inserts located on the outside face of each of the folding legs.

Lay the left folding leg down on the floor, to the outside of the loom, so that the tension plate is to the inside. Insert a 3/8" x 3 1/2" hex bolt and washer through the hole at the rounded end of the leg and on through the rearmost hole in the loom "foot" (see Figure 3). Secure the bolt with a washer and hex nut and repeat for the right side, making sure that the tension plate is facing the inside. These nuts are actually lock nuts and will be a bit difficult to turn. Tighten them just enough to allow some movement between parts.



UNFOLDING THE LOOM - FIGURE 3

Locate a #39 separation roller. If you ordered one beam you will have one of these rollers. If you ordered two beams you will have two rollers. Next you will need to insert the axles at the end of the separation roller(s) #39 into the folding legs. At this point you will need to decide which holes to use, as there are two possible locations for the separation rollers. If your loom will be equipped with two beams, you will use both positions, placing one roller in each position.

However, if you will just be using one beam on your loom you will now need to make a decision. You need to decide if you want your beam in the upper or lower position. Generally speaking, you would put a plain beam in the upper position, as it is a bit more convenient of a location. However, if you plan to use a sectional beam, you may want to put it in the lower position, thus making the set-up loom more stable and less top-heavy. This would not normally be a cause for concern unless you plan to use densely packed and fully loaded sectional beam on a regular basis.

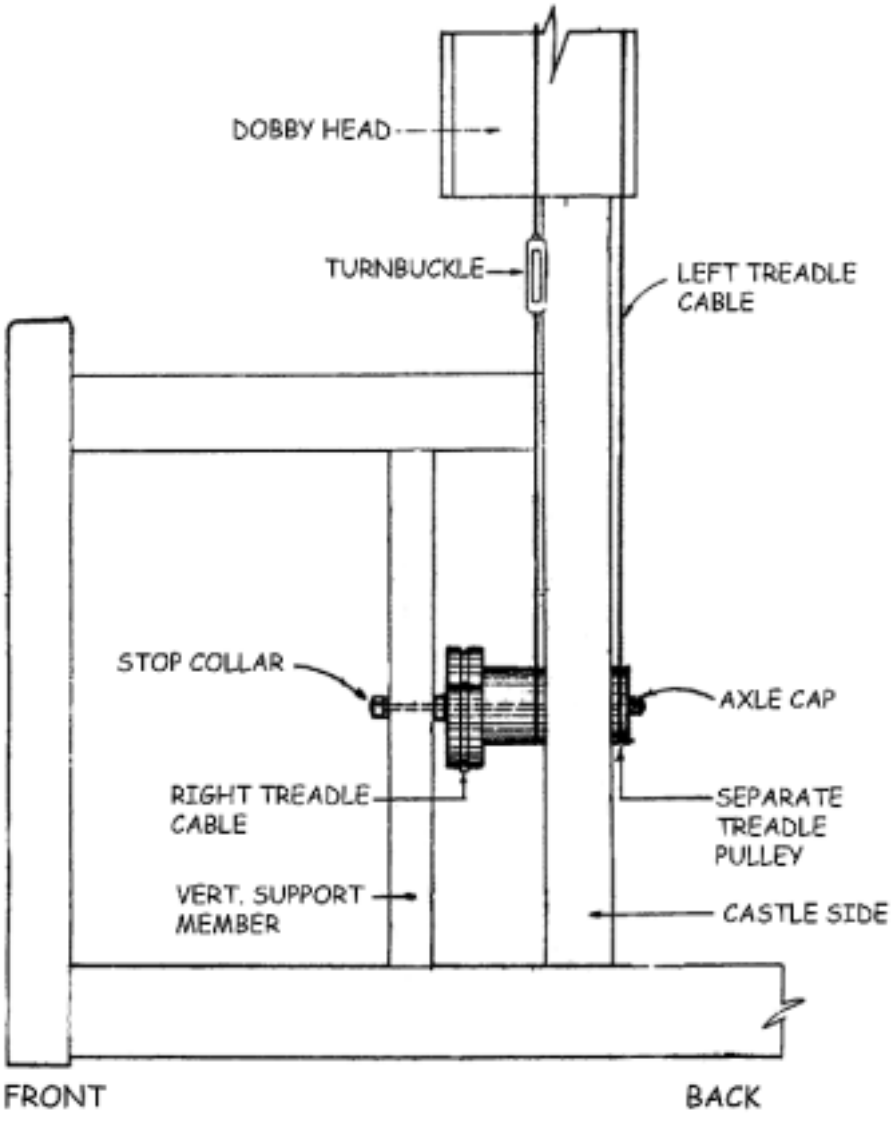
Now that you have decided where the roller(s) go, insert their axles into the holes on the inside face of the folding legs. These are the closest holes to the top of the legs that don't go through. Arrange both legs so that the rollers are captive between the two legs. Now locate the leg stiffner. This is a plain wooden bar with one hole at each end and a "nut access" hole near each end. Now, being careful not to dislodge the roller(s) from their positions, mount the stiffner between the legs using 5/16" x 3 1/4" hex bolts and square nuts. Be certain the nut access holes are facing down. Use the through holes that are nearest to the rollers. Holding on to the stiffner, lift this assembly up and secure in the weaving position by attaching the support arms to the lower black knobs (see Figure 3).

The Harness Pulley Support

Locate the Harness Pulley Support #10. This assembly has three rows of sixteen sheaves between two long cross-members. Orient it so that the AVL name plate is to the front. Using 5/16" x 8 1/2" hex bolts, washers and hex nuts (remember that you'll need washers under the hex bolts *and* the hex nuts) attach the harness pulley support assembly to the side frame as shown in Figure 1, leaving the hex nuts loose for now, especially the ones on the right side of the loom.

Locate the Dobby Cam Assembly (see Figure 4)

Orient it so that is matches the drawing. Using the allen wrench that came with the cross-member hardware package, loosen the stop collar and remove it from the axle and remove the axle from the cam and cylinder and pulley. These parts are going to be placed between the Right Castle and the Front Side Support. When putting this axle onto the loom, be certain that you insert it through the *lower* set of horizontal holes. The loom will not function properly if the upper holes are used. Slip the rod through the hole in the Side Support, then through the Dobby Cam and Cylinder assembly, and on through the Right Castle Side. Now slide the separate pulley onto the rod from the right and fit the stop collar back on, tightening it while making sure that the pulley can spin freely. See? This isn't so difficult.



DOBBY CAM (SHOWN FROM RIGHT SIDE OF LOOM) - FIGURE 4

JOINING SIDE FRAMES / INSTALLATION OF DOBBY HEAD

Beater Bumpers

Locate the Beater Bumper #40 (see Figure 1). (These are shipped with the side frames.) Notice that they are labeled R and L. The stamp, of course, identifies right and left Beater Bumpers. Mount each to its respective side of the loom, to the outside, orienting them so that the stamp is against the side frame and the bumper is toward the front of the loom. Use the 5/16" x 2 1/2" carriage bolts with washer and hex nut. Mount the beater bumpers to the rear most holes of the middle Horizontal of each Side Frame.

Mounting the Dobby

On the backside of the Dobby Head you will find three bolts with washers and hex nuts attached. Remove these washers and nuts, making sure you don't unseat the carriage bolt heads. Check back to Figure 1 to see where on the right side the Dobby is mounted. Now lift up the Dobby Unit and insert the protruding bolts into the corresponding holes in the upper horizontal and castle side. Replace the washers and hex nuts and tighten. Once the Dobby is in place, you can also tighten the four nuts that hold the Harness Pulley Supports in place.

Mounting the Dobby Arm

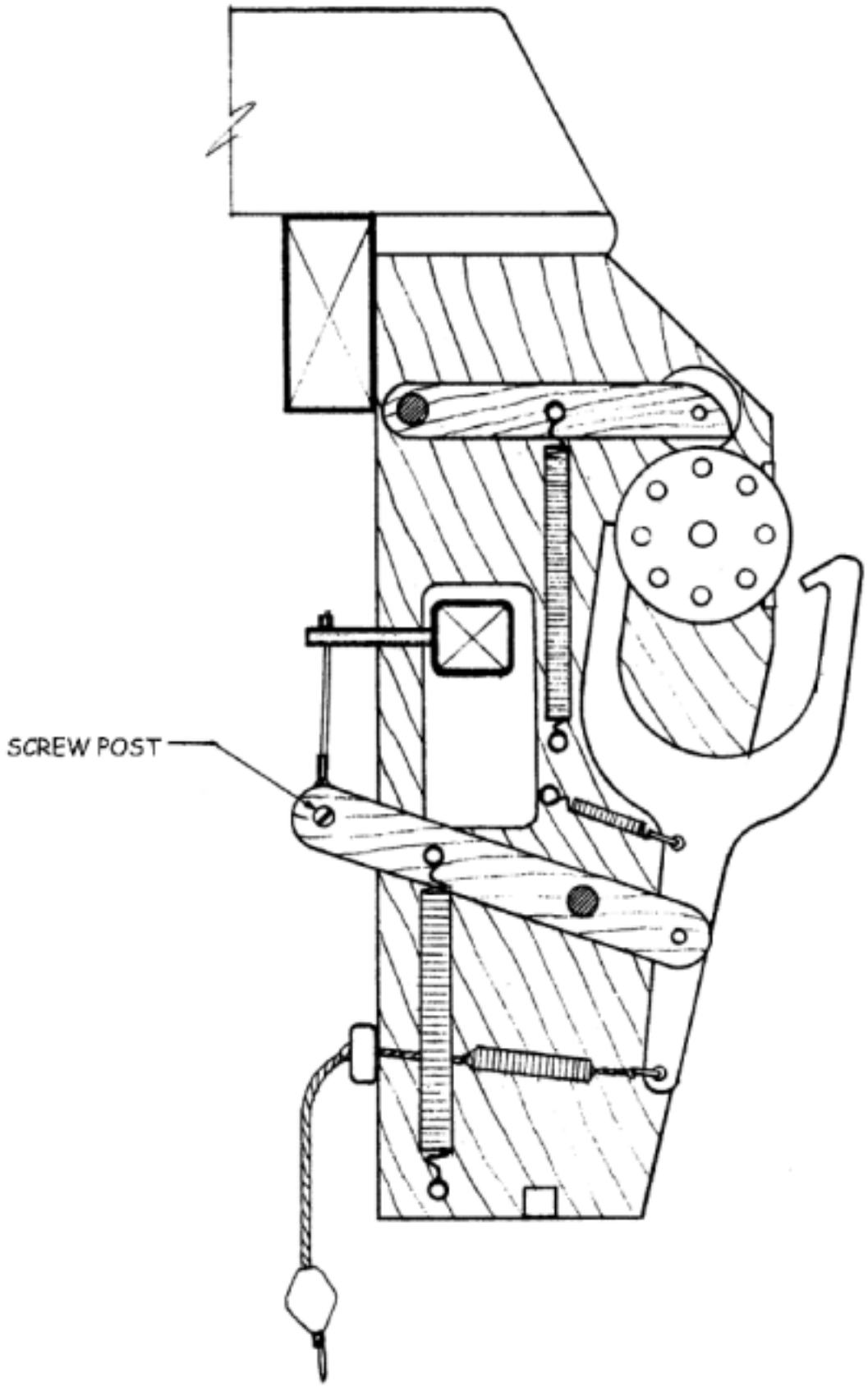
Lift the Dobby Arm and support into place (see Figure 1). With the heads to the outside, using the 5/16" x 2 1/2" hex bolts provided, attach the Dobby Arm Support to the upper horizontal loosely. (We will be making an adjustment to this later.)

Checking the Springs

Sometimes during shipping the springs on the Dobby Head come off their anchor pins. Check your unit against Figure 5 to make sure they are all in their proper places. Good, now don't worry about all of those cables coming from within the Dobby. We'll make sense of them in the next step.

Dobby Arm Stop Pin

By now you may have noticed a pin with a knob at one end of it that sits in a plastic hanger on the back edge of the dobby. Its purpose is to hold the dobby arm in the lower position, a feature that will come in handy when you thread your heddles. Its operation will be described later on in the weaving section of the manual. For now just remove the tape that is holding it in place.



DOBBY HEAD (SIDE VIEW FROM FRONT) - FIGURE 5

HARNESS TIE-UP

Attaching the Harness Cables

Locate the bag labeled Harness Cables. Unwrap and separate one from the rest. Hold it up and stretch it out. You'll see that there is a clip at one end and a loop at each of the other two ends. Hold the cable up by this clip so that the two loop ends are hanging down. The shorter end will support the right side of a harness and the longer end will support the left side of the same harness.

Look at the cables coming out of the top of the Dobby Head. Since the cable farthest to the left (closest to the front of the loom) corresponds to the first harness, and the cable farthest to the right (closest to the back of the loom) corresponds to the last, or sixteenth harness, we will refer to the cables as number 1 through number 16 from now on.

Now attach the clip you are holding to the loop at the end of cable number 1 in the Dobby Head. To spread the clip, simply press the two sides together and slip the cable loop toward the other side until it is free to move inside the clip and the clip sides are together again. Repeat this process for the remaining fifteen harness cables.

Cable Retainers

Mounted on top of the harness pulley supports are two wooden cross bars with felt on their undersides. Loosen these until there is about 1/4" between the felt and the pulleys.

Laying the Harness Cables

Take hold of the number 1 harness cable and route it over the pulley directly above it. Now bring that same cable (both ends) over the number 1 pulley (under the cable retainer) in the next set of pulleys. Repeat these two steps for the next fifteen harness cables. At this point all of the harness cables should be over all of the pulleys on the right side of the loom.

Tightening the Cable Retainers

Now tighten down the cable retainer above the right set of pulleys so that it *almost* touches the pulleys. Don't tighten the cable retainers down far enough that they impede the movement of the pulleys. It is essential to the proper functioning of the loom that they be free to move. The cable retainers' only purpose is to keep the cables from jumping to a neighboring pulley.

Routing the Cables

Route the long ends of each of the sixteen cables over the far left set of pulleys (under the cable retainers). Now, tighten the left cable retainer as you did the right one. Very good. Now on to the next step.

Locating and Identifying the Harnesses

Locate your harness sticks. They are long, thin pieces of wood with eyelets on either end. There should be two groups. One group is labeled "Tops". The other group is separated into bundles of eight harness sticks each. Each of the bundles of eight bottom harness sticks are labeled with a "1" or "2". Leave the tape and number stamp on these until they are needed.

Preparing for Harness Assembly

You'll need a table top for this next step. What you are going to do is assemble the harnesses so that you can hang them on the cables.

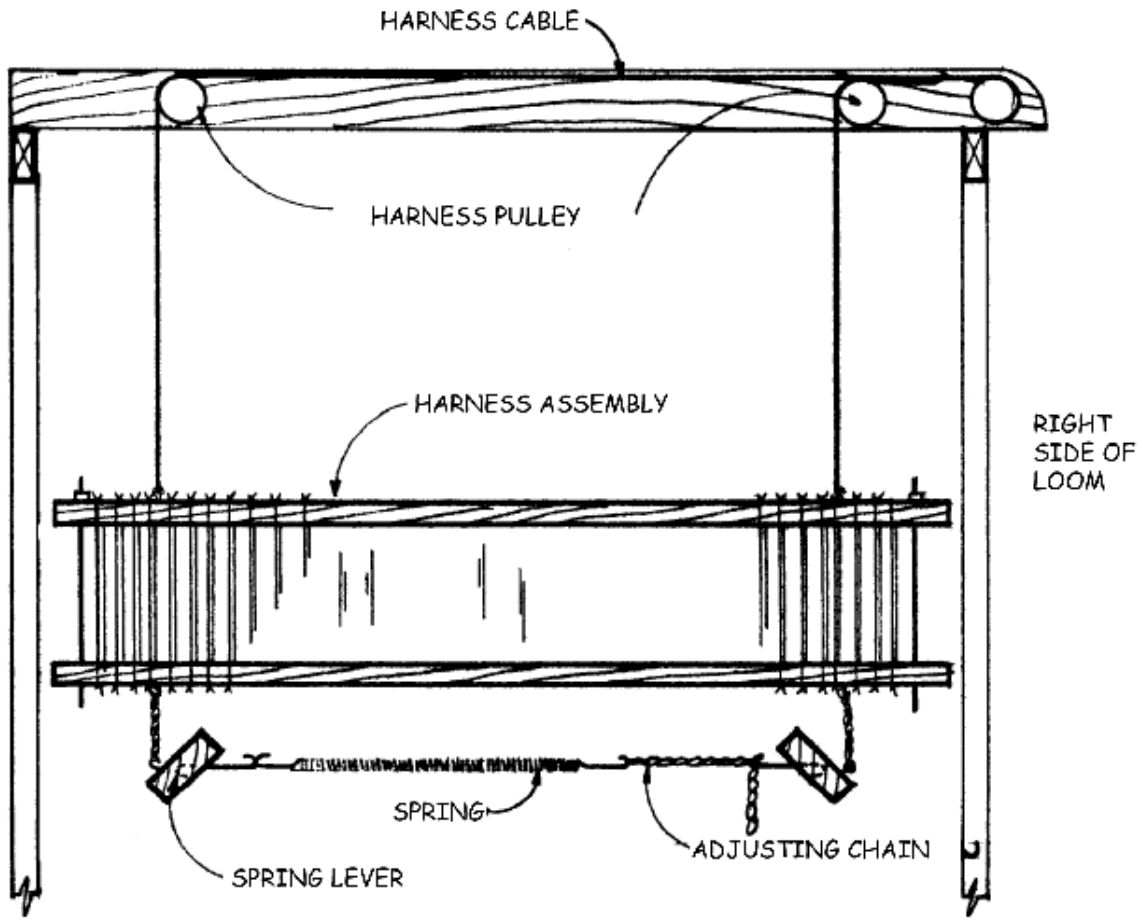
Untape the bundle of harness sticks labeled "Tops". Lay one of these on the table, about a foot and a half in from the edge, with the eyelets away from you.

Understanding Your Heddles

Now locate the bag of heddles. Open it and look at your heddles, but don't, I repeat **DON'T** remove the twist ties yet. Now locate your harness wires. (Those are the long wires with copper stops near one end.) Pick up a bundle of heddles, (there are approximately 100 Heddles in each bundle) and hold them up by one end allowing the other end to hang freely. Notice that there are four twist ties two above the eye of the heddle and two below the eye. Now with the thumb and index finger of your right hand take hold of the upper right twist tie. Grasp the upper left twist tie likewise with your left hand. Gently pull apart and notice that all of the strings are captivated in either the right or the left twist tie. If you had four hands you could grasp the bottom two twist ties in the same manner. Then you would realize that there is indeed some order and reason to this twist tie business. Into the space that is created by pulling apart the twist ties, you will later insert a harness. Now that you understand twist ties you can see that if they were to be removed at this point you would experience chaos.

Harness Assembly (see Figure 6)

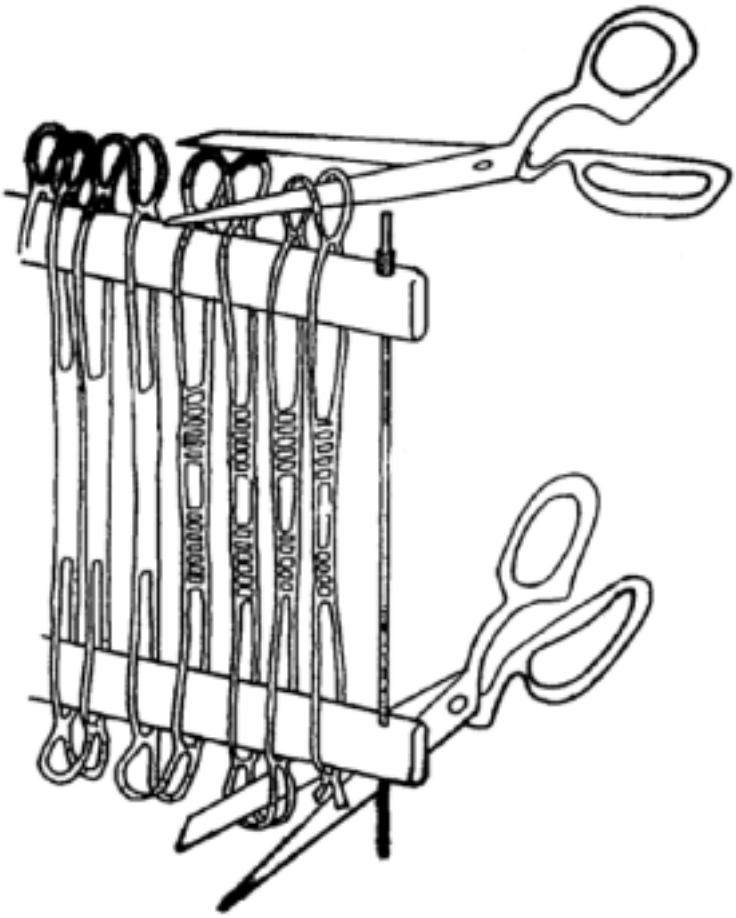
With one group of heddles in hand, return to the table with the harness stick laying on it. Now, insert the harness stick into the space that was created by pulling apart the twist ties. At this point you should have an assembly made up of one harness stick with eyelets facing away from you, and one bundle of heddles still possessing four twist ties. Around the end of the harness should be the heddles. The heddles should be oriented so that their eyes are between you and the harness stick. Notice that there is another "space" (between the twist ties) that should be lying between the eyes of the heddles and you, that will accommodate another harness stick. Okay, now untape the bundle of #2 harness sticks. Take one of these harnesses to the table, and with the eyelets facing you, insert the end of the harness into the "space" in the heddles.



HARNESS ASSEMBLY - FIGURE 6

Now pick up one of the harness wires and notice that there is a copper stop near one end of it. That end is the top. Insert the bottom end of the harness wire into the hole located at the end of the "top" harness stick and down through the hole in the bottom harness stick. Repeat this for the holes on the other end of the upper and lower harness sticks.

When you are certain you've done this correctly you can untie the twist ties. Now, if you will spread the heddles out along the lengths of the harness sticks you will notice that the heddles are all attached to one another at the top or bottom. These connecting loops can be cut to make threading easier. This will neither weaken nor unravel the heddles (see Figure 7).



CUTTING THE HEDDLES APART - FIGURE 7

(Another hint to make threading easier - while you have your heddles spread out between two harnesses, mark above the eye of each one with a colored pen. For instance you may use four colors of pen and mark the eyes on the heddles of harness #16 with purple, the eyes of harness #15 with red, the eyes of harness #14 with blue, and the eyes of harness #13 with orange. Harness #12's code color will be purple, harness #11's code color red, and so on. This makes it easier to tell which heddle belongs to which harness and helps to lessen the chance of threading errors.)

Now pick up your single harness assembly by the top harness (the one farthest away from you on the table). Bring it over to your loom and hook up your last harness cables (the ones closest to the back of the loom) to the eyelets in the harness stick. There, you've completed one harness, now the rest should be easy!

Repeat the steps above for each harness assembly. Always have the "top" harness stick be the one furthest away from you on the table with the eyelets facing away.

Remember to keep the bottom harness sticks in order. The ones go toward the front of the loom, followed by twos, threes, and finally the fours closest to the back of the loom.

Spring Installation
(see Figure 6)

Now it's time to hook the springs to the spring levers. Locate your springs with chain attached. Starting with the rear-most spring lever, attach the spring to the lever on one side and the chain to the lever on the other side. It doesn't matter which side the spring is on. The chain is for adjusting the harness tension, so for right now, just attach the last link to the lever and you can adjust it if need be after you get your first warp on.

Make sure that the wire levers are free to pivot on the metal pins in the spring levers otherwise they may get bent and won't work properly.

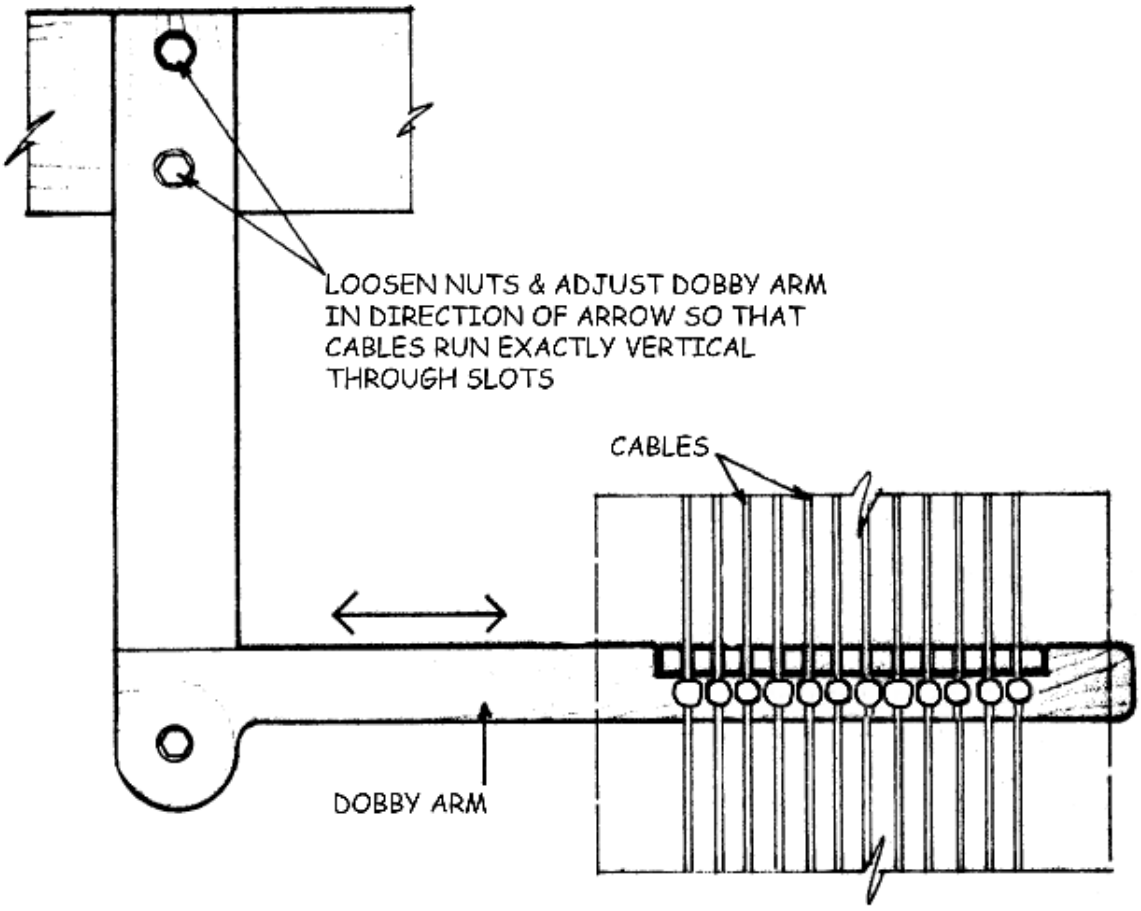
Attaching the Spring Lever Chain

Now that you have assembled and hung all of your harness sticks you can hook them up to the Spring Lever Chain. Near the outside end of each spring lever is a chain. Take the end link of your last spring lever on the left side and hook it to the left eyelet on the underside of the last harness stick. Repeat for the right side. Now hook up all of the harnesses in the same fashion.

Realigning the Dobby Cables

Your Dobby Head has been thoroughly tested at the AVL factory. At that time, all of the cables were in their proper positions for use. Frequently during shipping, however, the cables get jostled out of position and must be straightened out. Now's the time to do that. If you look up at your Dobby from underneath you will notice that there are sixteen vertical "fingers", each with a slot in it. There are also sixteen cables. There should be one cable in each slot. If there isn't, carefully rearrange them so that the first cable is inside the first finger slot, etc.

Now that there is some tension on the harness cables, the Dobby Arm can be aligned with the Dobby Cables (see Figure 8).



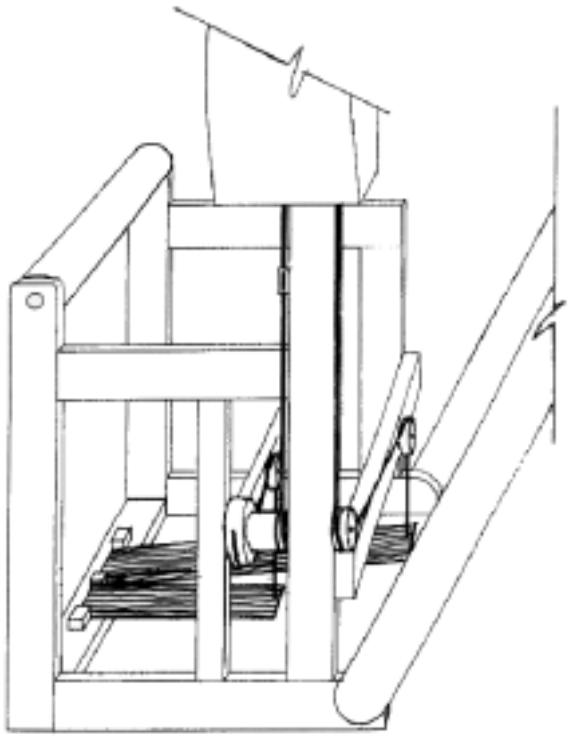
DOBBY ARM ALIGNMENT - FIGURE 8

Loosen the two bolts that attach the Dobby Arm to the top right horizontal just enough so that the Dobby Arm can be shifted back and forth slightly by tapping on it with the side of your fist. Lift the right end of the Dobby Arm up so that it touches the rubber bumper in the top of the slot in the right side of the Dobby Head. Now look inside your Dobby Head so that you can see the Dobby Arm straight on. Notice that attached to the Dobby Arm is a black metal piece with sixteen slots cut into it. What you have to do here is align the Dobby Arm so that the slots line up *exactly* with the Dobby cables. The Dobby won't work properly unless this alignment is absolutely perfect so position yourself directly in front of cable number 1. Now, while continuing to hold the Dobby Arm up against the bumper with your right hand, tap the other end of the Dobby Arm with your left hand and sight down the number 1 cable and slot until perfect alignment is achieved.

Now re-tighten the Dobby Arm attaching bolts. Check to see that the alignment is still perfect. Move the Dobby Arm up and down in the slot to be certain it doesn't bind. If it does you'll need to loosen the two bolts again, put a paper shim in between the Dobby Arm support and the top right horizontal, realign the Dobby Arm with the cables and tighten down the bolts. If, after you've tightened the bolts, the alignment is perfect and the Dobby Arm doesn't rub or bind on the sides of the slots in the Dobby Box, then tighten the nuts down tight enough so that you're certain they won't slip.

Left Treadle

There are two cables coming out of the bottom of the Dobby Head. Take the longest one and run it down to and under the groove of the pulley nearest to the rear of the loom in the Dobby Cam and Pulley Assembly (see Figure 9). Continue by routing the cable over and down the far left treadle pulley in the "Treadle Pulley Assembly" as shown. Notice the bolt that goes through the left treadle. Remove the nut and pull the bolt far enough out of the hole so that you can insert the loop at the end of the treadle cable around the bolt inside of the access hole. Do this, then push the bolt back into its hole. Replace and tighten the nut. With the treadle hanging, the cable should be coming straight up from the bolt and over the left side of the left pulley.



TREADLE CABLE ROUTING - Figure 9

Right Treadle

Now let's handle the right treadle. Look at the Dobby Cam and Pulley Assembly and you'll see another cable wound around and taped to the groove in the cam pulley (nearest to the front of the loom). Untape and partially unwind the cable around the pulley. Run the cable over the top of the pulley directly above the right treadle and down to meet the treadle. Attach the end of this cable to the treadle as you did before.

Cable with Turnbuckle

Look at your Dobby Head and notice that there's one more cable coming out of the bottom of it. Notice also that there's an eyebolt on the bottom end of the cable with a metal turnbuckle attached to it. Okay, now turn your attention back to the Dobby Cam and Pulley Assembly. There is, wound around the middle groove in the assembly, a cable with an eyebolt on the end of it taped down. Untape this cable and rotate the Dobby Cam Assembly by hand in a clockwise direction (as you are looking at it from the *rear* of the loom). This will cause the short treadle cable to wind-up on its pulley and raise the right treadle. Keep rotating the pulley until the treadle comes all the way up and stops against the treadle pulley. This has also probably caused the cable that you have just un-taped to get wound up on the Dobby Cam Assembly. If it has, unwind the cable while you hold onto the Dobby Cam, making sure that the right treadle stays up against the treadle pulley.

Now take hold of the end of the eyebolt and pull it up toward the Dobby Head. If you've done the assembly correctly you should be able to make the treadle go up and down by pulling the eyebolt on the cable up and letting it down.

Good, now take the turnbuckle completely off the Dobby cable and then restart it again but just enough to get it started (not more than two turns). Now pull up the cable that makes the treadle go up and down and route it in the manner shown in Figure 9. Screw the turnbuckle to the eyebolt (this is a reverse thread so turn the turnbuckle in the same direction you did to start it onto the Dobby cable eyebolt). That's it except for the final adjustment.

Adjusting the Turnbuckle

The purpose of the turnbuckle is that it provides a way to adjust treadle travel so that you get a full shed.

In order to get the proper adjustment you'll need to tighten or loosen the turnbuckle until, when the left treadle is pushed all the way down, the Dobby Arm raises and touches the upper bumper in the Dobby Box side. At this point the short treadle should stop about 1/2" below its cable pulley. When adjusted properly, the right treadle should stop approximately 1" from the floor on it's down swing and 1/2" from the cable pulley on it's upswing.

Rear Cloth Storage System Rollers

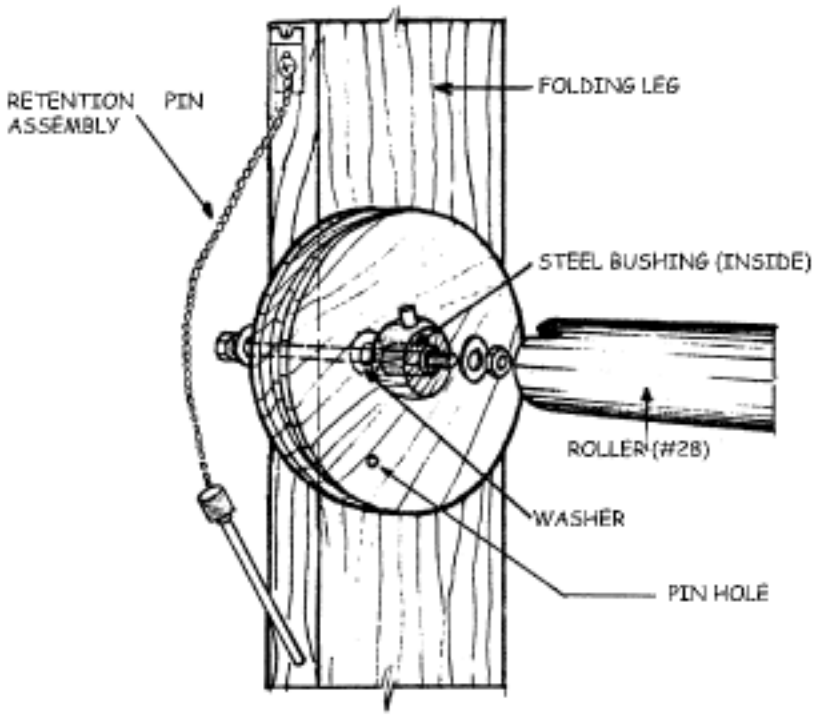
A. Upper & Lower Rollers

Now the roller tubes for the rear cloth storage system can be installed. Since these two rollers are identical, we have given each of them the same name, that is #26.

Drop the upper cloth roller #26 into the slotted brackets(see Figure 12 for placement). Then pick up the lower cloth roller #26 and slip one end into its pinned slot. Pull the pin out of the other bracket, drop the roller in, replace the pin and you've done it.

B. Cloth Storage Drum

Locate the cloth storage drum #29 (it's a drum with white dacron cord wrapped around it) (see Figure 10).



CLOTH STORAGE DRUM - Figure 10

Take off the washer and nut and pull the bolt out of the assembly. Now, keeping the washer next to the head of the bolt, insert the bolt through the corresponding hole located about 18" up from the bottom edge of the right folding leg from the outside of the loom. Slip a washer on from the inside.

Now slide the wooden drum (with the flat face toward the side frame) onto the bolt, making sure that the metal bushing stays in place in the center hole of the drum. Add another washer, the hex nut, and tighten down.

C. Cloth Storage Roller

Locate the Cloth Storage Roller #28. It has a pin sticking out one end and a notch cut out of the other end. Line the notch up with the pin on the small wooden knob located on the inside of the cloth storage drum. Push the roller toward the cloth storage drum until the roller seats itself against the drum. Slip the other end of the roller into its bracket on the left folding leg.

NOTE: Refer to Figure 12 for the next four steps.

Installing the Standard Plain Beam

Install the Standard Plain Warp Beam, with the large wooden tension drum *on* the same side as the tension cord anchor bracket (this would be to your left, as you face the *back* of the loom) in the two slots at the top of the folding legs. Make sure that the small spacers are in place on each end of the beam, with the shorter of the two on your left. To install the beam you will have to temporarily remove the steel retention pins. Make sure to replace them after the beam is in place.

Installing the Second Plain Beam (Optional Equipment)

On the rear most edge of the folding legs can be found two aluminum retention brackets secured with two small black knobs. The knobs can now be loosened and the brackets slid off to the side. Seat the second Warp Beam axle with the large wooden tension drum to your right, as you face the back of the loom, into the open slots making certain that the spacer is in place on the axle on each end of the beam, and pivot the brackets so that they are in contact with the black knobs and are in a vertical position. Tighten them down securely.

Sectional Beam (Optional Equipment)

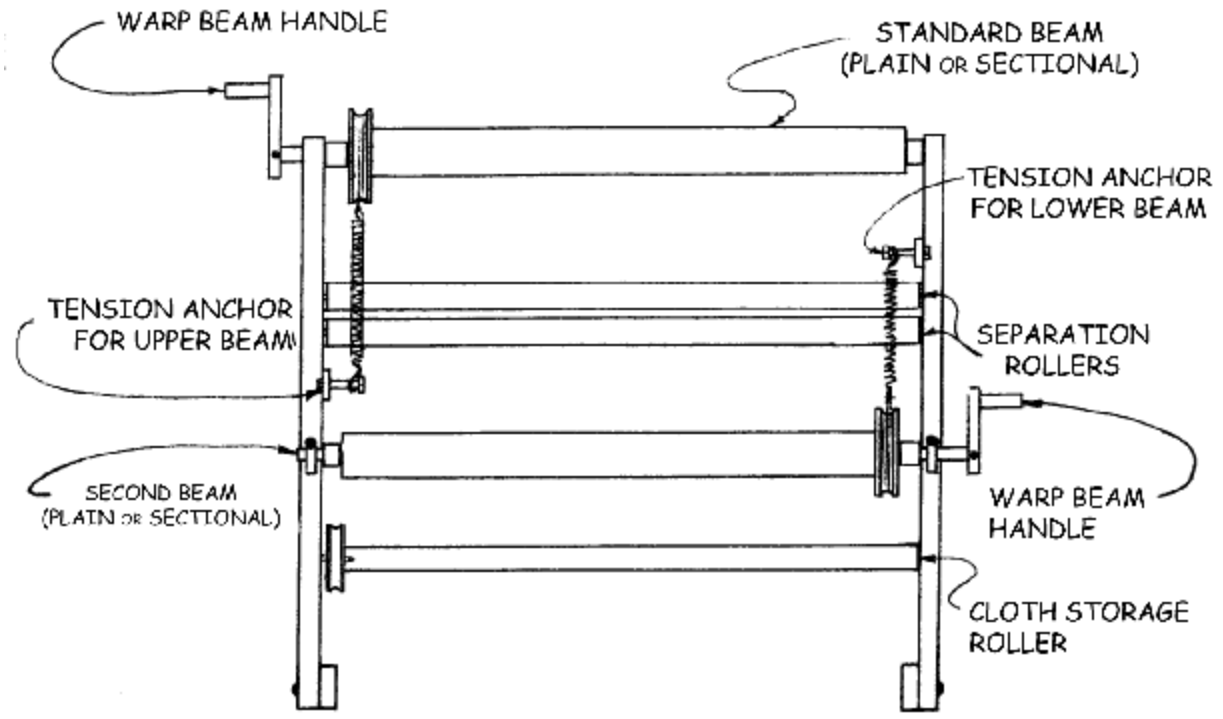
The sectional beam can be mounted in either the standard or the second beam position. However, we recommend that it be mounted in the lower position to keep the loom from becoming top-heavy. If a *second* sectional beam is ordered this can be mounted in the upper position. To install the sectional beam in the lower position simply follow the directions given for the second plain beam.

Install the *second* sectional beam with the large wooden drum to the right (as viewed from the *front* of the loom) in the two slots at the top of the folding legs. To do this you will have to temporarily remove the steel retention pins, making sure to replace them after the beam is in place.

Warp Beam Handle

Locate your Warp Beam Handle(s) #42. This is a wooden assembly with a tapered "crank" and a pivoting grip (see Figure 12).

Remove the wing nut, washer, and bolt from the end of the handle. Place the hole in the handle over the side of the standard beam axle and over the left side of the second beam axle. Line up the bolt hole in the handle with the through hole in the axle (making certain the pivoting "grip" faces away from the loom). Push the carriage bolt through and re-attach the washer and wing nut.



WARP BEAMS AND ROLLER (REAR VIEW) - FIGURE 12

Installing the Cloth Beam

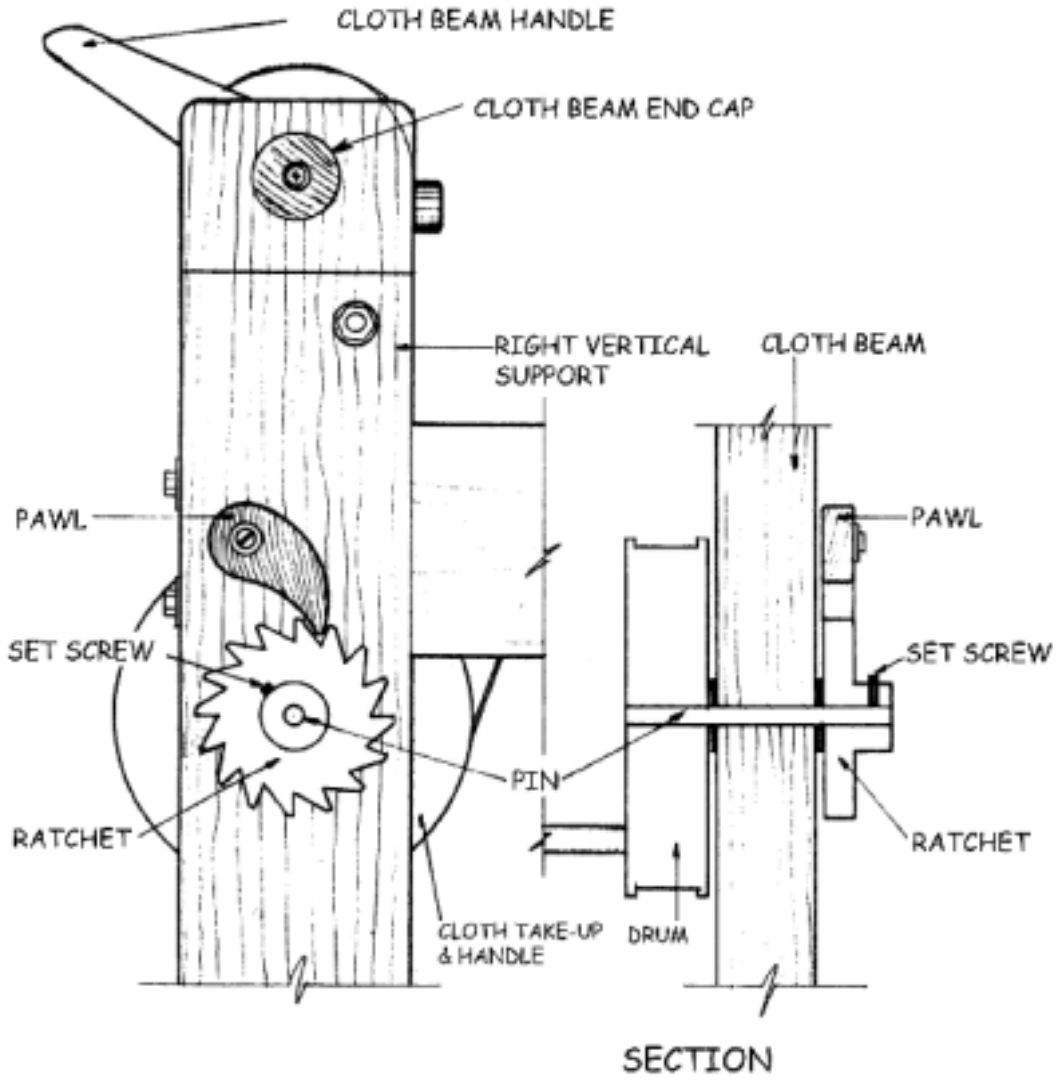
A. Removing the Vertical Cap

The cloth beam can be taken in and out of the loom simply and easily by removing the top section of the left or right cloth beam vertical (known as the vertical cap). If your loom will be equipped with an automatic cloth advance system, you will find it more convenient to use the cap on the right side for beam removal. Using a crescent wrench or 1/2" socket, turn the upper bolt counter clockwise until the nut disengages it. Now lift up on the vertical cap separating it from the lower portion of the cloth beam vertical.

To install the cloth beam (which, by the way, will be taken out again prior to threading) simply orient the beam so that the silver metal ratchet is to the right. Locate the aluminum cloth beam handle #25 (see Figures 1 and 13). Slip the handle over the right end of the cloth beam axle with the flat face of the handle away from the beam and ratchet. Now slip the large hole in the vertical cap over the left end of the beam axle. Insert one end of the beam into the corresponding hole in the right or left cloth beam vertical cap and seat the unattached vertical cap onto its previous position. Secure the vertical cap with its hex bolt and square nut.

This procedure takes only a very few minutes once you're accustomed to it and, if done prior to threading, contributes to the comfort and enjoyment of the weaver while threading.

B. A set of Cloth Beam End Caps have been included with your loom. These consist of a pair of dark wooden disks with mounting screws. These caps can be attached to each end of the cloth beam axle (with the mounting screw) after the beam has been placed in the loom. Their purpose is to limit the amount that the two Cloth Beam Verticals can spread apart. Since this is not all that common of an occurrence, you may not find them necessary. It is suggested that you do use them if you use a locking brake or when you place your warp under high tension.



CLOTH TAKE-UP DRUM - FIGURE 13

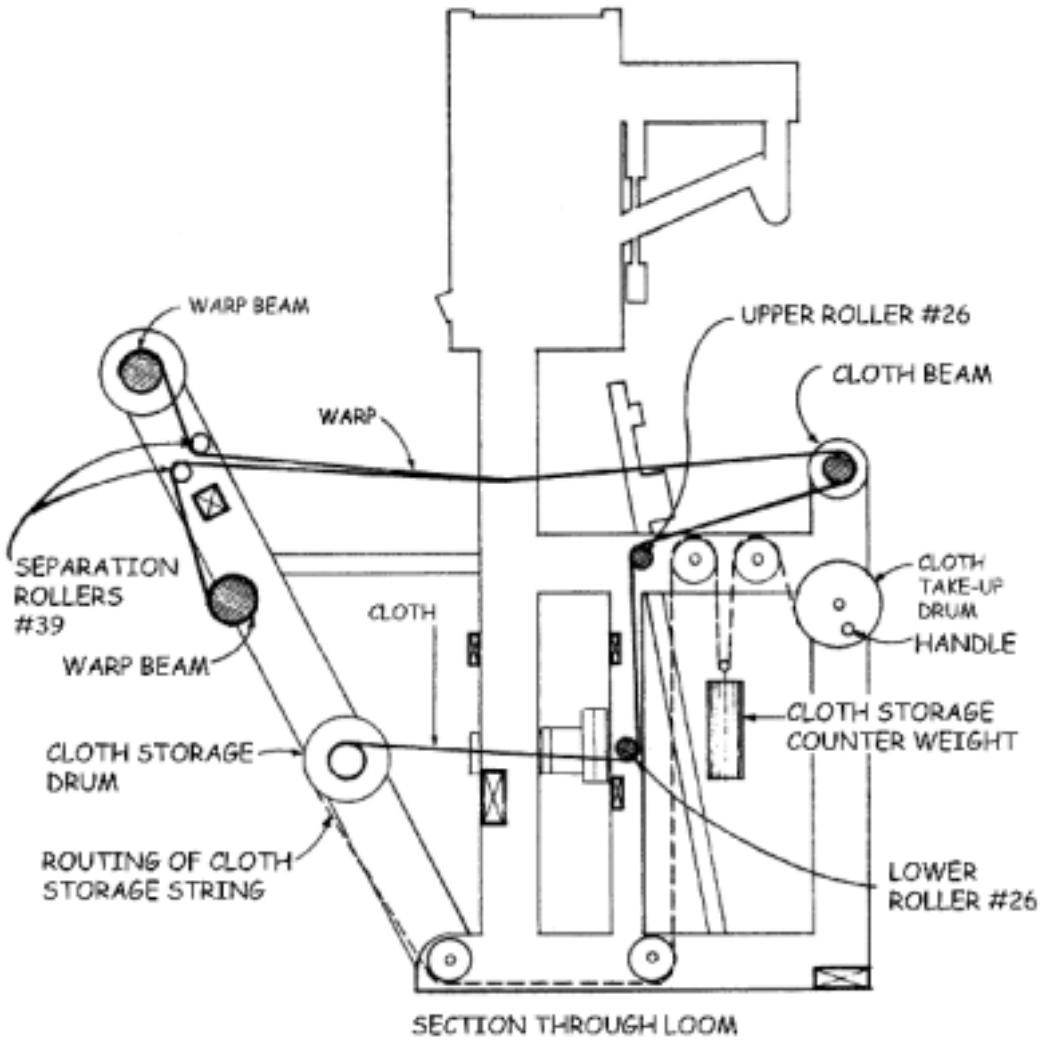
Locate the Cloth Take-Up Drum/Handle Assembly. This is a wooden drum with a wooden grip extending out from one face and an aluminum ratchet attached to a shaft extending out from the other face (see Figure 13).

With the allen wrench provided loosen and remove the metal ratchet from the shaft. Keeping one washer on, insert the shaft into the hole located in the right cloth beam support from the inside as shown. Slip one washer, then the ratchet onto the shaft from the outside with the flat face of the ratchet toward the loom. Tighten the set screw in the ratchet with the allen wrench onto the flat section of the steel axle, leaving enough clearance so that the assembly is free to pivot.

Route the cord from the cloth storage drum around the pulleys as shown by the dotted line in Figure 14. When the end of the cord is between the two upper cloth storage pulleys insert it into the metal counter weight pulley and continue routing over the last pulley and onto the concave surface of the cloth take-up drum/handle assembly. Thread the cord end through the hole at the base of the concave surface of the drum and tie a double knot on the outside.

Insert the retention pin through the hole in the cloth storage drum (see Figure 10).

Attach the counter weight (a black cylindrical weight) to the loop on the counter weight pulley.



ROUTING OF THE CLOTH STORAGE STRING - FIGURE 14

TENSIONING THE BEAMS

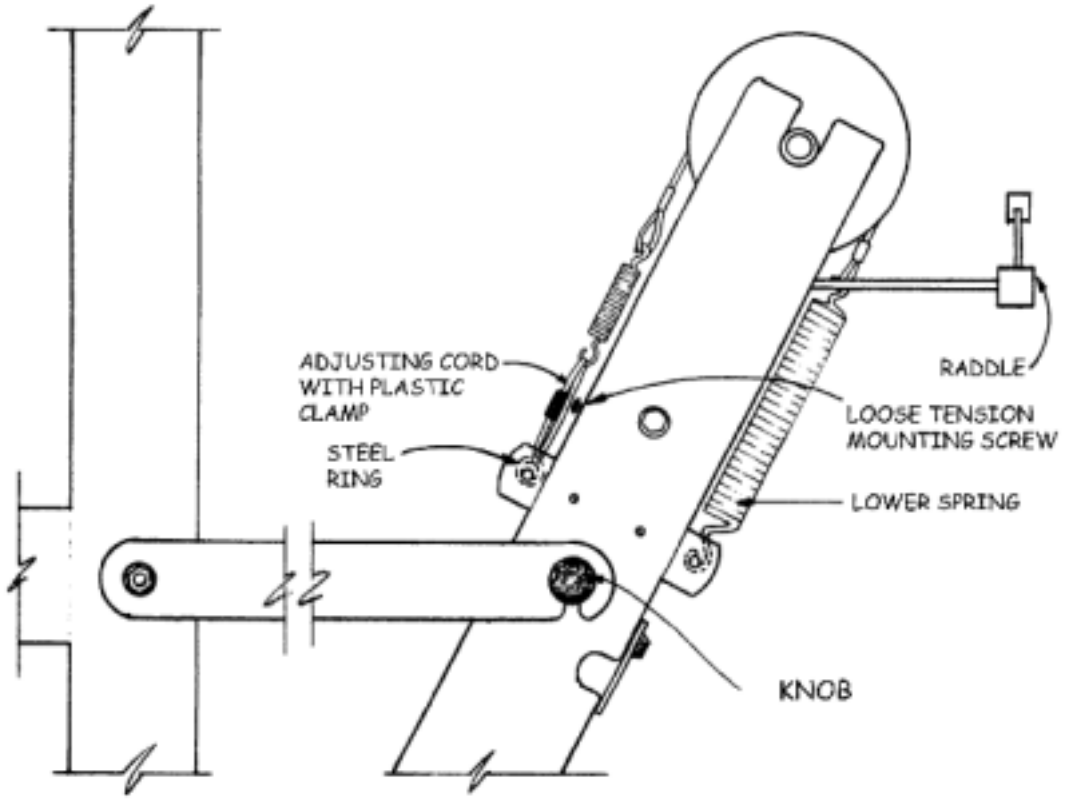
The tension device consists of a large and a small spring, a length of cord, an adjusting cord and clamp, and the anchor bracket which is pre-mounted on the folding leg.

Tensioning the Upper Beam

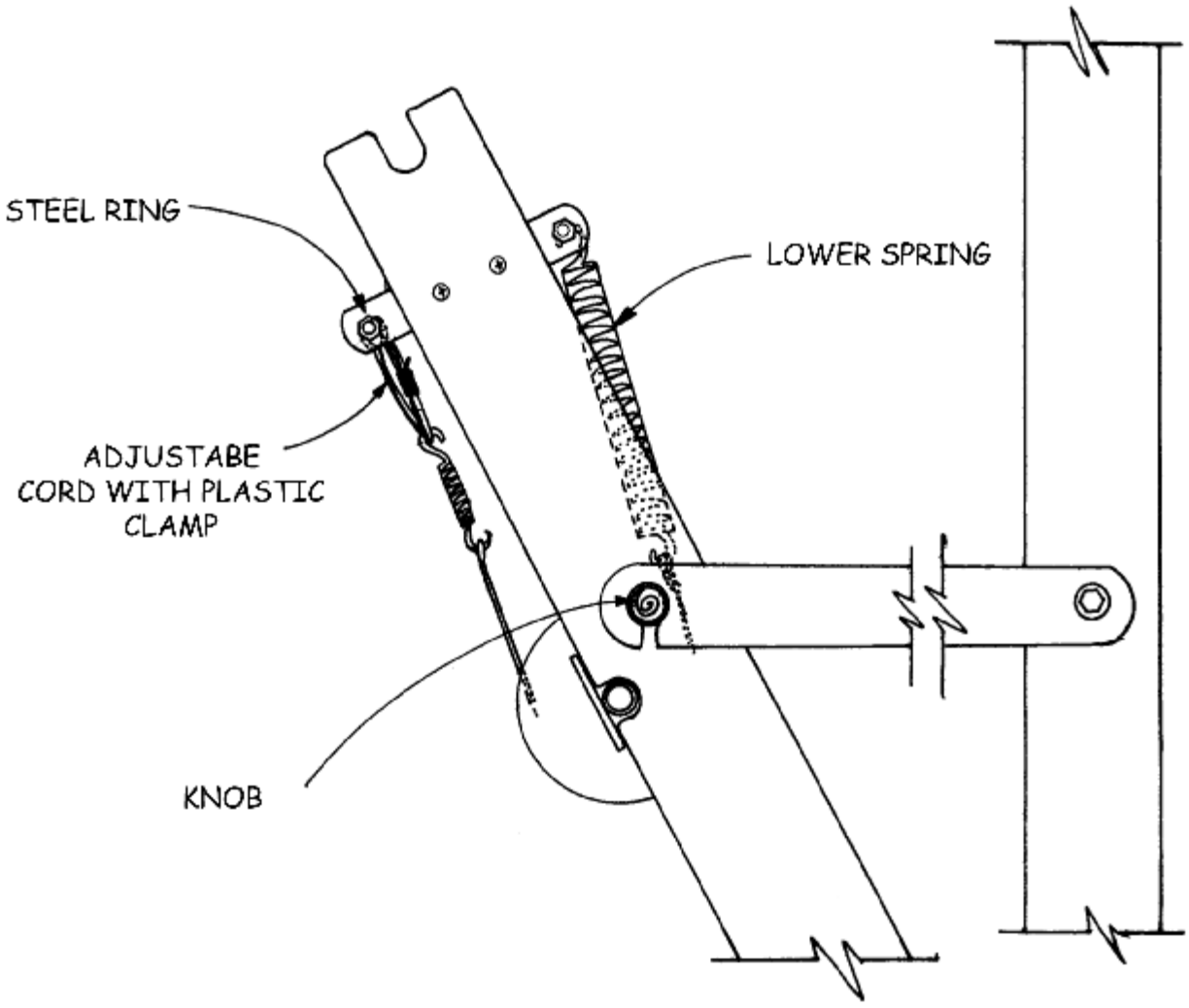
Assemble the tension device as shown in Figure 15, wrapping the cord four times around the tension drum. It is imperative that the cord not be crossed over itself to insure proper and consistent tension. Double check your work at this point by making sure that the larger spring is to the rear of the loom.

Tensioning the Lower Beam (see Figure 16)

The lower beam's anchor bracket is mounted above instead of below the beam (as is the upper beam). The tie-up is done in the same fashion. The large spring is hooked over the front post of the anchor bracket and the small spring to the rear post. Remember to wind the wraps of the cord with no cross-overs.



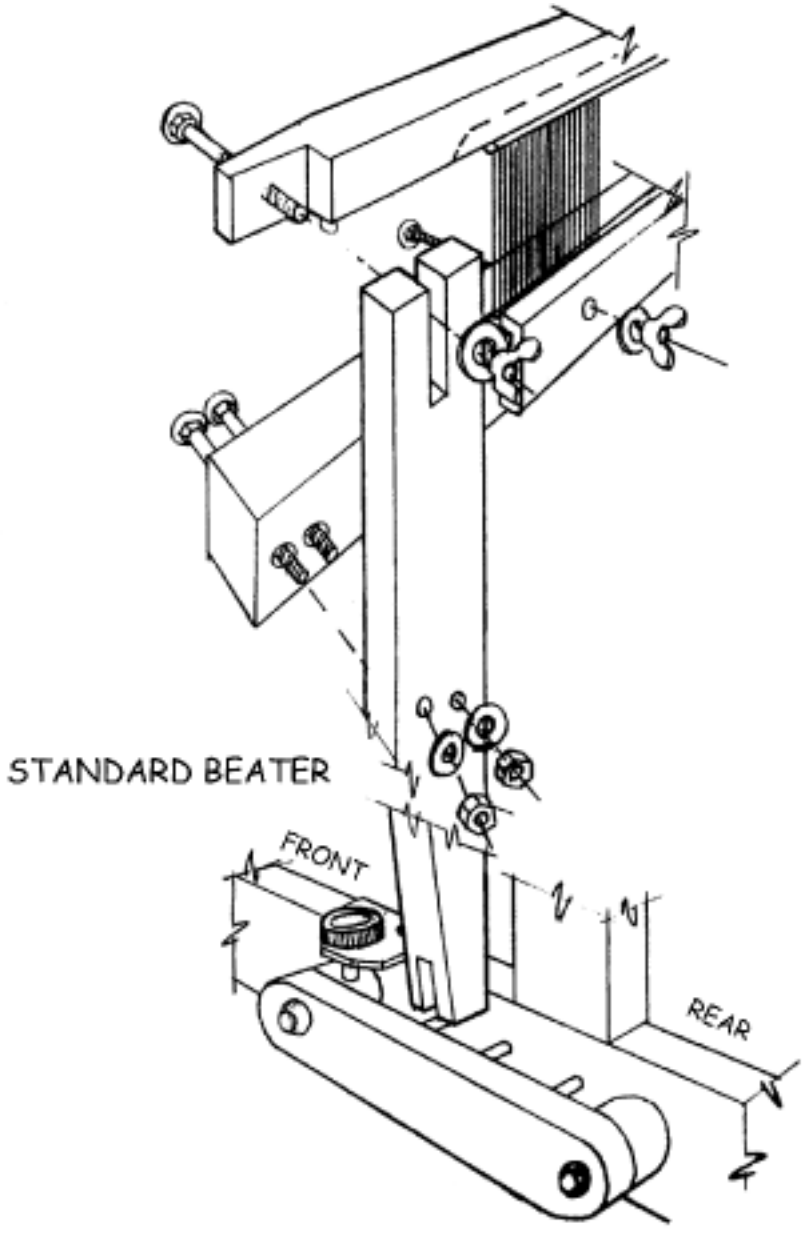
UPPER BEAM TENSION SYSTEM - FIGURE 15



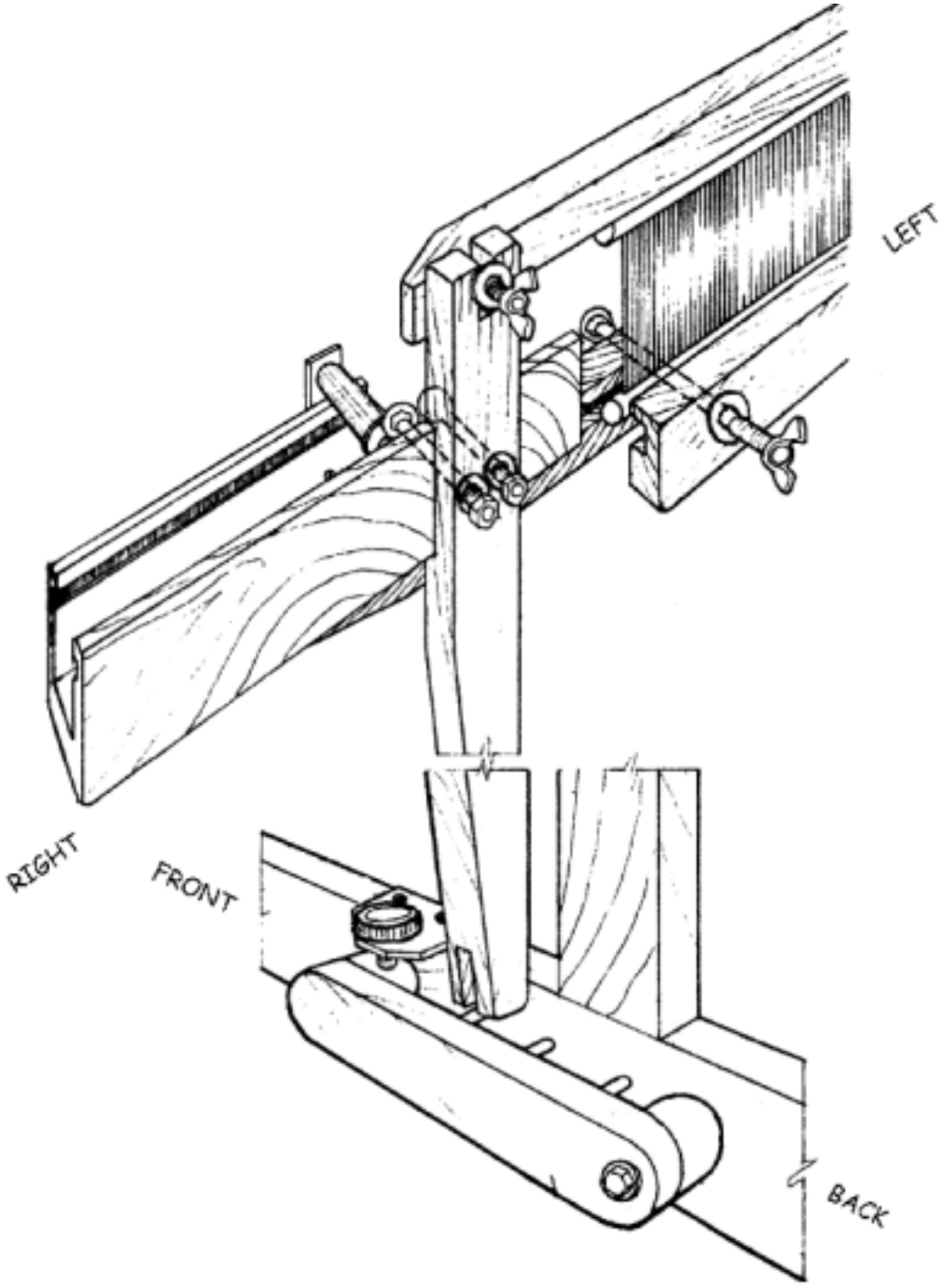
LOWER BEAM TENSION SYSTEM - FIGURE 16

The Beater supports can now be bolted to the loom. First, locate your beater supports #34. There's one for each side of the loom, so we'll start on the right side and you can refer to Figure 1 for correct placement.

Orient one of the beater supports so that the round spacers and metal pins are facing toward the loom and the spacer with the threaded rod and metal bracket is toward the front of the loom (see Figures 17 and 18).



STANDARD BEATER SUPPORT - FIGURE 17



SINGLE BOX FLYSHUTTLE BEATER - FIGURE 18

Remove the lock nut and washer from the rear spacer and insert the bolt through the right lower horizontal side frame member. Slip the washer and nut back on and tighten it just enough so that the beater support is still allowed to pivot. Now remove the two screws located in the top edge of the lower horizontal. Position the metal bracket that's attached to the wing nut bolt over the two holes and reinsert the screws. Tighten them down. Repeat this process for the left side.

Standard Beater

Locate the race, beater top, two legs, reed, and hardware. Now pick up the race and orient it so that the lengthwise groove is facing towards the rear of the loom and so that the groove is closest to the top of the race. The bottom of the reed will go in this groove shortly. Lay the race across the loom in the approximate position it will be in when in use. Now empty your hardware bag onto a table top. Pick up the four 1/4" x 2 1/2" carriage bolts with washers and hex nuts.

Now take your beater legs and position them so that the leg with a series of several holes near the bottom is on the left side of the loom and the slot at the narrow end of the leg is riding in the center pin on the beater support. Insert the bolts, from the front of the race, through the race, and into the corresponding holes in the beater leg. Attach washers and nuts and tighten slightly. Repeat this procedure for the other side of the loom.

Now locate the reed support. It is a long thin wooden part with six holes in it and a slot similar to the one in the shuttlerace. Using six 1/4" x 3 1/4" carriage bolts attach the reed support to the back of the shuttlerace with the slot to the top and facing the shuttlerace. The bolts should be inserted from the front of the shuttlerace, so that the washer and wing nuts will end up to the rear of the assembly. Before tightening the wing nuts, install the bottom edge of your reed in the void created by the slot in the reed support and shuttlerace. Center the reed between the two legs and tighten down the six carriage bolts.

There is a slot along the underneath side of the beater top which slides over the top edge of the reed. Push the beater top down on the top of the reed. Insert a 1/4" x 2 1/4" carriage bolt through the hole near each end of the beater top and through the slot at the top of each leg. Tighten each end down with a washer and wing nut. Now, making certain that the beater assembly is centered on the loom, securely tighten the carriage bolts that attach the legs to the shuttlerace. Watch the heads of these bolts as you tighten them. The square portion of the head should be drawn into the wood but the rounded part of the bolt head should stay above the surface of the wood.

Single Box Flyshuttle Beater (Optional Equipment)

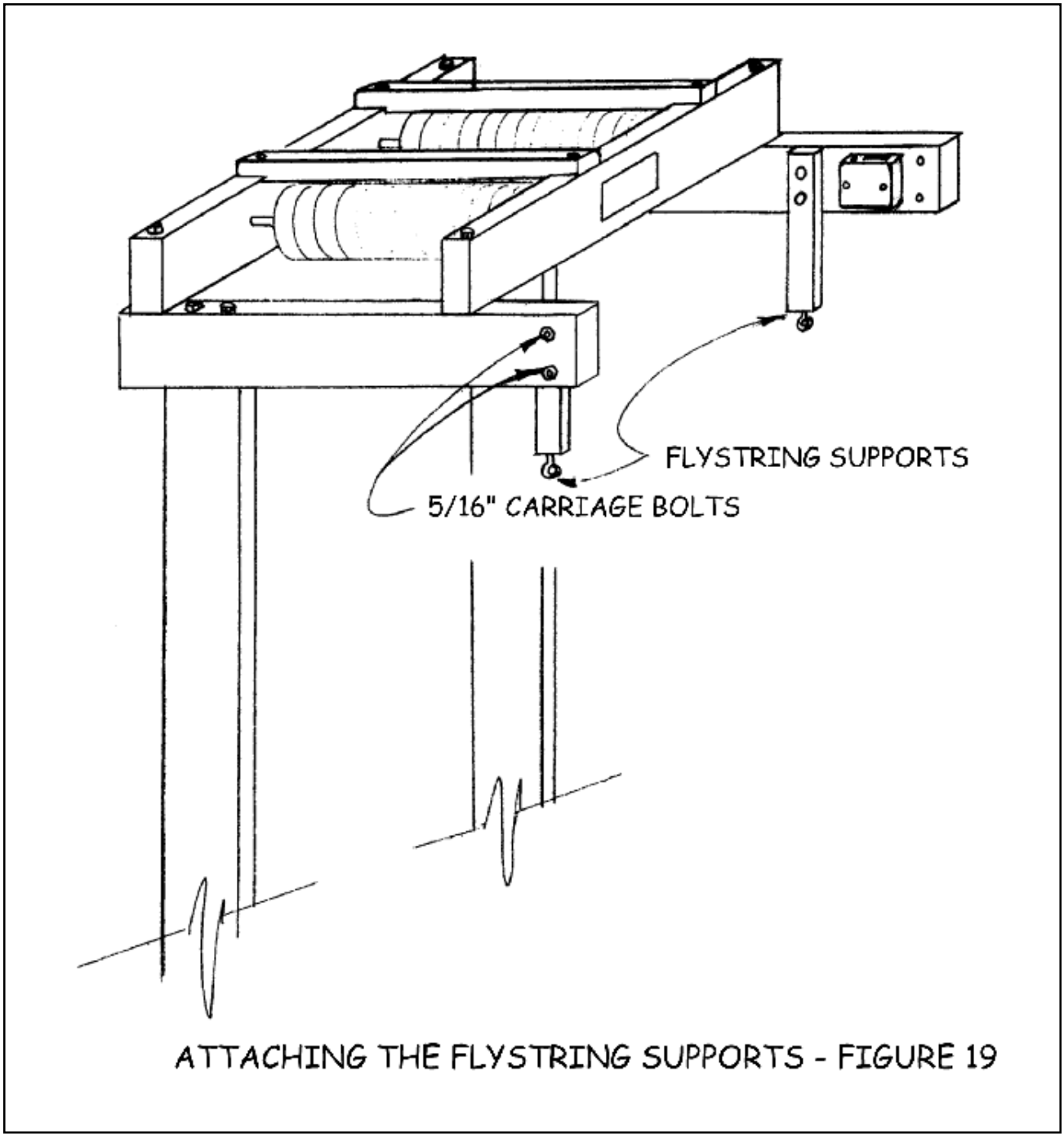
Locate the shuttle race, beater top, two legs, two flystring supports, hardware, string tie-up, and reed support (see Figure 18). Pick up the race and orient it so that the lengthwise groove is facing toward the rear of the loom and the shorter flyshuttle box-sides are towards the front. Now lay the race across the loom in the approximate position it will be in when in use.

Empty your hardware bag on a table top. Separate the 5/16" x 3" carriage bolts, washers, and hex bolts. Look at your beater legs. They are identified as to left and right by a stamp. Also, the left leg has a series of holes near its narrow end. Pick up the right leg and bring it to the right side of the loom. Orient it so that the cut-out section is toward the front of the loom and the tapered side of the leg to the outside. Position the notch, located at the bottom end of the leg, over the center pin in the beater support. Now, attach the race to the leg using two of the 5/16" x 3" carriage bolts. Slip on the washers and nuts and attach loosely. Repeat the procedure above for the left side making sure the tapered side of the beater leg faces away from the loom.

Push the six 1/4" carriage bolts through the race so that their heads sit flat on the front of the beater race. Now, carefully slide the reed support onto the six bolts so that the lengthwise groove in it faces the groove in the race. Leave enough room so that you can fit the reed in between the race and the reed support. Once the reed is in, the washers and wing nuts can be fitted onto the carriage bolts, one at a time. Start by slipping the washer and wing nut onto one of the center most bolts. Once this is fairly secure, do the same for the right side, then the left. Assemble the remaining bolts and tighten them well, as a perfectly straight and secure reed will assure a good straight run of the shuttle.

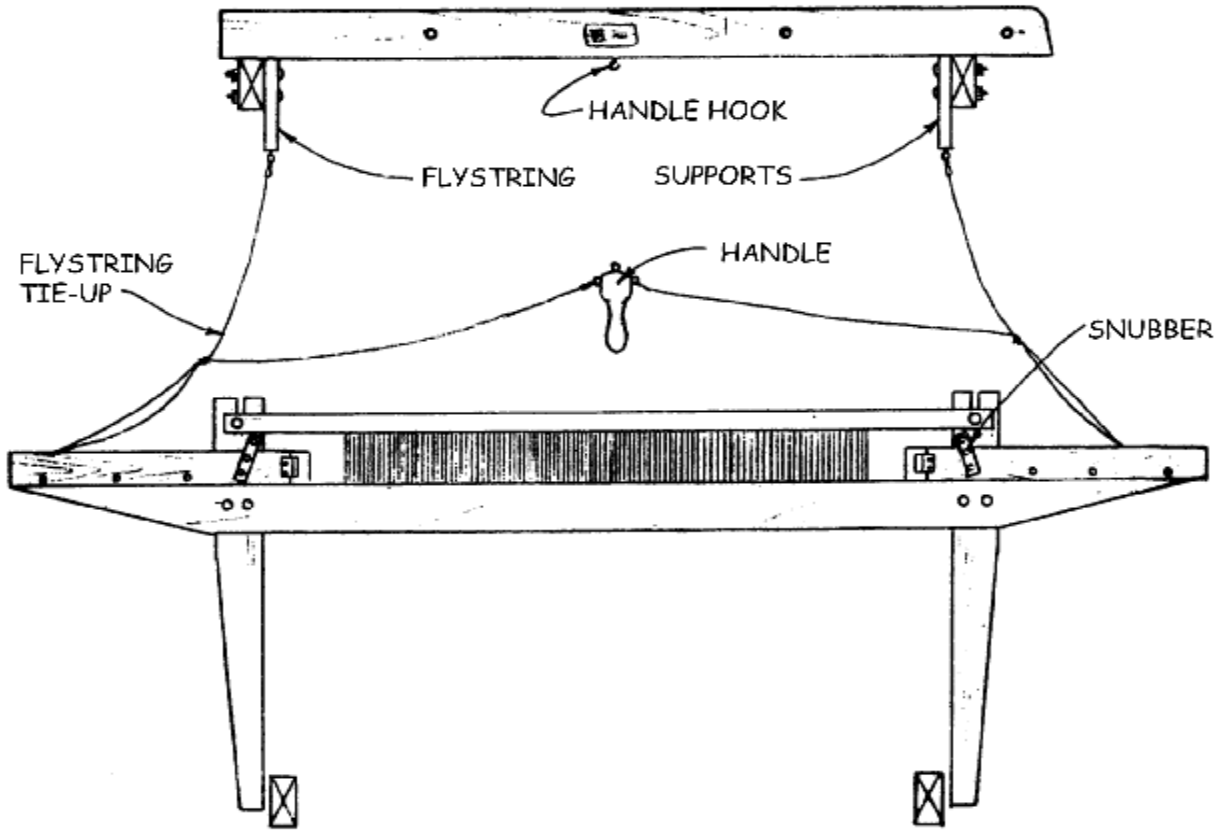
Now, orient your beater top so that the groove is facing down and the cut-outs at either end are facing toward the rear of the loom. Insert 1/4" x 2 1/4" carriage bolts into the holes located at each end starting them from the front. Placing the beater top over the race and reed, slide the bolts into the slots at the top of the beater legs and, once the reed is securely inside the groove in the beater top, attach the washers and wing nuts and tighten. Now securely tighten the carriage bolts that attach the legs to the race, but be careful not to overtighten them.

Now locate the flystring supports. These are two small wooden bars that each have a screweye at one end. They were packed with the flyshuttle beater. These flystring supports should be attached to the inside face of each top horizontal side frame piece as shown in Figure 19. Insert two 1/4" x 2 1/4" carriage bolts from the outside of the two holes on each top horizontal, directly above the beater assembly. These supports should hang down from the top horizontal with the screweye end on the bottom. Tighten the supports securely with washers and hex nuts.



ATTACHING THE FLYSTRING SUPPORTS - FIGURE 19

Now locate the long hook from the beater hardware package and screw it into the hole on the bottom edge of the front Harness Pulley Support (just underneath the AVL nameplate) (refer to Figure 20).



SINGLE BOX FLYSTRING TIE-UP - FIGURE 20

Take the string tie-up and handle from its bag. As you can see, there are three screweyes coming out of the handle - one at the top and two at the sides. Hold the handle up by the screweye at the top of the handle. This screweye connects the flyshuttle handle to the hook that you just attached to the front harness pulley support. This hook gives you a handy place to "park" your flyshuttle handle when the loom is not in use.

At this point there are two pickers hanging below the handle (the pickers are the small wooden pieces with leather loops on them). Take the one to the right and orient it so that the leather loop is toward the bottom, now take it to the very outside of the race on the right side. Slide the picker, with the leather loop down and toward the *outside*, into the slots between the box sides.

Now, the clip at the end of the cord on the right side of the tie-up and attach it to the screweye on the bottom of the right flystring support that you recently installed.

Pick up the left picker and with the leather loop down and toward the outside slide it into the grooves in the box sides from the very outside of the race. Attach the clip at the end of the cord to the other flystring support. Now notice that there is a snubber (small cylindrical wooden piece) attached to the front box on each side of the race. The cord should go over the snubbers. (Snubbers are the round wooden pieces that are mounted near the inside end of each shuttle box) (see Figure 20)

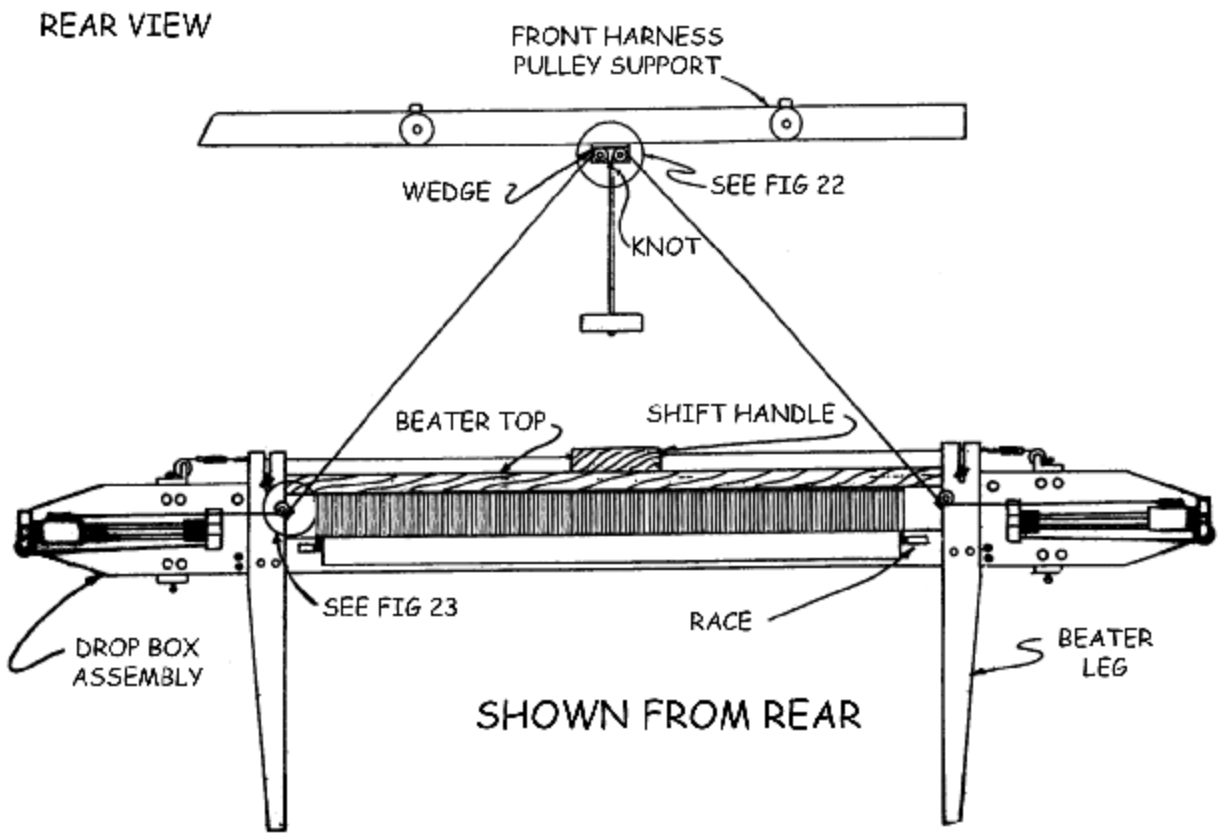
This completes the assembly of the Single Box Flyshuttle Beater.

Double Box Flyshuttle Beater (Optional Equipment)

This system is shipped partially disassembled to facilitate packing. Follow the instructions below to complete the assembly. Please refer to Figures 21 through 23 for help with terminology and locations.

A. The first step of this assembly is to locate the shuttle race and beater legs. Place the shuttle race in the loom between the front cloth beam and the harnesses. Orient the race so that its long groove is facing toward the rear of the loom and is closest to the top of the race. The bottom edge of the reed will go in this groove shortly. Now locate your hardware package and empty it onto a table top. Locate four 5/16" x 3 1/4" carriage bolts, each with one flat washer and hex nut. You will see that there are two holes near each end of the shuttle race that correspond with the two holes on each beater leg. Also notice that one of the legs has a series of holes near the bottom of it. This is the left leg. (The holes are for the optional Automatic Cloth Advance system, which is described later). Use the four bolts to attach the legs to the shuttle race, making sure that the tapered sides of the legs are facing outward. Don't completely tighten the nuts just yet, as a squaring adjustment will be made shortly.

   Now locate the reed support. It is the long, thin, wooden part with six holes in it and a slot similar to the one in the shuttlerace. Using six 5/16" x 3 1/4" carriage bolts, attach the reed support to the back of the shuttle race with the slot to the top and facing the shuttle race. The bolts should be inserted from the front of the shuttle race, so that the washer and wing nuts will end up to the rear of the assembly. Before tightening the wing nuts, install the bottom edge of your reed in the void created by the slot in the reed support and shuttle race. Center the reed between the two legs and tighten down the six wing nuts.



BOTTOM SWING DOUBLE BOX FLYSHUTTLE BEATER - FIGURE 21

There is a slot along the underneath side of the beater top which slides over the top edge of the reed. Push the beater top down on the top of the reed. Insert a 1/4" x 2 1/4" carriage bolt through the hole near each end of the beater top and through the slot at the top of each leg. Tighten each end down with a washer and wing nut. Now, making certain that the beater assembly is centered on the loom, securely tighten the carriage bolts that attach the legs to the shuttle race. Watch the heads of these bolts as you tighten them. The square portion of the head should be drawn into the wood, but the rounded part of the bolt head should stay above the surface of the wood.

B. Locate your left Drop Box Assembly: they are marked "L" and "R". You will notice that there are two holes through the Back Plate in the lower right corner and a larger one in the upper right corner with an intersecting hole coming from the right edge. Looking a few inches from the top of the left beater leg you will find a horizontal hole through the width of the leg, just below the slot for the Beater Top. This hole should be offset to the front of the shuttle race side of the leg. Take a 5/16" x 4 1/2" hex bolt with a washer on it, insert it through the hole in the leg from the inside, through the hole in the *edge* of the upper right corner of the Drop Box Assembly and thread it onto a square nut inserted in the nut access hole in the back plate. Do not tighten this yet. Your Drop Box Assembly should now be attached to the leg with this one bolt, with the movable boxes in the front.

C. Attach the Drop Box Assembly to the shuttle race with two 5/16" x 2 3/4" carriage bolts inserted from the front with washers and hex nuts behind the back plate. Now tighten all bolts holding the Drop Box Assembly to the beater. **Important**: The face of the Back Plate must be precisely flush with the face of the beater leg. Check this alignment by laying a straight edge across the two surfaces.

D. Repeat this procedure for the right Drop Box Assembly.

Multiple-Box Flystring Tie-Up Assembly

NOTE: The multiple-box flystring tie-up is currently available in two different configurations, both of which are described below. If you didn't specify a preference, you were sent the latest model which we refer to as the "Side Pull" style. The other configuration we offer is referred to as the "Vertical Pull" model. Neither style is particularly better than the other, it is more a matter of personal preference.

Side Pull Flystring Tie-Up

E. Remove the last remaining items from your better hardware package, (three screweyes) and screw them into the two holes on the bottom edge of the front harness pulley support near each end of the part. Screw the third screweye into the hole located at the very center of the loom. A thin screwdriver, allen wrench, or other similar object may be used to drive these screweyes into the pre-drilled holes.

Locate the bag marked "Multiple-Box Flystring Tie-Up, Side Pull" and remove its contents. This tie-up can now be attached to the loom as shown in Figure 20. Start by attaching the three snaps to the screweyes that you just installed. The snap that comes from the top of the handle can now be attached to the center screweye. The remaining two snaps can also be attached to the remaining two screweyes.

At this point you should have one free end of cord coming from each end of the tie-up. As shown in Figure 20, take each of these free ends and route them under the pulley (between the pulley and its retainer) on the inside back face of each beater upright. Then bring the cord to the screweye on the top of the picker. The picker is the plastic "hammer" that slides horizontally through the drop box assembly at each end of the beater assembly. Tie a good strong knot at the screweye to attach the cord to the picker. Where you tie the knot on the cord is not extremely important, but it will determine how tight or loose the tie-up but it will determine how tight or loose the tie-up is. A good place to start is by lightly pulling on the cord through the screweye until most of the slack is removed from the tie-up but the handle is not pulled from the center of the loom. Once this is done on each side, the tie-up assembly is complete.

Vertical Pull Flystring Tie-Up

F. Locate the bag marked "Multiple-Box Flystring Tie-Up" and remove its contents. These pieces can now be assembled on the loom as described below and shown in Figures 21 through 23.

Locate the bag marked "Flystring Tie-Up" and remove its contents. These pieces can now be assembled on the loom as shown in Figures 21, 22, and 23. Use the two screws to attach the pulley assembly to the bottom edge of the front Harness Pulley Support using two of the corresponding pre-drilled holes as shown in the illustrations, making sure that you include the small wedge shaped piece of wood as part of this assembly with the wider part of the wedge facing the rear of the loom. Also make certain that the pulleys are to the rear or away from the weaver. When assembled properly, the bracket should be angled slightly toward the front of the loom.

We suggest that you refer to Figures 21 and 23 before and during this next step of the assembly. Remove the flystring tie-up from the bag. This tie-up consists of a long dacron cord with a spring attached to one end of it.

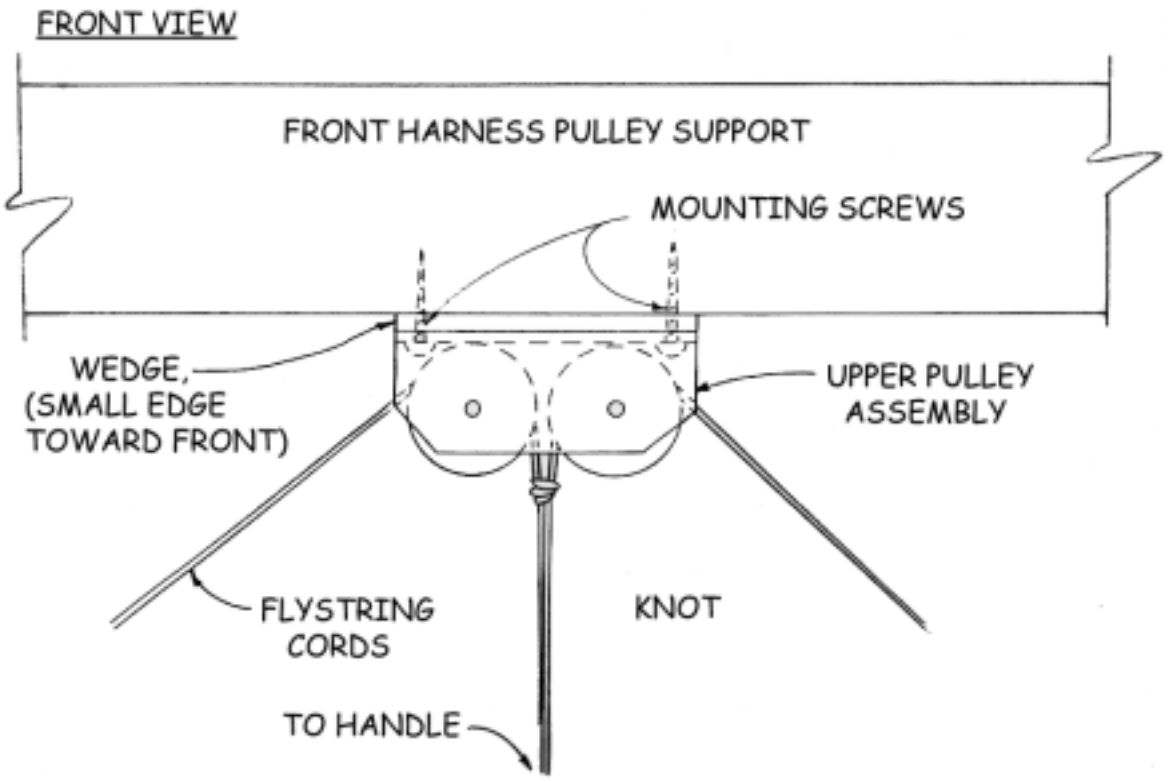
You should now attach the loop at the free end of this spring to the screweye that is affixed to the tope of the *left* Picker. The Pickers are the green plastic "hammers" that slide horizontally through the Drop Box assembly at each end of the beater assembly. Now route the end of the cord under the pulley that is mounted on the rear face of the left beater leg, making sure that the cord goes between the pulley and the attached retainer. From this point route the cord up to the Upper Pulley assembly that you just installed a few minutes ago. Route the cord over *both* of these pulleys and continue routing the cord on the right side of the loom exactly like you just did on the left side.

Now remove the remaining small spring from the bag and attach it to the screweye. You now need to tie a good strong knot at the loop on the free end of this spring. Where you tie this knot in relation to the end of the cord will determine the operating height of the Flystring Handle, which you will attach in a moment. If you tie the knot very near to the end of the cord, the handle will be at its lowest possible position. (If it went much lower, the Flystring Handle could collide with the Shift Handle or Beater Top when it reached the bottom of its throw). We suggest that you try this position first, as a lower handle position will generally be less fatiguing.

Now go back up to the Upper Pulley assembly where the cord passed over both of the pulleys. You now want to route the cord down between the two pulleys, taking up all of the slack, and forming a large loop at the center of the loom.

Locate the Flyshuttle Handle. It is a small, dark colored piece of wood with a hole and a brass pin through the center of it. Form a tight loop at the center of the cord that is now hanging below the Upper Pulley Assembly. Feed the loop down from the top of the handle through the hole on either side of the brass pin that divides the hole. Now feed the loop back through the hole on the *other* side of the brass pin. Now form a larger loop (6" or so) and run it back over either end of the handle. To do this you actually put the handle through this loop and bring the string of the loop all the way back up to the top of the handle. Now pull straight down on the handle, tightening the cord around the brass pin. This procedure should automatically center the handle on the tie-up.

G. Now you are going to have to tie an overhead knot in the cord between the two Upper Pulleys (see Figure 22). To do this, make a small mark on the cord where the cord goes between the two pulleys and pull it straight down a few inches to where you can tie a simple overhead knot with the handle already in place. Once the knot is tied, release the cord and let it return to its resting position. If the knot was placed correctly, the pickers should still return to the end of the picker rod at each end of the beater and the cord should stop before the knot stops the cords from moving any farther.

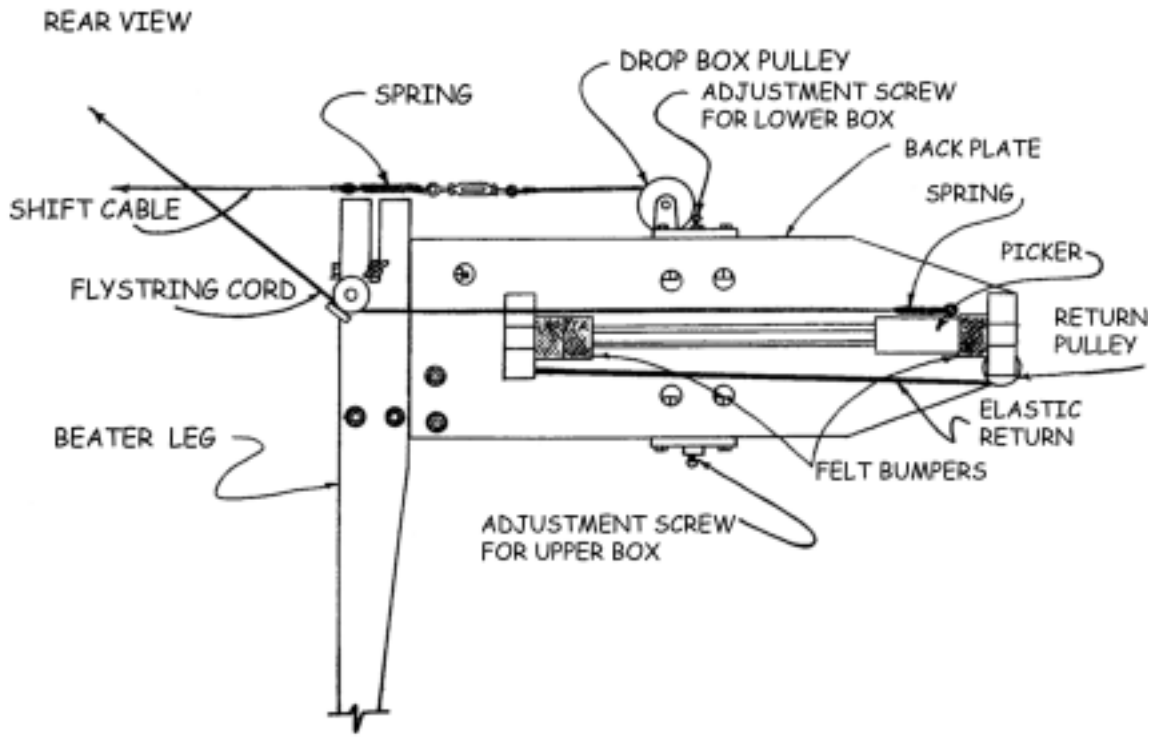


UPPER PULLEY ASSEMBLY
(seen from front of loom) - FIGURE 22

H. The next step is to adjust the movement of the shuttle drop boxes themselves. You will notice that the boxes slide up and down on a metal rod which is fixed at both ends to cast metal pieces. In each of these cast metal pieces you will find a brass adjustment screw with a locknut (see Figure 23). These brass screws provide a stop for the boxes at their upper and lower extremes of movement. Adjust the top screw so that when the boxes are all the way up, the lower box is in precise vertical alignment with the shuttle race. Adjust the bottom screw so that when the boxes are all the way down, the upper box is in precise vertical alignment with the shuttle race. *This adjustment is critical*, please make it carefully. It is wise to lay a straight edge across the shuttle race and drop box shelf when doing this to assist you in getting the two perfectly aligned. When you have it properly adjusted, secure the locknuts on the brass screws. Do these adjustments on both the left and right drop boxes. In the future, if your shuttle flight is erratic, re-check these adjustments.

To make sure that the adjustment screws stay in place, you might want to purchase a small tube of a thread locking agent (such as Loctite or even fingernail polish) and apply a drop or two to each of these screws where they go into the cast metal brackets.

I. The final step is to attach the cable from the drop boxes to the Shift Handle and adjust the cable lengths. On each side there is a cable attached to the drop box which has an eyebolt on the end. This cable is routed over the top of the Drop Box Pulley (see Figure 23) and the eyebolt threads into the turnbuckle on the end of the cable coming from the Shift Handle.



BACKPLATE ASSEMBLY (LEFT SIDE SHOWN) - FIGURE 23

Once you have both sides attached, they are adjusted as follows: with the Shift Handle shifted to its rightmost, adjust the left Drop Box turnbuckle so that the box is against its top stop and the spring at the turnbuckle is *slightly* extended. Shift the handle to the left and adjust the right turnbuckle in the same manner. **Attention!** When shifting, the leading end of the handle must be slightly raised first. If the trailing end of the handle is lifted first, the handle will lock up and not shift. Also, you want to make sure that the turnbuckles are not adjusted so tightly as to not allow the boxes to drop to their full down position. Once properly adjusted, tighten the locknut of each turnbuckle to keep them from moving.

That completes the assembly of your double box flyshuttle beater.

Check your assembly with Figure 21 to be certain you've gotten everything correct.

RADDLE / TENSION BOX

RADDLE (Optional Equipment)

The Raddle #41 is inserted into the holes in the back edge of the folding legs. Refer back to Figure 15 for relative position. These holes are used to mount the raddle for warping both the standard beam and the second beam. Be certain that the removable portion of the raddle is to the top. Once mounted into the holes, the raddle is not only held firmly in place but is also perfectly centered and can be left in place while weaving.

TENSION BOX (Optional Equipment)

Locate your tension box, track, tension box support arms, legs and hardware (refer to Figure 24 during assembly).

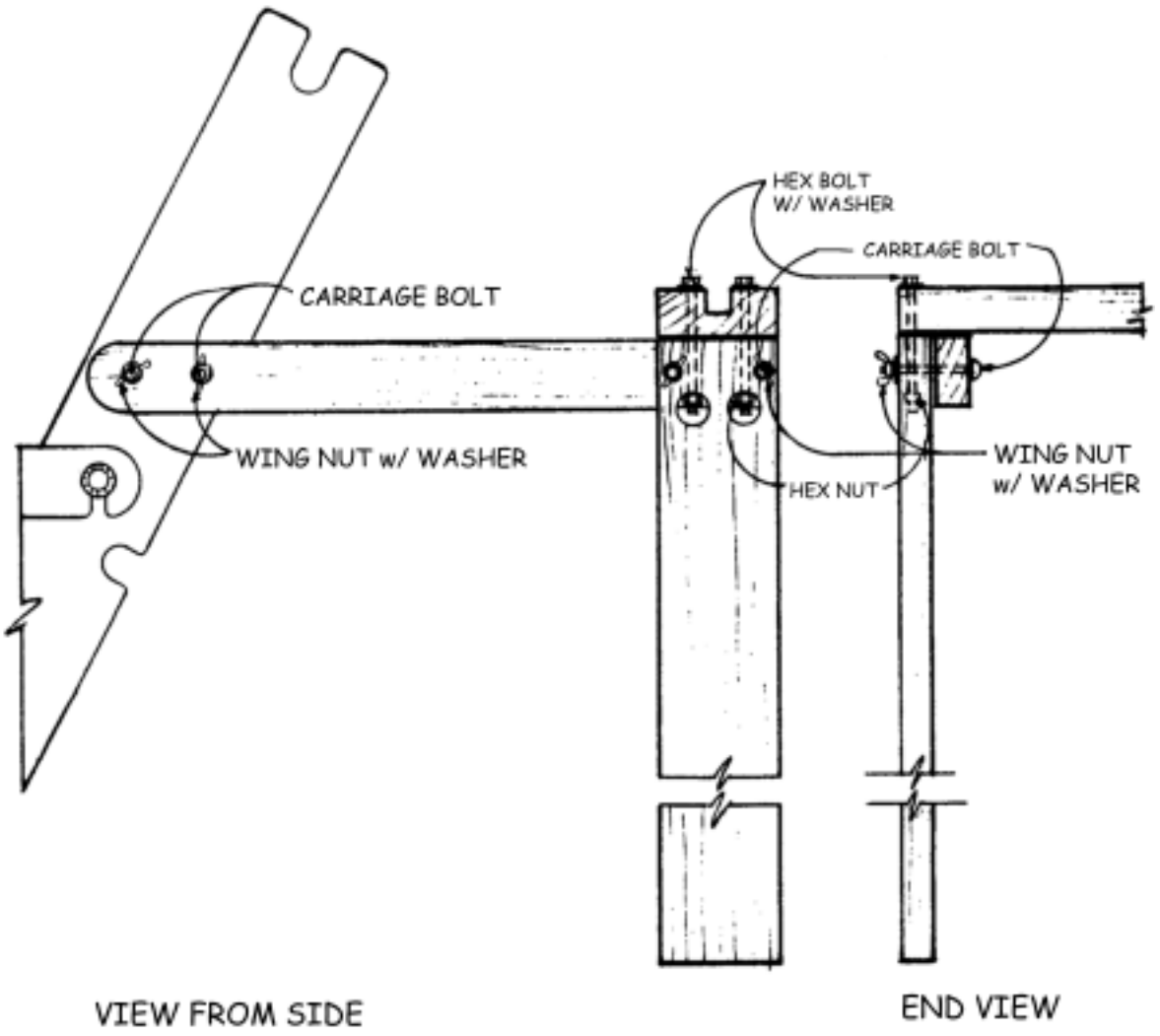
Insert the four 1/4" x 2 1/4" carriage bolts into the vacant "through" holes (beneath the separation rollers) in the folding leg from the inside. Now mount the rounded end of the tension box track arms onto these bolts with the squared off end protruding out away from the loom. Make sure these are mounted to the outside of the folding legs and secure with washers and wing nuts.

Next, connect the tension box support arms to the tension box legs using the 1/4" x 2" carriage bolts provided making sure the arms are to the inside of the legs and the wing nuts are facing outward.

Mount the tension box track onto the legs. Orient the track so that the groove is facing up four hex bolts through the holes in the tension box track and down through the legs. Secure with square nuts.

Mount the tension box to the track by first removing the wing nuts, washers, and clamp block located on the underside of the assembly. Place the tension box on the track so that the track runner on the bottom of the tension box fits into the slot in the track. Be certain that the heddles and harness assembly are facing toward the loom. Replace the clamp block, washers and wing nuts and you're all done.

NOTE: To remove the tension box assembly, you've only to remove the four wing nuts fastening the tension box support arms to the folding legs. This way the arms, track, legs, and tension box ban be removed as one entire unit.



TENSION BOX ASSEMBLY - FIGURE 24

WEAVING SECTION

PREFACE

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 really make these procedures your own will result in increasing your weaving speed and efficiency, and this leads to a greater enjoyment of the entire weaving experience.

WARPING THE PLAIN BEAM

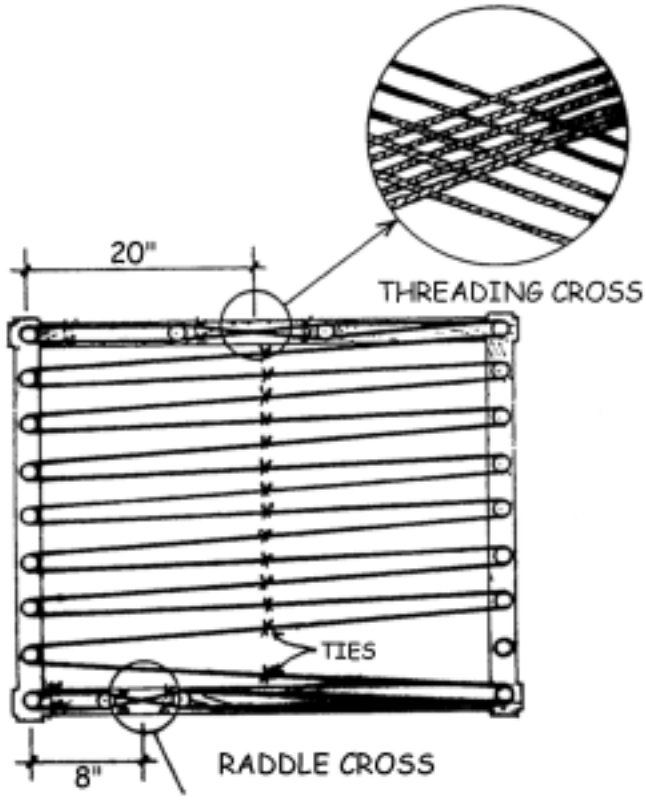
If you have ordered only a sectional beam, proceed to the section titled "Warping the Sectional Beam".

Various warping methods can be adapted to the AVL loom. However, we recommend the following method in which the warp is first wound on to the plain beam with the 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 twenty yards or more.

Creating Two Crosses

To begin, wind the warp on a warping board or reel. Make sure you put in two crosses:

- the threading cross
- the raddle cross



WARPING ON WARPING BOARD WITH TWO CROSSES - FIGURE 25

WARPING THE PLAIN BEAM

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 group can be determined by the number of ends to be placed in each section of the raddle or by the number of threads you are holding in your hand while winding the warping board.

Securing the Crosses

Before removing the warp from the board or the reel, secure the crosses. Use four ties to secure each cross. These ties go on each side of both pegs holding the cross.

It is usually a good idea to use different color threads for the ties on the tops of the pegs and another color to tie the bows underneath the pegs. By color coding your ties, you are less likely to twist the warp later.

Removing the Warp for the Warping Board

Remove the warp from the warping board by chaining or by winding on the kitestick. Start from the threading cross and proceed to the raddle cross.

Since the capacity of the warping board is limited, for wide warps you will end up making a number of mini-warps and taking them off individually.

Before winding on the warp on the beam, most of the tension should be released from the tension system. This can be done quickly and simply by removing the steel ring at the end of the tension cord from its mounting post and placing it on the screw provided at the edge of the folding leg. To protect the smaller spring from overstretching, this procedure should be done whenever the beam is turned in this direction. Using this method, you can easily reduce the tension without having to readjust your tension each time you have to back up the warp.

Attaching the Raddle

Now secure the raddle to the back of the loom. If you have an AVL raddle, simply slip it into the set of holes in the back of the rear vertical members.

Winding the Apron

Put your apron on the beam with velcro and wind your beam in the warping direction so that your apron is wound on the beam.

Attaching the Warp to the Apron

Bring the apron around the separation roller and put the metal rod through. You can also put your warp section onto that rod or you can attach another one with the warp.

Sticks in the Raddle Cross

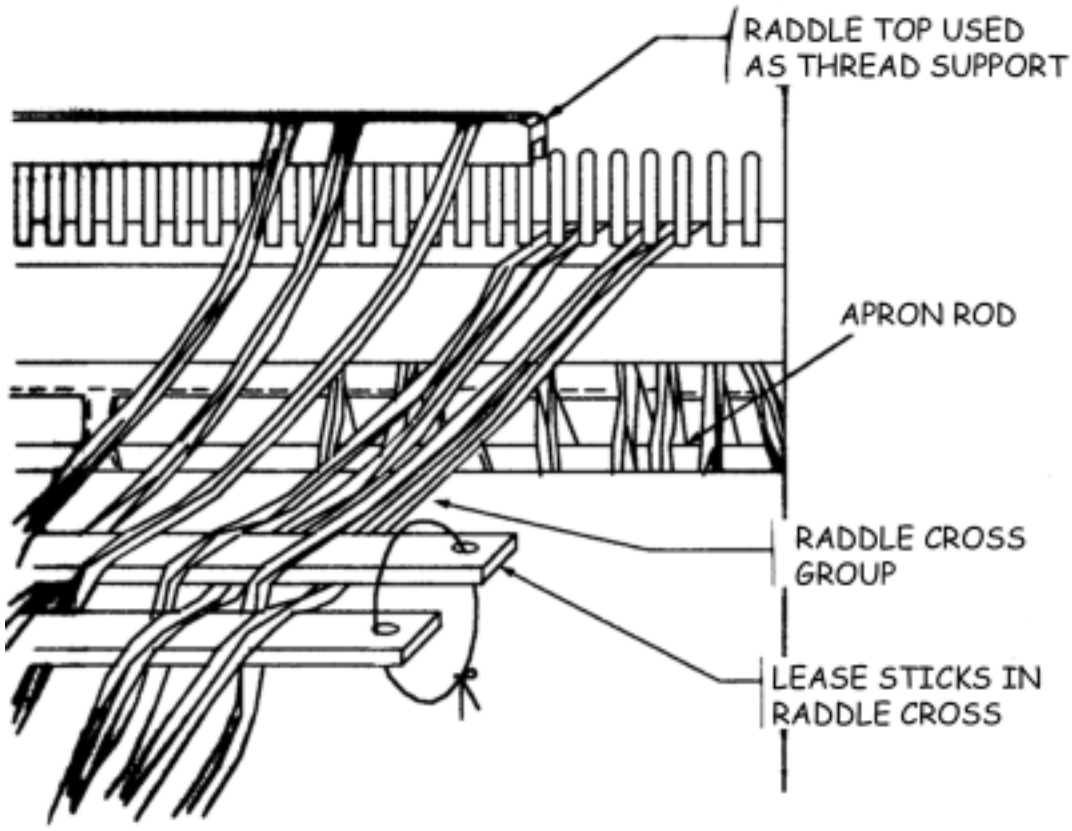
Place two lease sticks in the raddle cross and secure together with string through the holes in the ends of the sticks. Now remove the ties from the raddle cross and spread the warp out on the sticks.

Measure the center of your raddle to use it as a center of your warp. The warp threads should either go through the middle of the raddle or be offset 4” to the right.

NOTE: If you are going to be using a flyshuttle and you are planning a narrow warp, you need to offset the warp four inches to the right instead of centering it. (Remember, "the right" means the right side of the loom as you are seeing it from the weaving position at the loom bench.) This will ensure even selvedges.

Feeding the Raddle

To feed the raddle, distribute yarns through the raddle by dropping each raddle cross group into a dent in the raddle.



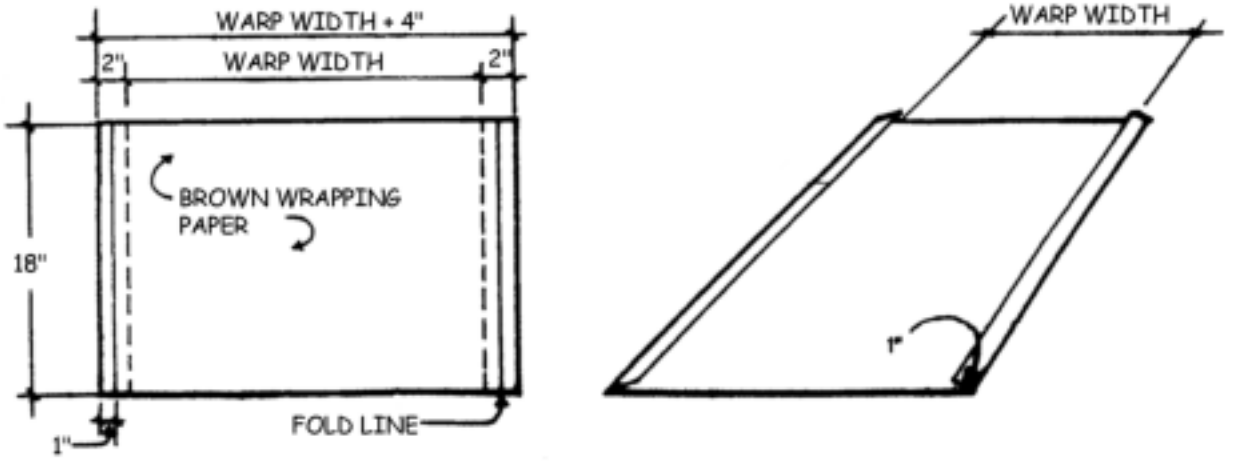
THREADING THE RADDLE - FIGURE 26

If you are using an AVL raddle with a sliding cover, slide it on after the raddle is threaded and secure it with two or three cord ties so it can't come off. Remove the raddle cross sticks when this is completed.

WARPING THE PLAIN BEAM

Preparing the Paper

Prepare the paper for winding between the warp layers. Again, for the most professional results, and fewer 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 warp too fate and/or lumpy. Corrugated paper is just too soft and the warp can never be wound tight enough with it. Heavy wrapping paper works well; seventy pound craft paper is good. 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 four 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 not overlapping them.

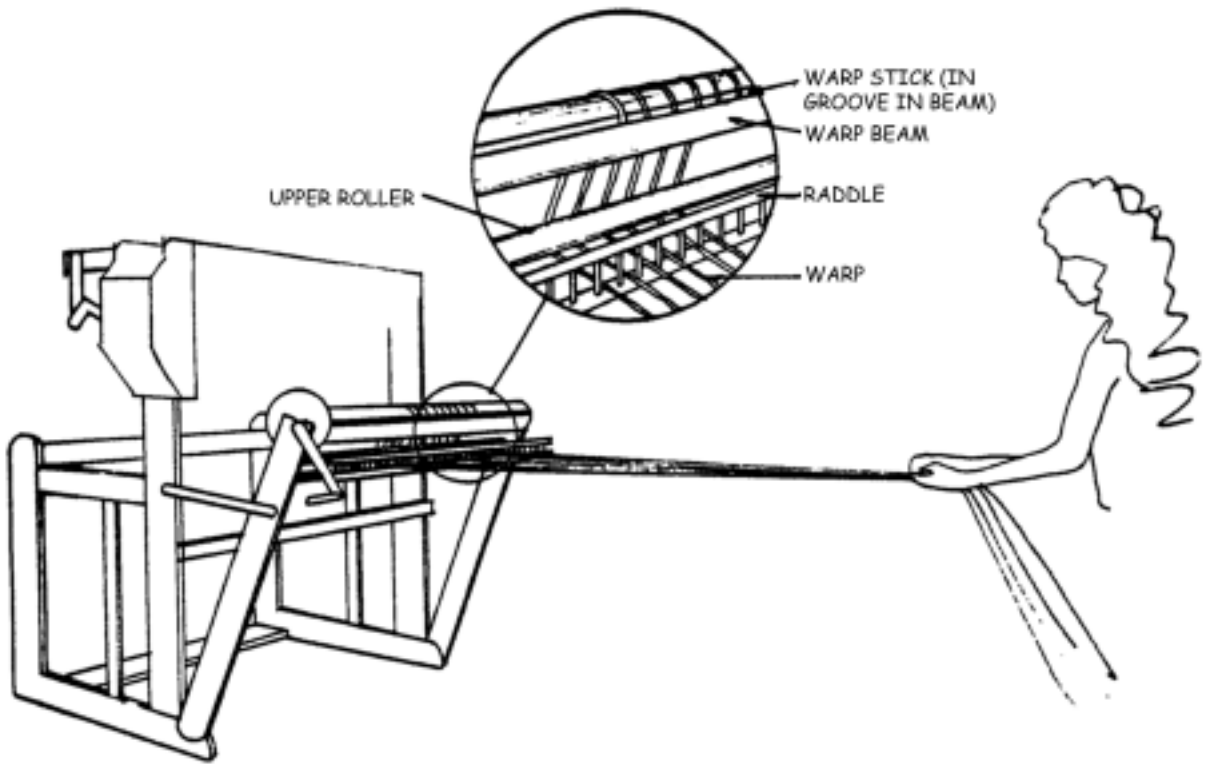


PREPARED PAPER WITH FOLDED EDGE - FIGURE 27

Winding the Warp

When winding the warp onto the upper beam from the back, i.e., with the warp spread out in back of the loom, turn the crank in a clockwise direction.

When winding the warp onto the lower beam from the back, turn the crank in a counterclockwise direction.



WINDING ON THE WARP - FIGURE 28

Remember, 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 the tension during the weaving operation. You will need one person to hold a warp under tension on the back and one person to wind the warp on the beam using a handle. The person winding the warp can also insert the paper. For a wide, heavy warp, several helpers may be required.

If you have to do it yourself, you can use the jerking method. Make one turn around with your beam crank and then go to the back of the loom and jerk one section at a time to make the warp that is already on the beam tight. The idea of this method is that the warp does not need to be under tension all the time, but the part that is on the beam has to be tight. Make another turn, go to the back of the loom and jerk all the sections again and so on. If you have a wide warp, you might need to do up to ten jerking motions after each turn.

Threading Cross

When you come to the end of your warp, insert lease sticks in your threading cross.

Now remove the ties from each individual threading cross and spread the warp out on the sticks.

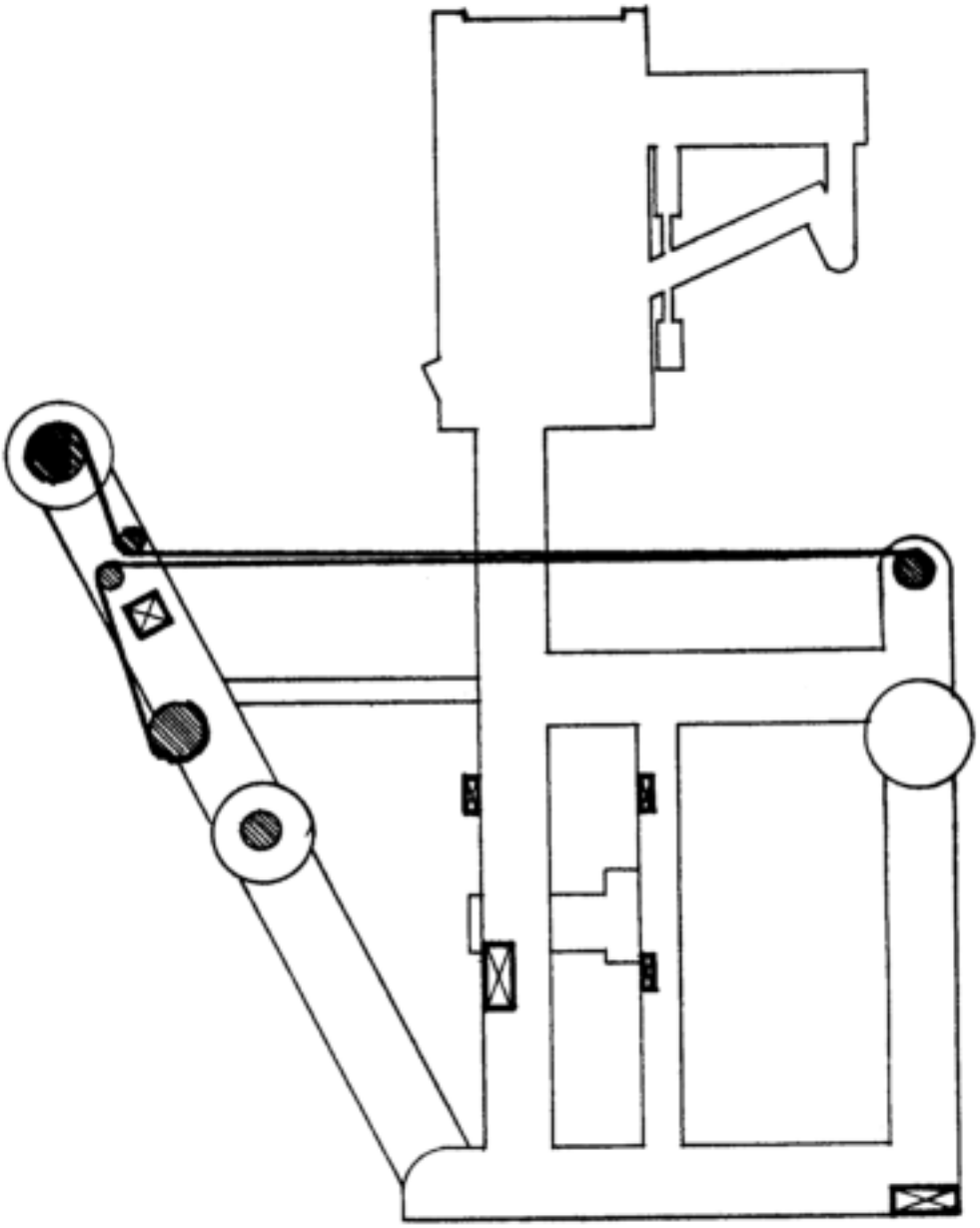
Remove the Raddle

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 as it will not interfere with the weaving process. Then be sure to bring the end of the warp around the separation roller so that it now travels into the loom.

Two Beams

There will be times when you will want to use more than one warp, which can not be put together on one beam. When winding the second beam, wind it in exactly the same manner as the first warp beam except if you put a second beam in the top position, the warp goes under the second warp beam separation roller and up to the top warp beam.

There will be times when you will want to use more than one warp, which can not be put together on one beam.



ROUTING THE WARP - FIGURE 29

WARPING THE PLAIN BEAM

When do You need to Tension Your Warps Separately?

When weaving:

a) Very different size yarns.

b) Yarns with different stretching qualities.

c) Different densities.

d) Different structures.

e) Supplementary warp techniques (because some warp threads do not interlace as often as others).

f) A group of special yarns for selvedges and borders.

g) Loops, piles, or puckers like seersucker.

h) More then one layer with different setts in each layer.

i) More than one layer with a different pick count in each layer.

Setting Two Beams

If you are confident in setting one beam, it is just as easy to set up a loom with two beams. It might take twice as much time and you do need to be more careful not to mix sequences.

a) Wind each warp on the beam the same way you would do it if there were only one beam on the loom (plain or sectional). Make a cross and have a pair of lease sticks with a cross in each warp.

b) Bring the warp with the lease sticks from the top beam around and under the top separation roller.

c) Bring the warp with the lease sticks from the bottom beam around and above the bottom separation roller.

d) Hang both pairs of lease sticks, one a little above the other, so you can see each lease from the threading position.

e) Proceed with a threading as if you only had one beam/one cross, following your threading instructions and taking special care of which thread from which pair of lease sticks comes next.

More than Two Warps, Separate Tensioning

If you have more than two warps to set and not more than two beams, you need to weight/tension your additional warps separately (do the same if you only have one beam and more than one warp to set).

a) Make your warp sections on the warping board and take them off the board in a chain, on a kite stick, or just in a plastic bag.

Make sure that each bundle is not too thick. You will know when you need to divide each bundle if you feel that all the threads are not being tensioned evenly.

b) The weight needs to have a strong loop of string on it so the warp bundles can be slip knotted into it. This makes it easy to undo the slip knot and move the weight when it climbs up to the back beam and must be let down again.

c) The weight also needs to be adjustable. Plastic bottles with handles filled with water are perfect. You can also use fishing weights, washers, nuts, bolts ... They are not as easily adjustable like water bottles, but take less space. The lower to the floor you can hang them, the less often you need to reposition them.

WARPING THE SECTIONAL BEAM

The AVL sectional beam is designed to be warped in sections with the use of a tension box. The yarn travels directly from cones or spools which are mounted on a rack behind the loom, through the tension box, and onto the beam. Throughout the warping process, the tension box automatically keeps a constant and uniform tension on the warp. Not only does this system save time, but it makes it possible to wind on very long warps which would never fit on a warping board or reel.

Sectional Beam Calculation

First, you must calculate the number of spools or cones of yarn you will need. Each section is wound onto the sectional beam separately, therefore, you'll need to have one spool or cone for each end in that section (if your section is 2" wide, with sixteen E.P.I., that would be thirty-two spools or cones of yarn).

Size of the Section

NOTE: It used to be that all sections were 2" wide. On an AVL sectional beam with metal pegs, you can decide to use 1", 2", or any number of inches sections. You can simply add more pegs in the pre-made holes or take them out.

WARPING THE SECTIONAL BEAM

To prepare for sectional beam warping, we need to calculate:

a) how many spools we need to wind
b) how many yards do we need to wind on each spool
c) total yardage for the project

a) NUMBER OF SPOOLS?

Sectional beaming requires the use of as many spools loaded with thread per individual section as your planned sett in the reed dictates.

To calculate the actual number of spools required, we need to know:

- how many EPI are we going to use in the fabric
- what SIZE SELECTION will we have to use in the fabric

If your warp is set at 24 epi per 1", you will need 24 spools for a sectional beam with 1" sections or 48 spools for a beam with 2" sections.

Therefore we can say:

 # OF SPOOLS = EPI x SIZE OF THE SECTION

b) NUMBER OF YARDS PER SPOOL?

To calculate the number of yards per each spool, we need to know:

- the LENGTH OF THE WARP
- NUMBER OF SECTIONS on the beam

We calculate the number of sections by dividing the WIDTH OF THE WARP by the SIZE OF THE SECTION. If the warp width is 40" and we are using 2" sections, our number of sections is 20.

All together, we can say:

 # OF YARDS PER SPOOL = LENGTH OF THE WARP x # OF SECTIONS

c) TOTAL YARDAGE?

If it is a single color warp or if a color sequence is repeating in each section, the same spools or cones can be used to wind all the sections needed for the warp.

TOTAL YARDAGE = # OF SPOOLS x # OF YARDS PER SPOOL

It is important to make these calculations in advance so that you can purchase your yarn in spools or cones corresponding to the amount of yardage needed on each. Sometimes this is not possible and you will need to wind your own spools from yarn that is in larger packages. For doing this, you will need empty plastic spools, a bobbin winder (preferably electric), and a yardage counter. These items are available from AVL.

Extension Cords

You might want to make a permanent set of extension cords to use when warping the sectional beam. Extension cords are also called apron cords and have the same function as the apron on the plain beam. They give you "reach" from the warp beam and allow you to weave every possible inch until the end of the warp touches the last shaft you are using. Make them out of a strong non-stretchable linen or cotton cord. You will need to make one extension cord for each section in your sectional beam. For each extension cord, cut a piece of cord. Take the two ends of the cord and knot them together. Measure to make sure that they are long enough to reach all the way to the harnesses. All extension cords should be exactly the same size.

When measuring the length of the cords, also check to be sure that when the cords are wound on to the beam, the end of the loop and any knots in the cords fall between the crosspieces of the sectional beam, not on them. A sectional beam is usually not solid. It is a frame that has metal pegs. That way you can keep the warp smooth on the beam without going over the knots of threads.

Feeding the Spool Rack

Next, place a spool or cone rack about five or six feet behind your loom. Place the spools or cones for the first warp sections on the cone rack.

Make sure you put each thread through the metal eye on the spool rack so the threads do not get tangled.

When arranging the spools on the spool rack, it doesn't matter whether you go top to bottom or bottom to top, the important thing is to be consistent in vertical columns and to place the spools in the order that the threads are in the warp.

Adjusting the Tension Device

Before winding on the warp on the beam, most of the tension should be released from the tension system. This can be done quickly and simply by removing the steel ring at the end of the tension cord from its mounting post and placing it on the screw provided at the edge of the folding leg. To protect the smaller spring from overstretching, this procedure should be done whenever the beam is turned in this direction. Using this method, you can easily reduce the tension without having to readjust your tension each time you have to back up the warp.

Setting a Tracking System

On the back of the loom, set a tracking system that will allow the tension box to travel from one section to another. The tension box is fastened to the tracking system with wing nuts. These can be released for the tension box to move. Once centered properly for a particular section, the tension box needs to be tightened again (for each section).

WARPING THE SECTIONAL BEAM

Tension Box

The tension box is an essential warping tool which:

a.) Puts threads under tension.

b.) Spreads threads to the proper width.

c.) Makes thread-by-thread lease.

Tension Box Heddle Instruction

If this is your first time to use a tension box, you need to install heddles on the harnesses.

Your tension box is delivered with one bundle of one hundred heddles. These are held together with twist ties. Leave these on for now. Refer to Figure #7W to familiarize yourself with the tension box and its parts. Push down on one of the harnesses until it stops. This causes the other harness to go up. You will use that later for making a threading cross. Right now we'll need to use it to help in the assembly of the heddles to the harnesses.

a.) Remove the "heddle retainer" of the harness that is up, using a phillips head screwdriver.

b.) Notice there are four twist ties holding the heddles together. Separate the top two. Insert the top bar (of the harness that is up) into the space created by pulling apart the twist ties. Insert the bottom bar (of the harness that is up) into the space created by pulling apart the bottom two twist ties, making certain that the heddles aren't' twisted. Now remove the twist ties.

c.) Count off fifty heddles and cut the loop at the top between the 50th and the 51st heddle.

d.) Now put the four twist ties back on the fifty heddles that were the last to go on the harness.

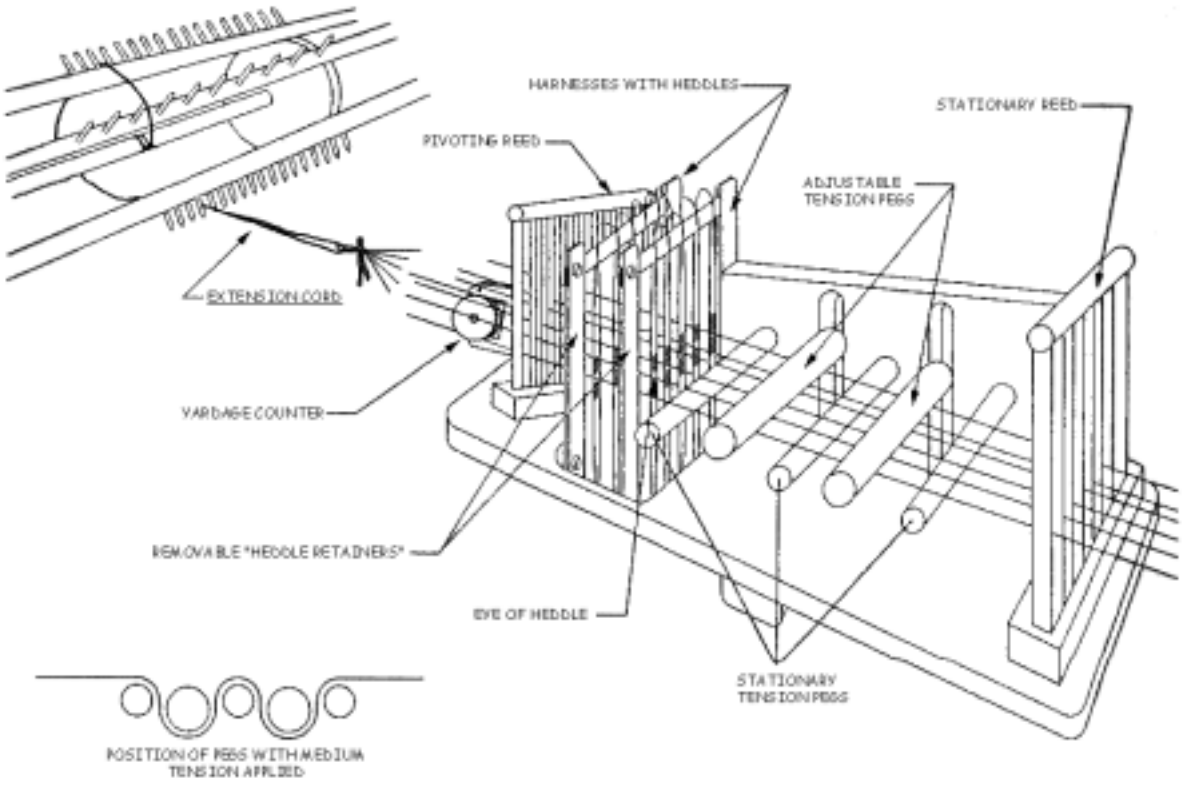
e.) Remove these fifty and reattach the "heddle retainer".

f.) Now push down on the harness that is up, making the other harness come up.

g.) Remove the heddle retainer.

h.) Pull apart the top two twist ties and insert the top of the harness (which is up) into the space created. Pull apart the bottom two twist ties and insert the bottom of the harness into the space created.

i.) Reattach the heddle retainer.



TENSION BOX - FIGURE 30

Threading the Tension Box

The best way to thread the tension box is to take one thread from the cone rack and thread it all the way through all the parts of the tension box, then the next thread all the way through. It works best to use the threads from the rack in a vertical order rather than a horizontal order.

Now let's go through the sequence for threading the tension box. First, move the two adjustable tension pegs up above the stationary pegs as shown in Figure #7W or remove them completely. Now sley the thread through the rear (stationary) reed section using a sley hook. Since this reed is eight dents per inch, you will divide the E.P.I. into eight to find out how many ends will be in each dent (with sixteen E.P.I, put two ends in a section). If your E.P.I. does not divide equally by eight, you can either vary the number of ends in each dent (with twenty E.P.I., alternate two and three ends in the dents) or thread the dents a little wider than two inches (with twenty E.P.I., put two ends in each dent; with forty ends, the reed will be sleyed 2 1/2" wide).

Next, bring the thread straight through the tension peg section in-between the larger adjustable tension pegs and the smaller stationary pegs or just above the smaller stationary pegs if you have removed the larger ones.

Next, thread the end through the two sets of heddles. The first thread goes through the front set of heddles and the next thread goes through the rear set of heddles. Repeat this alternating heddle threading for the rest of the ends. The heddle system will be used later to create the threading cross.

Now thread the end through the front pivoting reed. Here you have a choice of using an eight dent or ten dent reed. Pick the one that can be sleyed evenly and as close to the desired section width. If you can not get the exact width of the section, sley your reed slightly wider. This will make it just slightly wider than the space between the pegs. The section will be narrowed down by pivoting the reed. Never sley the reed narrower than the section on the beam. There is no way to expand it. After the tension box is completely threaded, the larger pegs are moved downward to apply tension. The further down they are moved, the more tension will be applied to the yarn. This is an adjustable system as different yarns require more or less tension. With a heavy wool the pegs may only need to be moved half way down, whereas with a fine silk, the pegs may need to be moved all the way down and the yarn wrapped an extra time around one of the stationary pegs to get the proper tension. Once you have adjusted the tension correctly, do not change it during the winding of the beam, as long as you are using the same type of yarn.

Once the tension box has been threaded, it is not always necessary to rethread it. If you need to change spools or cones, simply tie the new ends on to the old ends just before the rear stationary reed, then gently pull on the old ends until the new ends have come all the way through the box.

Winding the Warp

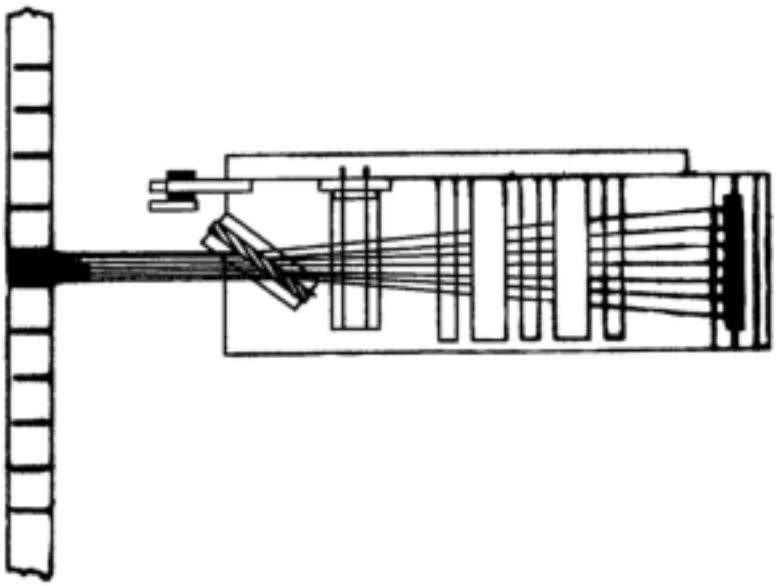
Before you start winding the warp, attach the section of the warp to an extension cord, tie an overhead knot in the warp threads from one section and slip that knot into the opening of the larkshead knot you created in the extension cord. Pull it tight.

NOTE: If you will be using a flyshuttle and are planning a narrow warp, you need to offset the warp 4" to the right instead of centering it. (Remember, "the right" refers to the right side of the loom as you are seeing it from the weaving position at the loom bench.) This offset will ensure even selvedges.

Route the warp ends and extension cords between the two metal rollers and either down to the lower beam or up to the upper beam. Turn the warp beam handle in a clockwise direction for the upper beam, counterclockwise for the lower beam.

Adjusting the Size of the Section

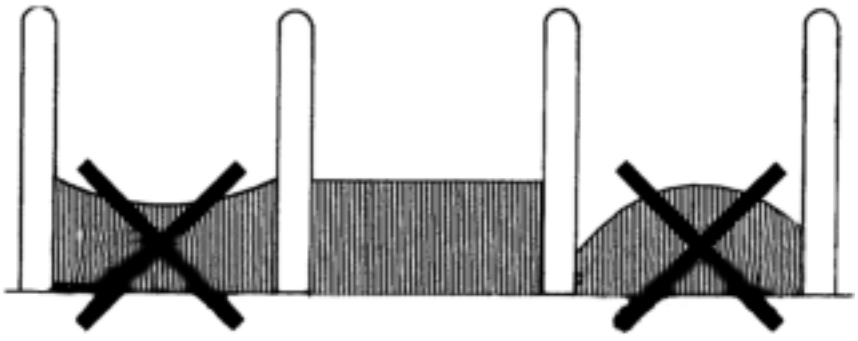
Line up the tension box approximately behind the section you will be winding. Now wind about one yard onto the beam. As you wind, you will need to fine tune the placement of the tension box along the track. When it is centered properly, tighten down the wing nuts under the tension box. At this point, you can pivot the "pivoting reed section" so that the yarn comes close to, but doesn't quite touch, either the peg to the left or the peg to the right. Now tighten the wing nut under the pivoting reed. This shouldn't need to be readjusted until you are using yarn of a very different size.



ADJUSTING THE SIZE OF THE SECTION - FIGURE 31

Extra care to correctly center and adjust the width of each warp section will result in more perfect tension while weaving.

Make sure that the threads are going on to the beam in flat layers. If you notice that warp piles up at the pegs, the section of the warp is too wide. If the warp falls down at the pegs, the warp section is too narrow.



CREATING FLAT LAYERS - FIGURE 32

If any of the above is happening, go back and pivot the front reed on the tension box again until you get perfectly flat layers. This is very important, otherwise you will end up having different length threads in one section, since the circumference of the beam within the section is not going to grow evenly. Therefore, you will end up having lots of tension problems.

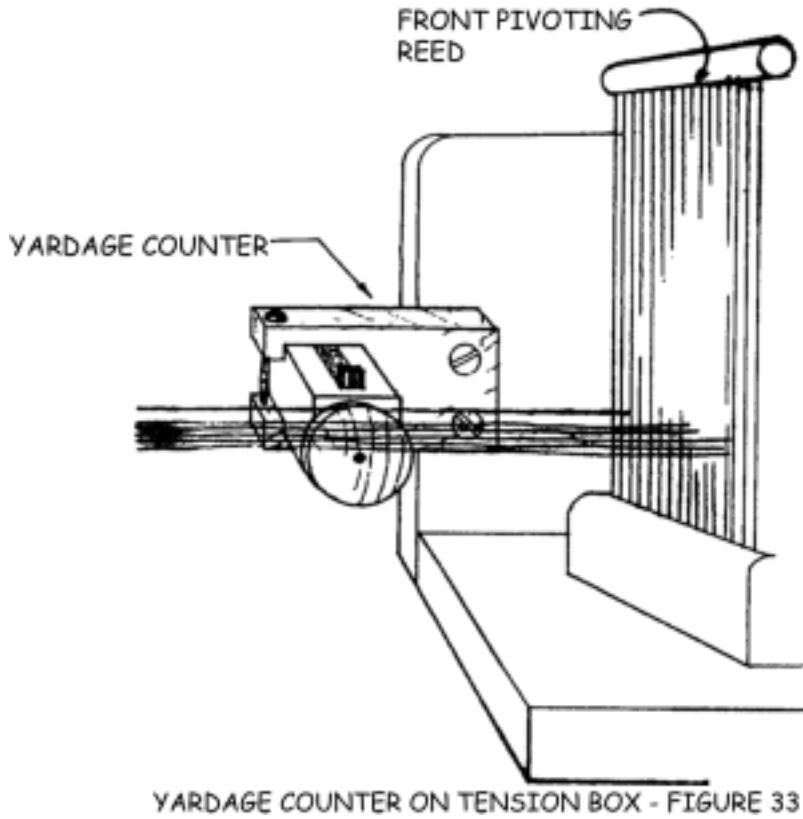
Counting Turns or Yardage

To determine the length of the warp you are putting on the beam, you need to count either turns, revolutions, or yards.

To count turns, you can do it in your head, but it is more reliable to use a digital or mechanical revolution counter.

Counting revolutions even with a digital counter will still give the approximate warp length only, because the circumference of the beam will increase slightly with each rotation. This is called beam build up.

To count yards with a yardage counter while warping the sectional beam, you need to place the yardage counter at the front of the tension box. You should use an extra thread for measuring yardage, because if you use one of the threads from your warp section, that particular thread would have a different tension once you start weaving. The extra thread you use for measuring purposes only can be reused for each section.



YARDAGE COUNTER ON TENSION BOX - FIGURE 33

Creating the Cross

When there is about a half yard left to be wound onto the beam, it is time to make the threading cross. Simply push on the rear heddle frame of the tension box, making half of the threads go up and the other half go down.

Now slip in an eight inch piece of contrasting thread (called a marking thread) through the opening (called a shed) created between the threads above and the threads below. Locate this marking thread about half way between the tension box and the separation roller.

Now push on the front heddle frame, making the other half of the threads go up. Now take one end of your marking thread and bring it through this shed. The two ends of the marking thread should now be together. Tie them in a bow knot. Wind the rest of the first section on, cut the ends, and secure to the wound on thread using a rubber band over the pegs.

Continue winding all the sections in the same manner by moving the tension box along its track.

Sticks in the Treading Cross

When all the winding is complete, remove the rubber bands, unwind a few feet of warp, and slip one lease stick through the path created by the upper portion of each marking tie. Now slip another lease stick through the path created by the lower portion of each marking tie. Secure the lease sticks together, leaving about two inches between them, using masking tape or string through the end holes of the lease sticks. Now bring the lease sticks, with the warp ends, around the separation rollers.

Routing the Warp

If you have a beam in the upper position, the warp will be routed **under** the **upper** separation roller. If you have a beam in the lower position, the warp will be routed **over** the **lower** separation roller.

Combining Sectional and Plain Warping

If you are winding a very fine warp, say forty ends to the inch or more, and do not have or do not want to wind a lot of spools or cones, it may be more convenient to wind separate warp sections on a warping board or reel and go from there directly to the sectional beam. If you decide to do this, however, your warp will be limited in length by what will fit on the warping board or reel. If you choose this method, follow these steps:

a) Calculate number of threads for each section on your sectional beam.

On the warping board or on the warping reel, make “baby warps” for each section on your beam (if you are using a warping board, you will be limited in length).

Make crosses at each end: raddle cross on one side and thread-by-thread cross on the other.

b) Take the warp off the board or reel by taking off the thread-by-thread cross first.

c) Put the warp threads from a first "baby" warp in the raddle, making sure that threads are spread evenly and that they are creating flat layers when wound on the beam. Put the raddle top on or secure warp threads with rubber bands.

Instead of a regular raddle, you can put a mini-raddle in place of the front reed on the tension box. In this case, the tension box is used only for guiding threads into the sections. You do not thread threads in the tension box through the harnesses nor through the back reed and you do not adjust tension with the pegs.

d) Attach each baby warp to the extension cords and proceed as in regular sectional beaming procedure.

e) Since you are not using the tension box for tension, be sure to keep it taut manually.

f) When you come close to the end of the section, take the reed cover off and continue winding the rest of the baby warp.

g) Secure that section to the beam and continue to the next one.

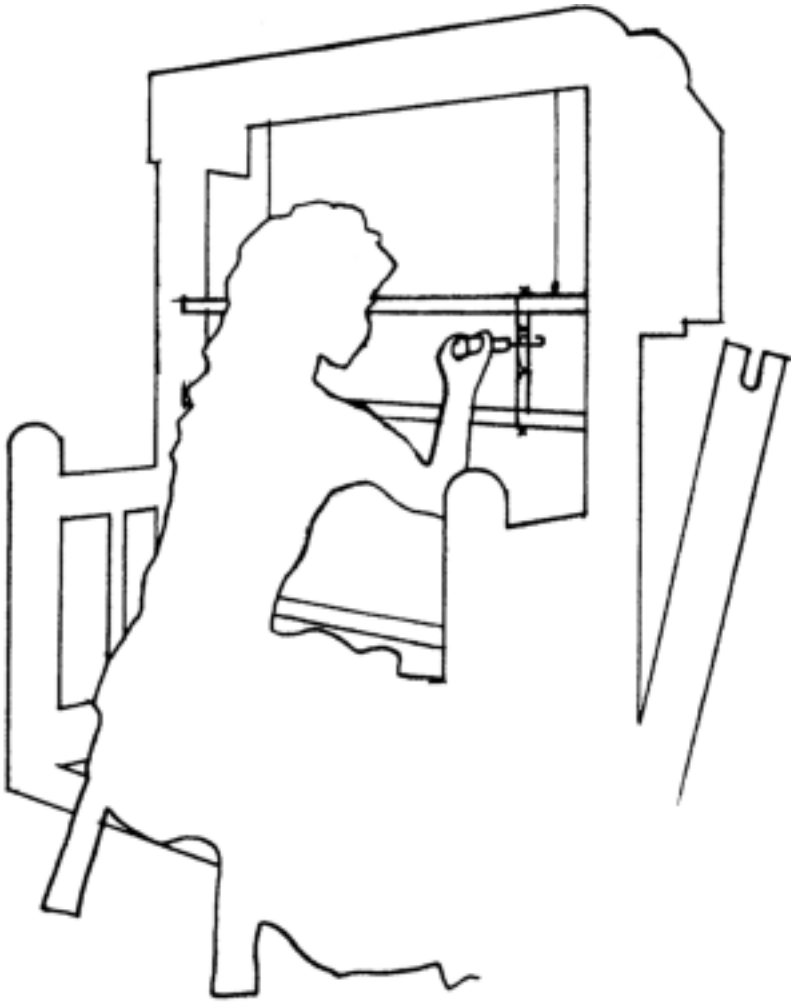
Preparation for Threading

To prepare for threading, tie the threading cross sticks up to the rear harness pulley support with lengths of string so that the cross is in a comfortable and visible position for threading.

First lift out the beater, then remove the front cloth beam by unscrewing the upper left bolt in the cloth beam support with a small wrench. Remove the lower bolt on the side of the built-in bench and tilt it to a vertical position so you can use it as a back rest. Place a small stool on the floor in front of the bench. Taller people may want to raise the harnesses.

You may also find it helpful to raise the harnesses. To raise the harnesses, pull the dobby arm down to the bottom of its slot. To secure the arm in this position, simply insert the steel stop pin that is hanging from the back of the dobby into the hole just above the top of the dobby arm. On the bottom of the dobby unit are 16 cable ends corresponding to the 16 harnesses. In turn, pull each cable end downward on each cable into its slot in the arm, thus raising the harnesses. Make sure to lower the harnesses again when threading is completed. Never remove the stop pin from its hole while any harnesses are lifted as this will cause the harnesses to drop too rapidly.

The important thing in threading is your comfort. Take the time to position everything so that your body feels at ease while threading.



THREADING POSITION - FIGURE 34

Threading the Harnesses

Now we're ready to thread the loom. If you are right handed, it is recommended to start at the right side of the warp. Grasp one group of ends in your left hand and your sley hook in your right hand. Direct the "hook end" of the sley hook through the "eye" of the first heddle you need to thread. Pull the thread through (for example, if you had a straight draft on eight harnesses, your first thread would go through the eye of a heddle on the 8th harness. The second thread would be threaded through the eye of the heddle on the 7th harness, the third thread through the 6th harness, and so on).

Unused Heddles

After threading is complete, make sure that the unused heddles are all pushed to the far sides of the harness sticks between the screw eyes and the ends of the harness sticks. For balance, there should be approximately equal numbered groups of unused heddles on both sides of each harness. This is especially the case if you have PES heddles. In some cases such as 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. In the first six months of using a new loom with polyester heddles, the heddles stretch out to adjust to the harnesses, and the heddles on each harness get stretched out to different sizes. For this reason, we do not recommend removing heddles from the loom for six months. When heddles are removed, they should be marked so they can be returned to the same harnesses. For the same reason, once the heddles have been on the loom for awhile, it is not a good idea to switch heddles to different harnesses. Mixing them up once they have been stretched would affect the evenness of the shed. What some weavers do with wide warps, in order to avoid having to take off extra heddles, is to distribute the unused heddles among the threaded heddles as the threading is taking place.

Sleying the Reed

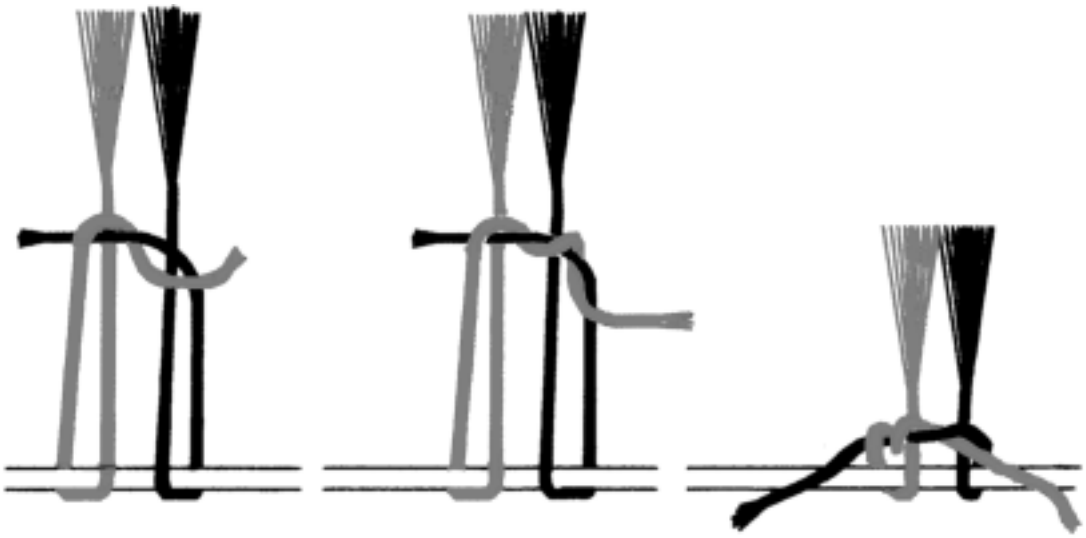
Now sley the warp ends through the reed. Some weavers start from the right side; some from the left; some in the middle. But, in all cases, be sure to measure accurately before starting so that the warp will be centered in the reed (or offset four inches to the right if the warp on the beam is already offset). Weavers have various ways of positioning the reed for sley.

Tying on to the Apron

Now that you have your warp ends ready to tie, we need to prepare the apron. The ends will be tied to the apron rod.

Notice that the apron has two hemmed ends. One end has openings in it and the other end has a plain hem. Take the end with the plain hem and lay it on the cloth storage roller (a black roller at the rear of the loom near the bottom). Making sure it is centered, tape the hem of the apron to the roller using masking tape. Then wind the apron once around so that it holds itself in place. Route the apron through the loom to meet the warp ends. This is done by bringing the free end of the apron over the treadle pulley assembly and around the bottom and front end of the lower cloth roller. Now up and around the upper cloth roller. Bring it up to and around the front of the cloth beam. Spread it out flat and center it over the cloth beam and insert the metal rod into the hem.

Now tie the ends to the metal rod. Starting from the middle, bring a first bundle toward you over the apron rod, then around and under it. Divide it in half and bring one half up on each side of the bundle. Use the ends to tie a surgeon's knot. It is the same as the first tie you make tying a shoelace, except you loop the end through twice. This kind of knot is very good for readjusting the tension.



TYING ONTO THE APRON - FIGURE 35

Start with one section in the middle, then the far right and the far left outside ones. Work your way in.

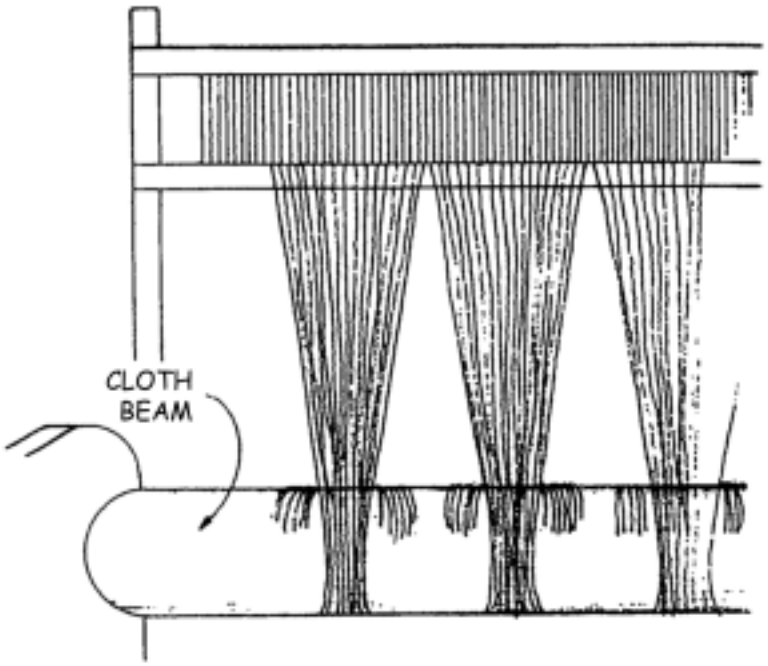
By now, the sections that were tied first are quite a bit looser than the ones tied last. To correct this, you do not need to untie the knots, simply grasp the ends and pull them away from you, then re-tighten the knots. Repeat this until all of the section are at approximately the same tension.

Wrapping the Warp around the Sandpaper Cloth Beam

Shortcut Method: You can skip using an apron altogether if you are planning a short warp and are going to have your cloth build up around your cloth beam. Wind the warp beam forward (raise the tension arm while doing so) until enough warp is released so that the warp ends will extend about twelve inches past the cloth beam. Now take a group of ends about three inches wide with one hand and use the other hand to comb them "flat". This can be done using a common hair comb. Starting at the reed, gently comb the yarn toward the ends until the yarn is flat and spread out. Now gently pull with the other hand to give it a little tension and lay it over the abrasive surface of the cloth beam. Repeat this procedure all the way across the warp. Now that you have nice even tension, you can wrap the ends (that were hanging down) around the bottom of the cloth beam.

This method is fast and usually quite accurate. However, there are certain warp materials that are not suitable for this method (see **NOTE** below). In that case, simply tie onto the apron as instructed above.

NOTE: The shortcut method does not work well with chenille. In fact, if you will be weaving with chenille warps regularly, we recommend the use of a "soft grip" cloth beam covering. This can be ordered through AVL.



WRAPPING WARP AROUND SANDPAPER BEAM - FIGURE 36

Tying on to an Old Warp

A new warp can be tied on to an old warp, thus eliminating the threading and sleying process, if the new warp introduced into the loom uses the same threading pattern and E.P.I. as the last warp. This process is especially good for production weavers as it saves time. It also takes less concentration and there is less chance of making mistakes in threading.

The tying on process starts when you are finishing the last warp on the loom. Before you cut off the fabric, make sure to leave enough unwoven warp to extend one foot behind the harnesses, through the heddles, and about six inches past the reed when the beater is in its rear position. Now open two opposite tabby sheds and insert the lease sticks into these sheds **behind** the harnesses. Secure the sticks together with tie tapes through the holes.

Now carefully cut the fabric from the loom and tie bundles of warp coming through the reed together so the yarn can't slip through. Cut the warp in back (leaving one foot past the lease sticks) and also tie bundles of yarn together for security.

After winding on the new warp on the beam, you can sit on a small stool placed in-between the harnesses and the back of the loom and tie corresponding yarns from the two sets of lease sticks together. An overhand or weaver's knot work well. This may seem slow at first, but you will work up a faster rhythm with some practice. A good goal to reach would be to tie 200 to 250 ends together an hour.

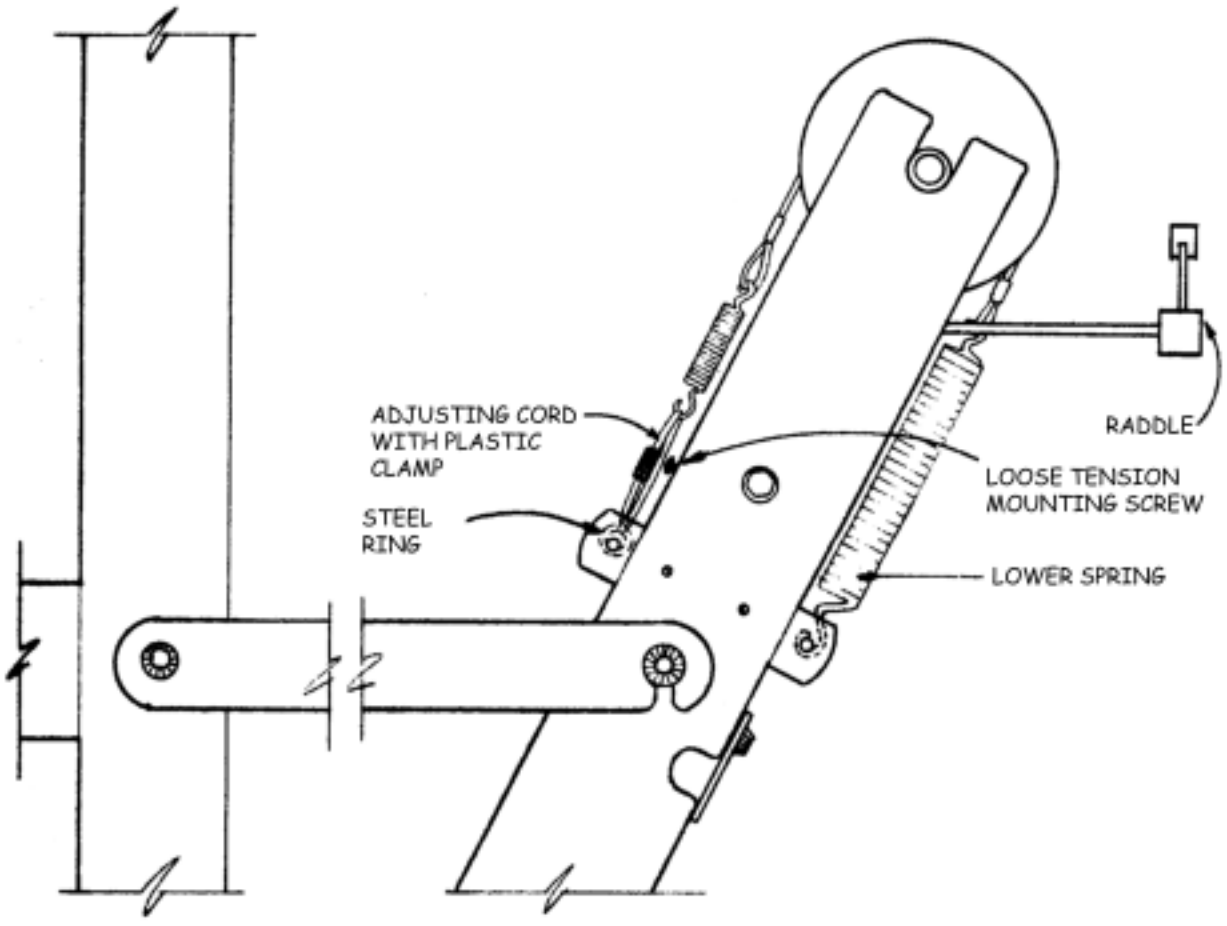
When all ends are tied together, go to the front of the loom and gently pull on the bundles of yarn going through the reed to pull the new warp through the heddles and reed. Then either tie on to an apron or simply wind the ends around the front cloth beam.

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.

Tension Device

First familiarize yourself with the tension device which is located on the left end of the lower beam and at the right end of the upper beam. (The right side of the loom is the side to your right as you are looking at it while sitting in the weaving position.) Notice that the tension system consists of a wooden drum around which a white dacron cord is wrapped four times, one end of the cord 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 cord and the small spring is a small adjusting cord held in position by a plastic clamp. At the end of this cord is a steel ring that is attached to a bolt on the metal warp tension bracket.



TENSION DEVICE - FIGURE 37

Adjusting the Tension

Now move the warp forward three or four inches using the front ratchet handle and 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 pressing in on the plastic clamp and letting the adjusting cord out. 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.

Reversing the Warp

In making these adjustments, at times the warp will be wound too far forward. To wind it back on the warp beam, first unlock the front ratchet handle so that the front tension is released, then go to the back of the loom and turn the warp beam handle in the direction used to wind the beam. Remember that **EVERY** time you are winding any material onto either warp beam you should reduce the amount of tension within the tension system. This can be done quickly by removing the steel ring at the end of the tension cord from its operating position and temporarily hooking it on the nearby screw provided on the edge of the folding leg.

If the tension isn't loosened the small spring may become stretched out of shape. If this happens warp tension problems will result.

After winding the warp back onto the warp beam, check to make sure the cord has not become crossed on the drum.

Wind the warp forward again with the front ratchet handle until the warp tightens and is in the correct position.

PEGGING THE DOBBY UNIT

Dobby System

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 metal pegs can be easily inserted. Each wooden bar has a row of sixteen or twenty-four holes in it. The first hole on the left corresponds to the first harness, the second hole to the second harness, and so on. 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.

Creating a Tabby Chain

The first pattern you can always choose to peg up on the dobby bars is a tabby weave. Tabby weave can always be used for the first inch of each new warp as a heading and to check for threading or sleying errors. Create one chain of eight dobby bars and lay it flat on a table with the wider side with holes facing up. Use plastic strips with holes to connect the dobby bars into chains. Make your plastic strip one hole longer than the size of your chain. You will notice you have two sizes of pegs: long and short. Use short pegs only in holes where harnesses should not be raised, but where pegging is necessary to attach dobby bar to plastic strip. In the first bar (start at the top of the chain and work downward), place pegs in holes 1, 3, 5, 7, 9, 11, 13, and 15 using the special wrench provided. Then, holding the wrench handle, screw the peg (clockwise) into its hole firmly, but not too tightly (use the wrench again when removing pegs). Use the short peg in hole 16. In the second bar, place pegs in holes 2, 4, 6, 8, 10, 12, 14, and 16. In hole 1, use short peg. Continue repeating these two sequences until all the bars are pegged.

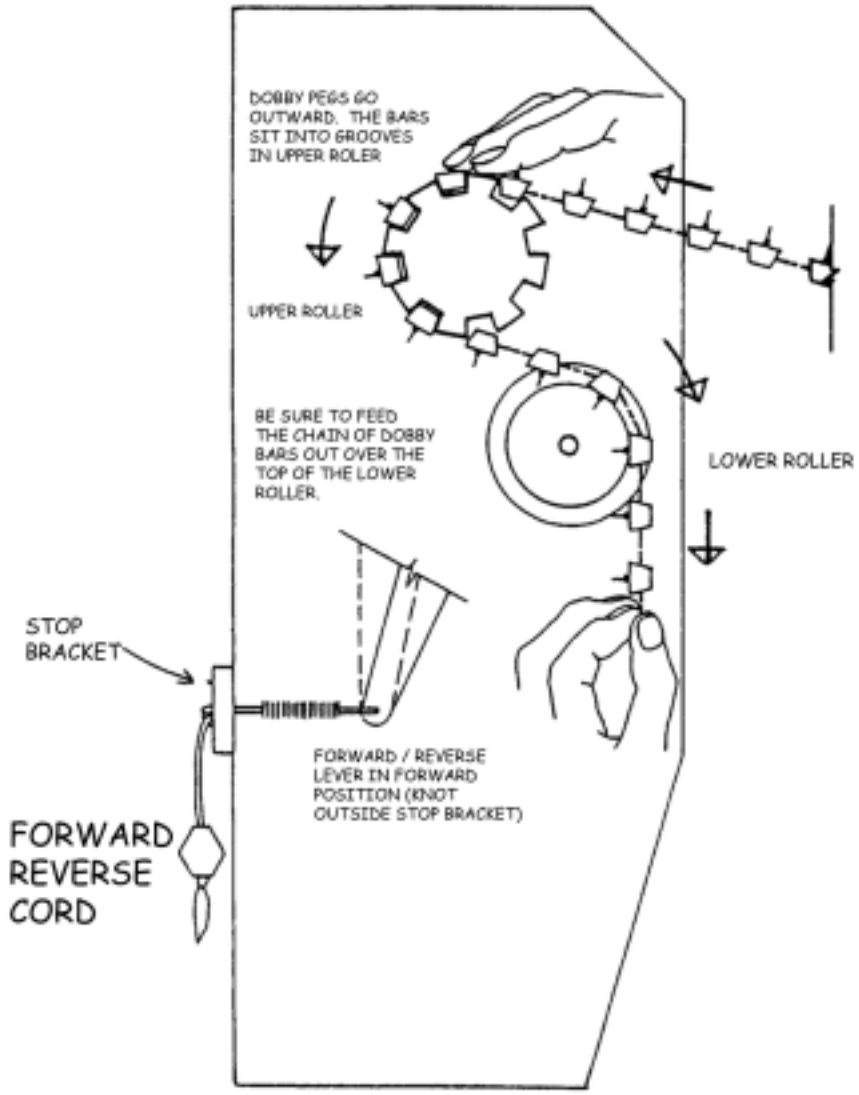
Feeding the Dobby Unit

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. Next, find the forward/reverse cord. It is on the side of the box facing the front of the loom (see Figure #38). There is a wooden pull hanging from the end of the cord. Pull this gently until the knot on the rope is caught on the outside of the wooden stop bracket. The large, grooved roller will now turn in a counterclockwise direction (assuming you are at the front of the loom).

Take your tabby chain and place the top few bars in the grooves in the upper roller of the dobby box. Turn the roller toward the top of the loom so that the chain moves over the top of the roller and into the dobby box. Place your fingers in the box under the upper roller and guide the chain so that it comes out over the top of the smaller roller which is underneath. This is very important because the dobby chain will jam in the box if it does not come out over the top of the smaller roller.

When enough chain is available fasten the chain together to form a continuous circle by removing pegs in the holes 1 and 16 on one side of your chain. Overlap the plastic strips and replace the pegs to secure the strips in place. You now have a continuous circle of bars.

If your chain is only eight bars long, it will only wrap around the upper roller, without touching the lower roller.



FEEDING DOBBY CHAIN INTO DOBBY HEAD - FIGURE 38

Creating Chains with More Complex Structures

Next, you will probably want to peg up another chain with a more complex weave structure (a sixteen 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:

- If you are used to working in tie-up mode, determine the tie up and treadling plan for the weave structure you will be using as you would for a conventional treadle loom. Figure #39, Diagram (A) is an example showing a typical pattern with its tie up on top and its treadling plan below. In the tie up, each vertical column represents one treadle (numbered one through sixteen from left to right) and each horizontal row represents a harness (numbered one through sixteen 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 **raised** harnesses.

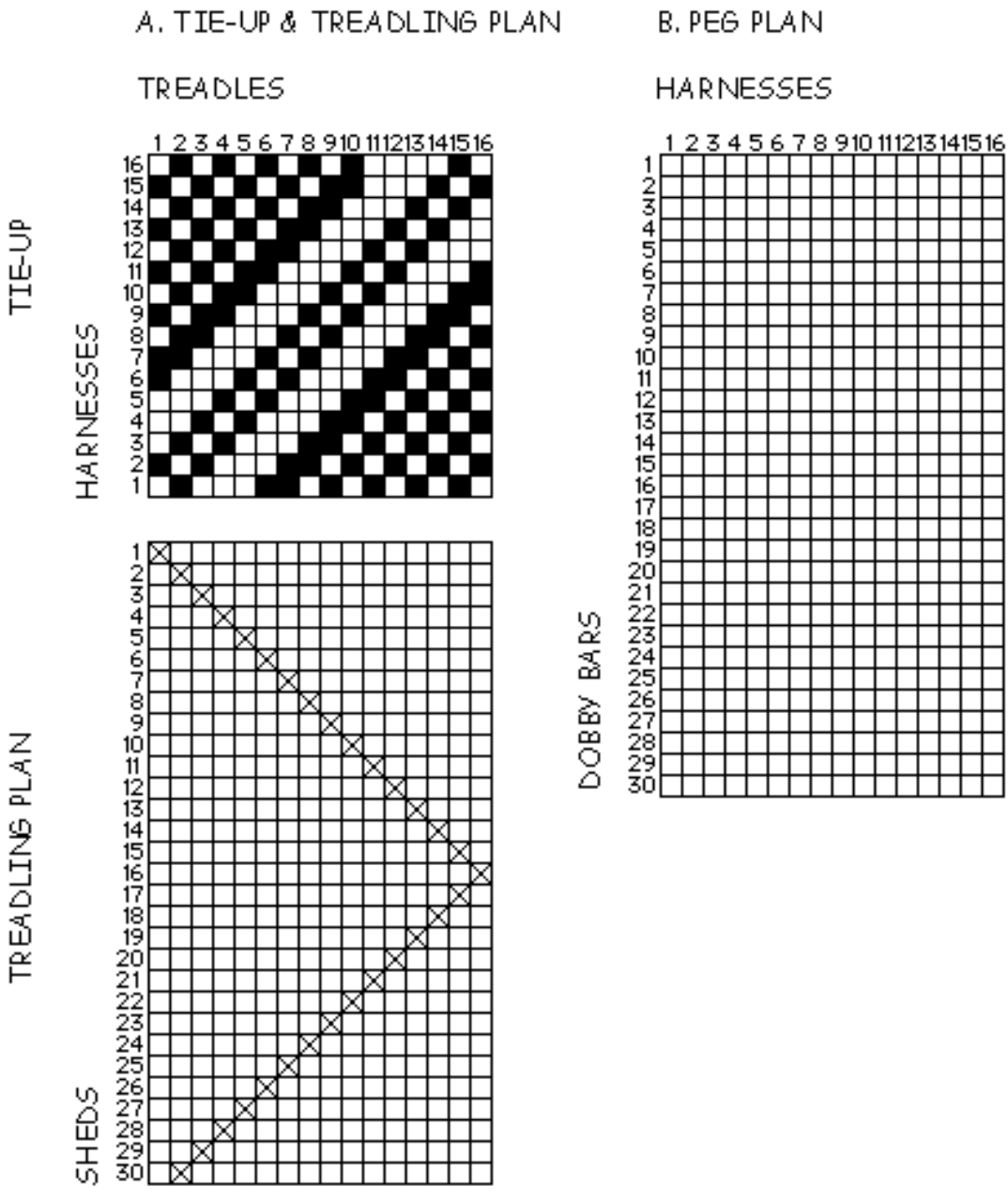
  In the treadling plan below it, each horizontal row represents one shed and they are numbered from top to bottom in the order they will be used when weaving. At each shed, an "X" is placed in a vertical column representing the treadle which is to be used. Make sure your treadling plan represents one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

- 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 top to bottom 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 sixteen harnesses on the loom, there will be sixteen 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 the sample peg plan (B) and notice that there are thirty horizontal rows since there are thirty sheds in the treadling plan (A).

- 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, 6, 7, 9, 11, 13, and 15. Now fill in the squares that correspond to the harnesses in the first horizontal row of your peg plan as we have done in diagram (C). This represents the holes which will be pegged in the first dobby bar and thus which harnesses will be raised by it. Notice how **horizontal** rows of the peg plan correspond to **vertical** columns of the tie up.

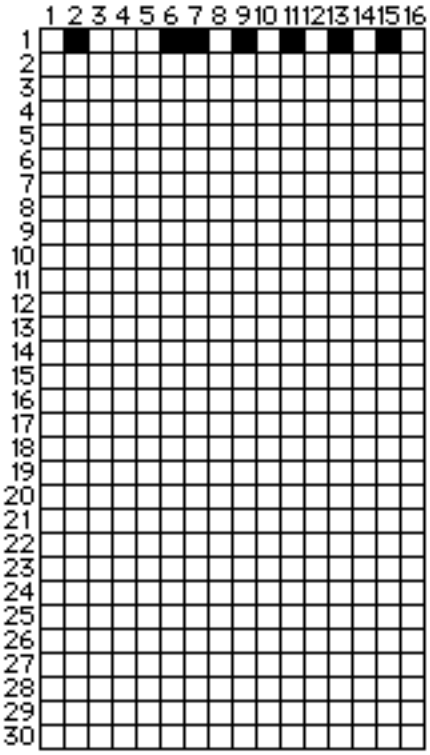
- Next, look at the second shed (2) of your treadling plan and note which harnesses will be raised. In diagram (A), that would be harnesses 1, 3, 7, 8, 10, 12, 14, and 16. Then proceed to the second horizontal row of your peg plan and fill in the squares corresponding to these harnesses as we have done in diagram (D).

- 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).

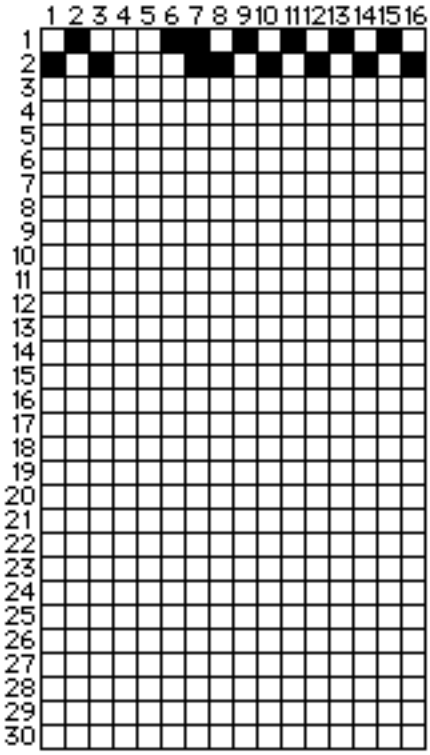


TIE-UP AND TREADLING PLAN: A. and B. - FIGURE 39

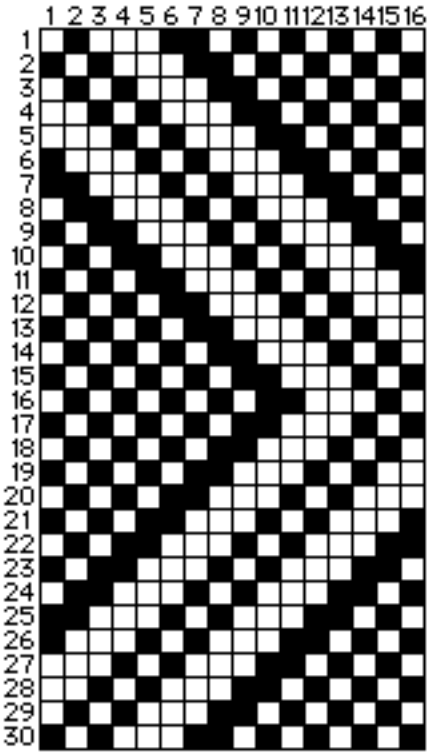
C. PEG PLAN



D. PEG PLAN

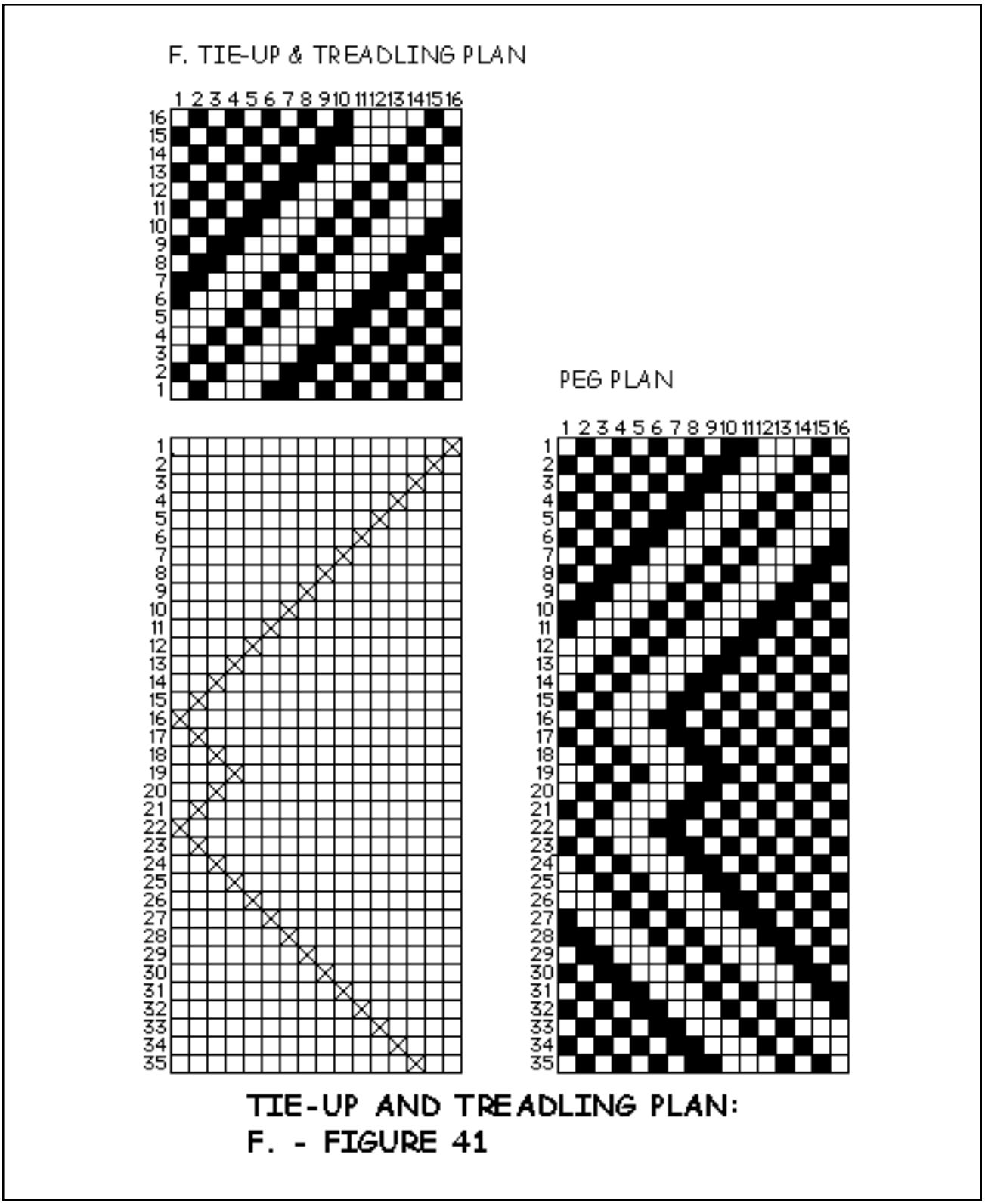


E. PEG PLAN



TIE-UP AND TREADLING PLAN:
C., D., and E. - FIGURE 40

Diagram (F) shows the same tie up as in diagram (A) with a different treadling plan and its corresponding peg plan.



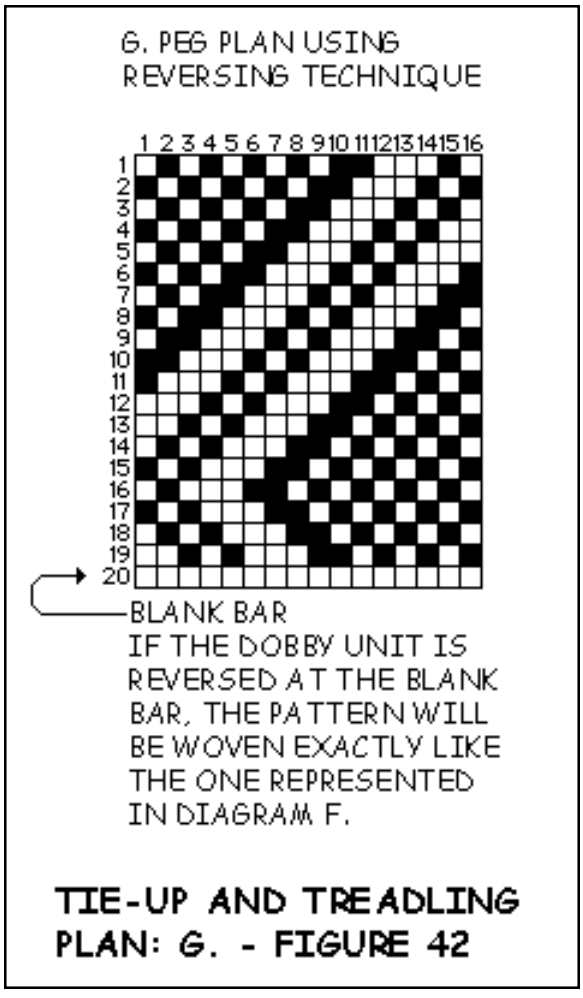
TIE-UP AND TREADLING PLAN:
F. - FIGURE 41

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

- At least **eight dobby bars** should be used at once. That is the size of our dobby cylinder. If the number of dobby bars or sheds in the treadling plan is fewer than eight, they should be repeated several times. As an example, for a tabby weave which has only two sheds, repeat the pegging four times so that you will be using eight bars.

- 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, two identical sheds will follow each other.

- There are times you will find it helpful to use blank dobby bars to mark your place in your pattern. For instance, if you need to know where the beginning of a pattern is, leave a blank bar just before the dobby bar corresponding to the first shed of the pattern. When you are weaving and come to this blank bar, no harnesses will raise.



- Keep in mind that the direction the chain moves can be reversed at any time. This feature can save pegging time and dobby chain. One example of its use is with a pattern where the second half is a mirror image of the first half. Only the first half of the pattern need be pegged. Then, by reversing the dobby unit, the second half or mirror image is automatically produced. When using this technique, you may want to leave a blank bar as a signal at the point at which the dobby is to be reversed. See diagram (G) below for an example of a peg plan using this technique. This feature can also be used where long lengths of tabby are to be woven between pattern borders. Simply peg up part of the tabby and by repeatedly reversing, as much tabby can be woven as necessary. Here again, use blank bars between the tabby part of the chain and the pattern part.

- 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.

- 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.

Now peg your pattern up on the dobby bars. The number of bars needed is determined by the number of rows in your peg plan.

Before starting to put pegs in the bars, it is a good idea to mark the left end of the top 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 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 box.

Long Dobby Chains

When pegging up the dobby head, one thing that you should remember is that if over 100 to 150 bars are used, the weight of this chain of bars 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 need to suspend an auxiliary roller (a rolling pin would work) so that it will support some of the weight of the bars.

Handling Your Dobby Chains

Here are some tips for handling your dobby chains:

- First of all, keep one chain pegged with tabby weave in a handy location. This way, you can quickly do tabby weave whenever necessary without having to re-peg 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 name.

- If you have lots of dobby chain, you can just leave the chain pegged up ready to be used at any time.

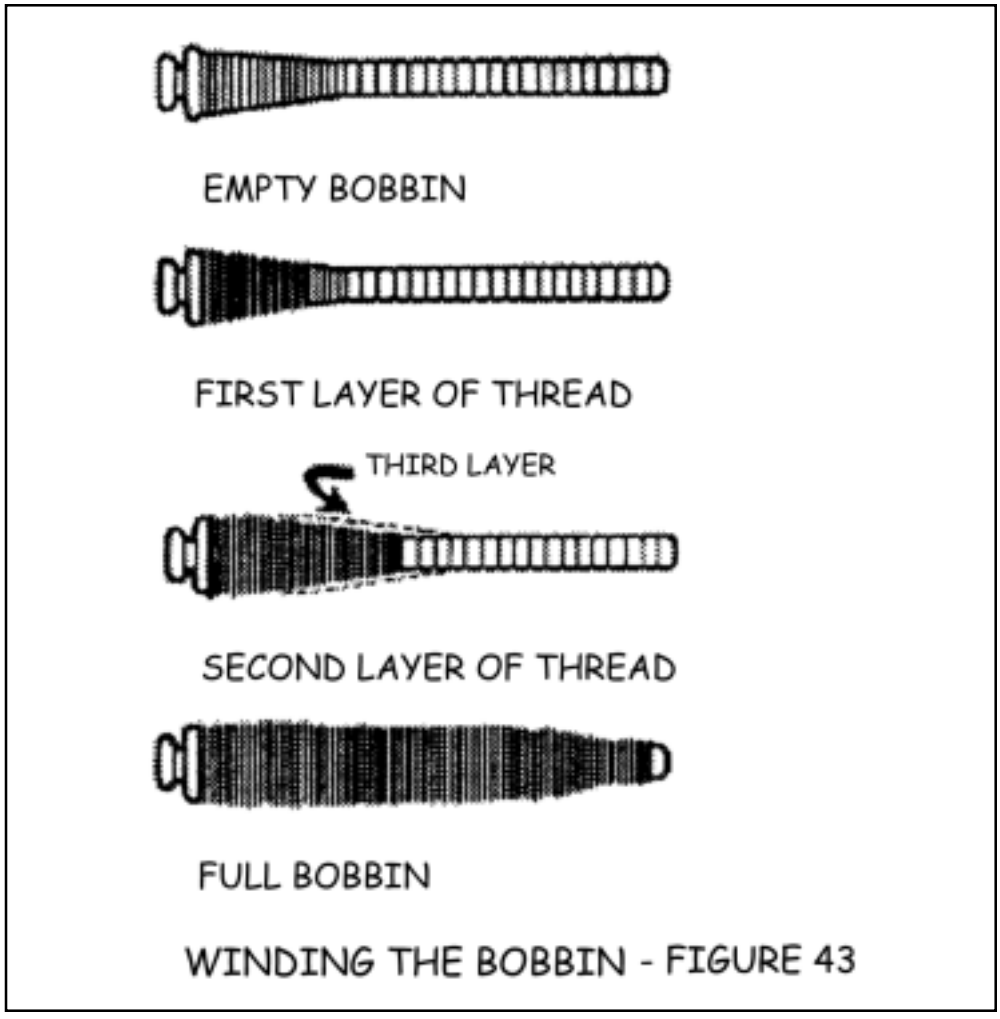
- Each chain will be easy to identify if you write its name on the top of the first dobby bar.

- If you do not have a lot of extra chain, here is a little trick that saves time if you are going to be re-pegging a pattern over again. Cut cardboard strips about the same length and width of the dobby bars. Make a guide by punching sixteen 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 re-peg the dobby bars.

Winding Bobbins

The AVL loom's shuttles use stationary, open end bobbins. The advantage of using this type of bobbin over the conventional spinning bobbin is that as soon as the shuttle is caught, thread stops coming off the bobbin, whereas the spinning bobbin tends to keep spinning and unwinding thread even after the shuttle is caught. The stationary bobbin allows the weaver to more easily obtain a clean selvage edge.

Stationary bobbins are wound quite differently than spinning bobbins. They are not wound back and forth from one end of the bobbin to the other, so please practice the following technique until you feel comfortable with it.



WINDING THE BOBBIN - FIGURE 43

Use a standard size bobbin winder. A hand winder will work, but an electric one is better and some sort of tensioning device is ideal since the thread should be wound very tightly (wearing a heavy leather or fabric work glove will help you to pull the thread tighter).

If you are right-handed, hold the tensioning device with the right hand for easy positioning of the thread onto the bobbin and with your left hand (have a glove on), hold the thread for tension purposes only. Make a few winds of the thread over itself at the far end of the bobbin (the end near the large coned shaped part) and then place it on the winder. To start, wind a thin layer going back and forth in one area, about 2" long at this far end. It should cover three quarters of the cone shaped part of the bobbin. Consider this the first layer of thread. Then move down 1/4" and start a new layer which will overlap 1 3/4" of the last layer. For each layer, wind the thread tightly and quickly back and forth covering a 2" area until that layer is complete. Then move down 1/4" and start a new layer which will overlap 1 3/4" of the last layer. Keep repeating these tapered overlapping 2" layers until there is 1/2" left at the end of the bobbin. You will soon learn when each layer is complete.

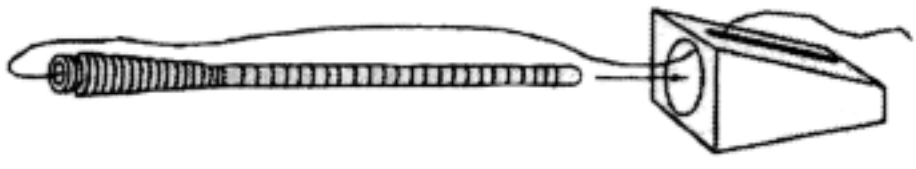
If the layers are too fat, the bobbin won't fit into the shuttle. If they are too thin, you won't get as much thread on the bobbin and it will have to be changed sooner.

Using the AVL Bobbin-Winding Guide

The AVL Bobbin-Winding Guide (BWG) can help you to create a perfect size "package". It will allow you to get as much yarn as possible on the bobbin, but it will not touch the side of the shuttle. One critical element in winding a bobbin is to maintain a uniform diameter of yarn around the bobbin.

The AVL Bobbin-Winding Guide should be used with a Bobbin Winder equipped with a foot switch because the guide should be held with one hand while the other moves the yarn back and forth.

First, it must be noted that at all the basic principles for winding an end-feed bobbin apply to the BWG. That is, feed the yarn in small increments from the cone end to the small end of the bobbin.

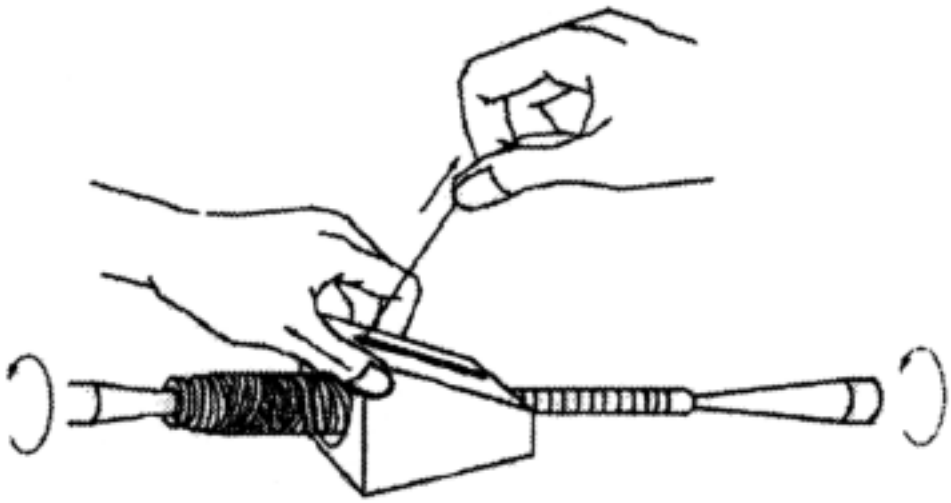


FEEDING THE BOBBIN-WINDING GUIDE - FIGURE 44

You will begin the winding at the flared cone end. Feed the yarn through the BWG's slot and push the guide toward the cone end. Keep the slot facing you so that you can observe the yarn as it winds onto the bobbin and make any necessary adjustments.

Turn the Bobbin Winder on, slow at first, then up to full speed. Swing the yarn from side to side and try to keep as strong tension as possible on the yarn. For the most part, the tighter the better. When holding the BWG with your left hand while winding the bobbin, give some resistance to the left. Do not attempt to move it to the right side.

As the yarn builds up on the bobbin, it will naturally push the BWG down toward the end. The pressure on the BWG should be just enough to keep it in contact with the yarn underneath. Be careful not to overwind at the end because it can cause extra loops which can get tangled in the tip of the shuttle. You should stop winding when the right side of the BWG reaches the end of the bobbin.



USING THE BOBBIN-WINDING GUIDE - FIGURE 45

Wind many bobbins at once so it won't be necessary to stop and wind bobbins while weaving.

A properly wound bobbin is essential to the correct operation of the flyshuttle. If the weft thread does not come smoothly off the bobbin, if the shuttle jerks and pulls the selvage edge too tightly, or if the shuttle fails to move lightly across the shuttle race, look to an improperly wound bobbin as the cause of your troubles. If a bobbin is not working properly, do not waste time trying to correct it. There is nothing you can do about it. Place it aside and use another bobbin.

Placing Bobbin in the Shuttle

Now pull up the metal rod in the middle of the shuttle and slip the large end of the bobbin onto it (it might be a little stiff at first) and then push the bobbin all the way down to the end of the rod so that the groove in the end of the bobbin straddles the retaining pin in the bottom of the shuttle.

Feeding the Shuttle with Standard Tensioner/Adjusting the Tension

Uncoil some thread from the front end of the bobbin and push it down between the two metal plates of the tensioning device. Slip it down the groove that runs toward the point of the shuttle and out the hole in the side.

The tension device on the shuttle can be adjusted by turning the screws inside the holes on each side of the shuttle with the screwdriver provided. For fine yarns which need a tighter tension, turn the screws so that the metal plates are tight against each other. For large yarns, loosen the screws so that the metal plates loosen up.

Throw a few weft shots with the shuttle and then check your selvages. If the selvages are too loose, increase the tension. If the tension is too great and the selvages are drawing in, reduce the tension. It may take a little experimenting to get it just the way you want it.

Feeding the Thick Yarn Shuttle/ Adjusting the Tension

If you have an AVL shuttle with two tension springs and plates to hold the yarn, to thread it simply pull the filling thread off the end of the bobbin. Use a small hook (perhaps a crochet hook or make one from a paper clip) to get the thread in between the plates and through the side hole.

The tension adjustment is just the same as in the shuttles with a standard tensioner. The only difference is that instead of the screwdriver, you will be using an allen wrench for the adjustment. This kind of shuttle with the spring tensioning system is especially useful for novelty yarns where diameters of the yarn changes across the yarn and, therefore, more flexibility is needed.

To Remove or to Change the Reed

To change the reed on the flyshuttle beater, remove the beater top and then remove the seven bolts from the reed support. That will loosen up the reed support and allow you to remove the reed. Now it's just a matter of reversing your steps for installing the new reed. On a flyshuttle beater, it is essential that the reed stays in perfect alignment with the shuttle race or else you'll have flyshuttles flying across the room.

Using the Flyshuttle Beater

The AVL loom's flyshuttle beater is designed to increase weaving speed. It has a light and easy action and little physical exertion is needed to operate it. Weaving can be done for hours without tiring the weaver. With a properly wound bobbin and a little practice of the throwing technique, selvage edges turn out smooth and even.

Throwing the Flyshuttle

It's going to take a little practice to learn to throw the flyshuttle. In the beginning, you should only be concerned with learning the technique described below. Practice each step slowly and carefully. This will form good habits which will become automatic and it is after that, that the speed will come.

You should practice at first with an empty bobbin and then with weft thread when it starts to go a little smoother.

- Push the beater away from you to its rearmost position, place the shuttle on the shuttle race and slide it into one of the shuttle boxes so that it pushes the picker as far as it will go to the end of the box.
- The hole in the side of the shuttle through which the weft thread passes should generally be facing the weaver.
- Place one hand (right hand if your are right-handed, left if you are left-handed) on the flyshuttle handle and the other hand in the center of the beater and open the shed.
- To send the shuttle along the shuttle race and into the opposite box with the single box flybeater, make a short quick wrist movement with the handle in the direction the shuttle is to travel.
- Beat the fell of cloth with the hand that is on the beater. Keep the body relaxed and do not waste energy by moving your body backwards.
- Now close the shed.
- Start the sequence again by opening the shed and throwing the shuttle to the opposite side, but be sure not to change hand positions.

Eventually, it should all become one smooth flowing movement.

Your body should stay straight and comfortable with no strain as light movements of the hands, wrists, and feet are used to operate the loom. Your eyes and attention should be focused on the fabric being woven, constantly on the lookout for flaws so that they can be corrected immediately.

Here is a good way to progress in learning to use the flyshuttle beater more efficiently.

Six steps progress:

- beater back
- open shed (press right treadle)
- throw shuttle
- shuttle stops
- close shed (release right treadle and press the left one)
- beater forward

After you feel comfortable with these, move on to the following four step progression:

- beater back and open shed at the same time
- throw shuttle
- shuttle stops
- beater forward and shed closed at the same time

Double Box

With the double box beater, you pull straight down on the handle. Your body should be erect and relaxed. Move only your hand and wrist. You will soon get a "feel" for the correct wrist movement. The shuttle should stop just at the end of the shuttle box without bouncing too far back or falling short. If the shuttle bounces too far back, too much weft thread will be let out of the shuttle and a loop may form at the selvage edge. If the shuttle falls short of its goal, it will not be in the correct position for throwing the next pick. If the shuttle falls short, push it to the end with your hand.

To change shuttles on the double box, simply lift up and shift the control handle. The easiest position to do that is when the beater is in the position closest to you. On the four box, there are four settings (you'll "feel" the notches).

Starting a New Bobbin

There are two methods:

- to throw the first shot by hand in the conventional manner. Hold on to the end of the thread, but instead of catching the shuttle, send it all the way to the opposite box.

- use the flyshuttle. Before sliding the shuttle into the box, take hold of the end of the thread with the hand that would ordinarily hold the beater.

Weaving with Two or More Shuttles on a Single Box Flyshuttle Beater

If you are doing a weave that requires two or more shuttles to be thrown in succession and you have a single box flyshuttle beater, you will need to hand throw at least one.

But if you are doing a weave that requires the hand throwing of both or more than two shuttles, you can simply unclip the cords and handle and remove the sliding pickers so that they don't get in your way. Then use the beater as you would a standard beater. If you are weaving a wide piece in this way, you might experience difficulty in getting the shuttle through the shed without interfering with the box sides. If so, just remove the four screws from each front box side and remove them. This will give you plenty of room to work.

If you do much of this type of weaving, you should probably consider the double box or four box flyshuttle beater.

Starting Your Weaving

At the onset of weaving, first weave in one inch 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.

Mechanical Dobby

The position of the forward-reverse cord determines the direction in which the dobby chain will move. When the cord is in its most extended position, with the knot caught on the outside of the hole in the wooden stop bracket, the chain moves in a counterclockwise direction. To reverse the direction in which the chain moves, gently pull and snap the cord so that the knot goes through the hole and rests on the other side of the stop. Be careful not to pull the cord too hard or you will pull the spring out of shape.

Advancing the Cloth

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 front of the beater in order not to have to wind it backwards. This easy, rapid method of advancing the cloth makes it practical to advance the cloth 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.

Using the Cloth Storage Roller

When weaving long lengths of fabric, the material is taken around the front cloth beam and through the loom to the rear cloth storage roller which can accommodate a roll up to 10" in diameter. The cloth storage system, which consists of three rollers, cord, weight, pulley and two drums is designed to automatically wind the cloth onto the storage roller as the warp is advanced. A looser tension is maintained on the storage roller than on the weaving. This eliminates any unnecessary strain or matting of the fabric.

The special abrasive surface of the cloth beam holds the proper weaving tension while allowing a lighter tension to be maintained for cloth storage. This also makes it possible to weave long lengths of fabric that have an uneven surface which would ordinarily cause poor tension because of the uneven build-up on the front beam.

You will need a long apron for this purpose. With the weight at the top, and the stop pin in place, tape the plain edge of the apron to the storage roller. Then wind the apron once around itself so that it holds itself in place. Then simply route the apron under the rear cloth storage roller, under the lower roller, over the upper roller and over the cloth beam. If necessary, release the stop pin and gently wind the apron up until the metal apron bar is in the proper position for tying on to.

As the weaving proceeds and the cloth is wound forward, the weight on the pulley will gradually descend. Before the weight hits bottom, wind it back up to the top using the take up drum. This will happen about every 1 1/2 to 2 yards.

Removing the Cloth from the Loom

After you've completed your weaving, use the following procedure for removing the cloth from your loom:

- bring the weight to its topmost position and replace the stop pin in the rear cloth storage drum.
- cut your cloth off where desired and lift it off the cloth beam.
- go to the back of the loom and grasp the cloth storage roller at both ends. Lift the right side of the roller up and toward you until it disengages with the ratchet on the left.
- manually wind the excess cloth onto the storage roller.
- take the cloth off the roller.
- rewind the cord that routes from the rear cloth storage drum to the front take up drum and handle. To do this, first take off the weight and set it aside. Remove the rear cloth storage drum pin and swing the little ratchet pawl off so that it disengages the ratchet. (The ratchet pawl can be found on the right side of the loom to the outside of the cloth take-up drum and handle.)

  Turn the rear cloth storage drum so that the cord winds back onto it evenly. This can be done quickly and easily by inserting the drum reverse handle pin into the cotter pin hole and using it as a handle.

Replace the empty rear cloth storage roller and the stop pin. Replace the weight.

This process needn't be done after every warp is removed. Once it is practiced a few times, however, it becomes fast and easy and if incorporated into your finishing ritual, may save you from running out of string in the middle of a warp and interrupting your momentum.

- replace the empty rear cloth storage roller in the loom.

Adjusting the Beater and Spring Levers

In preparation for weaving, all AVL beaters should be adjusted in height so that the bottom half of the shed is just touching the shuttle race in the open shed position. So open a shed (to open a shed on the dobby loom, press downward on the right treadle ... when closing the shed on the dobby, make sure the left treadle goes all the way down) and raise or lower the beater by using the adjusting wing nut screws which are near the bottom of the beater legs for floor mounted beaters.

Floor mounted beaters can also be placed in one of three positions depending on your personal preference and / or how hard the fabric will be beaten. For a very heavy beat, the beater should be placed in its rearmost position. For a very light beat, it will be placed in its frontmost position. Place the beater in one of the three positions "before" adjusting for height as above.

The springs of the spring lever return system should also be adjusted for positive harness return, i.e., the harnesses stay all the way down in the depressed position and require the least amount of effort for lifting. 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. 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. 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. Not all harnesses will need the same adjustment. It will depend on the distribution of your warp on particular harnesses.

To adjust the spring tension, simply unhook the spring and then re-hook it one chain link shorter (see the assembly section). 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 link less. 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, in some cases, the back spring levers might have to be adjusted shorter to give the same tension as the front ones. 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. In general, for most medium tensioned warps, you will find that adjusting will not be necessary. The loom comes with sixteen chains and sixteen springs (or twenty-four chains and twenty-four springs). If extra springs are needed, you can use 16" screen door springs which can be purchased in almost any hardware store. You can also get extra chain there.

LOCKING BRAKE SYSTEM (Optional Equipment)

Included in your locking system are the following assemblies and parts:

1 - wooden foot lever with eyebolt and chain
2 - metal foot lever release with bolt, four washers, two nuts, and three 'S' hooks
3 - tension adjustment cord with cord clamp and spring
4 - one hex bolt with two washers and one hex nut
5 - one metal bushing
6 - one wooden spacer
7 - tension cable

Identify each of these parts and assemblies prior to assembly (see "Upper Beam Locking Brake Assembly" drawing).

Upper and Lower Beam Locking Brakes

The locking brake can be attached to either or both warp beams. If it will be attached to the beam in the top position, your locking brake will be located on the right. If you will be attaching it to the beam in the bottom position, the locking brake system will be located on the left. (They cannot be interchanged due to the difference in cable length.)

In the instructions that follow the left and right systems are separated only when there are differences in the assembly.

Assembly

Tension Cable, Part 1: Disconnect your present tension cord. Unwrap it from around the warp beam drum.

Foot Lever Assembly

A. Right Side Assemblies: Take out the pivotal bolt that joins the right folding leg to the lower horizontal.

B. Left Side Assemblies: Take out the pivotal bolt that joins the left folding leg to the lower horizontal.

Remove the nut and one washer from the new hex bolt. Starting from the outside of the folding leg, insert this bolt into and through the folding leg and lower horizontal. Now slide the wooden spacer over the bolt.

Locate the tension adjustment cord assembly. Slip the loop of cords over the wooden spacer. Now locate the metal bearing and slip this over the bolt, next to the spacer. Locate the wooden foot lever assembly. Slip the hole that's located at the large end over the bearing, being sure to have the eyebolt facing toward the outside of the loom. Now reassemble the washer and nut to the bolt and tighten the nut securely.

Foot Lever Release: Locate your metal foot lever release assembly. Remove the first nut and washer on the attached bolt. Now go to the side of the loom that you are working on if you are not, indeed, already there. Locate the hole situated at a point 14 1/2" up from the bottom of the castle side. Into this hole, from the inside, slip the bolt belonging to the foot lever release assembly. Now put on the washer and nut and tighten securely.

Tension Cable, Part 2:

A. Right Side Assemblies: Locate your nylon coated tension cable. Hook one end of the spring to the rearmost bolt of the tension bracket. Now bring the cable up to the back of the warp beam drum and wrap it in a counter clockwise direction around the drum. The cable should wrap two and a half times around the drum and come off from the top towards the front of the loom. Make sure that the wraps don't cross over each other.

B. Left Side Assemblies: Locate your nylon coated tension cable. Hook one end of the spring to the frontmost bolt of the tension bracket. Now bring the cable down to the front of the warp beam drum and wrap it in a clockwise direction for three full wraps. It is important that the wraps start at the outside side of the drum and that they are not crossed over each other.

Attaching Hooks and Chains: Turn your foot lever release so that the longer end is toward the rear of the loom. Notice that there are two 'S' hooks attached to the rearmost hole. Take the largest of these two 'S' hooks and attach it to the empty loop of the tension cable. Now attach the smaller 'S' hook to the top of the spring belonging to the tension adjustment cord assembly.

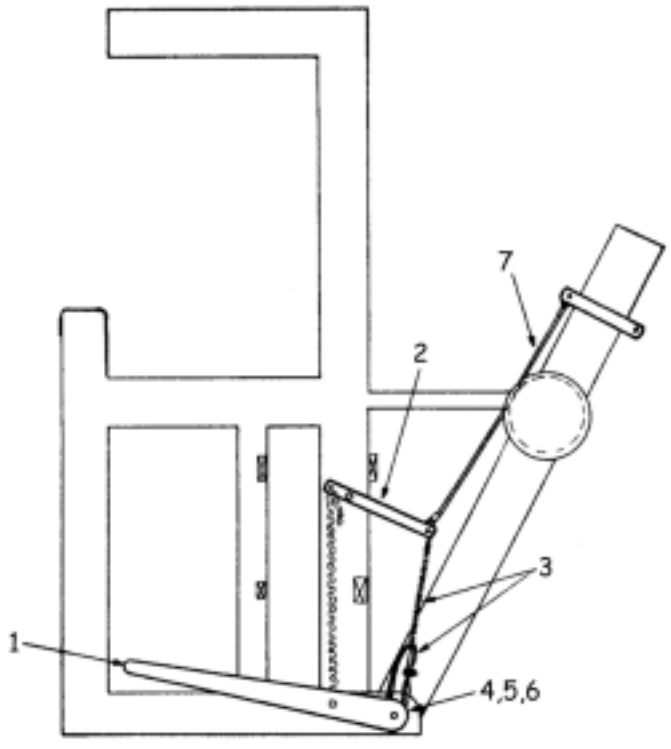
Look down at the foot lever and notice the chain that is attached to the eyebolt. This can now be attached to the forward most 'S' hook on the foot lever release. The ideal position for the front point of the foot lever is about four inches from the floor. Use the links of the chain to adjust the height of the foot lever.

Use

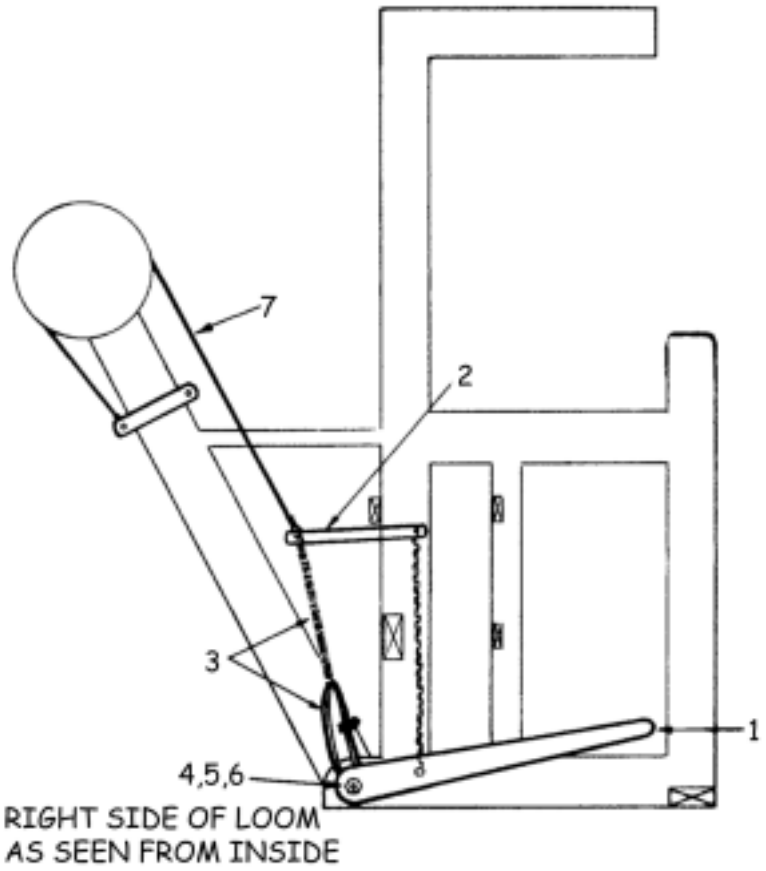
To set the tension on the locking brake simply pull the two ends of the tension adjustment cord in opposite directions.

Tighten the warp using the cloth beam handle, located at the right end of the cloth beam.

To advance the warp, simple depress the foot lever, turn the cloth beam handle and release the foot lever.



LOWER BEAM LOCKING BRAKE ASSEMBLY - FIGURE 46



UPPER BEAM LOCKING BRAKE ASSEMBLY - FIGURE 47

LOOM MAINTENANCE AND TROUBLESHOOTING

LOOM MAINTENANCE

1) Tightening the Bolts

The single most important thing you can do to extend the life of your loom, and preserve its operation, is tighten the bolts that hold its frame together. These will loosen over time, due to changes in its environment and to your own creative exertions. A loom which is allowed to become loose-jointed will certainly cost you weaving time, perhaps affect the quality of your work, and definitely become older than its years.

2) Lubrication and Cleaning

There are several mechanisms on your loom which will benefit from the occasional light application of an appropriate lubricant. Not all lubricants are suitable in the weaving environment. Machine oils and greases, for example, may provide plenty of slick, but they also capture yarn dust and will, over time, actually impede the action of your loom.

Loom Parts	Lubrication and Cleaning
Shuttles, Shuttle Race, Single-Box Flyshuttle Picker Grooves	Paste Wax
Slide Rods (double box pickers, bobbin winder)	Steel Wool
Axles (pulleys, spring levers, overhead beater)	Silicon Spray
Warp Beam Metal Rods (where metal works against the wood frame)	Paraffin
Warp Beam Brake Drum	Sandpaper

3) Cleaning a Filter

Unless you have an AVL Air Shuttle or other pneumatic accessory, you will have only one filter on your loom, and then only if you have a Compu-Dobby. This is the fan filter and it performs two functions: it cools the unit and it removes dust from the air before it is drawn into the fan.

a) Compu-Dobbies I

The filter is easily overlooked on our early generation Compu-Dobbies because it is hard to access.

The filter on older units is located on the back of the unit, below the solenoids. This means you must remove the CD to clean it. If the filter becomes clogged, it will restrict air flow, heat will build-up in the box, and sensitive electronic components may fail and will need to be replaced. If you do not feel comfortable doing this, we recommend that you remove the filter altogether. It's better to operate with no filter, than with a clogged filter.

b) Compu-Dobbies II

In our Compu-Dobby II design, we corrected the access problem.

The filter here is extremely easy to find: it sits atop the solenoid box.

In either case, remove the snap-on plastic cover that fits over the fan vent. Remove, rinse, and dry the foam filament. Replace. It is imperative that you clean this filter regularly. We recommend every two weeks, depending on how much you use the loom and what type of yarn you use.

4) Checking Cords and Cables

Check those cords and cables. All machines wear, and cords are usually the first things that fatigue on a loom.

5) Tool Kit and Spare Parts

Here's a list of the basics, nice-to-have-around items:

a) Minimum Tools

- [ ] Socket wrench with
  - [ ] 7/16", 1/2", 9/16" socket
- [ ] 6" or 8" crescent wrench
- [ ] Medium standard blade screwdriver
- [ ] 4-1 Screwdriver or medium phillips and standard screwdrivers
- [ ] 1/8" allen wrench
- [ ] Paste wax
- [ ] 0000 steel wool pad
- [ ] 220# sandpaper
- [ ] Paraffin wax

b) Spare Parts You Might Consider Having

- [ ] Spare Treadle Cable (left/right)
- [ ] Spare Flyshuttle Tie-Up Cord (Flyshuttle only)
- [ ] Spare Picker Returns (Flyshuttle only)
- [ ] 6' length of 350# Braided Dacron Cord (for emergency repairs)

TROUBLESHOOTING

1) Harnesses

Your AVL will have either polyester or metal heddles. The supporting harnesses (or shafts) are different for the two heddle types: metal heddles, whether twisted wire or flat steel, are suspended from rigid frames; polyester heddles are carried on transverse Harness Sticks, top and bottom. In all cases the harnesses are stabilized at the bottom by a series of spring-tensioned levers, Spring Levers. These hold the harnesses down and prevent your heddles from *floating*.

Some weavers like metal heddles because they believe they are easier to thread; others prefer the lighter and quieter polyester heddles.

On occasion you will find that one or more of your harnesses will misbehave. That is more likely to happen with harnesses with Polyester Heddles. There are a finite number of things that can cause these problems.

TABLE 1 / HARNESSES

Symptom	Possible Cause	How to Fix It
A.) One or more **top harness stick collapses**; it assumes a diagonal angle and one leg of the harness cable from which it is suspended goes slack.	1.) Your heddles are bunched together towards the center of the harness or on one side only. This is a problem because the heddles are part of the harness structure.	Move a few heddles to each end of your harness sticks; just to the inside of the harness wires that connect the top and bottom sticks. That way your harnesses will be balanced.
	2.) The harness cable supporting the shaft has come out of its pulleys at the top of the loom.	Trace the cable back through its pulleys in the Harness Pulley Support and make sure that the cable is properly seated. Check the action of the Dobby Cable as well. Make sure that it moves easily up and down. If the Dobby Cable seems to bind, check for debris in the hole where it comes through the Dobby Top. You may need to use a very thin piece of wire to dislodge accumulated yarn dust or other debris.
B.) The **heddles float**; they are lifter upwards by the warp thread when you tension the warp and your shed is not even or not large enough.	1.) The tension in your warp is greater than the tension in the springs that hold the harnesess down.	Take up a link or two in the chain that spans the Harness Spring Levers for that particular harness. Check the result and take-up more links if you feel you need more hold-down tension. Do not try to make all chains the same size. The size will depend on how much tension is required for each harness depending again on the number of threads going through that harness.

TABLE 1 / HARNESSES (cont'd)

Symptom	Possible Cause	How to Fix It
C.) **One or more harnesses that are supposed to raise don't**.	1.) Left treadle isn't being pressed all the way down.	Concentrate on getting both treadles all the way through their travel.
	2.) Dobby arm out of adjustment.	Realign the dobby arm according to the assembly instructions.
	3.) Dobby Cables out of finger slots.	Rearrange the cables according to the assembly instructions.
D.) **Harnesses don't raise properly**.	1.) Harness cables have been hooked to the wrong harness.	Rearrange the cables.
	2.) Chains from the spring levers have been hooked to the wrong harnesses.	Rearrange the cables.
	3.) Copper hooks on the spring levers have been bent.	Straighten the hooks with pliers.
E.) **Harnesses jam up on each other.**	1.) Heddles are not distributed evenly over the harness sticks.	Redistribute the heddles evenly on both sides from the center of the harness sticks.
	2.) Harness wire that connects the harness sticks has jumped out and got stuck in the heddles of the other harness.	Pull the wire out, make sure it does not catch any heddles and replace it to just connect the top and the bottom harness sticks. If you have a large number of extra heddles on each side, you might want to tie them in bundles to prevent getting caught by the harness wire.

2) TENSION

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.

Tension Device

First familiarize yourself with the tension device which is located on the left end of the lower beam and at the right end of the upper beam. (The right side of the loom is the side to your right as you are looking at it while sitting in the weaving position.) Notice that the tension system consists of a wooden drum around which a white dacron cord is wrapped four times, one

end of the cord 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 cord and the small spring is a small adjusting cord held in position by a plastic clamp. At the end of this cord is a steel ring that is attached to a bolt on the metal warp tension bracket.

Adjusting the Tension

Now move the warp forward three or four inches using the front ratchet handle and 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 pressing in on the plastic clamp and letting the adjusting cord out. 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.

Reversing the Warp

In making these adjustments, at times the warp will be wound too far forward. To wind it back on the warp beam, first unlock the front ratchet handle so that the front tension is released, then go to the back of the loom and turn the warp beam handle in the direction used to wind the beam. Remember that **EVERY** time you are winding any material onto either warp beam you should reduce the amount of tension within the tension system. This can be done quickly by removing the steel ring at the end of the tension cord from its operating position and temporarily hooking it on the nearby screw provided on the edge of the folding leg.

If the tension isn't loosened the small spring may become stretched out of shape. If this happens warp tension problems will result.

After winding the warp back onto the warp beam, check to make sure the cord has not become crossed on the drum.

Wind the warp forward again with the front ratchet handle until the warp tightens and is in the correct position.

TABLE 2 / TENSION

Symptom	Possible Cause	How to Fix It
A.) Your Warp Beam just won't hold tension, doesn't matter how tightly you've adjusted the cord, you just **can't get enough tension**.	1.) Your Tension Tie-Up has loosened.	Re-adjust the tie-up and either tie a bow in the cord ends or bind it tightly with a double wrap of cord.
	2.) You have mis-routed your brake cable. If you have just installed the system, disconnected your Brake Cable, to move the loom, or warp the beam, you may very well have incorrectly replaced it.	Review the cable routing as shown in the appropriate figure in the Assembly Section of your manual. Be careful, though, there are different illustrations depending on whether your beam is in the upper or lower position.
	3.) You may have warped your beam backwards. Go to your manual and consult that figure in the Weaving Section which illustrates how your warp should be routed.	If you did warp your beam backwards, you will need to reverse your tension cable. Unhook the buckle, loosen the cable, and wind it in the opposite direction. This is not a permanent fix. Use it only to weave off the warp you wound backwards.
	4.) The sandpaper on your Cloth Beam is not grabbing the warp and pulling it around as it should.	Check Symptom A.) in Table 3/Cloth Storage System. If the warp still won't adhere to the Cloth Beam, you'll very likely need to add SoftGrip or another kind of beam cover in order to get satisfactory warp tension.
	5.) The surface of the Brake Drum has become polished and no longer offers sufficient friction to grab and hold the Brake Cable.	Disconnect and unwind the Brake Cable. Lightly sand the surface of the groove in the Brake Drum with your #220 sandpaper. Replace the cable (but be sure about its routing!)
B.) Extensive tension on warp.	1.) Tension Adjusting cord is too tight.	Press on plastic clamp to let some cord out.
	2.) The tension cable has gotten crossed over itself on the warp beam brake drum.	Straighten out the cord.

TABLE 2 / TENSION (cont'd)

Symptom	Possible Cause	How to Fix It
C.) **Your warp tension is different in different places over the width of the warp.**	1.) It is not indicative of a tensioning problem. It is a matter of not having maintained even tension when warping the beam and there's no redress from the Tension Arm. It's just too late for this warp to be well tensioned.	You should have used a Tension Box for sectional warping, or craft paper for plain beam warping. If you do not want to waste this warp, place something (folded paper or cloth) in the areas on the beam where your tension is looser. You will have to move your paper everytime you advance the warp and also keep adding more since it will probably become looser and looser.

3) Cloth Storage System

There are two kinds of Cloth Storage Systems used on AVLs: one is used on our larger Production Looms, the other on our Folding Looms. They are similar in that both rely on the action of a dead-fall weight to create the energy needed to roll your cloth onto a rear mounted Cloth Storage Beam — that is, they harness gravity to do work. And both systems move your cloth to this beam automatically; you need only wind the weight back up when it's reached the limit of its travel.

The problem is that you have two drums that turn in opposite directions simultaneously. The best antidote here is to come to know the system so well that you can visualize its operation at any moment.

TABLE 3 / CLOTH STORAGE

Symptom	Possible Cause	How to Fit It
A.) The **cloth isn't moving** backwards **onto the Storage Roller**.	1.) The weight is at the bottom of its track and is no longer pulling on the cord, so there's no energy left to roll cloth onto the Storage Roller.	Wind the weight to the top position. If the weight does not want to stay in the top position, check if you forgot to insert the pull pin when you last had the Cloth Storage Roller off or the pin has fallen out. Replace the pin.
	2.) The cord on the Cloth Storage Drum at the rear slackens, unspools, and leaves quite a mess. The cord at the Cloth Take-Up Drum in the front may even snarl and wrap around its axle.	You will achieve the best result if you simply reinstall the system. First, locate the instructions in your manual, in the Assembly section, that pertain to installing your Cloth Storage Drum. Begin at the place where you are instructed to "Route the Cloth Storage Cord".
	3.) The Cloth Storage Spring has come unhooked at the loom frame or the spring has broken.	Lock the weight up. Go to the Cloth Storage Drum at the back of the loom, pull the pin, and turn the drum clockwise: If it seems not to offer any resistance, remove the drum and examine the spring (spring has hooks on both ends). If the spring is hooked over the pin inside the drum and has a corresponding hook at its other end, replace the drum,taking great care to engage the free hook on the pin in the side frame. If either hook is missing, the spring needs to be replaced.

TABLE 3 / CLOTH STORAGE (cont'd)

Symptom	Possible Cause	How to Fix It
	4.) The Clutch Bearing in the center of the Cloth Storage Drum is malfunctioning. To determine if this is the problem, with the pull pin in place, try turning the Cloth Storage Drum lightly clockwise. You should not be able to move it without moving the cloth storage beam.	You need to replace the Cloth Storage Ratchet Assembly and Clutch Bearing. Call AVL to order parts.

4) A Shed

AVLs are designed with a shed which exactly meets the need; not too wide, not too narrow. And there's of course a reason for this precision. Raising harnesses higher than you need may give you a larger shed, but it's also a waste of time and effort. You only need enough warp separation for the shuttle to pass freely. However, because the shed on AVLs is so precisely calibrated, you do need to be sure that you're getting all that the loom can deliver. There are three likely causes for restricted sheds:

TABLE 4 / A SHED

Symptom	Possible Cause	How to Fix It
A.) **Restricted Sheds**	1.) Shuttle Race is too high or low. When your beater is pushed all the way away from you, your warp threads should just be gently touching the race.	If the race is too high, you'll need to lower it. If you see a gap between the bottom of the warp and the top of the race, bring it up! On the overhead beaters, there is an adjustment screw at the top of the beater hanging arm. On the bottom swing beater, there is a same kind of adjustment screw, but at the bottom of the beater.
	2.) Treadle cables fell off the pulleys.	Replace the treadle cables so they go over the pulleys.
	3.) Dobby Cable Turnbuckle is out of adjustment.	You'll need a helper to check this. Have him watch the travel of the Dobby Arm in the slot on the right side of the Dobby while you treadle the loom. Do not have any harnesses engaging. The arm should travel all the way to the top of the slot and to the bottom. If it does not go all the way to the bottom, check if the dobby arm stop is not blocking the movement. If there is a pin in that place, pull it out. If it is not, you'll need to tighten or loosen the turnbuckle at the side of the loom.

5) Beaters and Flyshuttles

TABLE 5 / BEATERS AND FLYSHUTTLES

Symptom	Possible Cause	How to Fix It
A.) **Shuttle flying off the track**.	1.) Shuttle boxes are out of adjustment.	a.) Single Box Flyshuttle: Bridge the Shuttle Race and Shuttle Box with a ruler or other straight edge. They should be in perfect alignment. If one is lower than the other, loosen the Shuttle Box and reposition it. If you need help, go to the installation instructions in your manul.
		b.) Double or Four Box Flyshuttle: In the same way, check the position of each of your shelves relative to the race. If you have a problem, make the necessary adjustment at the turnbuckle in the cable that attaches to the shift handle; bring the shelves up or down. You may need to loosen the brass screws (motion limiters) top and bottom of the box carriages in order to create enough room to make this adjustment. Be sure to retighten them once you've corrected the elevation problem.
	2.) Your shuttle is hitting the end of the reed.	Insert small shims in the grooves that hold the reed into the race and beater top so that the end of the reed is deflected backwards.
	3.) Tensioner in your shuttle is not adjusted.	The advantage of an end-feed shuttle is that it allows you to tension the feed of your yarn. Most shuttles of this design have adjustable tensioners. Be sure yours is set to match the characteristics of the yarn used.
	4.) Bobbins not wound consistently.	If it's soft on the end and the wraps collapse and pull into one another, you will have to wind it again. Use an AVL Bobbin-Winding Guide.
B.) One side of your fabric is beaten more tightly than the other even if you are holding your beater in the middle. You have a **diagonal beat line** rather than horizontal.	1.) Your beater is out of alignment.	To check, push your beater all the way back against the Beater Bumper Blocks, it should strike both sides at exactly the same time. If it doesn't, you'll need to rack the beater.

6) Dobby

TABLE 6 / DOBBY

Symptom	Possible Cause	How to Fix It
A.) **Dobby skips**.	1.) Pressing too hard or too quickly on the treadles.	Press the treadles with a smooth, rhythmical motion.
	2.) Cable turnbuckle out of adjustment.	Adjust according to the assembly instructions.
B.) **Dobby head jams**.	1.) Dobby chain not brought out over the top of the lower roller.	Reverse the dobby and turn by hand to get the dobby chain out.
	2.) Dobby cable turnbuckle out of adjustment.	Adjust the turnbuckle according to the assembly instructions.
C.) **Dobby chain does not advance**.	1.) Detent wheel on the dobby head is loose.	Contact AVL Looms customer service for advice on correcting this problem.

7) Left Treadle Issues

If you do not fully depress the Left Treadle each time you lift, you will experience problems with your harnesses. Because the Left Treadle is unweighted, it's easy to forget that you need to do this. However, this treadle does something very important — it releases the harnesses that were engaged for the previous pick, but only in the last fraction of its stroke. So, if you seem to be experiencing harness lifting problems, your use of the Left Treadle is the first thing to suspect.