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FIGURE INDEX

BACKGROUND

AVL Looms was started in 1977, with the meeting of two unique individuals.

One of these individuals was engineer/designer/weaver, Jim Ahrens. Jim produced the original designs for AVL. He has been weaving, designing and building handweaving looms for over 40 years and is considered by many weavers to be the greatest hand loom designer in this country.

The other individual was Jon Violette, now president of AVL Looms. Jon studied engineering at California Polytechnic College and woods technology at California State University, Chico. With his knowledge of engineering and his highly developed skills in woodworking, Jon heads the team of people who make the efficient designs of AVL Looms available to handweavers throughout the world.

INTRODUCTION

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 are 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 his/her 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

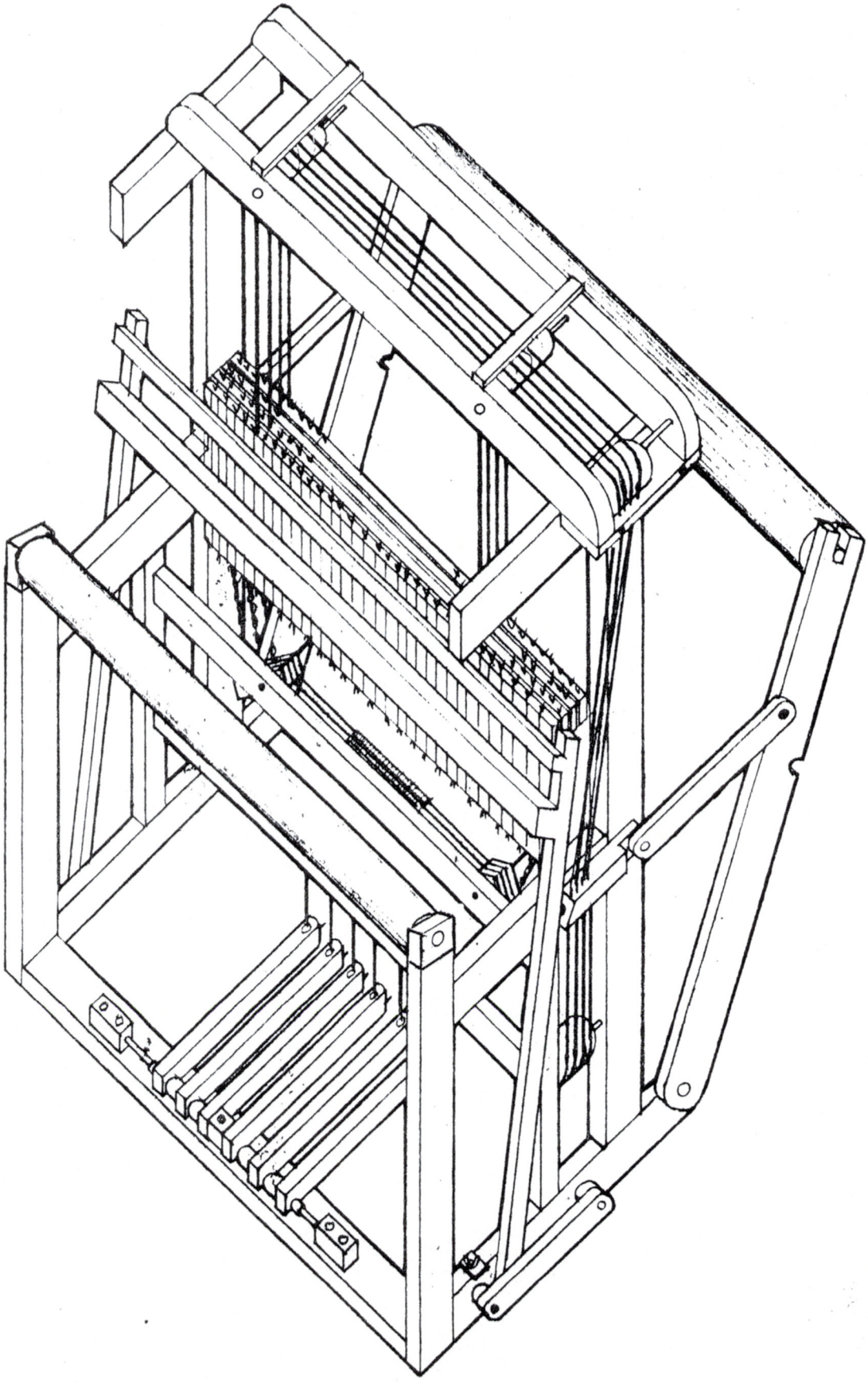
This manual was written to be read from beginning to end. Some of the information is quite basic and there are those of you who will want to skip those sections entirely. Instead of skipping them we suggest you skim them (there just may be important information hidden right in the middle of a very basic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

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

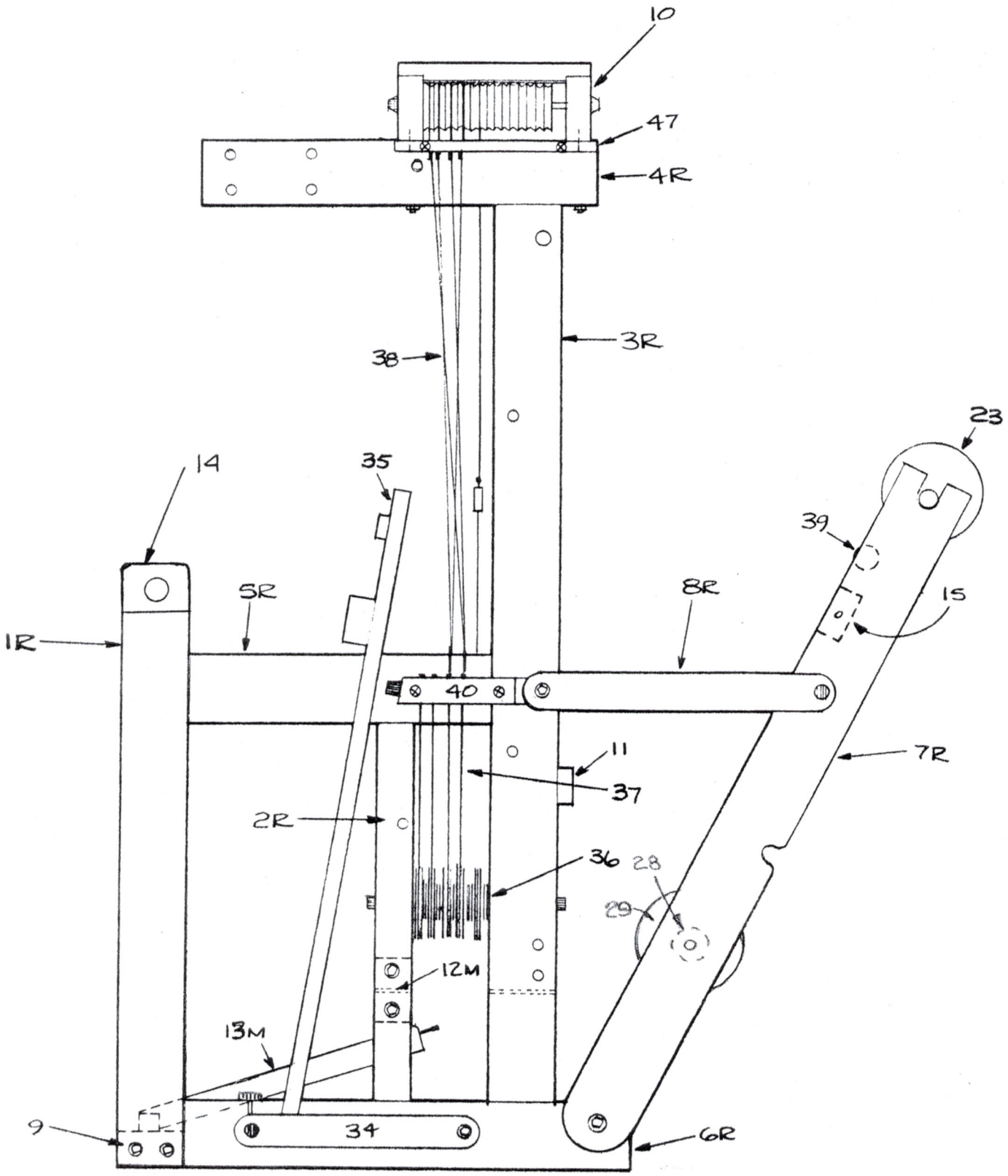
The main body of the manual gives instructions as to how to put together a standard modular loom. If you ordered any options (i.e., a single box flyshuttle beater instead of a standard beater) you will find their instructions at the back of the manual. Refer to the index for page numbers. All of the options can be assembled after the loom body.

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 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.



40" STANDARD MODULAR LOOM -5- FIG. 1



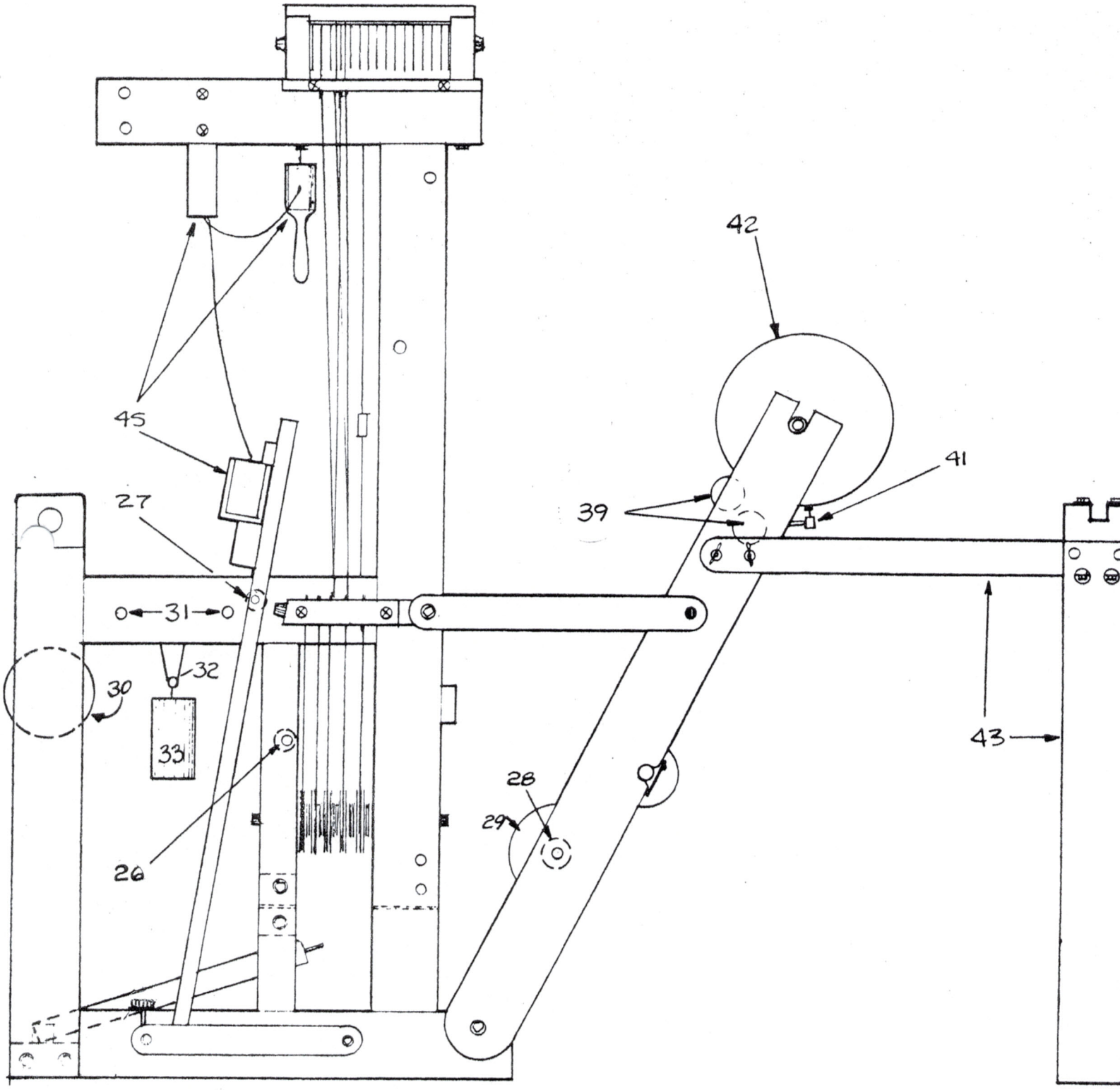
40" STANDARD MODULAR LOOM

FIG. 2

AVL LOOMS
40" MODULAR FOLDING LOOM, STANDARD

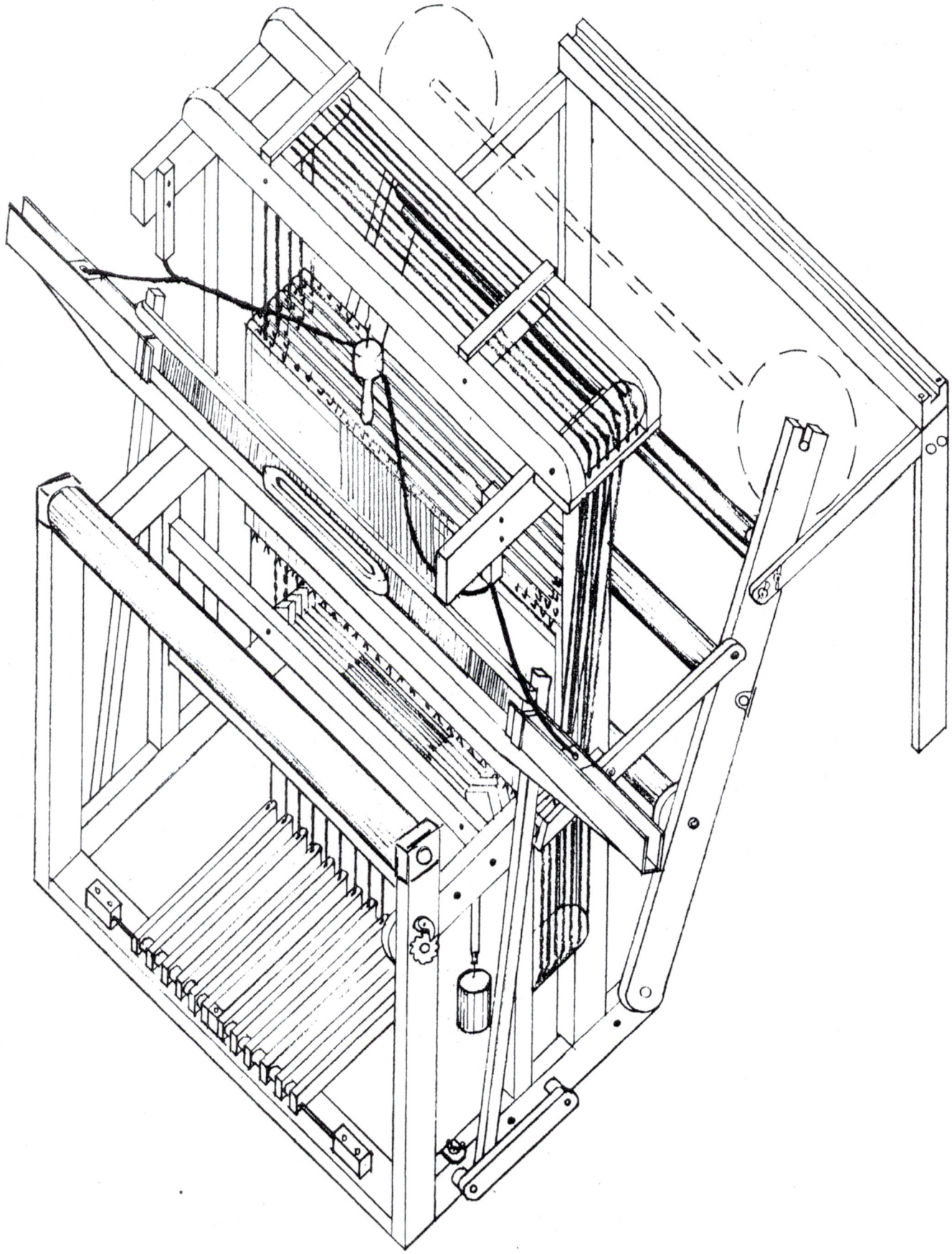
PARTS LIST

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
12M	Treadle Pulley Bar
13M	Treadles
14	Vertical Cap
15	Folding Leg Stiffner
17	Harness Assembly (not shown)
23	Warp Beam, standard
24	Cloth Beam (not shown)
25	Cloth Beam Advance Handle (not shown)
26	Upper Cloth Roller
26	Lower Cloth Roller (not shown)
28	Rear Cloth Storage Roller
29	Cloth Storage Drum
30	Cloth Take-Up Drum
31	Cloth Take-Up Pulley
32	Counter Weight Pulley/Hanger Assembly
33	Counter Weight
34	Beater Supports
35	Standard Beater
36	Side Pulley Assembly
37	Treadle Cables
38	Patch Cords
39	Separation Roller
40	Right Beater Bumper/Lower Cable Stop
42	Warp Beam Handle (not shown)
47	Harness Cable Stop



40" MODULAR LOOM
FULLY EQUIPPED

FIG. 3



40" MODULAR LOOM
FULLY EQUIPPED

FIG. 4

AVL LOOMS
40" MODULAR FOLDING LOOM, FULLY EQUIPPED
(Options only are listed)

PARTS LIST

Part Number	Part Name
41	Raddle
42	Half Yard Sectional Beam
43	Tension Box & Track Assembly (box not shown)
39	Second Warp Beam Separation Roller
45	Single Box Flyshuttle Beater
46	Double Box Flyshuttle Beater (not shown)
47	Auto Advance (not shown)

LOOM ORIENTATION

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 would be. 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 to your right as you are sitting at the loom and the left side to your left. Some parts and sub-assemblies have been marked with an "R" at one end. This end of the assembly would, of course, go on the right side of the loom. A piece marked "bottom" would, of course, go toward the floor.

There are two full drawings of the 40" Modular Loom preceding this page. The first shows the standard loom. The second drawing shows the loom with many of the options that are available for its use. You can refer to the appropriate drawing as often as necessary to obtain relative placements of assemblies. Following each of these drawings is a parts numbers list. The second parts numbers list includes only the names of those parts not included in the first drawing. Since these lists include the names of all parts and assemblies, you may need to refer back to them. Study all of the drawings carefully and make certain that your assembly looks like the one in the drawing before continuing.

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. A ratchet/socket set with 7/16", 1/2", and 9/16" sockets would be the best choice of tool to use for tightening most of the nuts and bolts, if you have these tools available.

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 packing materials. Lay all of the parts out so that you will be able to identify each one as they are called for.

IDENTIFYING PARTS

1. 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, machine screws, wood screws, washers, hex nuts, square nuts, allen wrenches, and 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 way 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"). Machine screws have a flat, slotted or phillips head and a flat tip, and are put in with a regular or phillips screw driver. These are measured for length from one end to the other. Wood screws are tapered, have a pointed tip, and coarse threads.

Hex nuts always have a washer between them and the wood, and square nuts always go in "nut access holes" (see Figure 5) 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 weaving position.

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

Bolt and Nut Hints

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

B. 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.

C. Always have the large "nut access hole" facing toward the inside of the loom unless otherwise specified.

D. 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.

2. Identifying Side Frame Parts

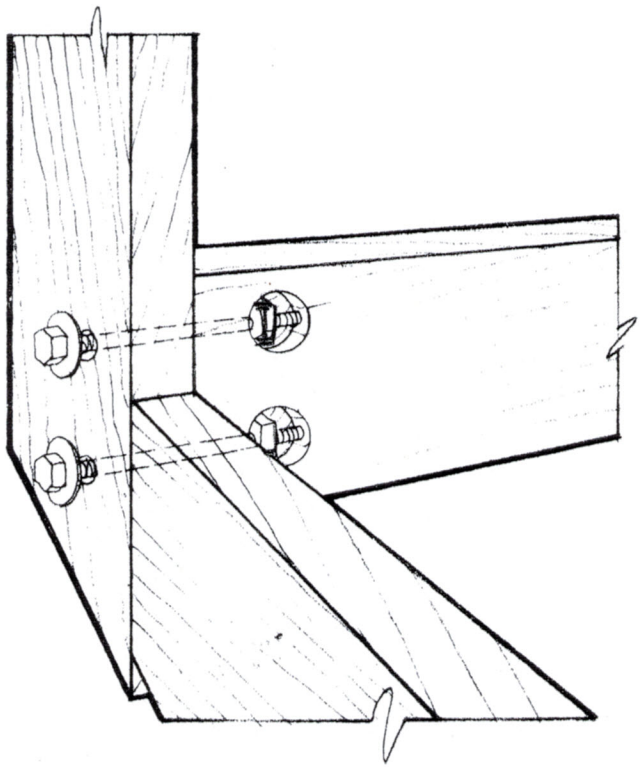
The side frames are the parts that came in box number 1, the big thin box. They are shipped with the insides facing each other just as they will be when the loom is set up. To determine which is the right side and which the left, first orient them as they are oriented in Figure 1; i.e., with the castle 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 and a half feet apart.

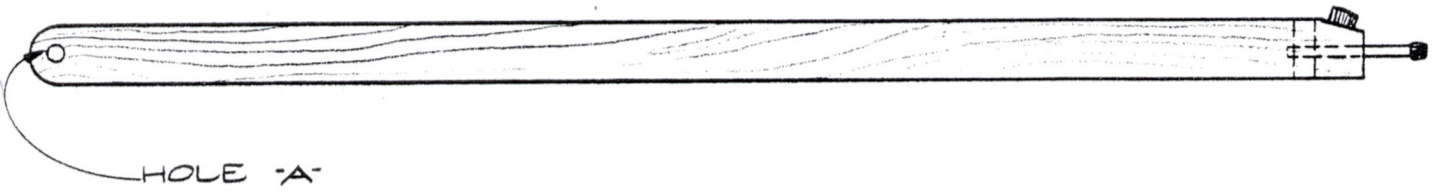
1. The Treadle Pulley Bar (#12)

Locate four 5/16" x 3 1/4" hex bolts with washers and square nuts. Remove the nuts from the bolts, keeping the washers on. Now locate the Treadle Pulley Bar. This part consists of one long wooden crossmember with ten pulleys attached to the rear face. Orient this piece so that the pulleys are facing the rear of the loom (or toward the floor if you have your loom tipped on its back), and so that the stamp "bottom" will be facing the floor when the loom is standing upright (refer to Figure 1 to locate the relative placement of the Treadle Pulley Bar, #12M). From the outside insert two of the 5/16" bolts halfway into the holes labeled "12M" in Figure 2. Now hold the Treadle Pulley Bar in position and slide the two bolts into the corresponding holes. Insert two of the square nuts into the "nut access holes", (located on the same face as the pulleys), and align them so that the threads of the nut will catch the threads of the

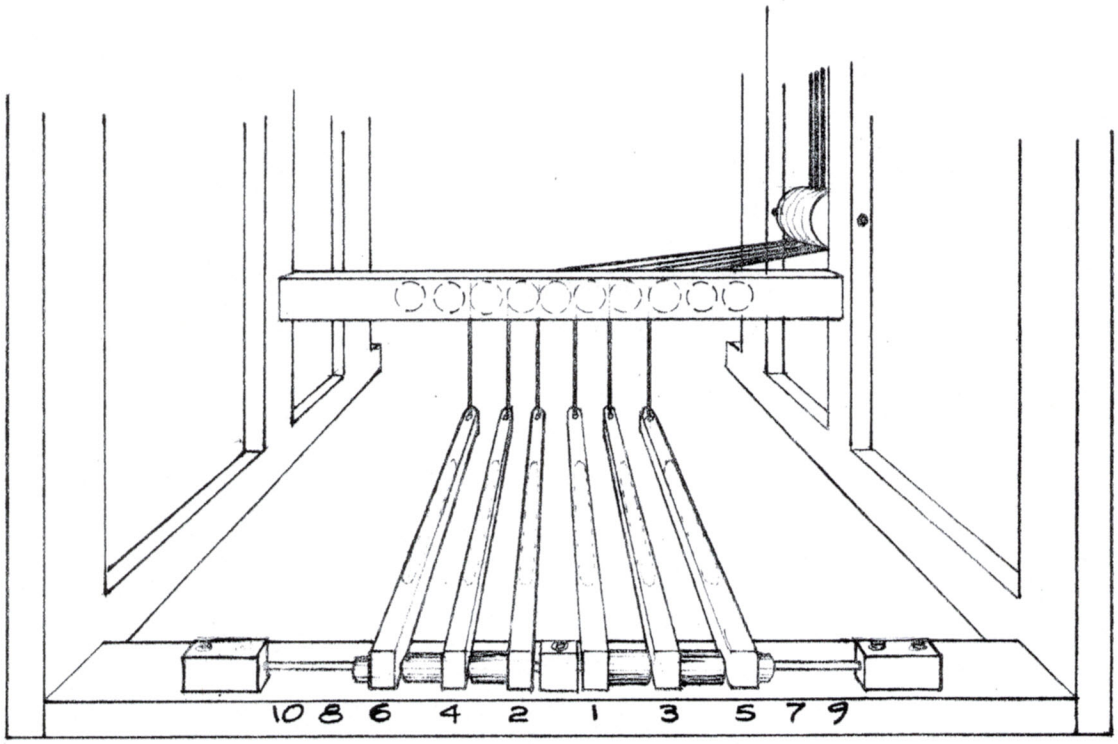


NUT ACCESS HOLES

FIG 5



MODULAR TREADLE FIG 6



TREADLE ASSEMBLY FIG. 7

bolt. Using a 1/2" socket on a ratchet, or a crescent wrench, turn the head of the bolt in a clockwise direction. (Remember, for most bolts and screws the "Rightsy Tightsy, Leftsy Loosey" Rule applies.) Tighten these bolts until it feels secure and repeat this for the other side, using the other two 5/16" x 3 1/4" hex bolts.

2. The Lower Front

A. Attaching the Lower Front to the Loom

Locate the lower front #9. This is a long wooden bar with metal rods and wooden blocks and spacers 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. From the outside insert four 5/16" x 3 1/4" hex bolts into the corresponding holes (see #9 on Figure 2) 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, some round wooden spacers, and two stop collars (there are no stop collars with an 8 harness loom). 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. Remove the round wooden spacers.

C. Identification of Treadles

First locate your treadles (see Figure 6). Pick up one and hold it so that the pin sticking out the end is away from you. Notice the largish hole (labeled "A" in Figure 6) that runs horizontally through the end of the treadle closest to you. This is where the rod goes through and fastens it to the lower front. Pull the pin with the black cap out halfway. The end loop on the treadle cable goes around that pin (more about this later).

3. Installation of Treadles (see Figure 7)

Set half of your treadles on the left side of your lower front and half on the right side. Orient them so that their pins are away from you, pointing toward the rear of the loom. First pick up the rod that you removed from the left side of the Lower Front, insert the right end of the rod

into the "rod hole" in the center mounting block. Now, insert the left end of the rod into the rod hole in one treadle, follow that with a round wooden spacer. Repeat until you've used up all the treadles in your left pile.

NOTE: If your loom will be equipped with 10 treadles (the maximum amount), you should omit the outer two spacers if you plan on using the AVL bench, as the feet of the bench will occupy this space.

Now insert the right rod into the right "rod hole" in the center mounting block. From the far right side, slip a treadle onto the rod followed by a spacer. Repeat this until all of the treadles in your right pile are gone. Now, if you've ordered fewer than the full set of treadles (10) you can slip a stop collar to the outside of each outside treadle and tighten it about 1/8" away from the treadle. If you've ordered the full set you won't have room for the stop collars so you can put them aside. Now slip the left end of the left rod into the left mounting block and likewise for the right side. Remount the blocks to the Lower Front and tighten down the nuts.

4. 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. Using the four #10 x 1 1/2" flat head screws, attach 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.

5. The Beater Bumper Blocks

Locate the beater bumpers (#40 in Figure 2). (These are shipped in box #3.) Notice that they are labeled L and R. The stamp, of course, identifies right and left beater bumpers. The right bumper consists of three pieces and looks considerably different from the left one. Look ahead to Figure 10 to see how the right bumper block goes on the loom. 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.

Check to see that the right beater bumper is situated so that the large hole lines up with the corresponding through hole in the castle side.

Using the #12 x 2 1/2" flat head wood screw provided, attach the right beater bumper with one screw in the front-most hole. Place a #12 x 1" flat head wood screw into the remaining hole in the right bumper. Attach the left beater bumper with the two remaining #12 x 2 1/4" flat head wood screws. Attach the left beater bumper with two screws.

6. The Support Arm

Locate the two support arm assemblies (#8R and #8L). Each are oblong pieces rounded at both ends. The left support arm has a wooden spacer and two washers at one end and the right has only two flat washers. Remove the nut and one washer from both support arms. Notice that on the inside surface of each castle side about half way up, is a large counterbored hole. Insert one washer into each of these holes until they hit bottom. Now keeping the spacer between the left support arm and its corresponding castle side, mount the arm to the outside. Tighten down the nut making certain to leave it loose enough so that it can still be pivoted. Make certain that the large hole in the right beater bumper block is in line with the support arm hole and mount the arm, again to the outside, keeping the washers next to the bolt head and hex nut and make sure the arm is loose enough to be pivoted.

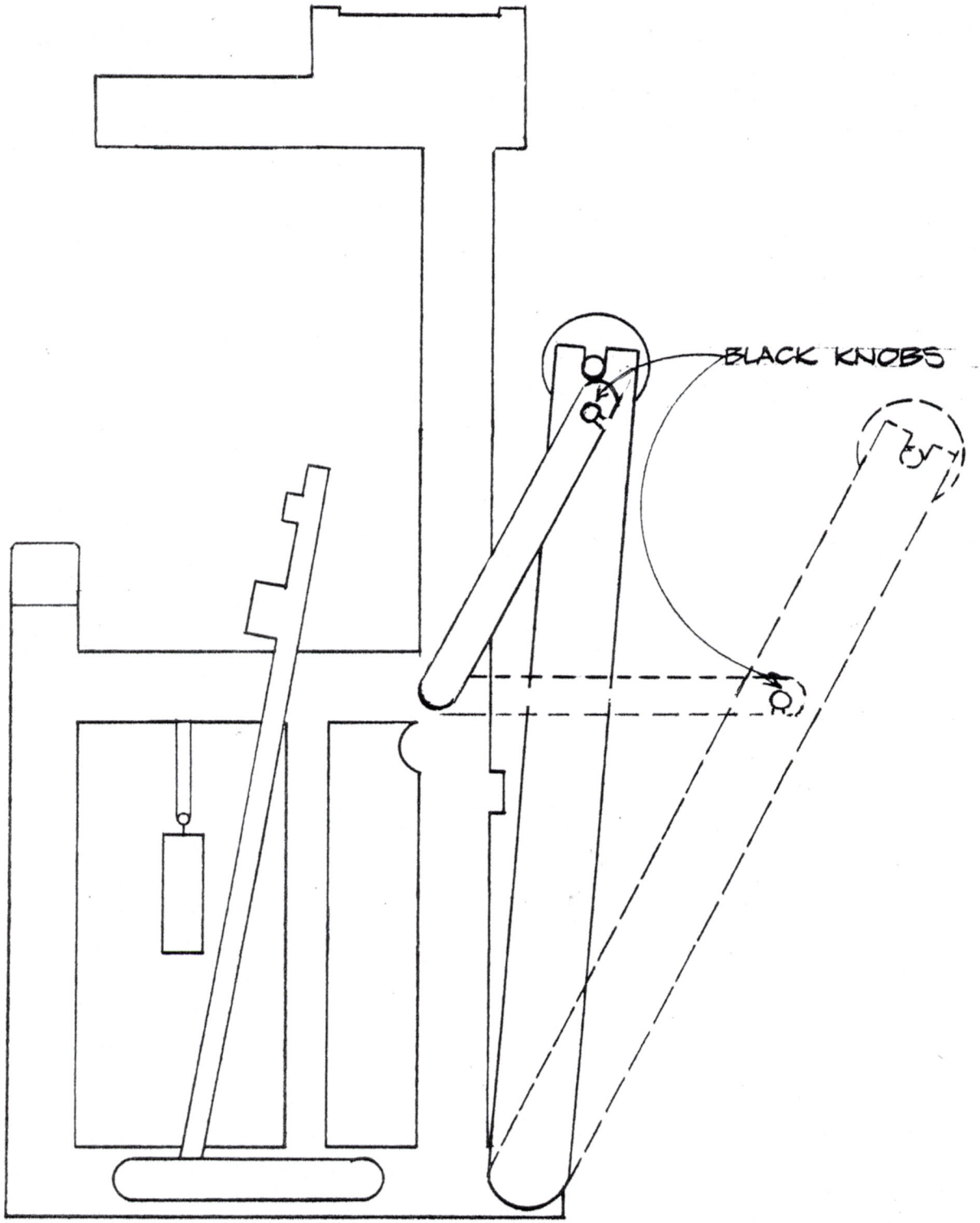
7. The Folding Legs

Locate the two Folding Legs, #7R and #7L. These are long wooden pieces rounded at one end. The Right leg has an aluminum plate mounted to the inside surface about 1/3 of the way down from the squared end. The left folding leg has an aluminum tension plate mounted to the inside surface about 4" down from the squared end.

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 5/16" x 3" hex bolt and washer through the hole at the rounded end of the leg and through the rearmost hole in the loom "foot" (see Figure 2). Secure loosely with a washer and locking-type hex nut. Repeat this process for the right side, making sure that the black knobs are facing the outside.

Locate the separation roller #39. If you ordered a second beam you'll have a second rollers #39. Insert the pins at the end of the separation roller #39 into the "holes that don't go through" closest to the top of the legs, so that the roller is captive between the legs. Repeat this with the second roller #39, if ordered, using the holes that are



UNFOLDING THE LOOM

FIG. 8

the next closest to the top of the legs. Locate the stiffner (#15). This is a plain wooden bar that has two holes at each end and two "nut access" holes near the ends. Now, being careful not to dislodge the rollers 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 while this assembly is on the floor. Use the "through: holes that are nearest to the rollers. Holding on to the stiffner, lift this assembly up and secure in either the folded position or the weaving position by attaching the support arms to the upper or the lower black knobs (see Figure 8).

8. The Harness Pulley Support

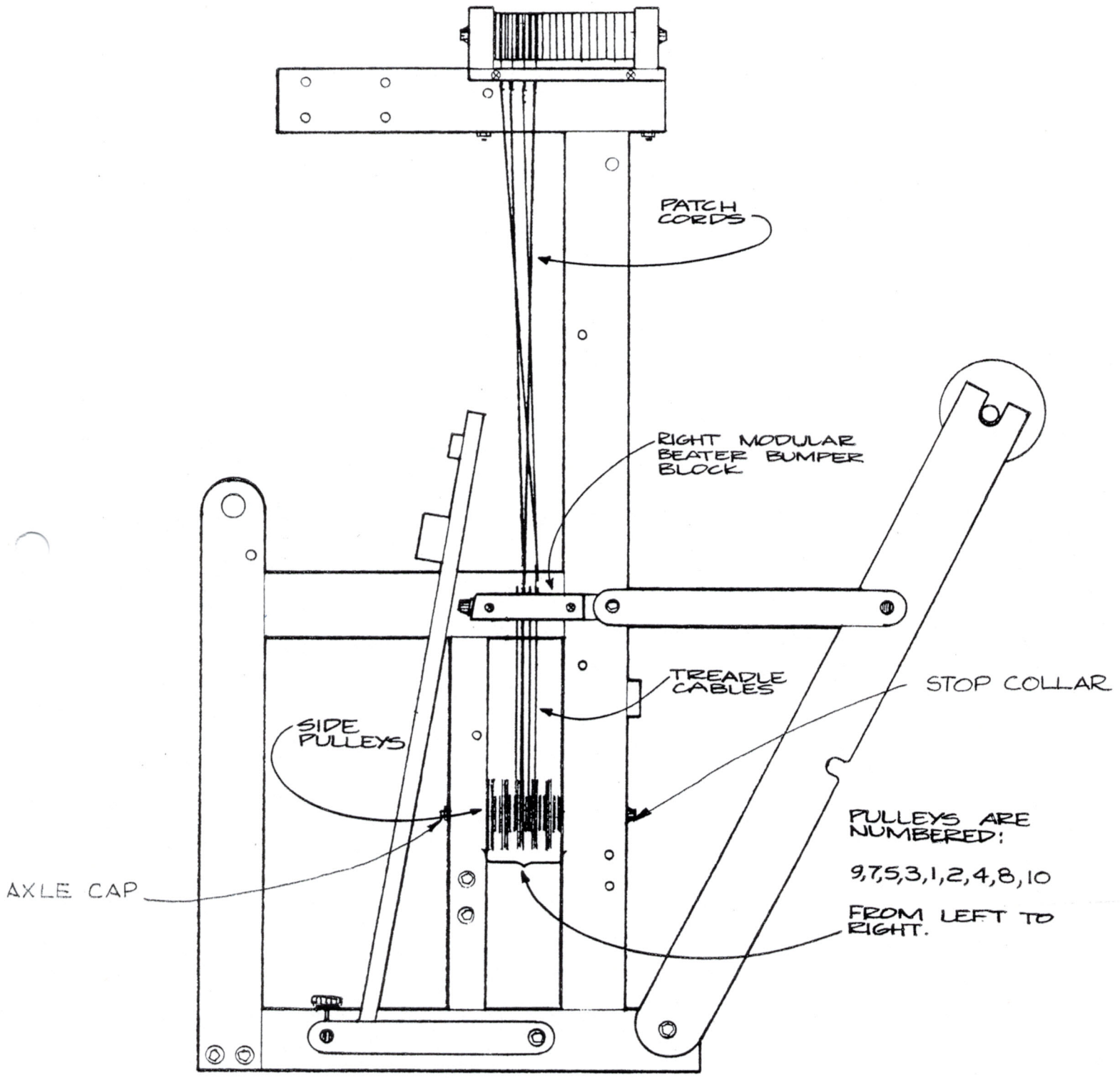
Locate the Harness Pulley Support #10. This assembly has three rows of sixteen sheaves between two long crossmembers. Orient it so that the AVL name plate is to the front. Using four 5/16" x 7 1/2" hex bolts, washers and hex nuts, (remember that you'll need washers under the hex bolts and the hex nuts) attach the harness pulley support assembly to the side frame as shown in Figure 2.

9. The Harness Cable Stop

Locate the Harness Cable Stop #47 (see Figure 2). This is a two piece part with twelve holes in it corresponding to the twelve possible harnesses. Now locate the two brass threaded inserts located on the under side of the right end of the harness pulley support assembly. Orient the Harness Cable Stop so that the countersinks are on the bottom and the rounded edges are facing you. Using the two 1/4" x 1 1/4" machine screws mount the Harness Cable Stop to the threaded inserts.

10. Side Pulley Assembly

Locate the side pulley assembly (#36 in Figure 2, also see Figure 9). Orient it so that it matches the drawing with the stop collar to the right as you face it. Using the larger allen wrench that came in the crossmember hardware package, loosen the stop collar and remove it. Pull the rod out from the left, keeping the pulleys in order and locate the upper set of horizontal holes in the right vertical support members. Slip the rod through the hole on the left (as you are looking at it). Now place the side pulley assembly onto the axle between the two vertical frame members. Then slide the rod on through the hole on the right vertical frame member. Fit the stop collar back on and tighten it using the allen wrench. See? This isn't so difficult.



SIDE PULLEY ASSEMBLY

FIG. 9

CABLE TIE-UPS

1. Treadle Cables

A. Locating Treadle Cables

Locate your Treadle Cables. Each one is labeled with a number corresponding to a number in the right beater bumper block and the treadle numbers (see Figure 7 for treadle numbers).

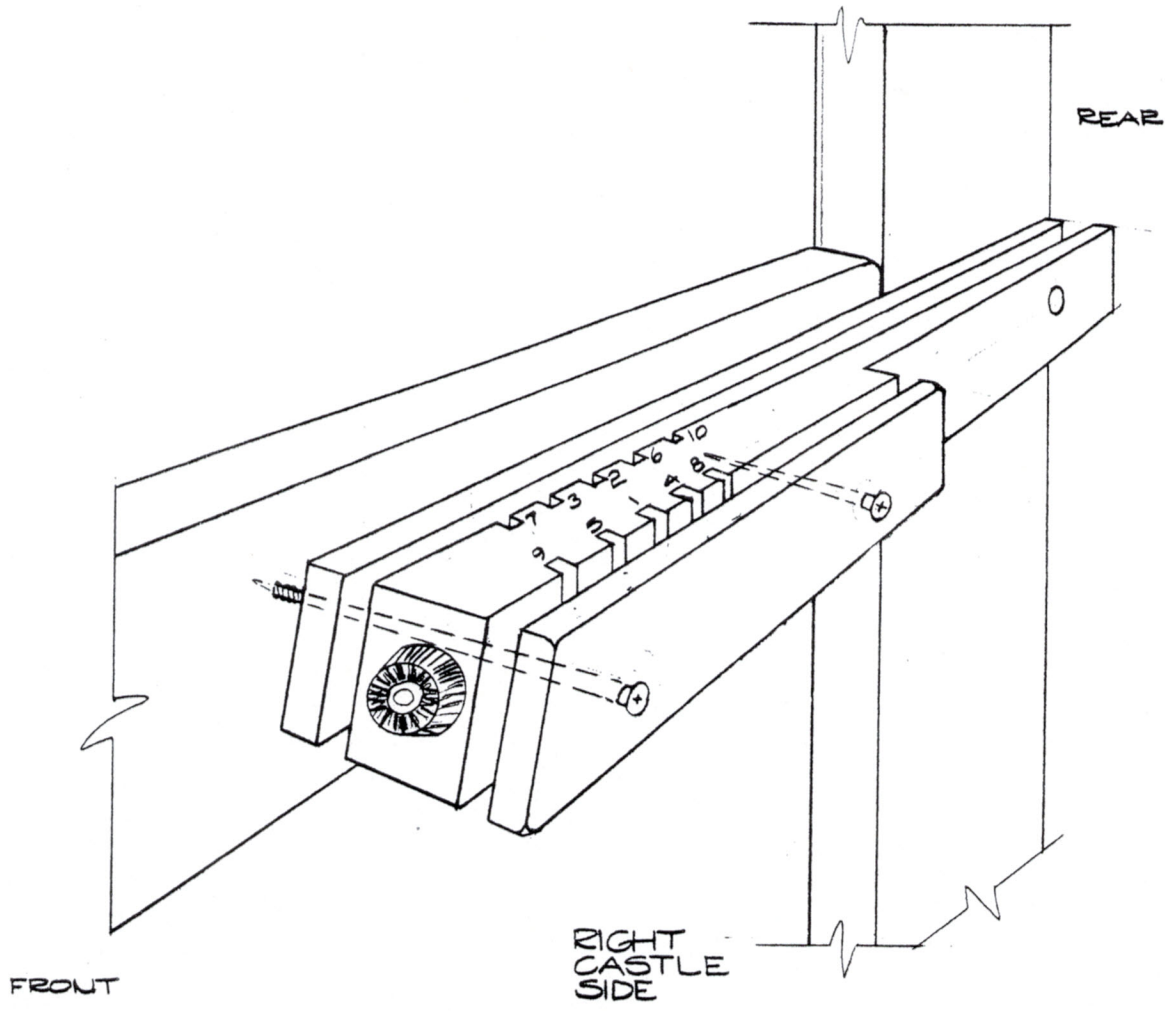
B. Captivating the Cables

Notice that each treadle cable is numbered at the loop end of the cable. Open up the right beater bumper by backing out the two screws and the support arm bolt so that there is about 1/4" space between the first and second section where the even numbered stamps are. (Remember, turn it to the left or counterclockwise to loosen a screw.) Install cables 3, 2, and 6 (or 7, 3, 2, 6 and 10) in their correspondingly numbered holes with the treadle clips and rubber impact collars above the block (see Figures 10, 11, 12). When all of these cables are in their proper slots push the middle section in so that it meets the first section thus captivating the cables. Make sure each cable is properly seated in its slot and that they aren't being pinched. The slots for cables 9, 5, 1, 4, and 8 should now be open. Repeat the above process for installing these cables.

Now, again being sure not to pinch any cables, tighten up the two screws of the beater bumper block.

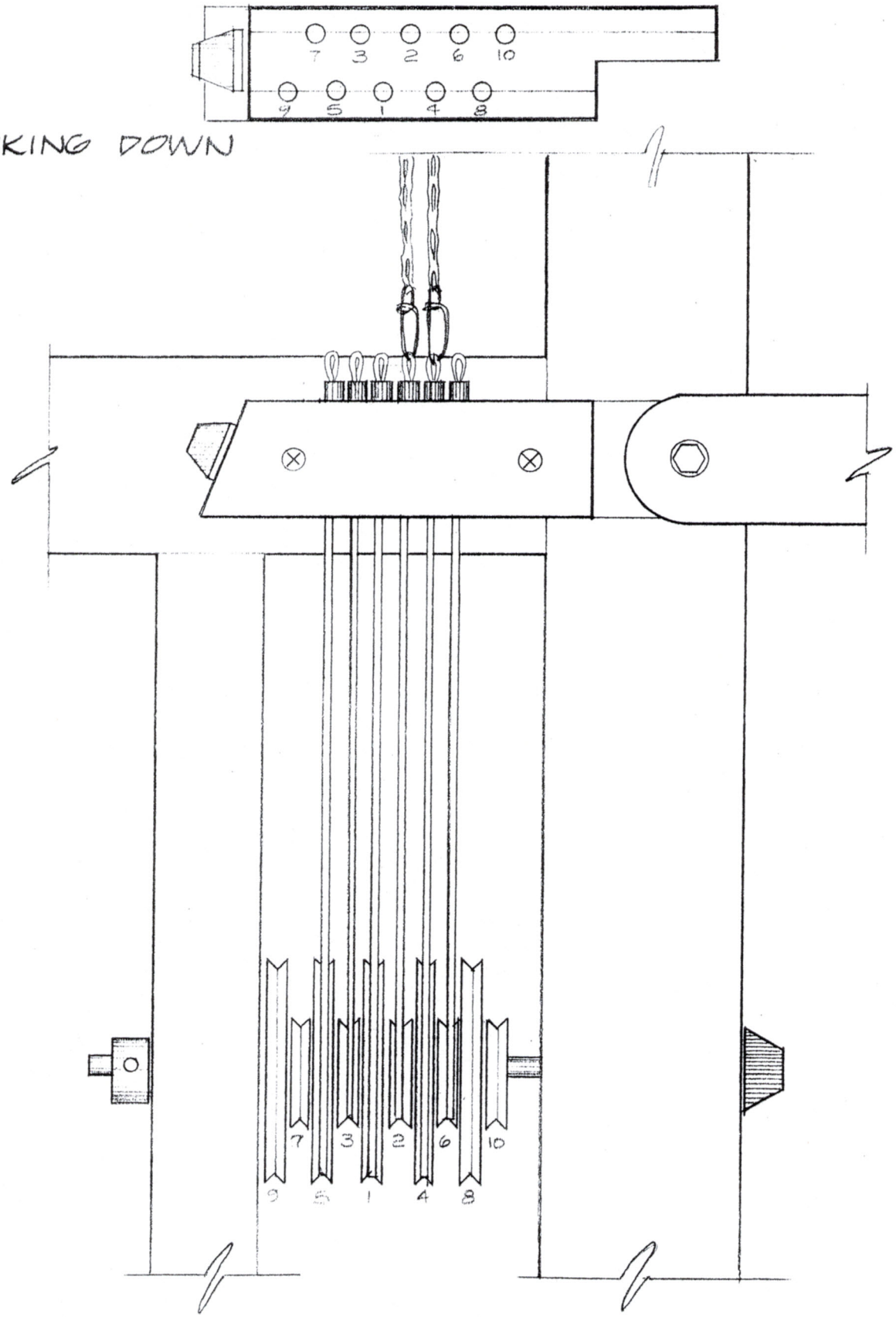
C. Attaching the Treadles

Now it's time to hook the cables to the treadles (see Figure 12). Each of the treadle cables will be routed under their corresponding side pulley, through the loom, over the corresponding pulley of the Treadle Pulley Bar and straight down the left side of the pulley to meet the pin of the treadle. Pull out the pin with the black cap on it, capture the loop on the end of the cable inside the large access hole and push the pin back in securely. Note that the numbers assigned to the pulleys on Figure 9 correspond to the numbers of the treadles on Figure 7.

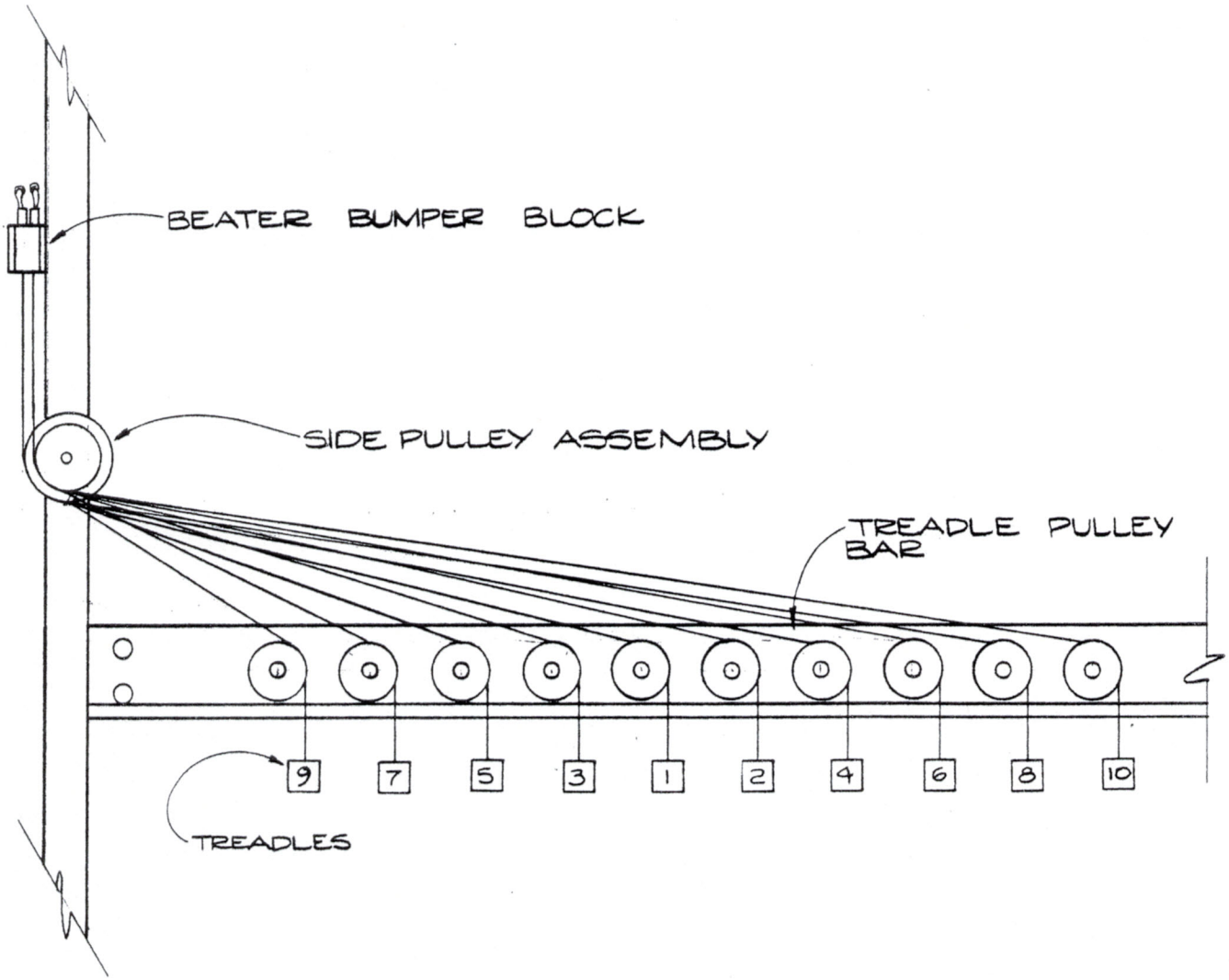


RIGHT MODULAR BEATER BUMPER BLOCK

FIG. 10



MODULAR LOOM TIE-UP FIG. 11



ROUTING OF MODULAR TREADLE CABLES
AS SEEN FROM REAR

FIG. 12

2. Harness Cables

A. Loosening the Cable Stop

Using a screwdriver, back out the machine screws that attach the two parts of the Cable Stop so that there is about 1/4" between the part with the slots in it and the outer piece. Now locate the bag containing the Modular Harness Cables. (Notice with pleasure how your pile of unassembled parts is shrinking as your loom is growing.)

B. Identifying the Harness Cables

Take the harness cables out of the bag and separate one from the rest. Holding it up by the end with the clip and rubber stop, notice that there are two other ends each with a loop. The shorter end will support the right side of a harness and the longer end will support the left side of that same harness. (Harnesses, for those of you who aren't familiar with the word are the frames which hold the heddles. They are also known as shafts.)

C. Installing the Cables

Bring the two looped ends up through the space between the two parts of the cable stop and into the groove at the left side. (The side closest to the front of the loom, see Figure 9). Repeat for the next cable inserting it into the groove directly to the right of the one you just did. Pull each cable through the groove until the rubber stop touches the harness cable stop. Repeat for the rest of the cables. (All of the empty grooves, if there are any, should be at the right side of the cable stop.)

D. Tightening the Cable Stop

Now slowly tighten the machine screws holding the two pieces of the cable stop together captivating the cables. You'll probably need to work with them a little bit to persuade them to stay in their respective slots. Have some patience, sing a little song, and when they are all in their slots tighten down the screws. (The clips and rubber stops should be beneath the cable stop.) It is important that they are all the way seated and are free to move up and down, so try each one and when you're sure things are as they should be go to the next step.

E. Cable Retainers

Mounted on top of the harness pulley supports are two wooden crossbars with felt on their undersides. These are the harness cable retainers. Temporarily remove these parts from the loom.

F. Laying the Harness Cables (refer to Figure 13)

Take hold of the harness cable closest to the front of the loom. (This is the cable for harness number 1 and from now on will be referred to as cable number 1 no matter how many treadles or harnesses you have ordered. The cable next to it will be referred to as cable number 2 and so on.)

Lay both ends over the pulley directly above cable number 1. Now bring both ends of the same cable over the first pulley of the next rack of pulleys, letting the shorter end of the cable hang off of this pulley. Route the remaining end of cable over the first pulley of the remaining rack of pulleys. Repeat these steps for the remaining cables. At this point all of the harness cables should be over all of the pulleys.

G. Replacing the Cable Retainers

Replace the cable retainer above the two sets of pulleys and tighten the screws so that they <u>almost</u> touch 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 off of the pulleys.

HARNESS ASSEMBLY

1. Locating and Identifying the Harnesses

Locate your harness sticks. They are long, thin pieces of wood with screweyes on either end. There should be two groups. One group is labeled "Tops" while the other group consists of either one or two bundles of four harness sticks each. These other bundles should be labeled "2". Leave the tape and number stamp on these until they are needed.

2. 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.

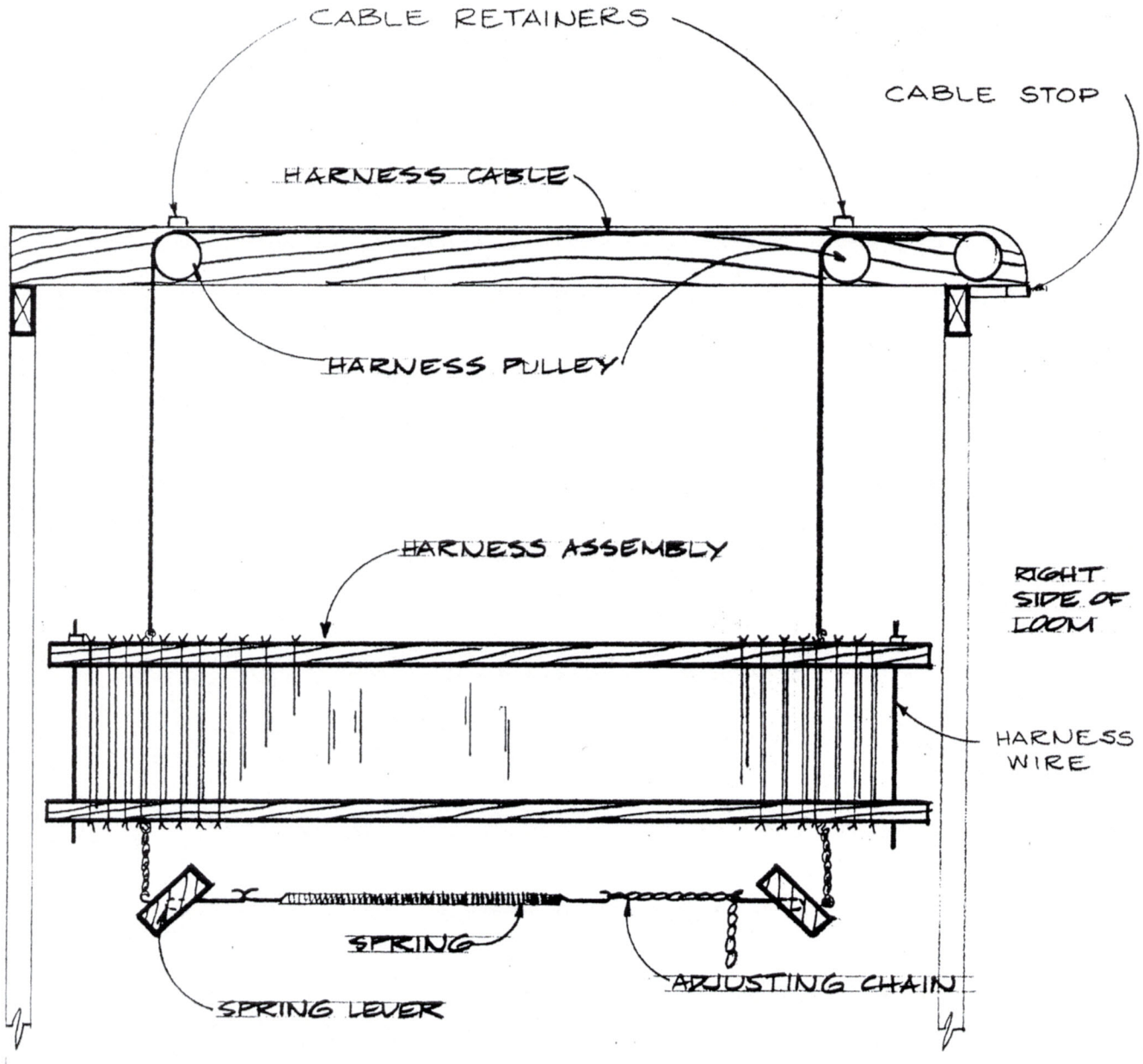
Untape the bundle of harness sticks labeled "Tops". Lay one of these on the table about a foot and a half in from the edge with the eyelets away from you.

3. Understanding Your Heddles

Now locate the bag of heddles. Open it and look at your heddles but DO NOT 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.

4. Harness Assembly (refer to Figure 13)

With one group of heddles in hand, return to the table with the harness stick lying on it. 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



HARNESS ASSEMBLY

FIG. 13

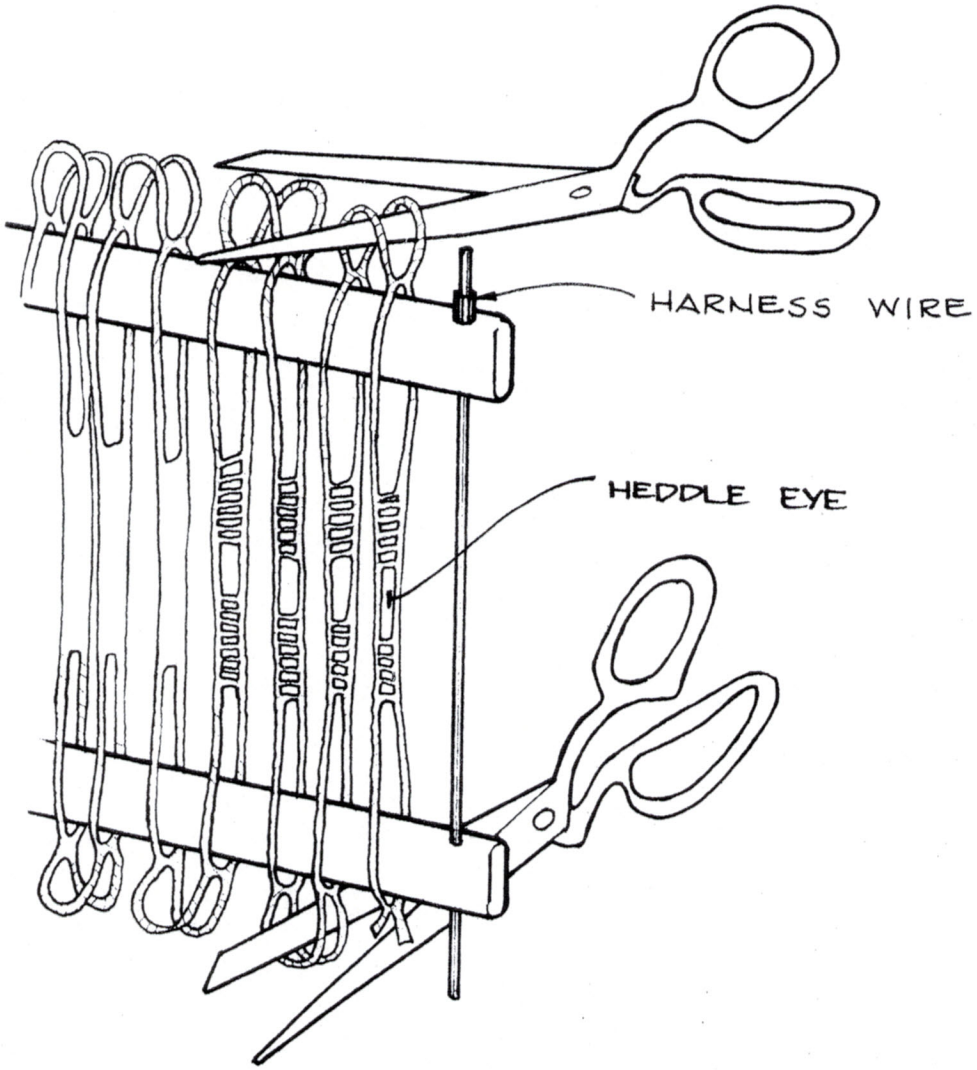


FIG 14

the harness stick (see Figure 14 for identification of heddle eyes). 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 if you have them, or #1 harness sticks if you have a standard loom. Take one of these harnesses to the table and with the eyelets facing you, insert the end of the harness into the above mentioned "space" in the heddles.

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 14).

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 #4 with purple, the eyes of harness #3 with red, the eyes of harness #2 with blue and the eyes of harness #1 with orange. If you have ordered six or eight harnesses you can repeat this sequence using orange for #5, blue for #6, red for #7, and purple for #8. This makes it easier to tell which heddle belongs to which harness and lessens 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 screweyes 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 screweyes facing away.

5. Spring Installation (see Figure 13)

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. The chain is for adjusting the harness hold-down 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.

6. 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 either your first or last spring lever on the left side and hook it to the left screweye on the underside of the last harness stick. Repeat for the right side. Now hook up all of the harnesses in the same fashion.

7. Installing Harness Wires

The last step of installing the harness system in the loom is to place a harness wire at each end of each harness (see Figure 14). These wires are long enough to extend two or three inches beyond the bottom harness sticks. This will prevent the harness from riding on top of one another.

INSTALLING BEAMS AND ROLLERS

1. Installing the Standard Plain Beam

Install the Standard Plain Warp Beam, with the large wooden drum to the right, in the two slots at the top of the folding legs. You will need to temporarily remove the metal retention pins to do this.

If you have ordered a sectional beam or a second plain beam refer to the index for the location of assembly instructions.

2. Warp Beam Handle

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

Remove the wing nut, washer and bolt from the end of the handle. Place the hole in the handle over the right side of the standard beam axle in the upper position and over the left side of the second beam axle in the lower position. 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 reattach the washer and wing nut.

3. 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, look ahead to Figure 36 to see this part on the loom). 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 socket, turn the upper bolt counter clockwise until the nut disengages it. Now lift up on the vertical cap separating it from the main 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 metal ratchet is to the right. Locate the aluminum cloth beam handle #25. Slip the handle over the right end of the cloth beam axle with the flat face of the handle facing <u>away</u> from the cloth beam. Next, place the vertical cap over the right end of the beam axle. Insert the left end of the beam into the corresponding hole in the left cloth beam vertical cap and seat the right 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.

TENSIONING THE STANDARD BEAM

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.

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.

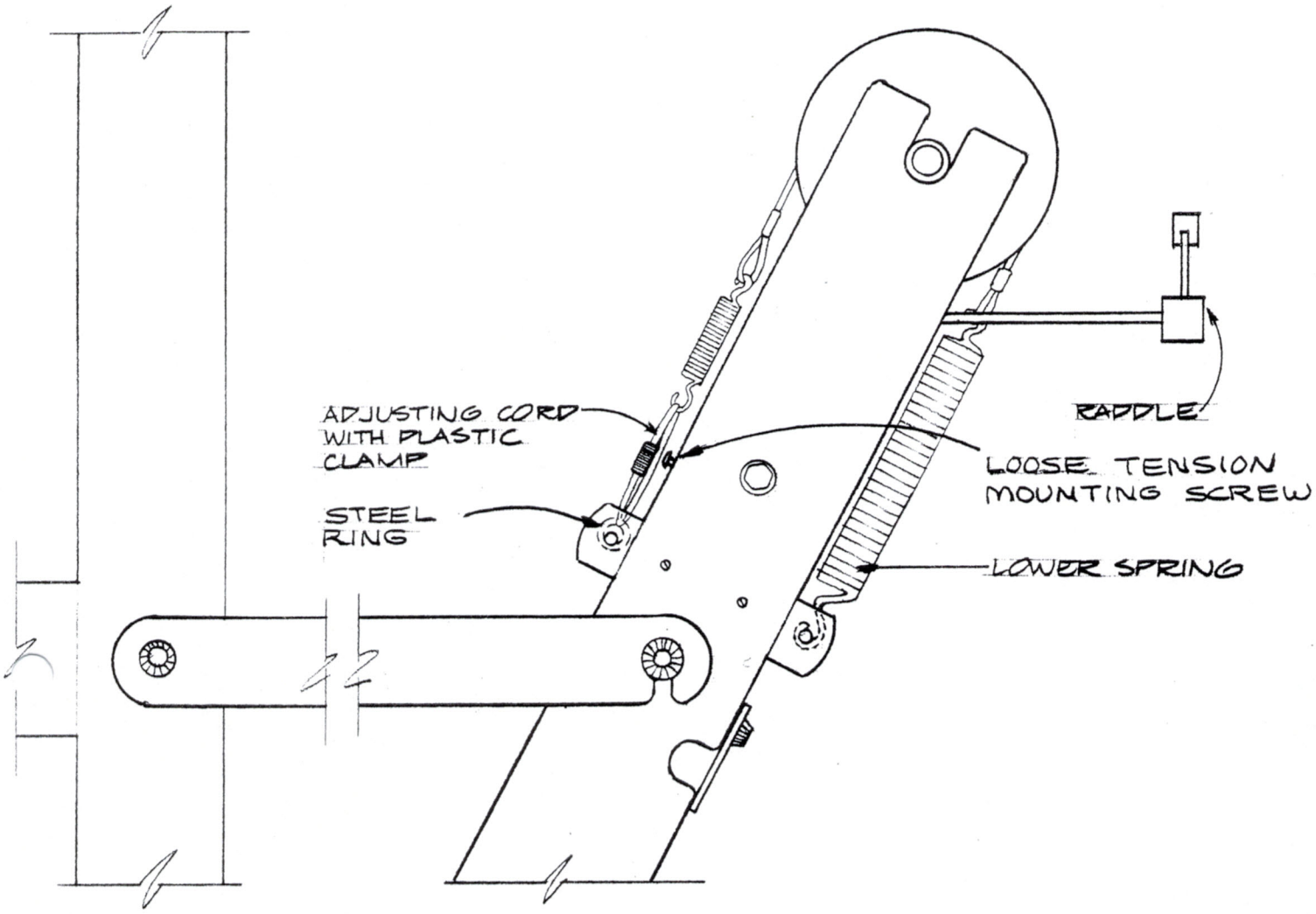


FIG. 15

TENSION DEVICE

BEATER ASSEMBLIES

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 Figures 1 and 16 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 Figure 16).

Remove the hex 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. Remove the two screws located in the top edge of the lower horizontal and 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.

1. Standard Beater (see Figure 16)

   Locate the shuttlerace, beater top, two legs, reed, reed supports, and hardware (see Figure 28).

   Now pick up the shuttlerace and orient it so that the lengthwise groove is to the top and is facing toward the rear of the loom.

   Position it in the loom so that it is resting on the cloth beam supports between the Cloth Beam and the harnesses. Now empty your hardware bag onto a table top. Pick up the four 5/16" x 3 1/4" carriage bolts with washers and hex nuts.

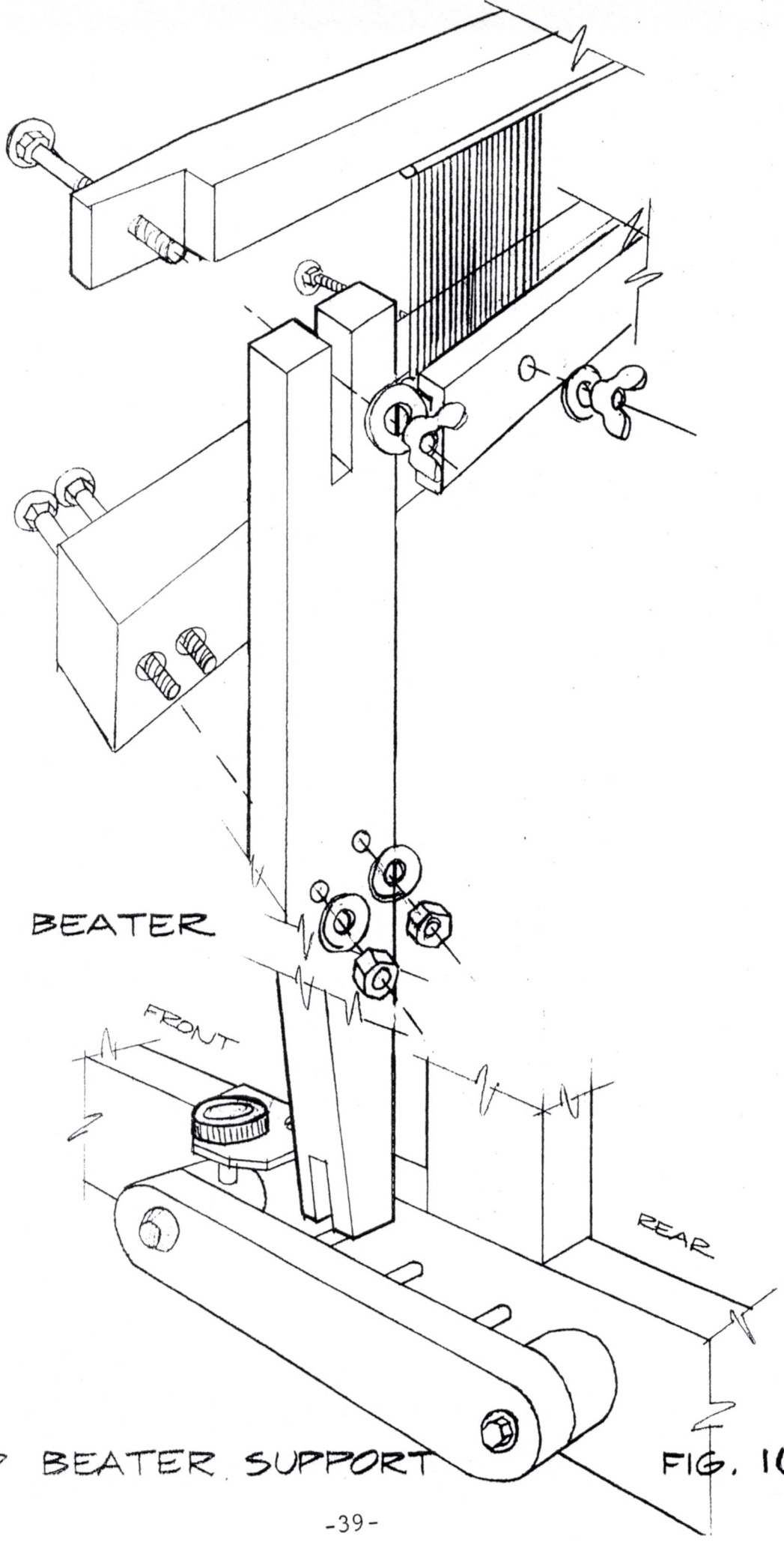
   Using either leg, orient it so that, with the bottom slot riding in the center pin on the beater support, the tapered side of the leg faces away from the loom. Insert the bolts, from the front of the race, through the race and into the corresponding holes in the beater leg. These are the two inner-most holes. The two outer holes on each end will not be used on this assembly, they are for a single or multiple-box flyshuttle beater, should you ever care to adapt your loom. Attach washers and nuts and tighten slightly. Repeat this procedure for the other side of the loom, making sure that the tapered side of the leg is always facing away from the loom. Attach the washers and nuts, leaving them loose for the moment.

   From your hardware package, locate either six, seven, or nine (depending upon the width of your loom) 5/16" x 3" carriage bolts, with washers and wing nuts attached. Push the carriage bolts through the race so that their heads sit flat on the front of the beater race. (Don't be afraid to use a hammer to tap these bolts in place.) Now, carefully

slide the reed support onto the seven bolts so that the lengthwise groove in it faces the groove in the race. Leave enough room so that you can fit the reed between the race and the reed support. Once the reed is in and centered, the washers and wing nuts can be fitted onto the carriage bolts and tightened.

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 1/2" 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 them.

At this point, you should center the beater assembly in the loom and tighten the bolts that attach the beater leg to the shuttlerace. Centering the beater will insure that the legs will not rub on the loom frame.



STANDARD BEATER

STANDARD BEATER SUPPORT FIG. 16

CLOTH STORAGE SYSTEM

Following is a list and description of parts included in the cloth storage package:

Cloth take-up drum/handle assembly, including an axle and a metal ratchet.

Cloth storage drum assembly: a wooden drum around which white dacron cord is wrapped.

Two front rollers: long metal rollers with pins at each end.

One storage roller: a long metal roller with a pin at one end, slot at the other end.

Five roller brackets: square wooden brackets (attached to side frames of loom).

Retention pin assembly: small pin in a chain with small plastic holder (attached to Right Rear Folding Leg of Loom).

Counter weight: a black cylindrical weight.

Counter weight pulley: a small metal pulley.

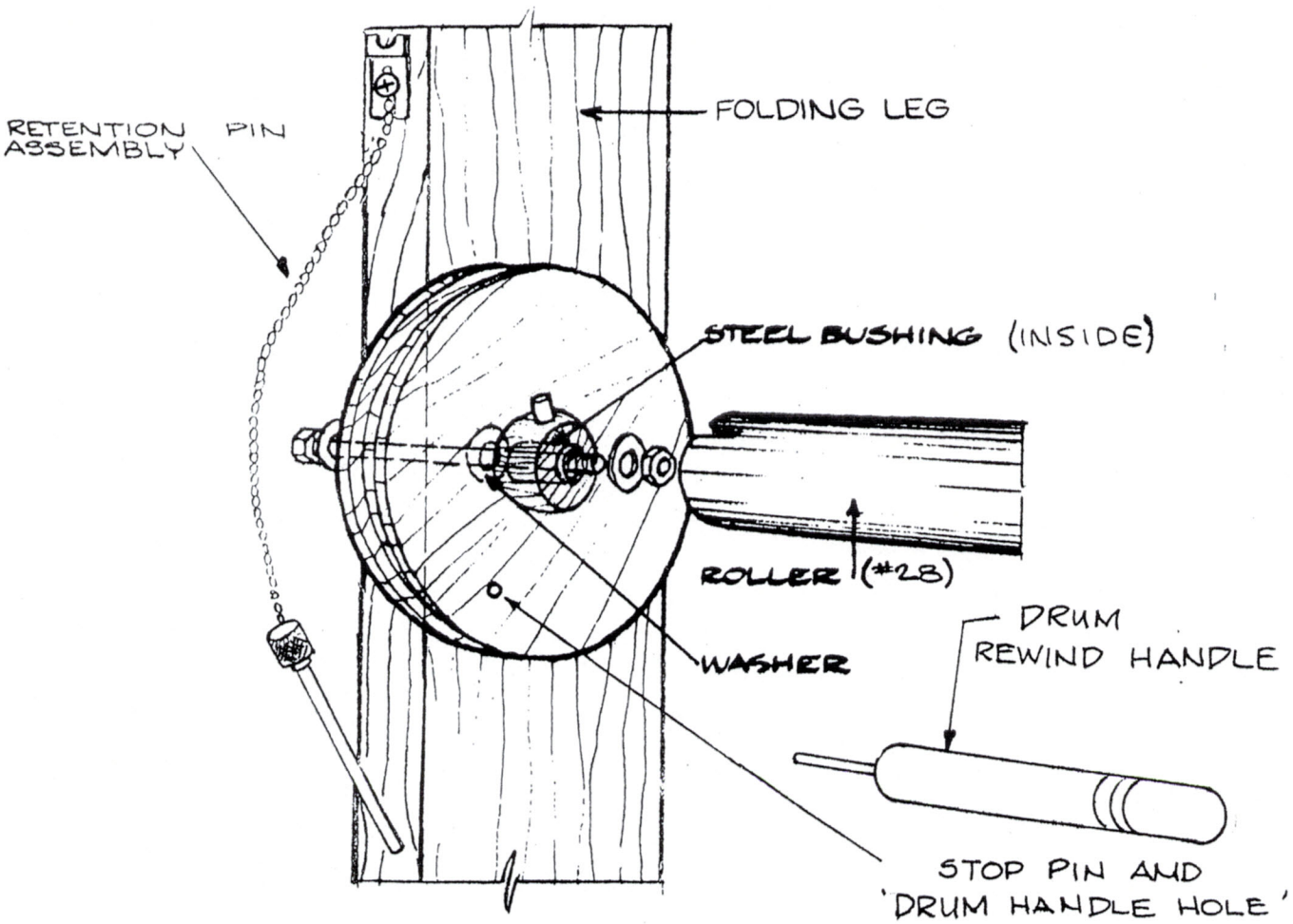
Drum rewind handle: a wooden handle with a small metal pin at one end.

ASSEMBLY (refer to Figures 17 through 19)

1. Take the long bolt out of the cloth storage drum. From the outside of the loom, insert the bolt and one washer into the hole located about eighteen inches up from the bottom edge of the folding leg.

   Now slip one washer over the bolt from the inside of the loom. Next, slip on the metal bushing and storage drum with the large flat side of the drum against the wood. Add the last washer, then the nut and tighten down.

2. With the allen wrench provided, loosen the metal ratchet on the cloth take-up drum/handle assembly (see Figure 18). Remove the ratchet. Keeping one washer on, insert the drum axle pin into the hole located on the right cloth beam support, from the inside, as shown. Slip one washer and the ratchet on the pin from the outside with the flat face toward the loom. Tighten the set screw in the ratchet with the allen wrench.



CLOTH STORAGE DRUM

FIG. 17

3. Locate the two front rollers (#26). Slip one of these into the slots in the upper roller brackets. Pull the retention pins out of either lower roller bracket and drop the other front roller into the slots (see Figure 19). Replace the retention pins.

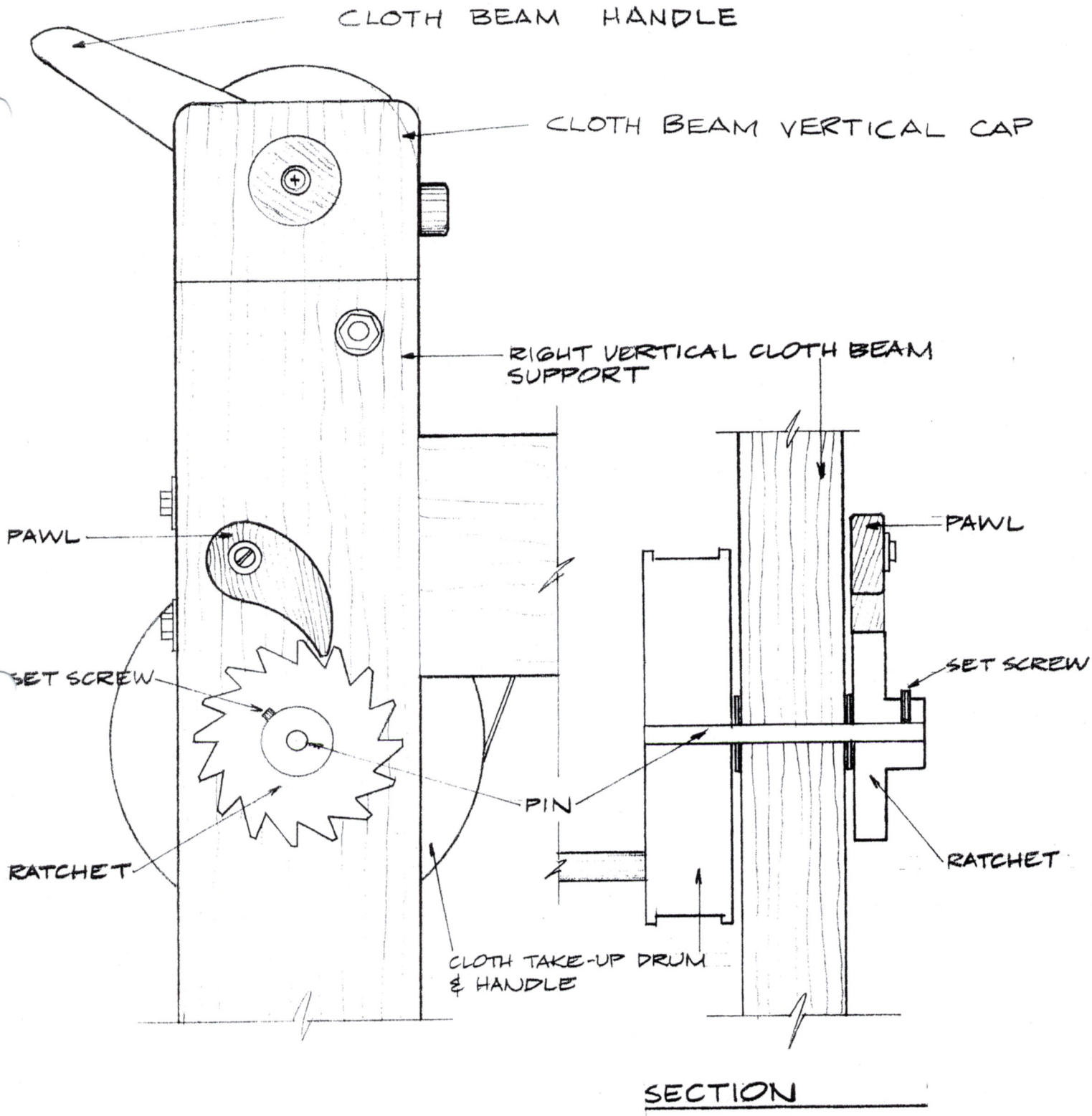
4. Locate the cloth storage roller. Standing at the back of the loom, orient the roller so that the pin is to your right. Fasten the slotted end over the drum end as shown in Figure 19. Now slip the pin end into the bracket to your right.

5. Route the cord from the cloth storage drum around the pulleys as shown in Figure 19.

   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.

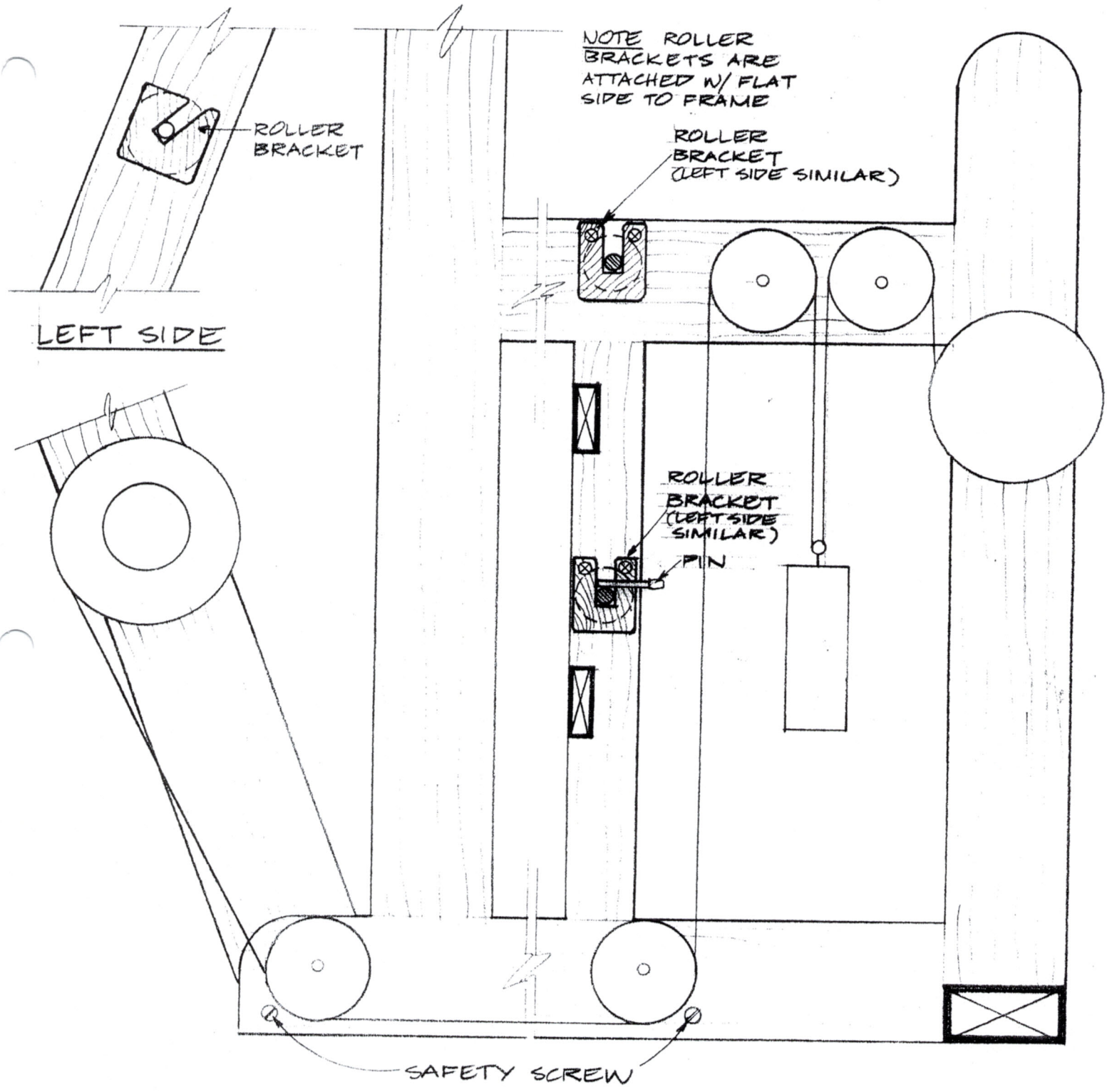
6. Insert the retention pin through the hole in the cloth storage drum (see Figure 17).

7. Attach the counter weight to the counter weight pulley.



CLOTH TAKE-UP DRUM

FIG. 18



SECTION THRU LOOM SHOWING RIGHT SIDE

ROLLER BRACKET PLACEMENT

FIG. 19

OPTIONAL EQUIPMENT

The following section is for optional equipment only. If you have ordered anything that would fall into this category simply flip to the section needed and follow the directions. Should you decide to order any additional equipment in the future the directions for their assembly and/or use are located in this section. Included in this section are:

Single Box Flyshuttle Beater

Double Box Flyshuttle Beater

AVL Handshuttles & Bobbins

Raddle

Second Plain Beam

Half Yard Sectional Beam

Tension Box & Track

Automatic Cloth Advance System

Warp Beam Flanges

Locking Brake System

SINGLE BOX FLYSHUTTLE BEATER (Optional Equipment)

NOTE: The single box flyshuttle system now incorporates removable shuttle boxes. This allows the weaver to completely remove the boxes and flystring tie-up from the loom any time that handshuttle weaving becomes necessary. It also makes it much easier to convert any other AVL beater system to a single box flyshuttle beater.

Locate the shuttle race, beater top, two legs, hardware, string tie-up, reed, and reed support (see Figure 21). 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 toward the front. Now lay the race across the loom in the approximate position it will be when in use.

Empty your hardware bag on a table top. Separate the 5/16" x 3 1/4" carriage bolts, washers and hex bolts. Look at your beater legs. They are identified as to left and right by a stamp. 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. Tighten the nuts on the left side.

From your hardware package locate six 5/16" x 3" carriage bolts with the washers and wing nuts. Push the carriage bolts through the race so that their heads sit flat on the front of the beater 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 and tighten them, making sure that the reed is centered in the beater.

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 20. Insert two 5/16" 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 with the washers and hex nuts.

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 1/2" 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.

Now locate the long hook from the beater hardware package and screw it into the center hole on the bottom edge of the front Harness Pulley Support (just underneath the AVL nameplate). Refer to Figure 22.

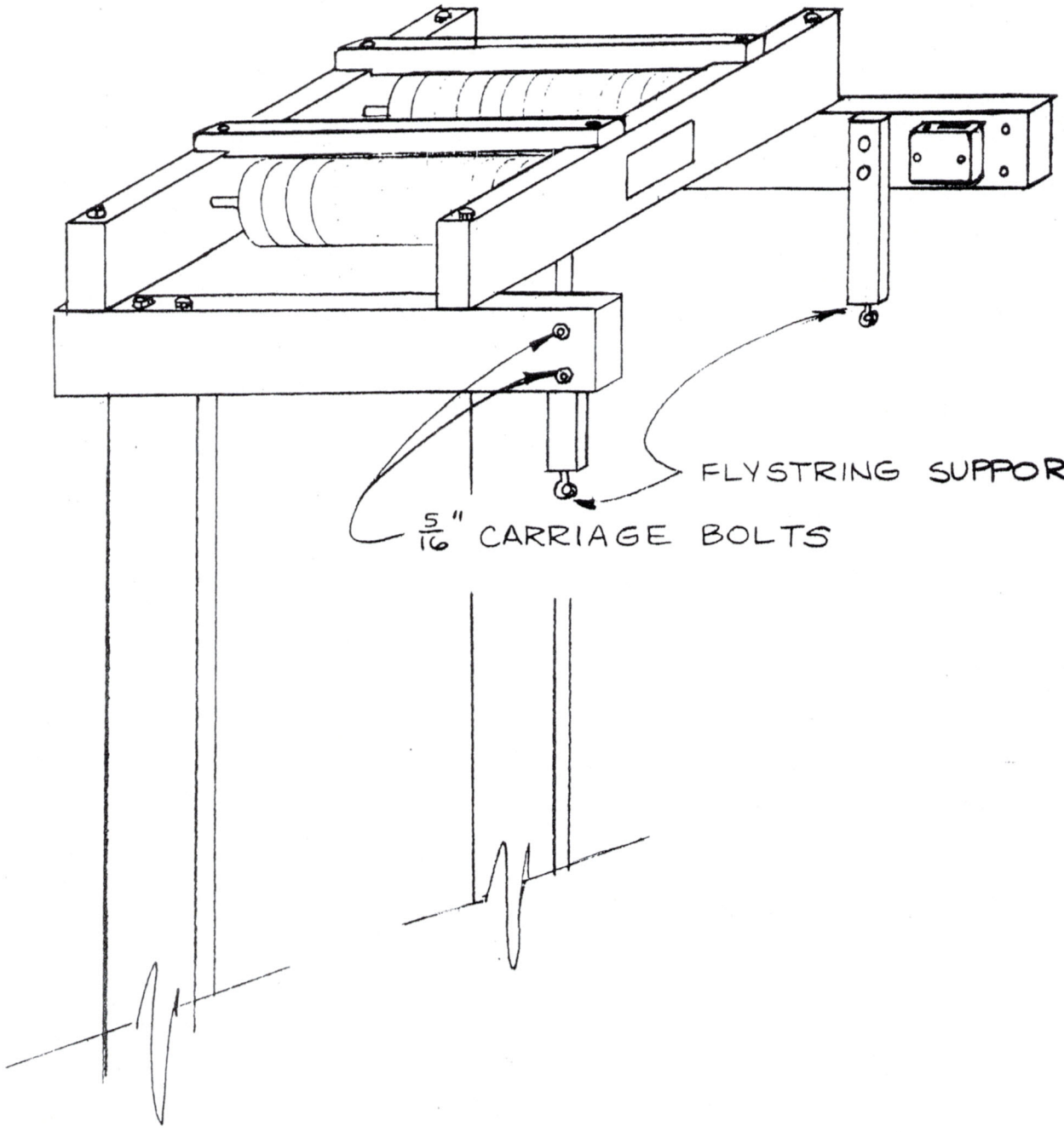
Take the string tie-up handle from its bag. As you can see, there are three screweyes coming out of the handle one at the top and two at the sides. Hold the handle up by the screweye at the top of the handle. When not in use, the flyshuttle handle can be hung from this screweye on the hook that's located directly below the AVL name plate.

At this point, there are two pickers hanging below the handle. Take one of these 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 attach the clip at the end of the cord to the screweye on the flystring support that you installed earlier.

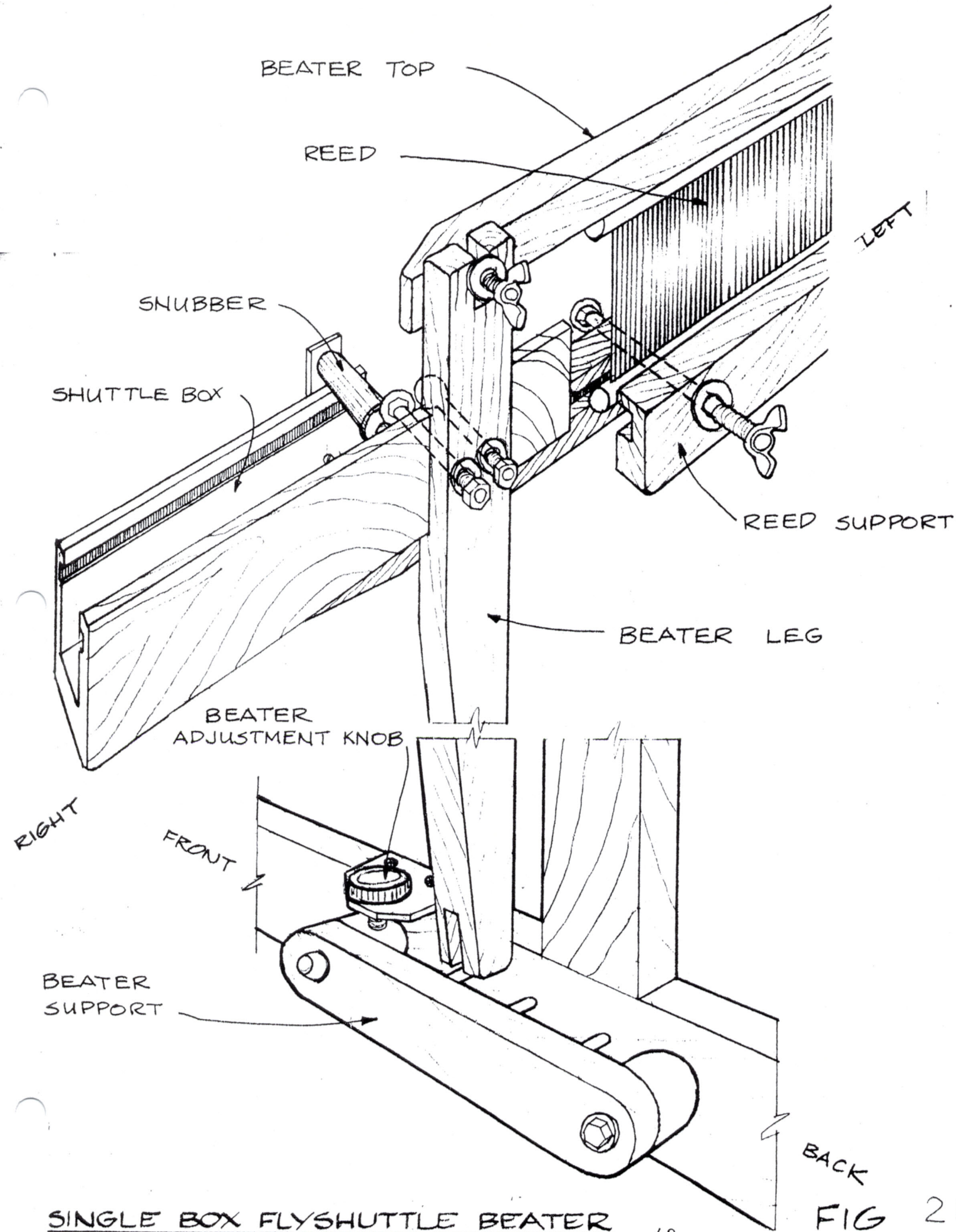
Now, pick up the left picker and with the leather loop down and toward the outside, slide it into the grooves in the box side from the very outside of the race. Attach the clip at the end of the cord to the screweye on the remaining flystring support. Now, notice that there is a snubber attached to the 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.)

This completes the assembly of the Single Flyshuttle Beater.

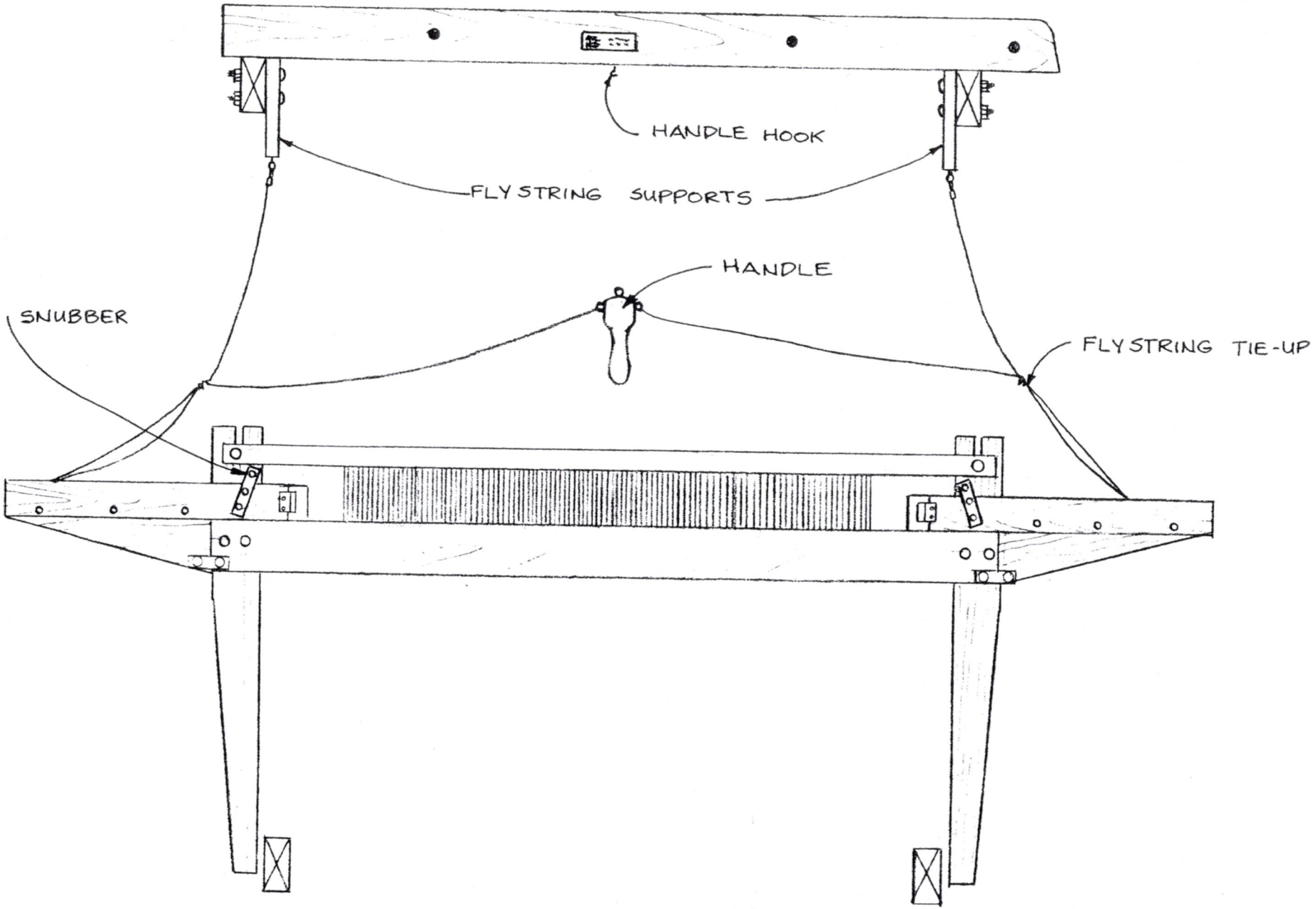


ATTACHING FLYSTRING SUPPORTS

FIG. 20



SINGLE BOX FLYSHUTTLE BEATER FIG 21



SINGLE BOX FLYSTRING TIE-UP

FIG. 22

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 23 through 25 for help with terminology and locations.

1. 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" 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.

   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.

2. 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.

3. 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.

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

Multiple-Box Flystring Tie-Up Assembly

Vertical Pull Flystring Tie-Up

5. Locate the bag marked "Flystring Tie-up" and remove its contents. These pieces can now be assembled on the loom as shown in Figures 23 through 25. Use the two screws to attach the upper 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 22 and 24 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.

6. Now you are going to have to tie an overhead knot in the cord between the two Upper Pulleys (see Figure 24). 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.

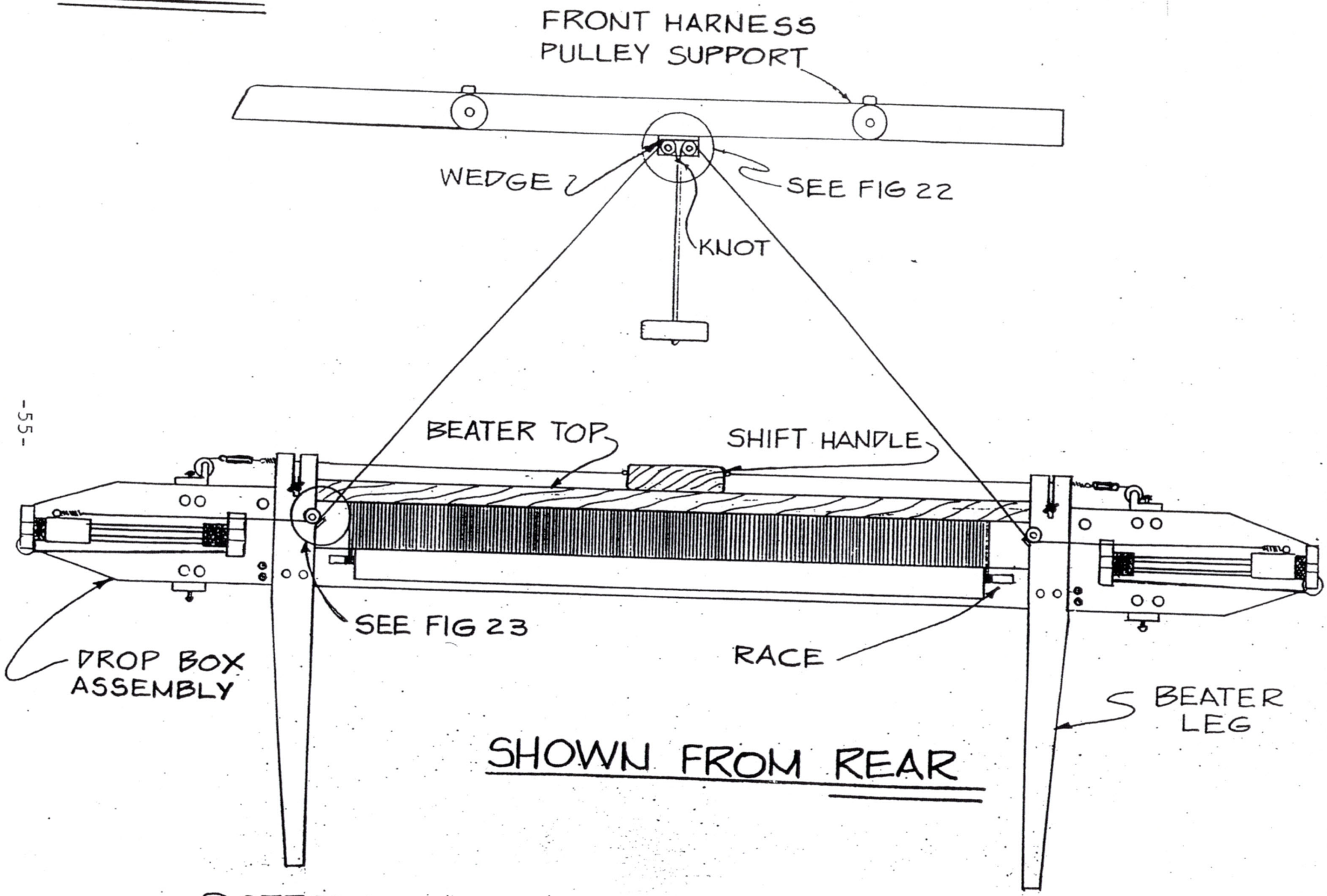
7. The next step is to adjust the movement of the shuttle drop boxes themselves. You will notice that the boxes slide up and down on a metal rod which is fixed at both ends to cast metal pieces. In each of these cast metal pieces you will find a brass adjustment screw with a locknut (see Figure 25). 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.

8. 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 25) and the eyebolt threads into the turnbuckle on the end of the cable coming from the Shift Handle. 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 23 to be certain you've gotten everything correct.

REAR VEIW



SHOWN FROM REAR

BOTTOM SWING
DOUBLE BOX FLYSHUTTLE BEATER

FIG. 23

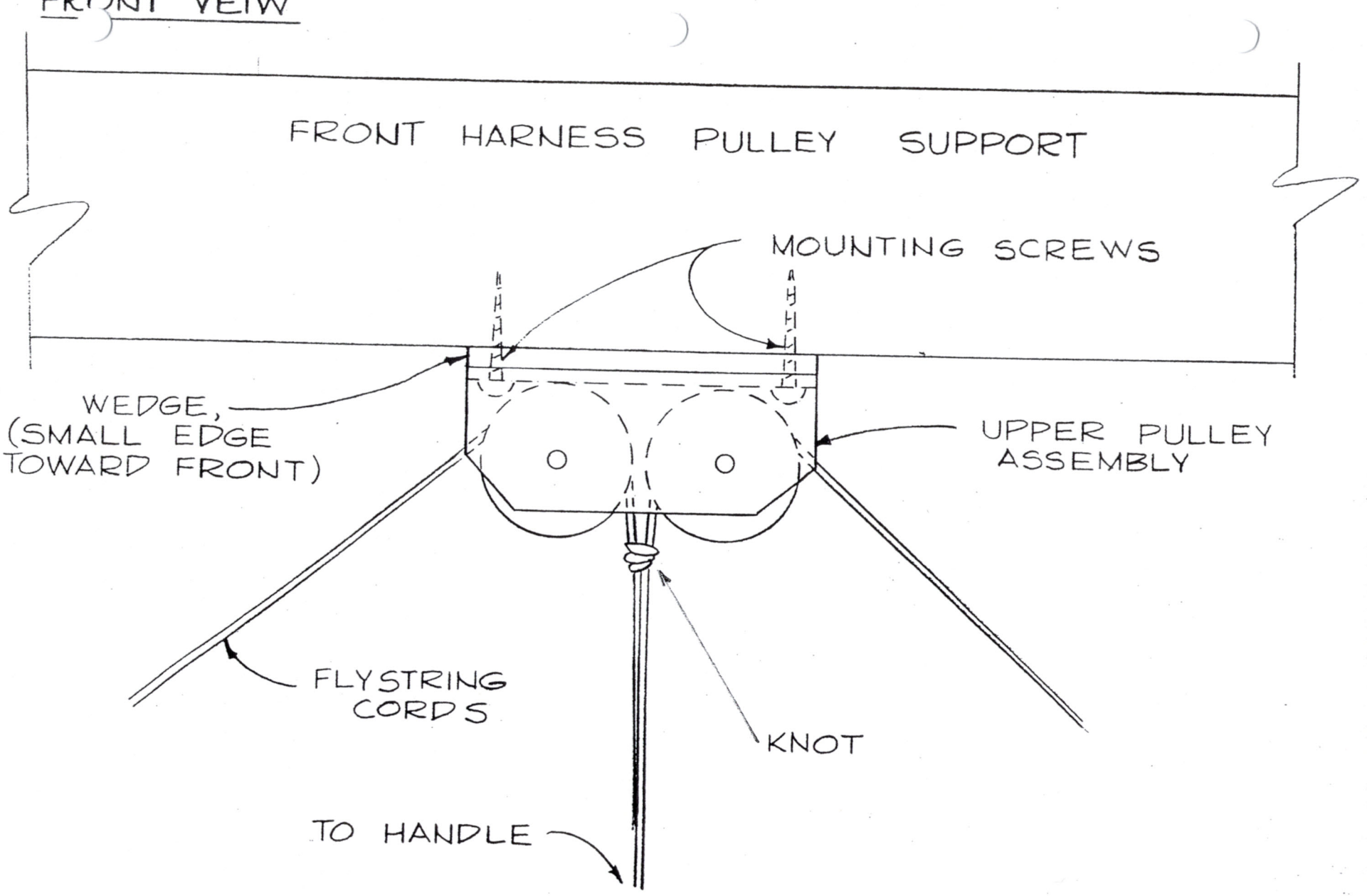
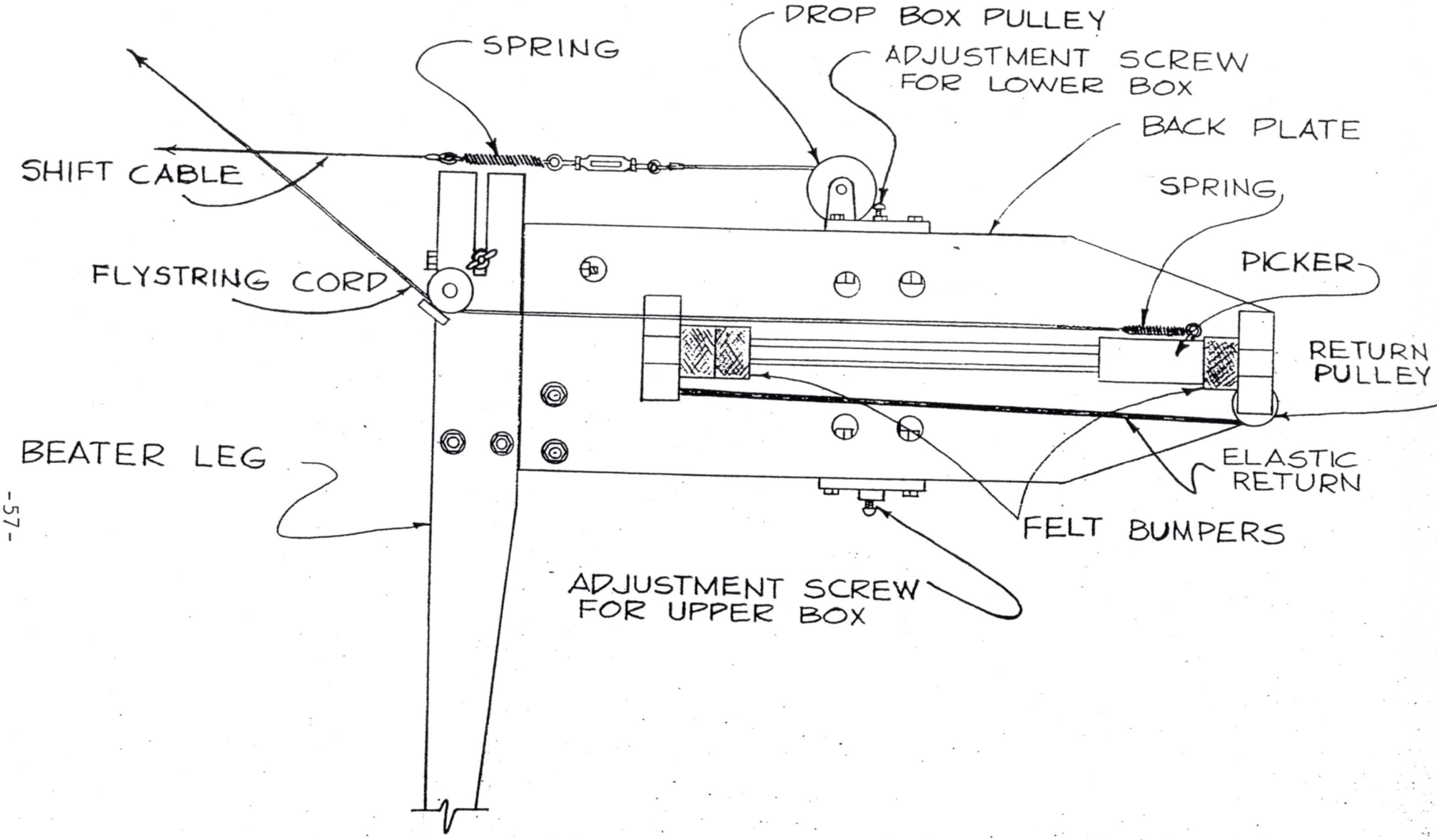


FIG. 24

UPPER PULLEY ASSEMBLY - SEEN FROM FRONT OF LOOM

REAR VEIW



BACKPLATE ASSEMBLY (LEFT SIDE SHOWN) FIG. 25

AVL HANDSHUTTLES & FLYSHUTTLES (Optional Equipment)

AVL Looms' 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 thus unwinding thread even after the shuttle is caught. The stationary bobbin allows the weaver to more easily obtain a clean selvage edge. Some AVL shuttles also have a built in adjustable tension devise that puts the proper tension on the thread as it comes off the bobbin. This eliminates the need to lay in each weft shot and thus greatly speeds up the weaving process.

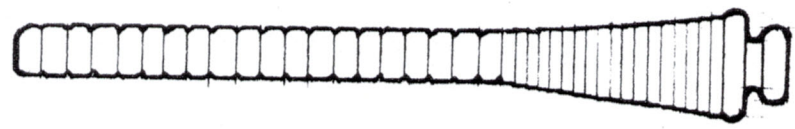
Stationary bobbins are wound quite differently than the spinning bobbins. They are <u>not</u> wound back and forth from one end of the bobbin to the other, so please practice the following technique until you get it right.

Use a standard size bobbin winder; a hand winder will work but an electric one is better; and some sort of tensioning devise is ideal since the thread must be wound very tightly for best results. Make a few winds of the thread over itself about one and a half inches down from the large end of the bobbin and then place it on the winder. Wind the thread **TIGHTLY** onto the bobbin in continuous overlapping two inch layers starting at the large end of the bobbin and working downward (refer to Figure 26). Each layer will be tapered toward the small end of the bobbin and be cone shaped like the first layer which is pre-shaped for you at the large end of the bobbin. For each layer wind the thread tightly and quickly back and forth covering a two inch area until that layer is complete, then move down one fourth of an inch and start a new layer which will overlap one and three quarter inches of the last layer. Keep repeating these tapered overlapping two inch layers until there is one half inch left at the end of the bobbin. You will learn to know when each layer is complete, if the layers are too fat the bobbin won't fit into the shuttle, but if they are too thin you won't get as much thread on the bobbin and it will have to be changed sooner. Wind many bobbins at once so it won't be necessary to stop and wind bobbins while weaving.

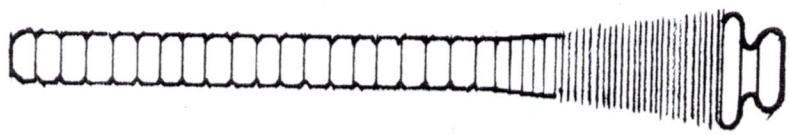
Now uncoil about six inches of thread off the bobbin and pass the end of this thread through the two middle plates of the tensioner at the end of the shuttle.

Now pass the thread through the curved opening and out through the eye on the side of the shuttle.

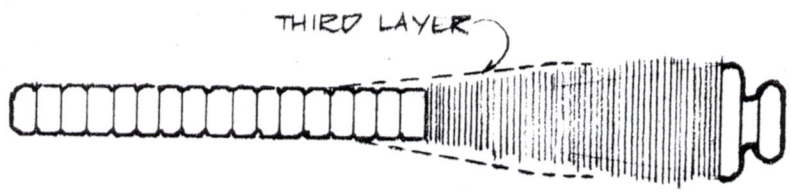
Pull up the metal rod in the middle of the shuttle and slip the large end of the bobbin onto it, it might be a little stiff at first; and then push the bobbin down into place so that the groove in the end of the bobbin straddles the retaining pin in the bottom of the shuttle. This prevents the bobbin from



EMPTY BOBBIN



FIRST LAYER OF THREAD



SECOND LAYER

FULL BOBBIN

WINDING THE BOBBIN

FIG. 26

slipping off of the shaft. The shuttle is now ready to be woven with, but, if you have a tension device, first take another look at the tensioner. You'll notice that on the outside of the shuttle are two adjusting screws, one on each side. By screwing in these screws you increase the pressure of the spring on the middle tension plates and thus increase drag on the thread running between them.

So throw a few weft shots with the shuttle and then check your selvedges. If the selvedges are too loose, increase tension using a small screwdriver; if tension is too great and the selvedges are drawing in, reduce tension. It may take a little experimenting to get it just the way you want it, but when properly adjusted they work beautifully, so have fun.

If you have an AVL handshuttle with a ceramic eye you can control tension by running your thread through one or more of the vertical posts on the outside of the shuttle. The more posts you use, the more tension and vice versa.

Some AVL shuttles also have replaceable tensioners so you can change the system for different type yarns. Look underneath the shuttle for a large screw that's located under the tension device. Removing the screw will allow you to pry out one tension device and insert another one. In this way you can use virtually any type yarn or thread with your AVL shuttle.

A little trick that speeds up bobbin changing is to make the change before you have completely run out of thread. Simply unwind the last little bit off the bobbin and tie the end of it to the end of thread on the new bobbin. Then pull on the old thread to bring the new thread through the holes. This eliminates the necessity of having to rethread each time you change bobbins.

RADDLE (Optional Equipment)

The Raddle #41 is inserted into the holes in the back edge of the folding legs (see Figure 18 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 (see Figure 27).

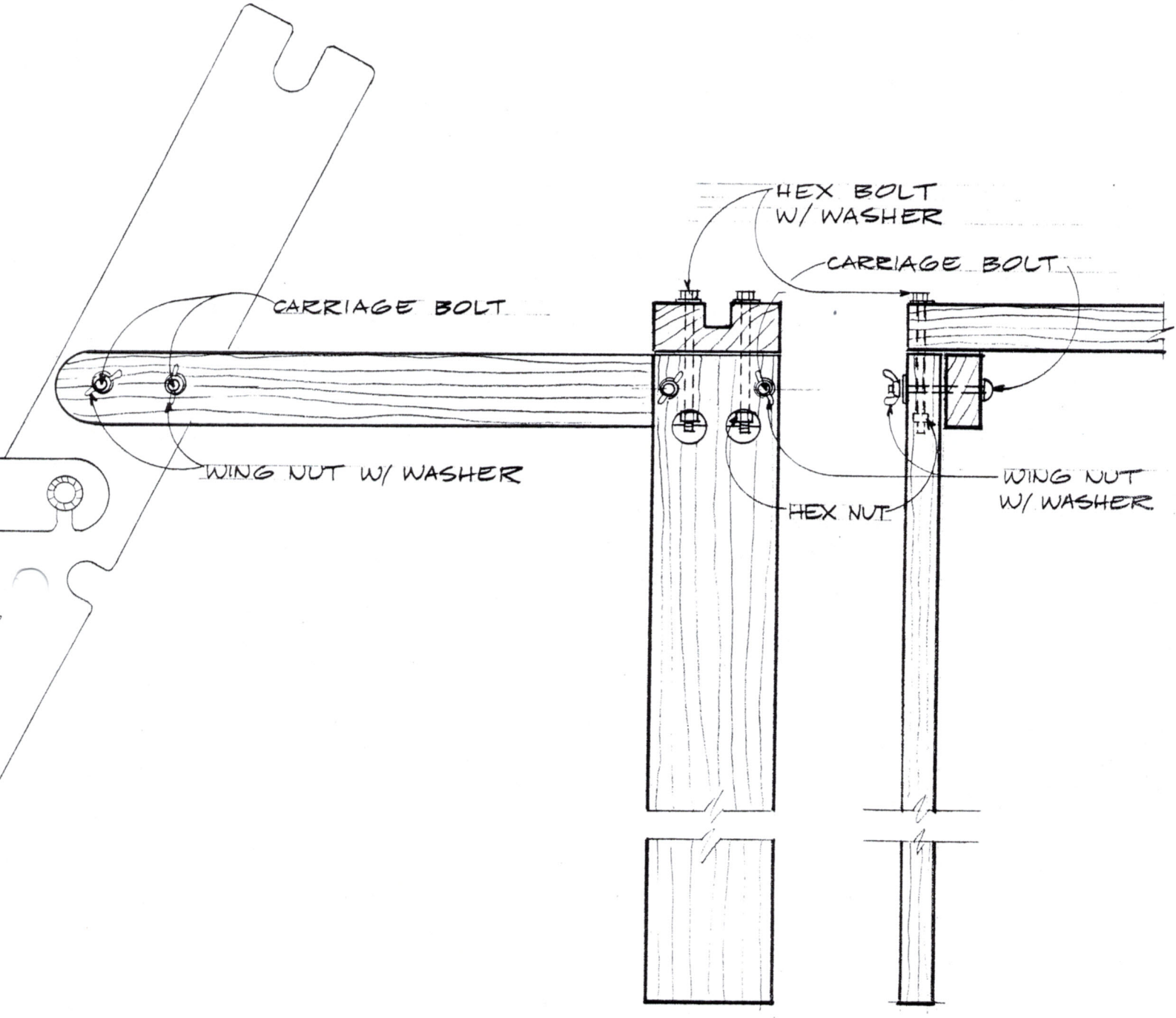
1. Insert the four 5/16" x 2 1/4" carriage bolts into the vacant "through" holes (beneath the separation rollers) in the folding leg from the inside. Now mount the rounded end of the tension box track arms onto these bolts with the squared off end protruding out away from the loom. Make sure these are mounted to the outside of the folding legs and secure with washers and wing nuts.

2. Next, connect the tension box support arms to the tension box legs using the 5/16" x 2" carriage bolts provided making sure the arms are to the inside of the legs and the wing nuts are facing outward.

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

4. 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 track assembly, you've only to remove the four wing nuts fastening the tension box support arms to the folding legs.



TENSION BOX ASSEMBLY

FIG. 27

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 the left, into the open slots and pivot the brackets so that they are in contact with the black knobs and are in a vertical position. Tighten them down securely.

INSTALLING THE HALF YARD SECTIONAL BEAM (Optional Equipment)

If only one sectional beam has been ordered it should be installed in the lower position. If another beam is ordered it should go in the upper position, even if it is a sectional beam. However, when using the sectional beam in the upper position it is important to also use the AVL tension box.

To install the sectional beam in the lower position simply follow the directions given for the second plain beam (above).

Install the second sectional beam, if ordered with the large wooden drum to the right, in the two slots at the top of the folding legs. Temporarily remove the two warp beam retention pins before setting the beam in place.

Tensioning a Beam in the Upper Position

Locate the tension device. This consists of a large and a small spring, a length of cord, an adjusting cord and clamp and the anchor bracket which is premounted on the right folding leg.

Grasp the tie-up by the large spring and hook it to the rear stud of the tension bracket, as shown in the drawing titled "Tension Device" (refer to the figure index for location). Bring the cord up and four times around the tension drum in a counter clockwise direction, being sure not to cross the cord over itself. Now hook the other end, a metal ring, to the front stud of the anchor bracket.

Tensioning a Beam in the Lower Position

Locate the tension device. This consists of a large and a small spring, a length of cord, an adjusting cord and clamp and the anchor bracket which is premounted on the inside of the left folding leg.

Grasp the tie-up by the large spring and hook it to the front stud of the tension bracket. Bring the cord down and wrap it three times around the tension drum of the beam in a clockwise direction, as seen while facing it. Be sure that the cord is not crossed over itself. Now clip the metal ring to the rear stud of the tension bracket.

AUTO ADVANCE ASSEMBLY INSTRUCTIONS

There are two ways to receive the AVL Auto Advance. One way is with your loom. The other way to receive it is as a retrofit to your present AVL loom.

The following is a complete list of parts and assemblies necessary for the Auto Advance system. Depending on the loom you have now, you will receive all or only some of these parts and assemblies. If you see some items that are on this list that you didn't receive, don't worry, you probably already have them on your loom. These instructions are written so that anyone can put the Auto Advance System together starting from any 40" AVL Modular or 16 Harness Dobby Folding Loom.

Left beater leg with eight pin holes
Auto Advance vertical cap with bronze oilite bearing
Cloth beam gear
1/8" allen wrench
Advancing mechanism with #18 pick wheel
Advancing linkage with leg pin
Top drive assembly
Seven pick wheels (20, 22, 24, 26, 28, 30, and 32)
5/16" x 5 1/2" hex bolt (one each)
5/16" x 7 1/2" hex bolt (one each)

1. If your present left beater leg doesn't have a series of holes near the bottom of it, replace it with one that does. Replace the legs back on the rear beater support pins (the pins that the legs sit on). The rearmost pin is the best pin position with the Auto Advance system.

2. Remove the vertical cap, located to the left of your cloth beam, by removing the hex bolt. Save the square nut and the washer as you will be using these later.

3. If your cloth beam came with a black gear mount at the left end, go to step 4.

   Lift out your cloth beam. The one inch wooden spacer located at the left end of the beam must be removed and replaced with the black gear that came in your Auto Advance kit. Use the same 3 screws and screw holes as with the wooden spacer. (Be sure to tighten the screws down securely.)

4. Remove the Left Front Cloth Beam Vertical Cap. This is the small piece that holds the left side of the Cloth Beam in place.

5. Locate the Auto Advance vertical cap (see Figure 28 for identification). Orient it as shown in the drawing. Slip the left end of the cloth beam (the end with the black gear) into the corresponding hole in the vertical cap. Replace the cloth advance handle onto the right side of the beam and slip this end back into the large hole to the right side of the loom. Secure the Auto Advance vertical cap to the main body of the loom using the two 5/16" hex bolts sent with the package and the two washers and square nuts you removed earlier. Be sure to slip the washers over the bolts before inserting the bolts into the holes.

6. Remove the cloth beam ratchet pawl. This is located on the right cloth beam vertical. It can be removed by simply unscrewing the hex nut located on the outside of the cloth beam vertical and pulling the bolt/pawl assembly out from the inside.

7. Locate the top drive assembly (see Figure 28). Using the 1/8" allen wrench provided, loosen the set screws in the small gear and remove it and one of the plastic spacers from the shaft. Insert the shaft, from the outside of the loom, into the bronze oilite bearing in the Auto Advance vertical cap. Slip the plastic spacer and the small gear, with the toothed side closest to the side frame, onto the shaft. Leaving about 1/32" between the plastic spacer and the bronze oilite bearing, tighten down the set screws in the small gear so that you're certain they won't slip.

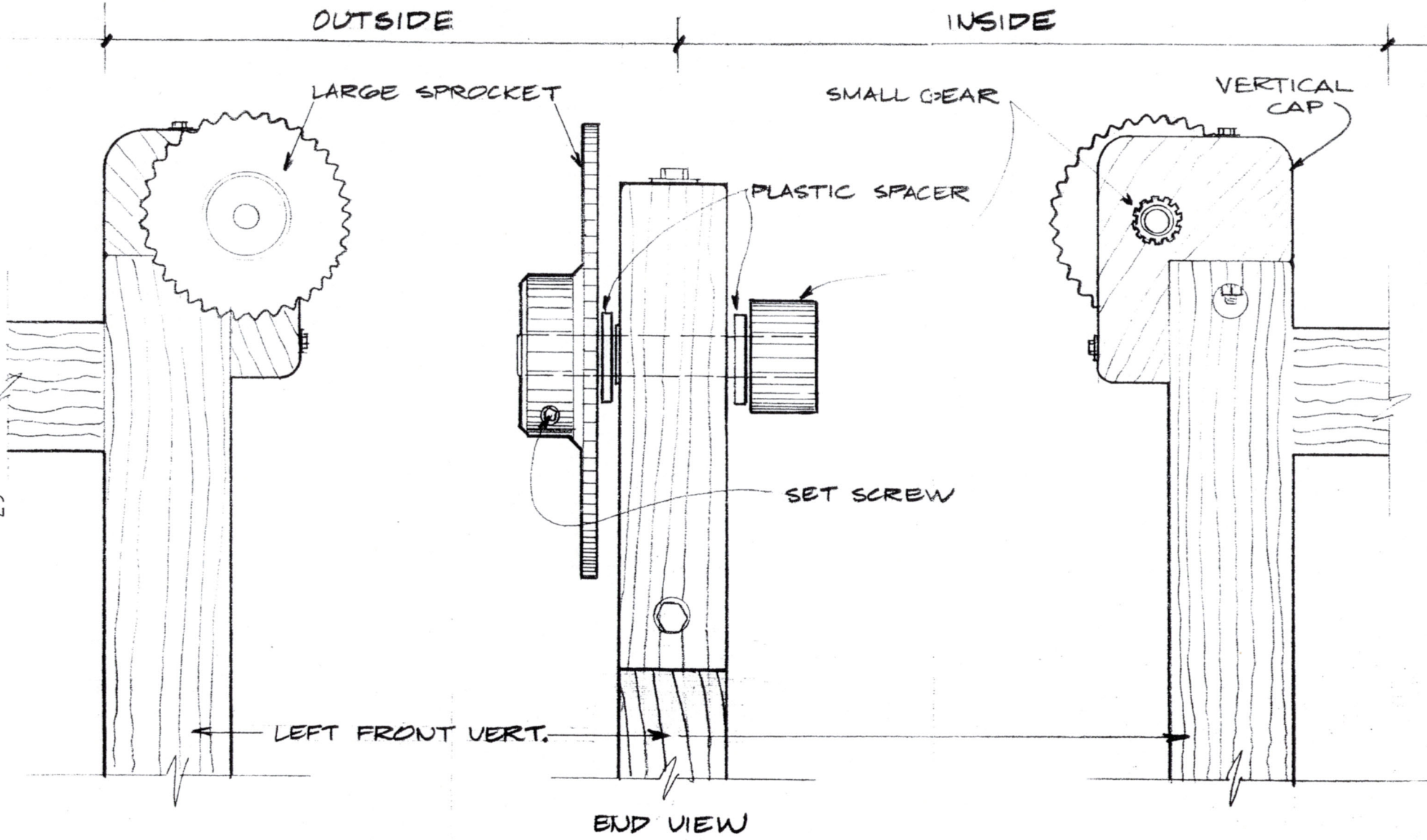
8. Locate the advancing mechanism (see Figures 29 and 30). Orient it as shown in Figure 31 to the outside of the left front vertical.

   Run the chain over the top of the large sprocket in the top drive assembly and down around the small sprocket located in the advancing mechanism.

   Line up the holes of the advancing mechanism with the holes in the left front vertical and fasten them together with the bolts provided.

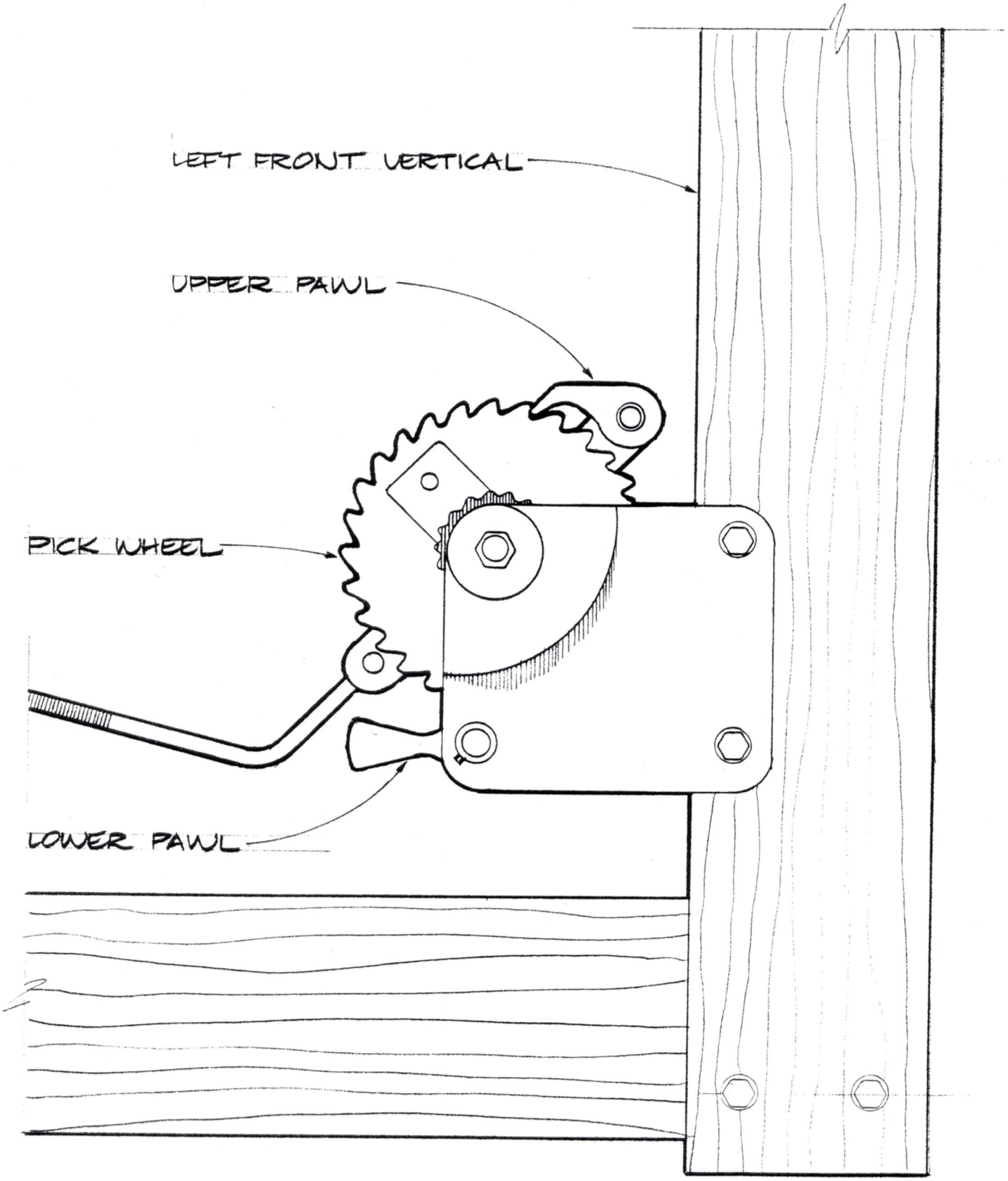
9. In your Auto Advance system the picks per inch are determined by four factors - the pick wheel, the leg pin position, the drive arm position and the drive arm post position.

   Look at the **PICK TABLE** to determine which wheel and leg pin position is required for the picks per inch you need.



TOP DRIVE ASSEMBLY

FIG. 28



ADVANCE MECHANISM FROM OUTSIDE FIG. 29

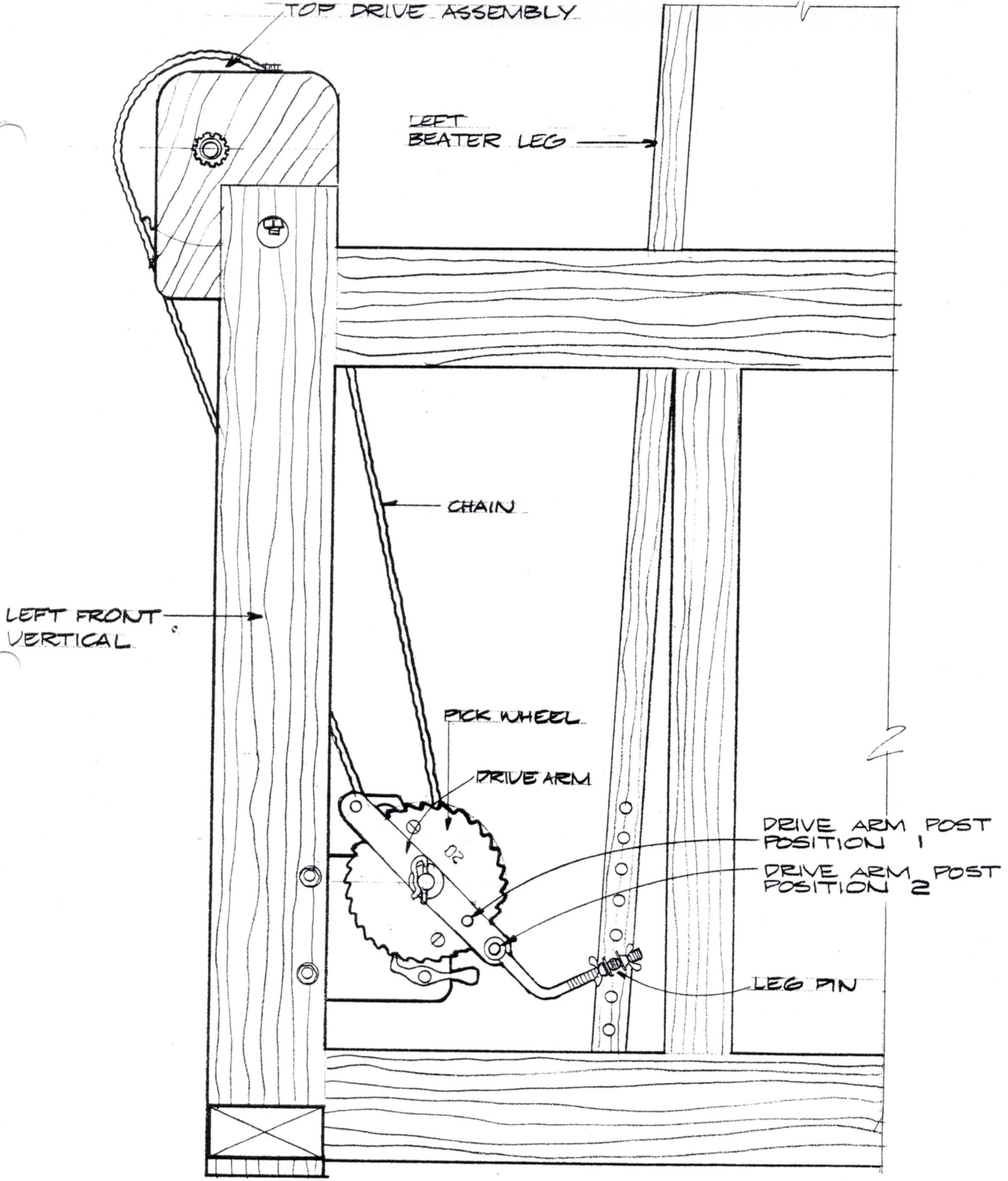


FIG. 30

COMPLETE AUTO ADVANCE MECHANISM FROM INSIDE

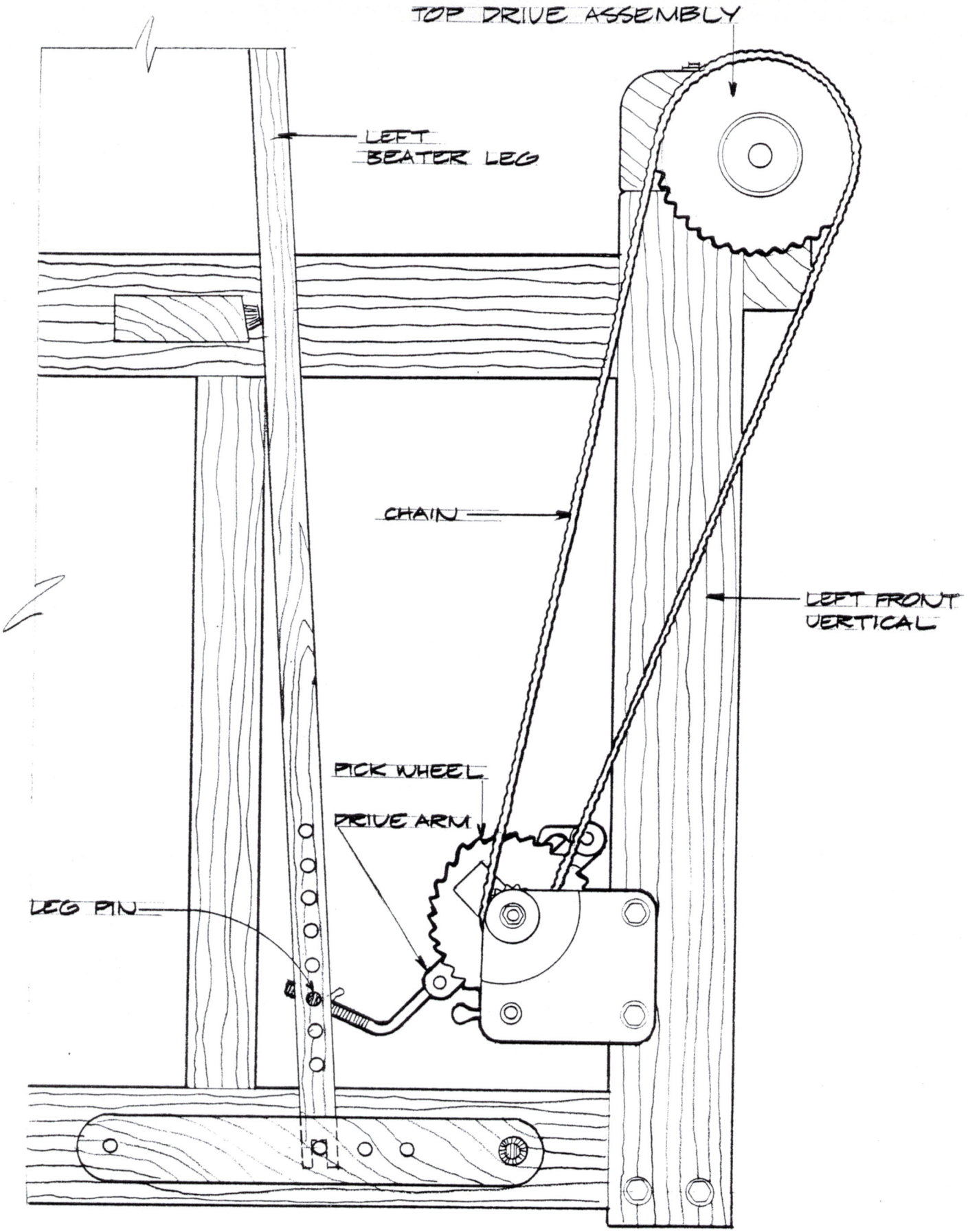


FIG 31

COMPLETE AUTO ADVANCE MECHANISM FROM OUTSIDE

To change the pick wheel here's all you need to do.

A. Pull off the hitch pin clip shown in Figure 32.

B. Pull the drive arm assembly off.

C. Unscrew the two screws holding the pick wheel to the bracket.

D. Put on the new pick wheel, with the number facing the inside of the loom. Screw each screw in loosely, then tighten.

E. Slip the drive arm assembly back on. Slip the hitch pin clip back over the rod.

10. Slip the advance linkage bearing end over the pin on the drive arm assembly while inserting the leg pin into the desired hole in the left leg (see Figure 34). The advance linkage is held in place on the pin by tightening the stop collar with the set screw provided.

11. Turn the drive arm assembly in such a way that the round end of the upper pawl is about 1/2" from the inner edge of the left front vertical (see Figure 32). Seat the pointed end of the pawl into the gullet between two of the pick wheel teeth.

12. Warp up your loom if you have not already done so and apply the desired warp tension.

13. The next step is to adjust the upper pawl so that it sits properly between the teeth of the pick wheel. The pawl is adjusted by moving the advance linkage wing nuts along the advance linkage. The proper starting pawl adjustment can be seen in Figure 32. This must be done whenever the pick wheel is changed or the leg pin is moved. If you've adjusted everything properly and you aren't getting the correct picks per inch you'll need to place the pawl into a gullet further forward and readjust.

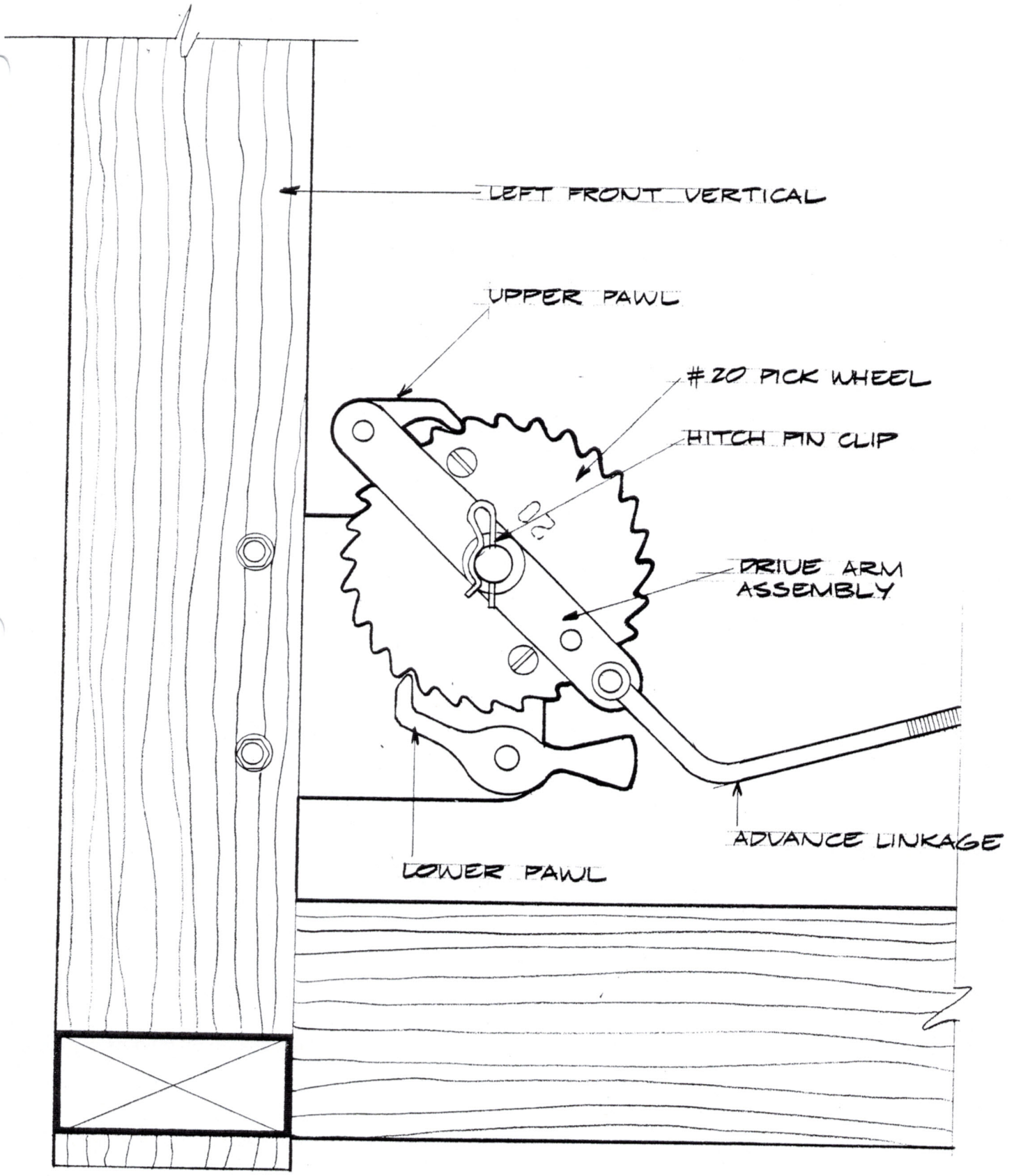


FIG 32

ADVANCE MECHANISM FROM INSIDE

USING THE AUTO ADVANCE SYSTEM

The AVL Auto Advance system is an efficient means by which you can automatically advance your warp as you are weaving. It allows you to maintain an absolutely consistent beat throughout your warp even after changing weft material.

NOTE: Due to the fact that the picks per inch vary according to the diameter of the front cloth beam, the rear cloth storage is highly recommended for use in conjunction with the Auto Advance system.

For this reason also, a long apron should be used so that you can start your warp directly on the rear cloth storage roller.

With your loom warped and tensioned and the Auto Advance system adjusted, pull your beater forward so that it lightly contacts the front bumpers. Now bring it back so that it contacts the rear bumpers. (This full swing of the beater is crucial to the proper functioning of the Auto Advance system.) Repeat this sequence slowly a few times, checking to see that the "increment clicks" are the same as those listed on the Pick Table for your desired picks per inch. (Increment clicks are the number of pick wheel teeth passed with every beat. For example, using the #30 pick wheel you can get 30, 15 or 10 picks per inch depending on the increment clicks. One increment click means that the cloth advances at every tooth - 30 picks per inch. Two increment clicks means that the cloth advances every other tooth, giving you 15 picks per inch and three increment clicks means that the cloth advances every third tooth - 10 picks per inch.) The cloth advances as little as 1/30 and as much as 1/6 of an inch with every beat.

The following formula may come in handy for determining the rate at which your cloth will advance while using the Auto Advance System:

$$\frac{\text{Number of Pick Wheel}}{\text{Number of Clicks}} = \text{Picks Per Inch}$$

The Pick Table is a guideline for your convenience. It lists only one way to obtain the desired picks per inch. With a little experience you can develop an alternate series of adjustments to fit your needs. For example, the Pick Table lists pick wheel #30 as a proper wheel for 10 picks per inch. You can also use #20 pick wheel however, if this best fits your needs at the time.

Automatic Cloth Advance
Pick Chart (inch)

Regular Automatic Advance Mode

Sprocket Configuration: 48 Tooth x 13 Tooth with Short Chain

Picks Per Inch	Pick Wheel #	Pin Position	Increment Click
3.5	18	8	6
3.5	22	8	6
3.75	26	8	7
4	20	8	5
4	24	8	6
4	32	8	8
4.25	30	7	7
4.5	22	7	5
4.75	24	7	5
4.75	28	7	6
5.25	26	5, 6	5
5.25	32	6	6
5.5	28	5	5
6	18	5, 6	3
6	30	4, 5	5
7.25	22	4, 5	3
8	24	3, 4	3
8	32	4, 5	4
8.5	26	3	3
9	18	2, 3, 4	2
9.25	28	3	3
10	20	4, 5	2
10	20	1, 2	2
10.5	32	2, 3	3
15	30	2	2
16	32	1	2
22	24	1	1
24	24	1	1
26	26	1	1
28	28	1	1
30	30	1	1

FIG. 33

If you want to back up your cloth for any reason here's what you'll need to do. With the cloth beam handle, which is located to the right of the cloth beam, release the warp tension. Now, reaching down to the Auto Advance system disengage the lower pawl by applying upward pressure on the large end. Flip the upper pawl away from the pick wheel. Your cloth beam is now free to turn. Once you feel you have it about where you want it, advance the cloth beam with the manual handle until, with the beater in a forward position (against the front bumpers), your last shot is in contact with the reed. Put the upper and lower pawls back into their proper position and continue weaving.

WARP BEAM FLANGES

Warp beam flanges are used to support the edge yarns while warping and weaving. They replace the wound-in paper that is sometimes used for this purpose.

Prior to installing the flanges you should have the warp stick and ends in the groove of the warp beam and the fiber thru the raddle and ready to be warped.

To install the flanges simply remove the bolts connecting the flange halves together. Now fit them around the beam, to the outside of the warp, making sure the flat faces are toward the warp. Adjust the flanges so that they are exactly in line with the center of the raddle pins just to the outside of each edge of the warp. Tighten up the bolts securely. Continue with the warping process.

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, upper or lower

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 (refer to Figures 34 and 35)

1. Tension Cable (Part 1)

   Disconnect your present tension cord. Unwrap it from around the warp beam drum.

2. 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.

3. 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.

4. 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.

5. 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.

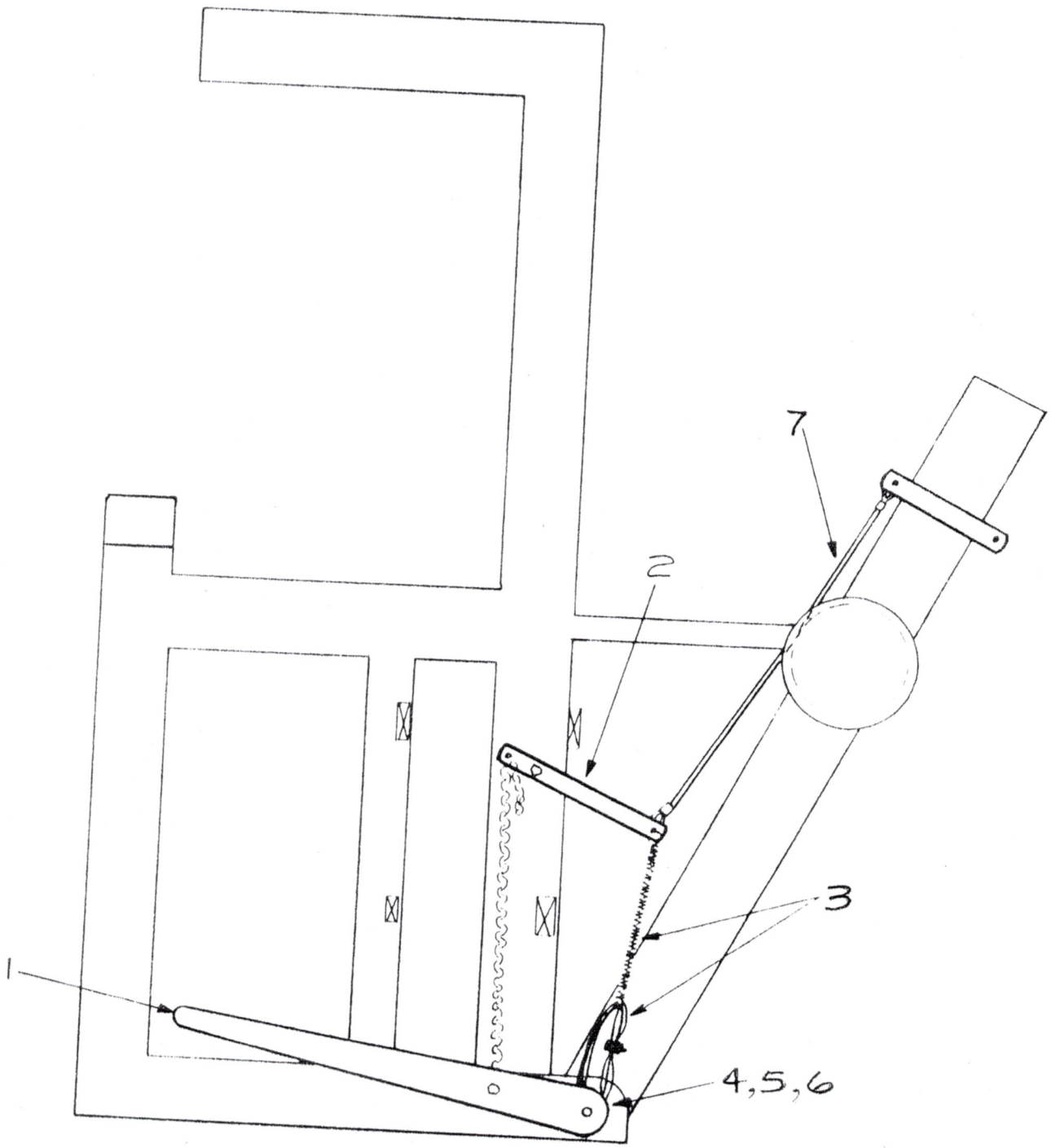
Look down at the foot lever and notice the chain that is attached to the eyebolt. This can now be attached to the forward most "S" hook on the foot lever release. The ideal position for the front point of the foot lever is about four inches from the floor. Use the links of the chain to adjust the height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

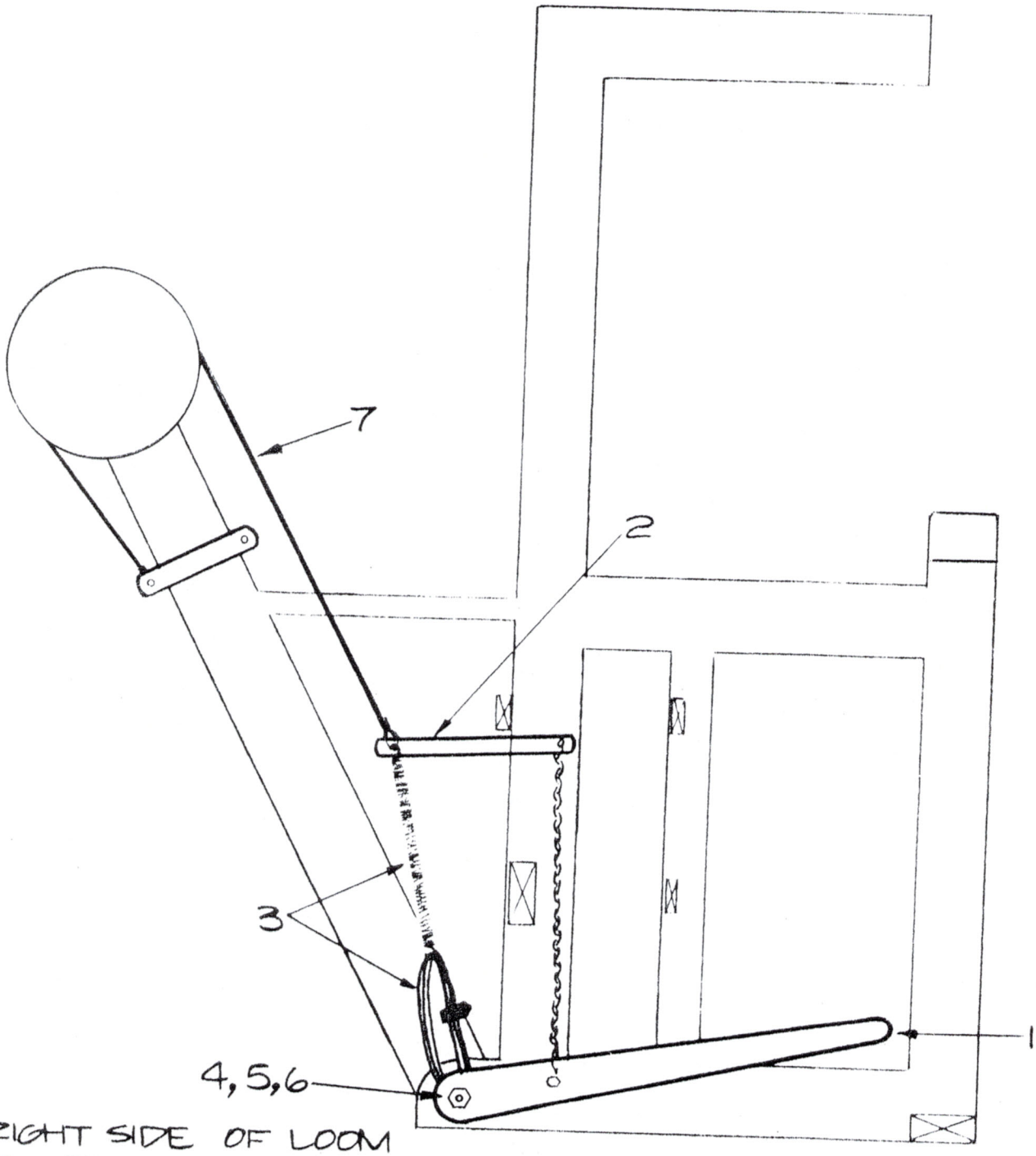
To advance the warp, simply depress the foot lever, turn the cloth beam handle and release the foot lever.



LEFT SIDE OF LOOM AS SEEN FROM INSIDE

LOWER BEAM LOCKING BRAKE ASSEMBLY

FIG 34



RIGHT SIDE OF LOOM
AS SEEN FROM INSIDE

UPPER BEAM LOCKING BRAKE ASSEMBLY

FIG 35

LOOM MAINTENANCE

Your AVL Loom, like all high quality equipment, must be properly maintained in order to insure many years of consistent, reliable service. Periodic inspections of your loom are imperative. The frequency of these inspections depends upon relative use and humidity among other things. The loom maintenance schedule suggested below is targeted for a loom located in an area of average humidity, with average use (say 10-15 yards per week). If your loom will be located in an area of above or below average humidity and your use is less or exceeds that of the example, adjust your inspections accordingly.

DAILY INSPECTIONS

1. Check that all cables are riding in their assigned pulleys.

WEEKLY INSPECTIONS

1. Check that all pulleys are moving freely.

MONTHLY INSPECTIONS

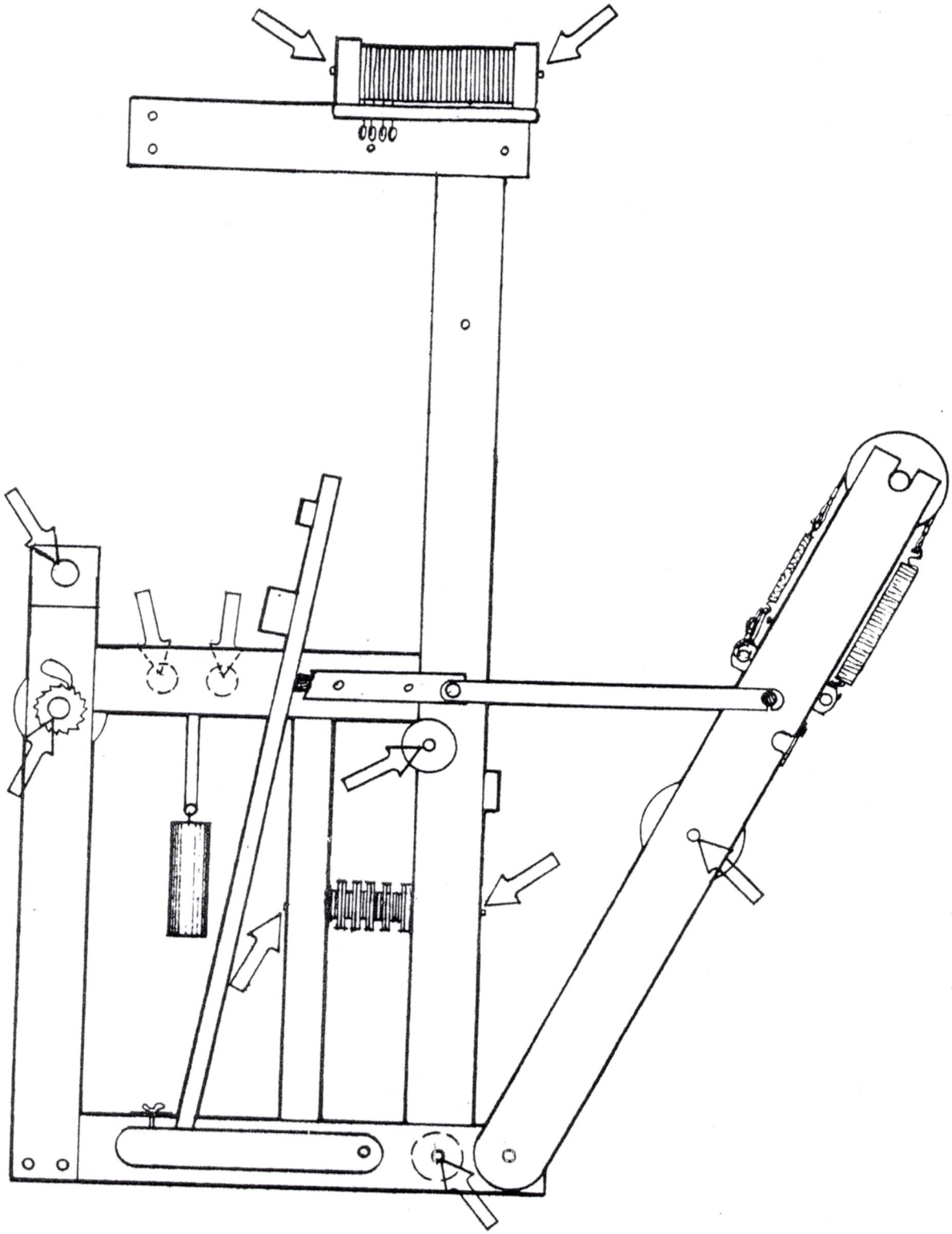
1. Lubricate all points specified on the Lube Chart (we suggest WD-40 in a spray can). Also lubricate all moving metal/wood junctions (i.e., all pulley rods, the spring lever axle rods, etc.). Don't lubricate the warp or fabric surfaces of any beams or rollers or the warp beam tension drums.

2. Check all bolts for tightness.

3. Check that all cords and cables are intact and not frayed.

YEARLY INSPECTION

1. Check to see that your loom is properly protected. Most parts of the loom were originally finished with a high quality moisture resistant lacquer. This lacquer finish should need no maintenance. However, scratches can be repaired with either clear semi-gloss lacquer or clear fingernail polish. Larger blemishes can be refinished by using a clear semi-gloss finish such as Deft. It would be best if this were done by a person with some previous experience in applying wood finishes.



LOOM MAINTENANCE LUBRICATION POINTS FIG 36

TROUBLE SHOOTING

The Problem	The Cause	The Remedy
Harnesses don't raise properly	Harness cables have been hooked to wrong harness	Rearrange cables
	Chains from spring levers have been hooked to wrong harnesses	Rearrange chains
	Copper hooks on spring levers have been bent	Straighten hooks with pliers
	A harness cable has slipped off its pulley	Put cable back on pulley
	A treadle cable has slipped off its pulley	Put cable back on pulley
Small or uneven shed	Beater not adjusted properly	Adjust according to weaving instructions
Harnesses jam up on each other	Heddles not distributed evenly over harness sticks	Redistribute heddles evenly on both sides from the center of the harness sticks
Squeaking noise when harnesses are raised	Probably in treadle or harness pulleys	Isolate where the squeak is coming from then either rub with paraffin or lubricate with WD-40 or a silicone spray
Excessive tension on warp	Tension adjusting cord is too tight	Press on plastic clamp to let some cord out
	The tension cable has gotten crossed over itself on the warp beam brake drum	Straighten out cord

The Problem	The Cause	The Remedy
Flyshuttle hits the box sides	Reed not absolutely flush with shuttle race	Place small shims in back of reed so that it is perfectly even with the rear beater box side
	Picker too loose	Shim box sides so that picker just moves freely without too much play
Flyshuttle works hard	Change in weather can cause the sliding pickers to stick in their grooves	Place shims in back of front box sides so that pickers just slide freely. Don't over do this
Can't get enough warp tension	Tension adjusting cord has slipped thru plastic clamp	Shorten cord by pulling both ends in opposite directions until the correct length is attained. Tie ends in a simple knot over clamp.
	Small tension spring stretched out	Replace through AVL
Shuttle flies off race	Bobbin improperly wound	Rewind bobbin from beginning
Fell creeps forward with Auto Advance in place	Too thick of weft thread is being used for the picks per inch chosen	Change pick wheels or weft thread