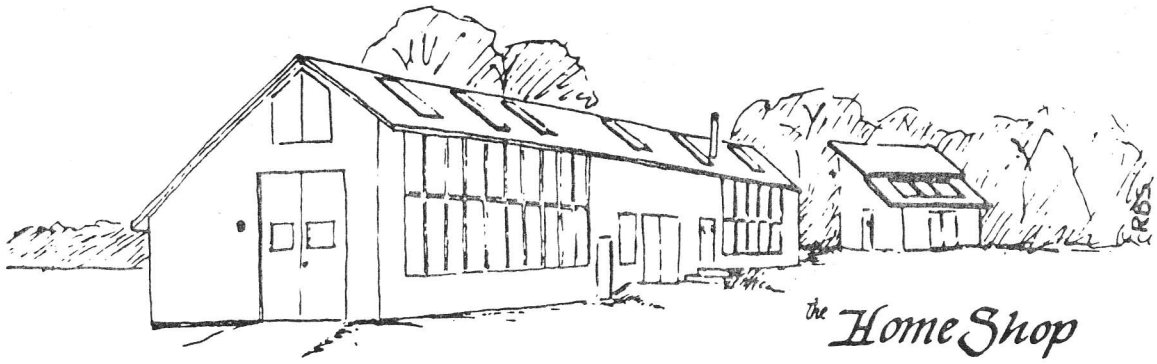
Tom Redlow

Shaker Oval Box Class Booklet

Hi. I'm John Wilson. Welcome to a class where you CAN learn the traditional craft of Shaker oval boxes. Turn to the back page for more . . .



WELCOME TO THE SHAKER OVAL BOX WORKSHOP

How long does it take to make a box? Probably the most asked question for which there is no simple response. I hedge with "it depends. . ." before feeling that others have a right in expecting me to be more definite after making boxes for over fifteen years. One run of unfinished boxes where I made a dozen sets of five nesting boxes, starting with cutting the veneers and 1/4" pine to the final sanding and packaging, I averaged half an hour per box.

How long does it take to become a box maker? It should take you less time than it did me with this information in hand. I spent over a year dabbling with box making before meeting Joel Kamaraad who enabled me to make my first box. I have been making boxes since 1981. Besides making finished boxes, I travel the country teaching traditional box making skills, and provide a full line of supplies for craftsmen.

How long will it take you to make your first box? The workshop is designed to enable you to successfully make and understand the factors involved with boxes in the day-and-a-half session. During this time you will have the opportunity to make a nest of five boxes. Materials are prepared in length & width for bands and tops & bottoms so that you can concentrate on all steps of construction that are unique to box production. To overcome the usual two day drying interval after bending bands, we will use a simple electric fan to speed drying. It is better, however, to let the wet band dry slowly.

Expect a new appreciation of Shaker oval boxes. This appreciation is for the Shaker craftsmen whose example we follow. You will also gain a critical eye for all boxes, old and new. You will no longer take for granted things well done, nor overlook aspects that have been done better by others. Finally, you will appreciate your own ability to participate in the entire box making process.

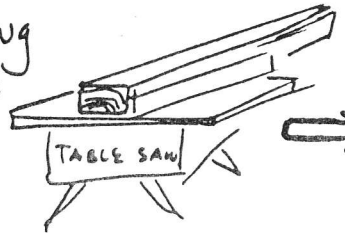
Process is much more interesting to me than the product itself. True, the product claims our attention because it is tangible, but the process by which it is created is the life that produces it. Focusing on process spares us from the tedium of material acquisition. It is the line between craftsmen and collectors.

I invite you to join the ranks of box makers.

John Hudson
1997

500 E. Broadway Hwy., Charlotte, Michigan 48813 (517) 543-5325

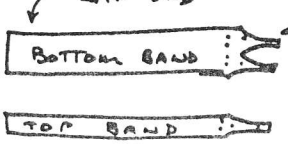
Cutting Bands



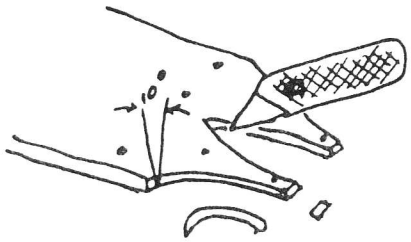
TRACE

FEATHER LAP END

Cut + Drill

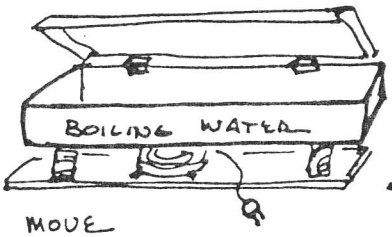


SOAK in H2O

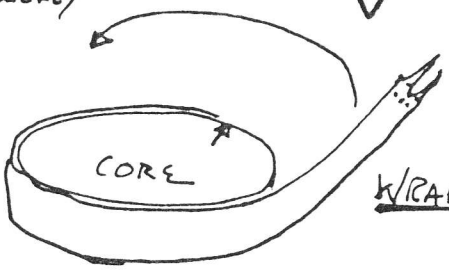


TRIM SWALLOW TAILS

SOAK 10-20 minutes

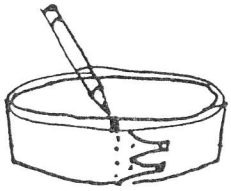


MOVE QUICKLY

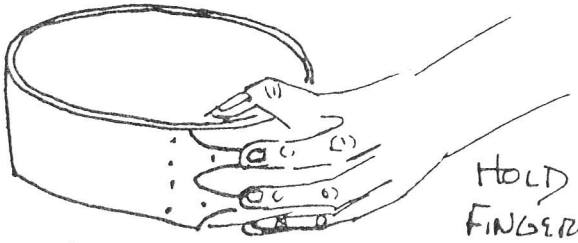


WRAP

MARK CIRCUMFERENCE

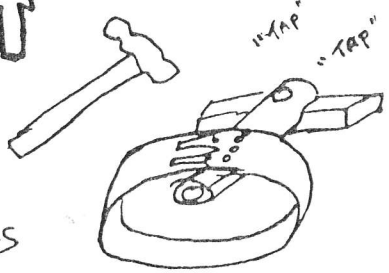


REMOVE CORE

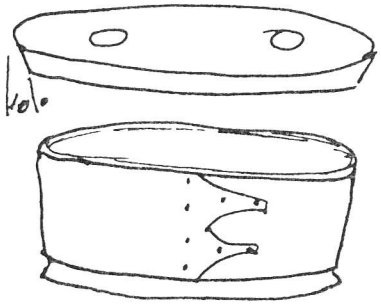


HOLD FINGERS SECURELY 'TIL TACKED

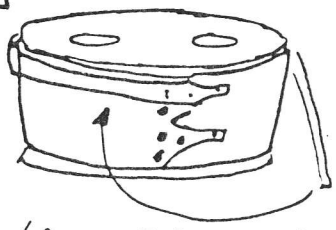
TACK & CLINCH COPPER TACKS



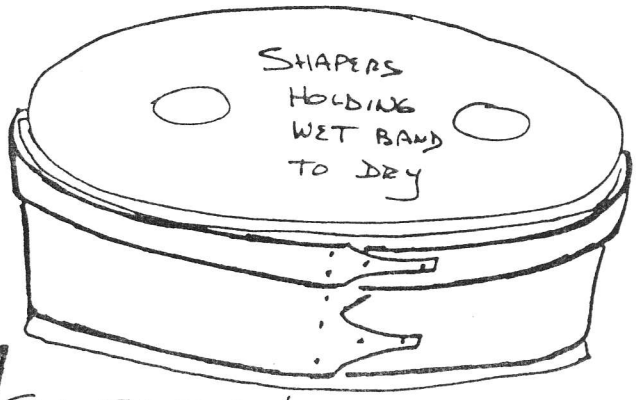
SHAPERS



WRAP TOP BAND



TACK TOP BAND & PLACE OVER BOTTOM BAND



BENDING OVAL BOX BAND

STEPS IN BOX MAKING

There is no one right way to make an oval box, just as there is no one material for bands, no one system for numbering sizes of nesting boxes, nor only one set shape to the fingers. Clearly there are boxes within the Shaker tradition, and those outside it. What can be said for the following steps in making boxes is that I have found it to work for me, and for others in the shaker oval box workshop. It produces a box in the Shaker tradition.

MAKING THE BAND

1. **PICK BAND BLANK,** check for clear grain and even thickness. The #2 size is the best one to start with in bending bands and fitting tops and bottoms. **DETERMINE OUTSIDE** surface of veneered band stock by flexing band. Observe edge where fiber separation denotes an inside surface (see page 5). **SMOOTH** both sides of band if need be. **MARK FINGER** pattern and location of tacks. *(Measured Drawings of Shaker Furniture and Woodenware* by Ejner Handberg on pages 14 & *15.)*

2. **CUT FINGER PATTERN** in rough outline on the band saw. **DRILL TACK HOLES** using 3/64" or 1/16" drill bit. **SOAK FINGERS** by standing band in hot water for a few minutes. **TRIM FINGERS** to finished form by clamping band on to masonite cutting board and use Stanley utility knife with heavy duty blade to bevel the gothic arch, and bevel the ends of each finger. When cutting, keep finger lines arched, bevels slight (10^0 - 20^0, not 45^0!), and tips narrow (1.5 times the tack head, or 3/16" at most, as shown on page 6).

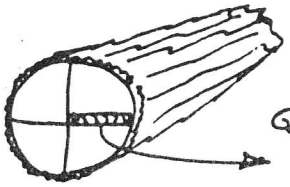
3. **FEATHER THE END** of the band using the power sander or block plane. This means starting the taper 1" to 1 1/2" back from the end (depending on the thickness of the band) and make a pretend knife edge of the end of the band (see page 6). (When band stock is thicker than that used for #4 and smaller boxes, I thin the underside of the finger ends to help them hug the oval and look finer. Such thinning reduces the tip to about half thickness).

4. **SOAK BAND** in hot water (above 180^0 F) for ten minutes, twenty minutes will insure that the troublesome bands are fully soaked (nothing is gained or lost after a half-hour). While band is soaking, make sure the right size core is ready, be ready to move quickly to bend while wood remains hot. Should it cool, stick it back in the bath for half a minute. **CURL BAND AROUND CORE** paying attention that right side of the bevelled fingers faces out, and **THE OVERLAP** by making a pencil mark across the edge of the lap. Be sure to hold all the fingers all the time, or else the band is likely to split up the middle between the fingers.

5. **TACK FINGERS** by removing from core, repositioning band so overlap marks line up, and place on anvil. Hammer copper tacks so they clinch inside.

6. **SHAPE OVAL** by entering shapers in both sides of oval, keeping the main row of tacks on the center line of the oval. Avoid pushing shapers in too much. Let dry with good air circulation for two days, but avoid forcing the process with fan or heat.

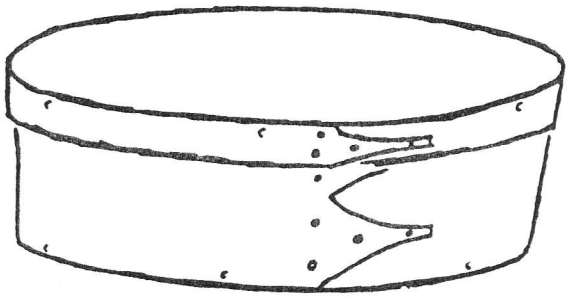
7. **TOP BAND** is made by repeating steps for box band, only instead of using core to bend band, bend top band around your box band. After tacking top band, leave on box to dry.



QUARTER SAWN BOARD

TRACE OVAL PATTERN FOR TOP & BOTTOM

CUT JUST OUTSIDE THE PATTERN LINE



SAND EDGES

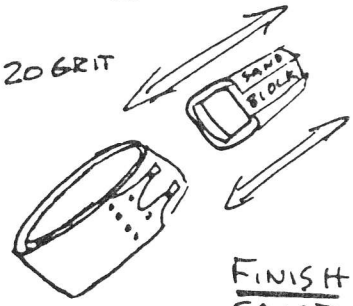
PRESS INTO BAND

BOTTOM BAND

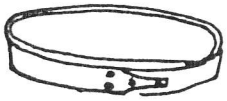
WATCH DIRECTION OF fingers WHEN DOING THIS STEP

FITTING TOPS & BOTTOMS

'120 GRIT



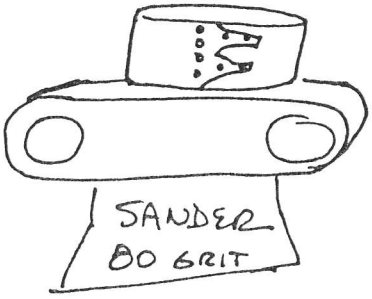
FINISH SAND



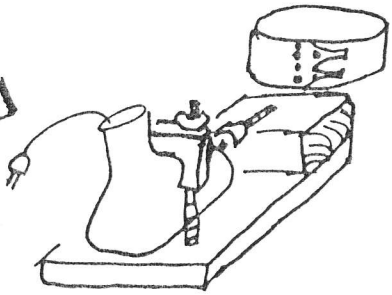
TOP BAND

SAND FLAT

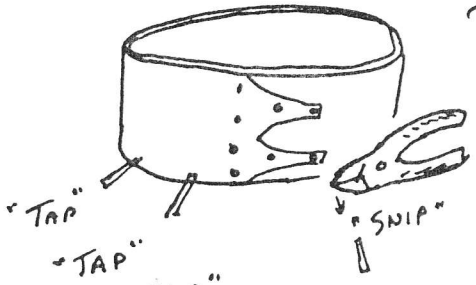
Repair gaps WITH GLUE & SAND immediately



DRILL PEG HOLES



PEG



FITTING TOPS AND BOTTOMS

1. **SELECT WOOD** for top/bottom. Interesting features such as figured grain or knots can be included as there is no bending here. Wood must be dry. Vertical grain (quarter sawn) has one half the expansion and contraction of horizontal grain (flat sawn) wood, reducing the likelihood of developing gaps or band breakage.

2. Before proceeding, **SAND INSIDE OF BOX BAND AND TOP BAND,** and improve inside feathered end of band if necessary.

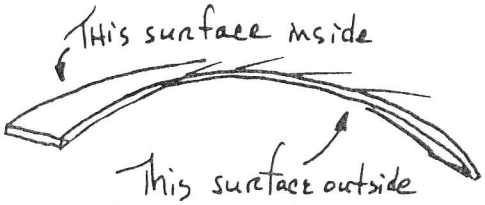
3. **MARK OVAL SHAPE** for bottom and cut outline on band saw. (You can use an oval pattern for top and bottom, or the band itself -- each method has its own way and use.) With the disc sander set on a 4^0 bevel, **FINISH SANDING THE EDGE OF THE OVAL.** The slight bevel gives a cork effect for tight fit. However, do not switch the sides of the oval while sanding, but keep the same side always up so the cork effect is maintained. Proceed by successive sanding to approach an oval that fits.

4. **FIT THE OVAL BOARD** against the front lap and into both ends, then work to stretch the back of the band over the oval board. Press into place. **CHECK FINGER DIRECTION** as most boxes have fingers pointing to the right. It is the side of the band that you fit the bottom that determines the finger direction. Top band fingers point in the same direction as the bottom band.

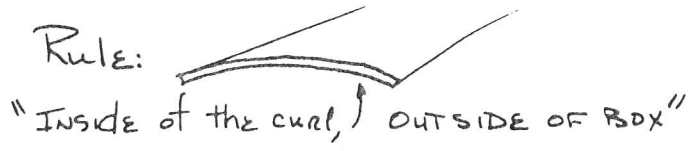
5. **TOP OVAL** is made repeating steps 1 through 4 using top oval pattern (1/8" larger than bottom oval), or use the inside of the top band. If the top band is a bit loose, elongate the top oval when doing your sanding to take up the slack at the ends of the oval. The lid will then hug the middle of the box for a positive friction fit.

6. **DRILL HOLES FOR WOOD PEGS** around the rim of box. First sand surface of top/bottom flush. Use 1/16" drill bit for 3/16" thick top/bottoms in #0 and #1 boxes, and 5/64" drill bit for #2 and larger boxes. Drill holes equally spaced around the box, 2"- 3" apart which makes three holes to a side for the #1 and #2, and four holes per side in the #3 and #4. **TAP WOOD PEGS** into holes. **SNIP OFF PEG ENDS AND SAND FLUSH.**

7. **FINISH** the box using an oil or clear finish, or milk paints. Leave the inside wood plain if you intend to store food in them like the original boxes. Sand the finger lap only slightly so that the hand carved finger bevels are crisp. Shakers painted their boxes in the period before mid-1800, and varnished them in later years.



DRY BAND FLEXING



AFTER SOAKING WOOD

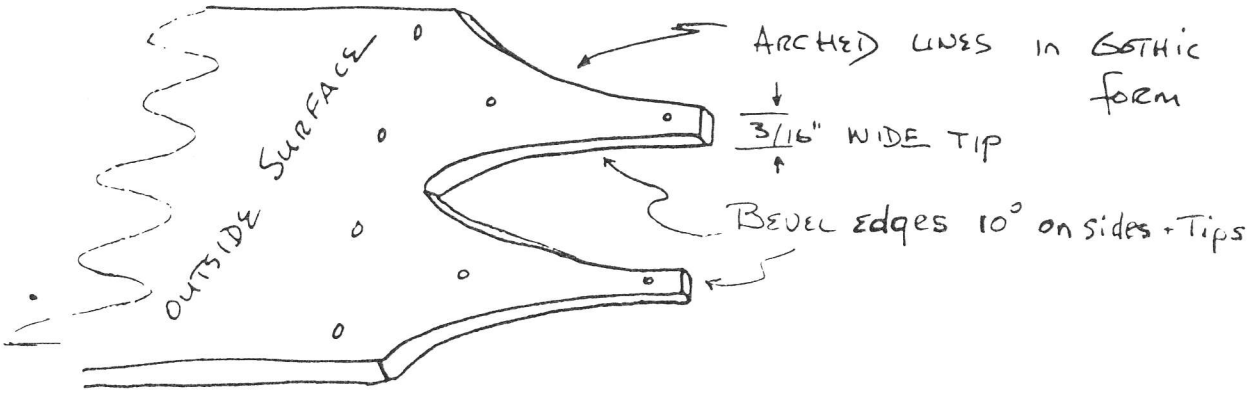
TESTING BAND FOR KNIFE CHECKING

MATERIALS FOR BOX BANDS AND TOPS/BOTTOMS

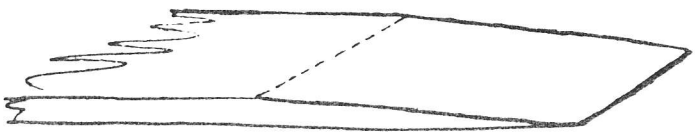
Box bands for the base and lid of an oval box are thin slices of hardwood, commonly referred to as veneer, that will bend and tack without splitting. The Shakers used maple bands and pine tops/bottoms more than anything else. A wide range of hardwoods are suitable for box making including ash, cherry, walnut, apple, hackberry, hard and soft maple, and birch. Any wood can be used for tops/bottoms, although softwoods have less seasonal movement than hardwood.

Two factors to consider in selecting wood are the grain direction and the moisture content. Grain, or the alignment of the annual rings relative to the flat face of the wood, can be vertical or horizontal. Lumbermen refer to these two cases as quarter sawn or flat sawn. I prefer the terms vertical or horizontal which are descriptive of how the piece of wood looks. In bands vertical grain (quarter sawn) works best because curling edges of veneer is minimized at the finger lap. In tops/bottoms vertical grain results in less shrinkage: there is one-half the wood movement in vertical compared with horizontal grain alignment. Ray patterns of quarter sawn tops give added appeal.

Moisture content (MC) is the second important factor. Wood moves as it looses or takes back moisture in reaching an equilibrium with the moisture in the air, in winter drying and in summer swelling with humidity. There are moisture meters to measure MC, but knowing your source and how you handle the wood can be all important. Tops/bottoms must be as dry as the interior of your home in winter with central heating. A 1/4" thick board can finish drying in two or three days, if left with air to circulate around it in a warm dry space. Moisture in bands is important for a different reason. Wood that has been dried in a commercial wood kiln that gets up to 180^0 F becomes brittle. Wood that has not been subjected to that heat, and that has not been dried below 12% MC is best. Lumber cut from freshly cut trees is ideal. Moisture in such wood is in the 15% to 20% MC range. Having said what I find ideal, let me say that many different woods will work. The fault rate and difficulty of working increases, but you can learn to work with stock at home.



CUT AND FINISH
EDGES ON FINGERS



FEATHER LAP END 1" BACK

BAND THICKNESS

The most difficult dimension in making boxes is the thickness of the bands. The thickness varies with the size of the box. Both bands and tops are thinner in smaller boxes. There is a sheet summarizing information at the end of this booklet. Bands vary from .060" to .085" from #0 to #5 oval. Accuracy here goes beyond the capacity of the carpenter's measuring tape to the talk of "so many thousandth of an inch." If you plan to do much cutting of box bands, get a vernier caliper or micrometer. I prefer the dial indicator vernier caliper which costs around $25.

Thickness is both a matter of being able to bend the wood around the oval form without having it break, and a matter of the right feel and look to the box. The smaller the box, the tighter the radius. Veneers need to be thinner to make the turn. The larger the box, the thicker the veneer needs to be to give a sturdy feel to the band and make the finger laps stand out in relief. There is no absolute dimension in all this; it depends on things like the species of wood being used, the dryness or remaining moisture in the wood, the visual effects which the craftsman wishes to achieve. Therefore, take these as guides or relative size.

The thickness of veneer also relates to the copper tack sizes. The smallest copper tack, the #1, will clinch two thicknesses of .060" veneer, but not much thinner. At the other end of the scale, #2 copper tack will clinch .075" to .100" veneer. There are, in addition, a #3/4 copper tack for #00 & 000 boxes, and longer copper tacks which you want to use on larger boxes.

A special note for bands produced by slicing on a veneer mill (our stock sizes #0 through #8). When bands are sliced from the log, some have one surface defected with tiny splits from the slicer knife. This means that the fibers come apart when bent on the outside of the box. The remedy is to make this surface the inside of the box. By flexing the band before trimming the finger bevels, you may notice the fiber separation, especially at the edges (diagram page 5 shows two ways). When taken from water bath, the band will be slightly curled. The inside of the curl is the outside of the box. Therefore, if it becomes evident at the moment of bending that you made a mistake, **STOP**. Rebevel the fingers, reheat the band, and bend with the better side outside.

All box band dimensions discussed here and on the data sheet (page 16) relate to the standard nesting sizes. However, various alternatives can be made by accident or design. For instance, a shallow box of any size, often referred to as a button box, may be the result of a split appearing in the edge of a band when being bent. Cut down to a narrow band before tacking. Tall and small boxes are less common, but intriguing.

oval	thickness[1] x width x length[2]	top band	copper tack[3]
#0	.060" x 1 1/16" x 11 7/8"	7/16" x 12 1/4"	#1
#1	.062" x 1 1/2" x 15"	1/2" x 15 1/2"	#1
#2	.067" x 2" x 19"	5/8" x 19 3/4"	#1 1/2
#3	.072" x 2 1/2" x 23"	11/16" x 24"	#1 1/2
#4	.077" x 3 1/16" x 27"	3/4" x 28"	#2
#5	.082" x 3 11/16" x 3 1"	15/16" x 32"	#2

TOP/BOTTOM WOOD

Any wood that is planed to thickness and is dry will work for tops and bottoms. Cherry, white pine and western red cedar make attractive tops, as do figured pieces of birdseye maple and lacewood (quarter sawn sycamore). While bands must be straight grained for bending, anything works for tops as long as it is dry.

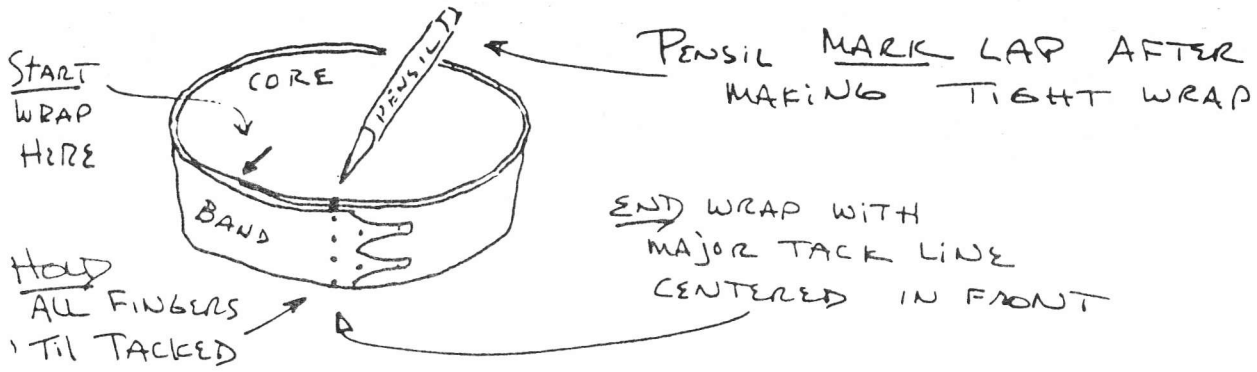
Tops are 3/16" for #0, 7/32" for #1 and 1/4" for #2, #3, #4. A source of 1/4" pine can be found in 1" x 12" boards at the local lumber yard, which often provide boards with a section of vertical grain. Resaw into two 1/4" halves, and stand them up against a wall to dry for a couple of days in a warm dry space. A 3/4" board takes longer to finish drying usually a couple of weeks. Both bands and tops/bottoms can be resawn on a 10" table saw. The kind and quality saw blade is important. A sharp 40 tooth blade with carbide teeth will work. It must be sharp. Since a 10" table saw will cut a 3" cut, you can resaw up to a #4 box band in one cut. Getting two pieces for tops/bottoms from one 3/4" board can be done with resawing, and can cut up to 6" wide when cutting from both sides of the board. This is wide enough to make a #4 box. Resawing by bandsaw requires more sanding, and I have not been very successful in my attempts, although others report success.

Tops & bottom boards of solid wood (#O - #5) will respond to moisture changes resulting in either gaps at the edges (shrinkage) or splitting the band at the ends (expansion). To avoid problems have your boards 8-9% moisture content before making up your box. We try to meet this standard in all our boards, but changes can occur during storage, either here or with you, as unfinished wood of 1/4" thickness can absorb humidity in a matter of days. If this is a problem try using a scrap of wood with 1/4" notches cut along the top edge to provide a stand-up for boards in your home A small fan will hasten the process. **Do not** parch the wood in an oven or furnace room. Two or three days with equal ventilation on both sides will be sufficient.

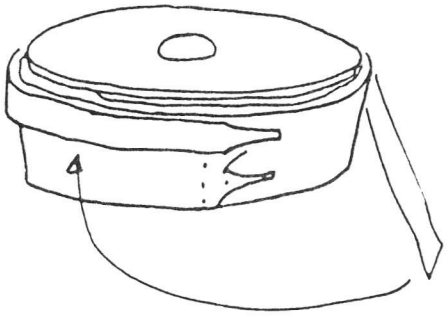
number[4]	thickness	oval[5]
#0	3/16"	1 7/8" x 3 1/2"
#1	7/32"	2 9/16" x 4 9/16"
#2	1/4"	3 1/2" x 5 3/4"
#3	1/4"	4 1/2" x 7"
#4	1/4"	5 1/2" x 8 1/4"
#5	9/32"	6 1/2" x 9 1/2"

BOX MAKING SUPPLIES AND INSTRUCTIONAL MATERIALS

John Wilson/The Home Shop supplies box makers with a complete line of supplies for box making together with instructional materials. The **ONE HOUR VIDEO** *Making Shaker Oval Boxes with John Wilson* is available for $29.95 ppd. The **CLASS BOOK.LET** ($5.00 ppd.) used in the oval box workshops includes patterns for the nest of five boxes as well as helpful directions and the **PATRERN PACKET** ($13.00 ppd.) gives outlines and instructions for the entire line of boxes and carriers from the smallest #000 to #12. All three at special price of $42.75 ppd. Write to John Wilson, The Home Shop, 500 East Broadway, Charlotte, Michigan 48813, or call 517-543-5325 for a current price list of supplies.



WRAP WET BAND AROUND CORE



Complete wrap by lifting finger end of top band to allow feathered end its place.

WRAP TOP BAND

Notes:

1. Tolerances are ± .005". A good average for one veneer to fit the common sizes of #O, #1, #2, is 1/16" or .0625", and for #3, #4, and #5 is 1/12" or .077".

2. Band sizes follow those given in Ejner Handberg: *Measured Drawings of Shaker Furniture and Woodenware*, The Berkshire Traveller Press, 1980, pp. 69-70. I have rounded fractions where accuracy of an 1/8" means little. Bands can be longer by anywhere from 1/2" to 2", but not much shorter.

3. Copper tacks are available from John Wilson, The Home Shop, 500 E. Broadway, Charlotte, MI 48813 (517-543-5325) in one ounce packages, enough to do 30 to 50 boxes, and the Tac Pac which gives 3 ozs. of tacks in sizes to do #0 - #6. A box of pegs is included. One pound quantities are also available.

4. About numbering systems, to quote Handberg: "The oval boxes were sold by numbers, the largest size being No. 1" (p. 73, *Measured Drawings of Shaker Furniture and Woodenware).* Since Handberg first published his patterns in 1973, many box makers have been influenced by the six sizes he gives. These are numbered for illustration purposes in the 1973 edition (see duplication of this on page 14). They are widely used by boxmakers today, even though Handberg himself erased the numbers from the 1980 edition. The smaller box size given in my table thus becomes a Number 0.

5. The size of the inside of the box

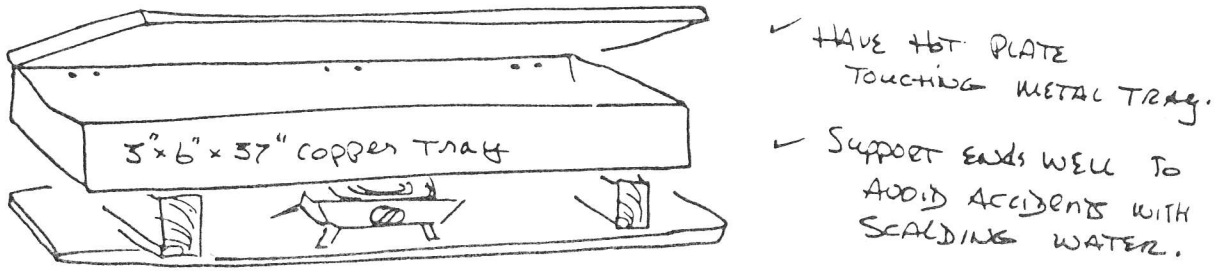
FORMS AND PATTERNS

I make my **CORES** out of pine or basswood that is dry, cutting on the band saw and sanding on the disc or belt sander. See page 13 for ovals from which cores are made. After the band is tacked, a **SHAPER** is put in both sides of the damp band to hold the shape until it dries. These shapers are made from 1/2" pine for #0 and #1, 5/8" for #2, #3, #4, and 3/4" for #5. Use the same oval patterns and cut slightly outside of the line on a 10^0 bevel so that the sides resemble a cork, which they become when stuffed into the damp band. Two holes are drilled for ventilation and ease of removal. (Sometimes Shaker craftsmen used a 1/4" thick shaper the same size as the core that slipped inside the wet band).

FINGER AND TOP/BOTTOM OVAL PATTERNS are made by having pages 10, 11, and 12 duplicated on heavier paper and cut out. Permanent patterns are made from aluminum "coil stock" used by residential siding contractors for window and door trim. It is prepainted white and cuts easily. Straight cuts are made by scoring the aluminum with straight edge and point of the utility knife, and flexing. Curved lines can be scored free hand, or cut with shears. Drill holes 5/64"d. to indicate where copper tacks go.

Oval Bottom patterns are the same as the core, or inside oval. Top oval patterns are about 1/8" larger. A 2% enlargement of the bottom oval patterns page is a close approximation.

COPPER HOT WATER TRAYS exclusively made for The Home Shop are now available for the serious boxmaker in both the 3" x 6" x 37"size, and 3" x 6" x 48". Nursery window planter trays of painted steel are also available up to 30" long. Alternatively, a pan such as the vegetable drawer from an old refrigerator that is enameled metal will do as well. A length of steel eaves trough with end caps and a plywood cover can be used for longer narrow bands.



HOT WATER TRAY FOR SOAKING BANDS IN BOILING WATER

CARRIERS, HANDLES AND PEGS

Shakers made carriers by adding handles to the boxes. They were made in both fixed handle and swing handle versions, and were left open as well as made with lids. The pattern page 15 gives information on the size and shape of a swing handle for a #4 box. These were used for sewing baskets with some being lined with satin and having matching pin cushion, needle holder, emery and bees wax.

The open version uses a copper washer between the handle and box, while the handle with a top lid needs more space to be able to swing. A wood washer 1/4" thick by 3/4" d. is made from 3/4" d. hardwood dowel, drilled in the end and cut off to make washers. Since the length used varies slightly between boxes, the washer which slides on the rivet allows for surplus to be clipped or ground off, leaving a 1/16" end for peening.

The handle for this carrier is 1/8" x 3/4" x 15 1/4". It is bent over a 3/4" plywood form to obtain characteristic "bonnet" shape handle, so called after the profile of the Shaker Sister's bonnets of the last century. This can be used after an hour on the form, or allowed to fully dry.

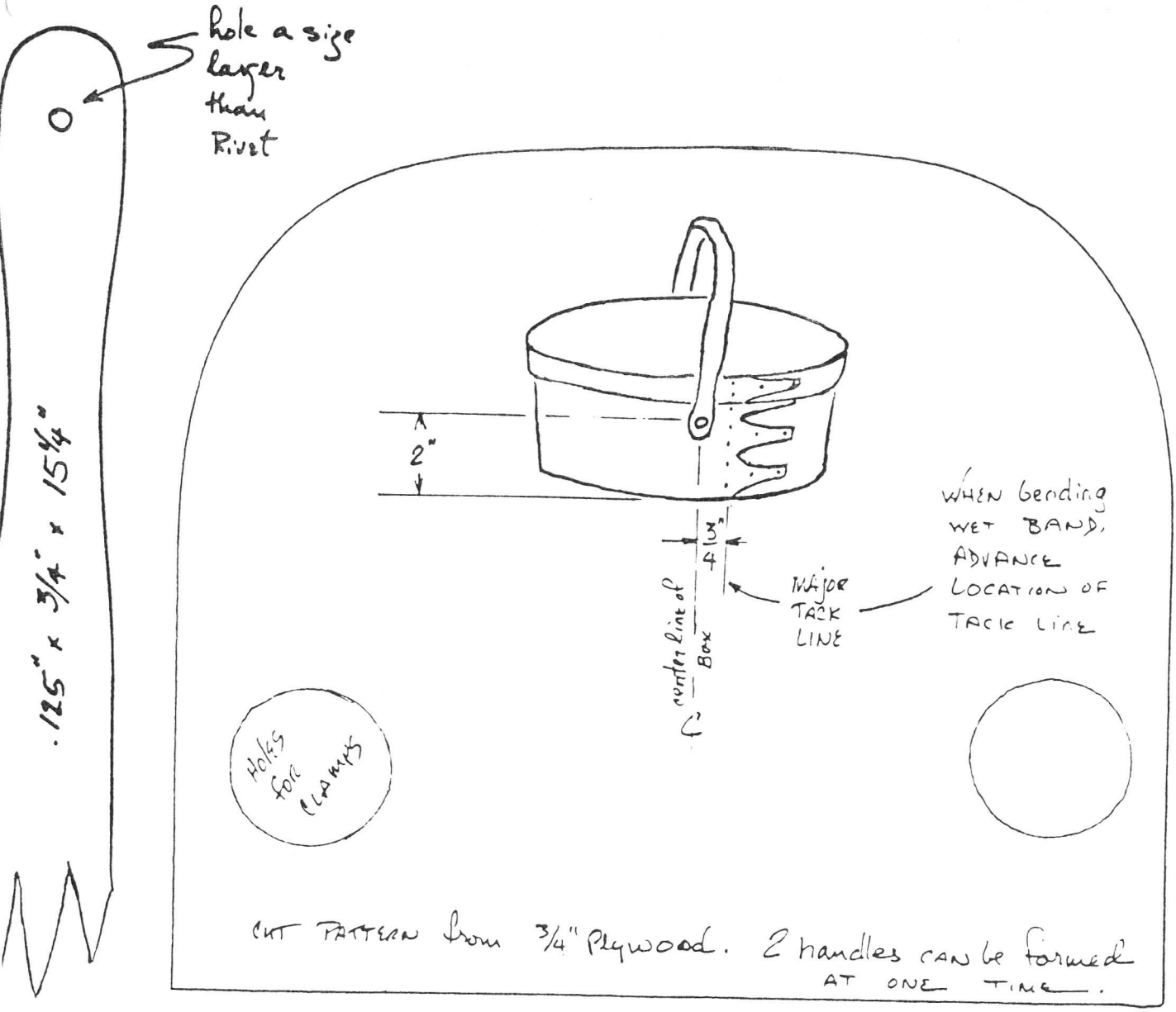
The fixed handle carrier can be made from any of the box bottoms. Handles are located either inside or outside of the band. The handle is applied with a spot of glue and several tacks. The very little carriers (below #2) are hard to tack with a hammer on the inside, so I use a channel lock pliers to press the tacks into place backing the outside with a scrap of veneer to allow the point to emerge fully which can then be clinched over.

Fixed handles can be either bonnet shape or rounded over. The first requires a mold. The rounded style can be bent free-form by hand and applied immediately to the box where it is glued, tacked and dried in place. A #3 fixed handle, rounded and applied inside, is 1/8" x 3/4" x 15 1/2", while a #4 of the same style is 1/8" x 3/4" x 17". Fixed handle tacks (a long #1 1/2) are used to tack handles. Predrill handles for tacks, and allow the surplus length to come through and snip off before clinching.

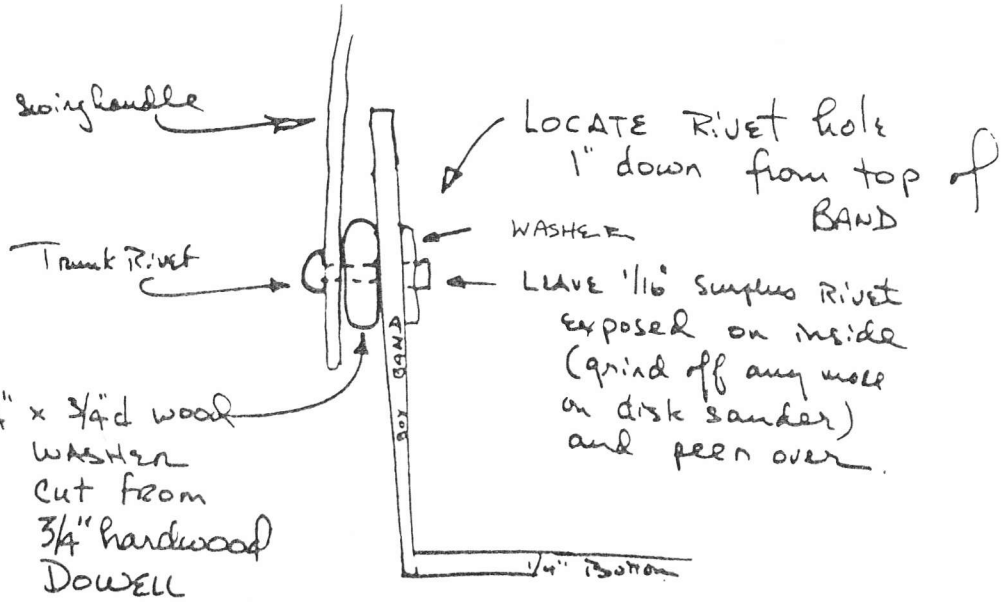
Historically, both wood pegs and copper or iron "shoe pegs" were used to secure tops/bottoms. I like the wood pegs and find supplies readily available. One brand with the correct taper to the ends is made by Diamond Brand (formerly Worlds Fair Round toothpicks). Cut the box of toothpicks in half. Do this on the band saw being careful to hold the box firmly down to keep the saw blade from splintering loose toothpicks inside. A majority of stores around here carry them, or you can order from The Home Shop.

It is possible to glue tops/bottoms into place. I do this for very small boxes (#00, #000) where the thin wood used cannot be pegged. A clean way to do this is to engage the top/ bottom slightly into the band edge, and apply a bead of glue around the rim. Press the wood into place with a block of wood covering the oval to prevent going too far. Normally larger sizes are not glued. To do so will fill all the spaces that might help absorb expansion in humid weather and prevent splitting the end of the band.

SWING HANDLE #4 PATTERNS FOR CARRIER



Sequence for Securing handle:



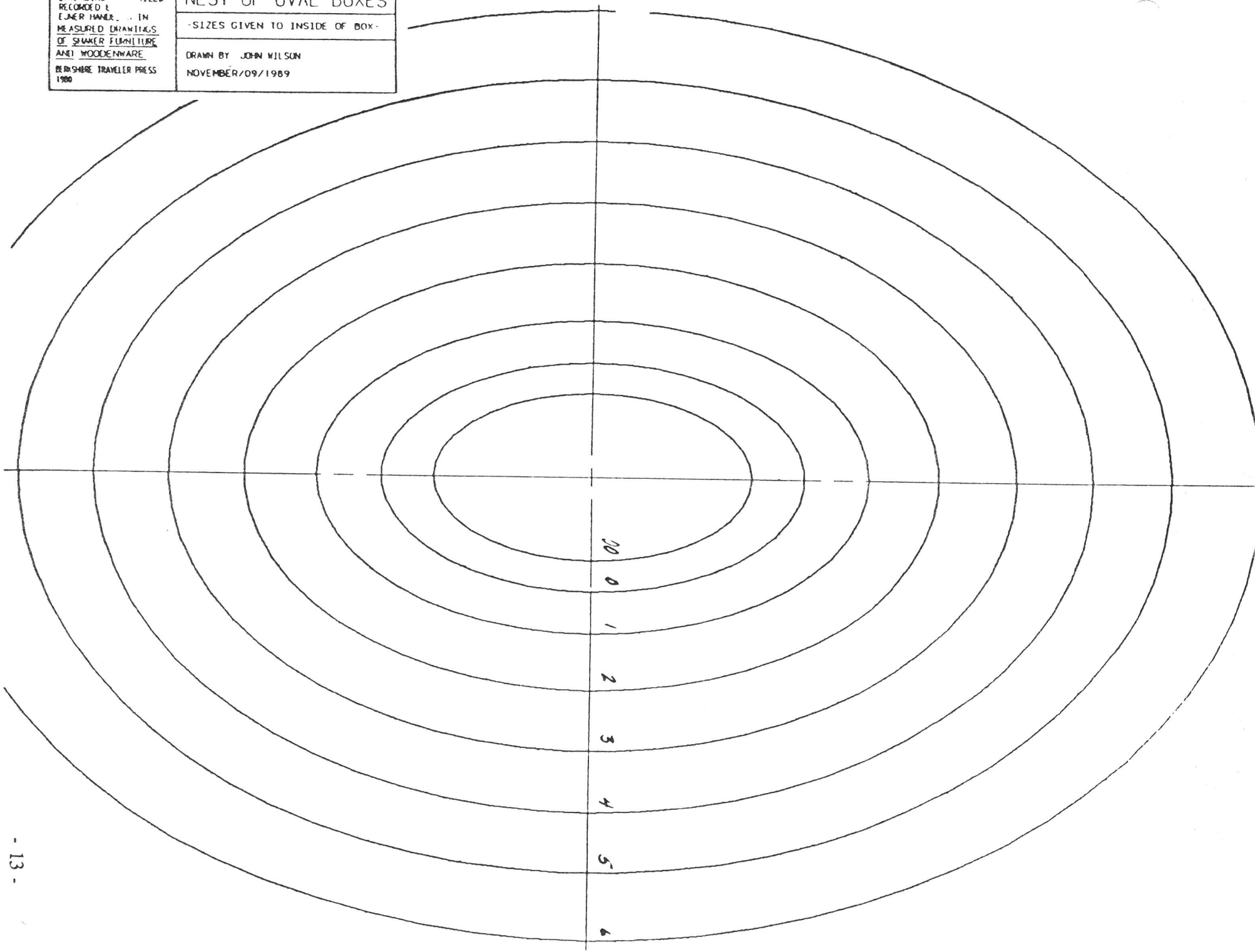
EXTENDING SIZES RECORDED E EJNER HANDE.. IN MEASURED DRAWINGS OF SHAKER FURNITURE AND WOODENWARE
BERKSHIRE TRAVELLER PRESS 1980

NEST OF OVAL BOXES

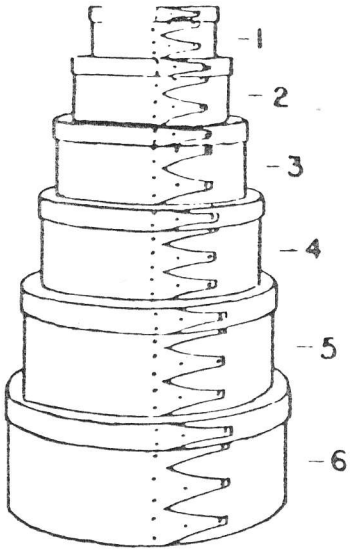
-SIZES GIVEN TO INSIDE OF BOX-

DRAWN BY JOHN WILSON

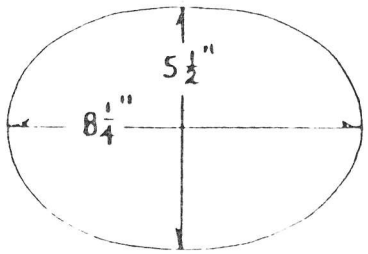
NOVEMBER/09/1989



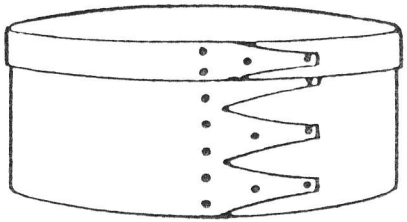
OVAL BOXES



INSIDE MEASUREMENTS OF BOX

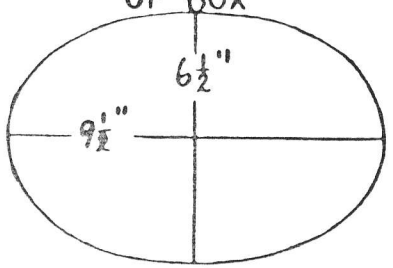


COVER TO FIT



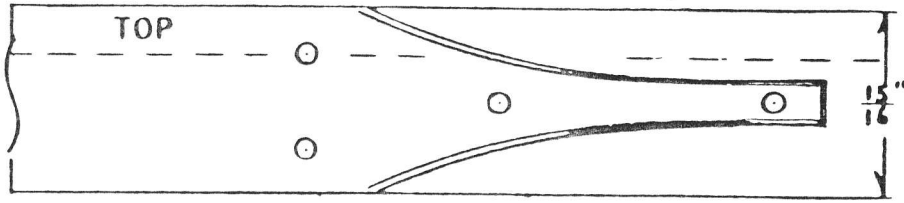
OVAL BOX

INSIDE MEASUREMENTS OF BOX

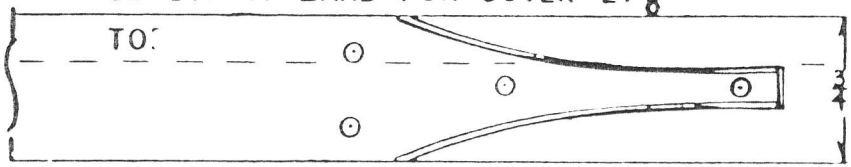


COVER TO FIT

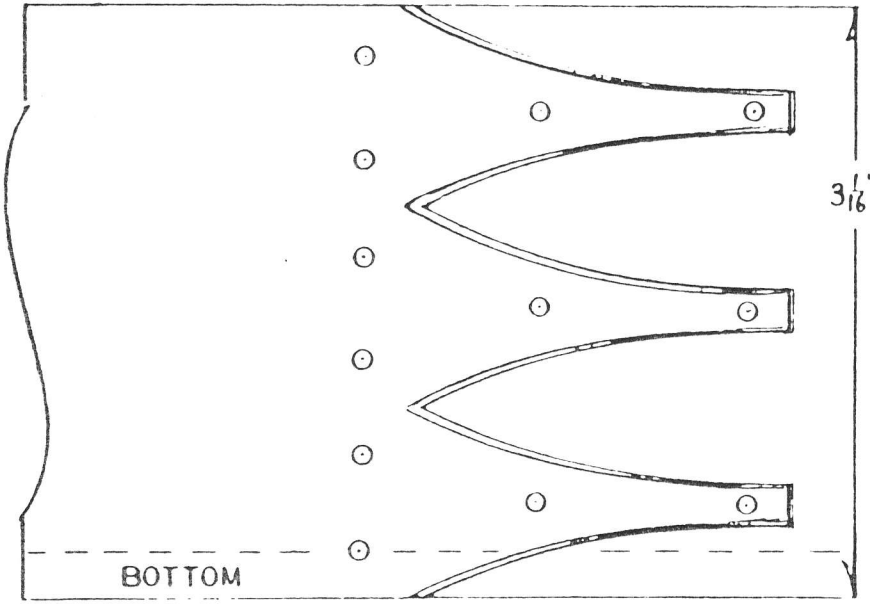
LENGTH OF BAND FOR COVER 31 3/4"



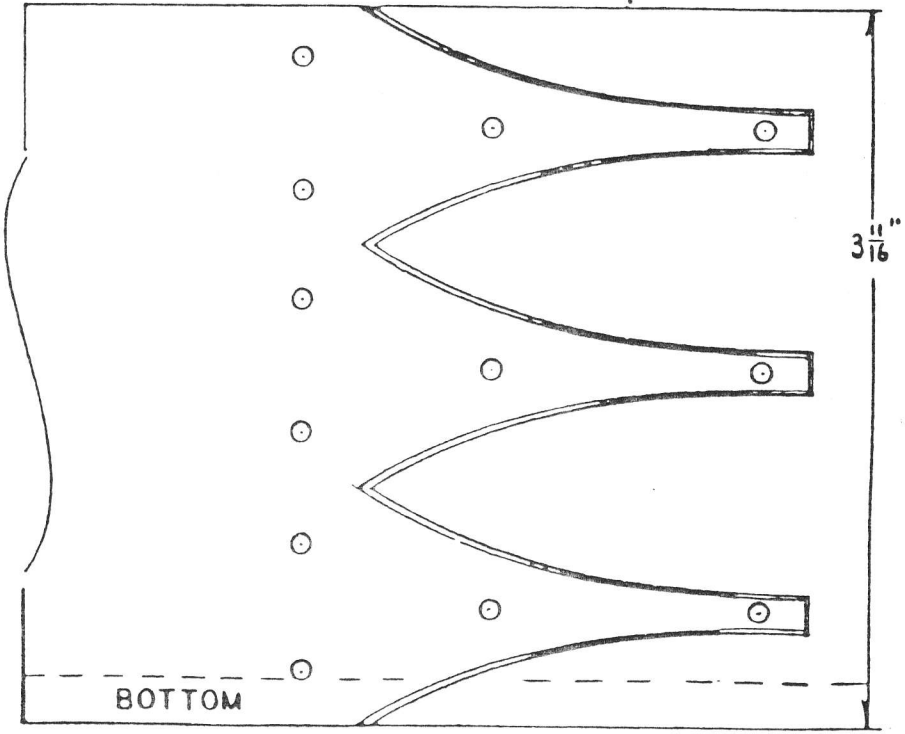
LENGTH OF BAND FOR COVER 27 3/8"



LENGTH OF BAND FOR BOX 26 1/2" #4



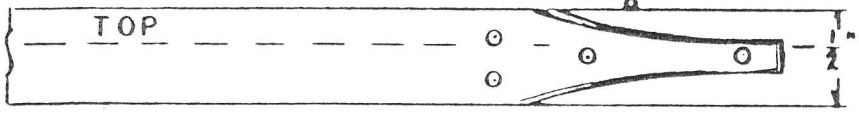
LENGTH OF BAND FOR BOX 30 3/4" #5



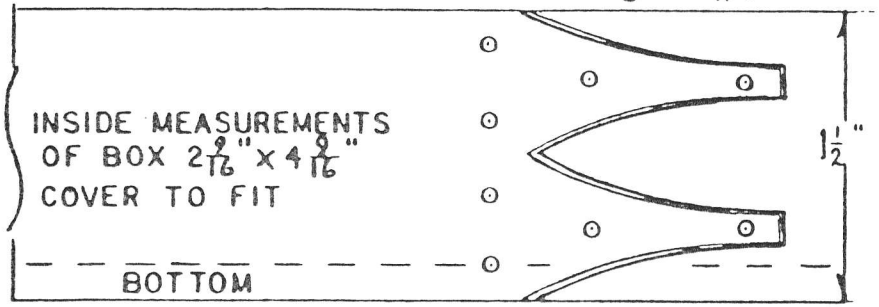
Adapted from Ejner Handberg's Shop Drawings of Shaker Furniture and

OVAL BOXES

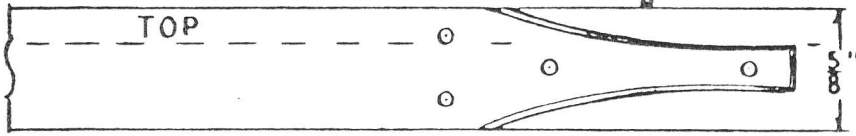
LENGTH OF BAND FOR COVER 15 3/8"



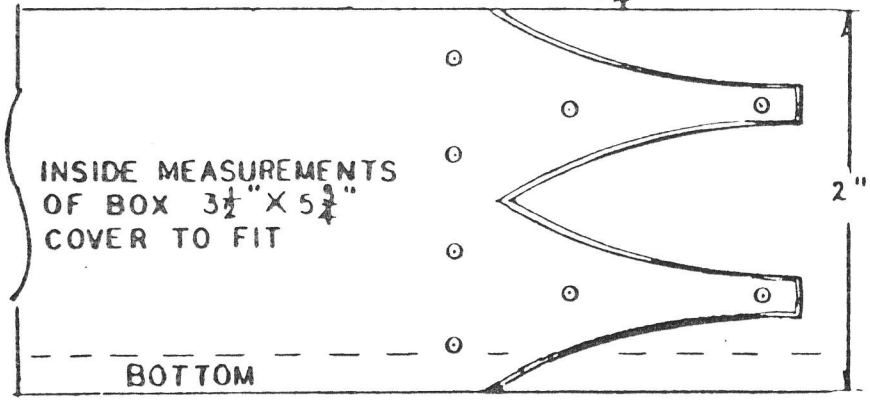
LENGTH OF BAND FOR BOX 14 7/8" #1



LENGTH OF BAND FOR COVER 19 3/8"

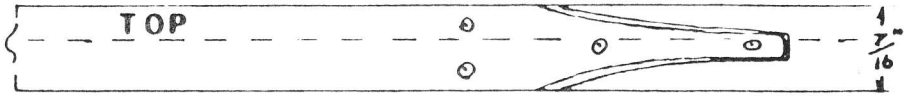


LENGTH OF BAND FOR BOX 18 3/4" #2

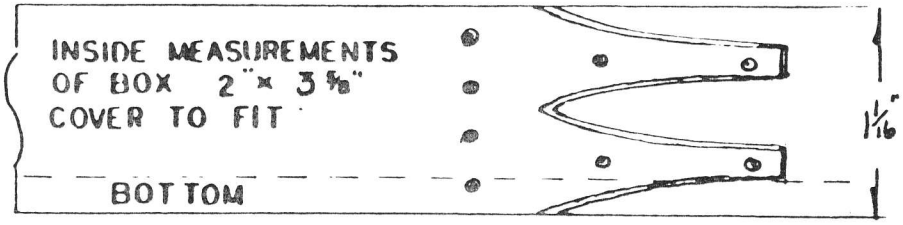


OVAL BOXES

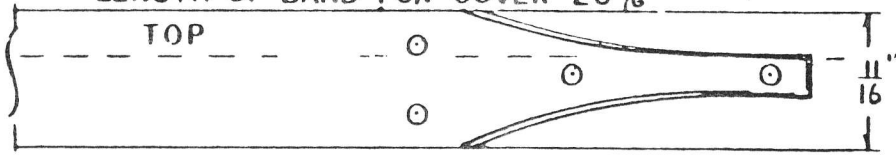
LENGTH OF BAND FOR COVER 12 1/4"



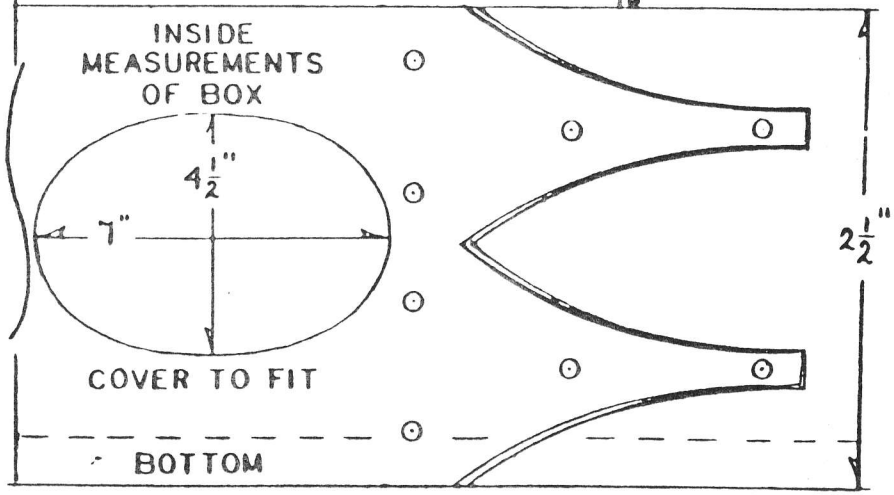
LENGTH OF BAND FOR BOX 11 7/8" #0



LENGTH OF BAND FOR COVER 23 5/16"



LENGTH OF BAND FOR BOX 22 9/16" #3



Shaker Oval Box Specifications

Box Size	Tack Size Note 1 & 2	Band Thickness Range	Bottom Band Width Length	Top Band Width Length	Elipse Width Length	Circumference Note 3	Top & Bottom Thickness Note 4	# of Fingers & Length to Tack line
000	3/4	.050 - .060"	9/16" x 6 5/8"	5/16" x 7 1/4"	1" x 2"	Use tight wrap around core for circumference mark on smaller boxes. This is difficult with larger boxes.	.150"	2 - 1"
00	3/4	.050 - .060"	13/16" x 8 3/4"	3/8" x 9 1/2"	1 3/8" x 2 5/8"		.150 - .160"	2 - 1 1/4"
0	1	.058 - .062"	1 1/16" x 11 7/8"	7/16" x 12 1/4"	1 7/8" x 3 1/2"		.195 - .210"	2 - 1 5/8"
1	1	.060 - .065"	1 1/2" x 15"	1/2" x 15 1/2"	2 9/16" x 4 9/16"		.210 - .220"	2 - 1 3/4"
2	1 1/2	.065 - .070"	2" x 19"	5/8" x 19 3/4"	3 1/2" x 5 3/4"		.235 - .250"	2 - 1 7/8"
3	1 1/2	.068 - .075"	2 1/2" x 23"	11/16" x 24"	4 1/2" x 7"		1/4"	2 or 3 - 2 1/16"
4	2	.072 - .080"	3 1/16" x 27"	3/4" x 28"	5 1/2" x 8 1/4"		1/4"	3 - 2 1/4"
5	2	.078 - .085"	3 11/16" x 31"	15/16" x 32"	6 1/2" x 9 1/2"		1/4" to 5/16"	3 - 2 7/16"
6	2 or 2 1/4	.080 - .095"	4 3/8" x 36"	1 1/16" x 37"	7 5/8" x 11"	30 1/4"	1/4" to 5/16"	4 - 2 5/8"
7	2 1/4	.095 - .115"	5 1/16" x 40 1/2"	1 1/8" x 42	8 3/4" x 12 1/2"	34 3/4"	1/4" to 5/16"	4 - 2 13/16"
8	2 1/4 or 2 1/2	.100 - .125"	5 3/4" x 45"	1 3/16" x 46 1/2"	9 7/8" x 14 1/4"	39 1/4"	1/4" to 5/16"	4 - 3"
9	2 1/4 or 2 1/2	.100 - .125"	6 7/16" x 51"	1 1/4" x 52 1/2"	11 1/8" x 16"	44"	1/4" to 5/16"	5 - 3 3/16"
10	2 1/4 or 2 1/2	.100 - .140"	7 1/8" x 56"	1 5/16" x 57 1/2"	12 3/8" x 17 3/4"	48 3/4"	1/4" to 5/16"	5 - 3 3/8"
11	2 1/4 or 2 1/2	.100 - .140"	7 13/16" x 61"	1 3/8" x 62 1/2"	13 5/8" x 19 3/4"	54"	1/4" to 5/16"	5 - 3 9/16"
12	2 1/4 or 2 1/2	.100 - .140"	8 1/2" x 67"	1 7/16" x 68 1/2"	14 15/16" x 21 3/4"	59 1/4"	1/4" to 5/16"	6 - 3 3/4"
13	2 1/2 or 3	.125 - .150"	9 3/16" x 72"	1 1/2" x 73 1/2"	16 1/4" x 23 3/4"	64 1/4"	1/4" to 5/16"	6 - 3 15/16"
14	2 1/2 or 3	.125 - .150"	9 7/8" x 78"	1 9/16" x 79 1/2"	17 5/8" x 25 7/8"	70 1/4"	1/4" to 5/16"	6 - 4 1/8"
15	2 1/2 or 3	.125 - .150"	10 9/16" x 84"	1 5/8" x 85 1/2"	19" x 28 1/8"	76"	1/4" to 5/16"	6 - 4 5/16"
16	2 1/2 or 3	.125 - .150"	11 1/4" x 90"	1 11/16" x 91 1/2"	20 3/8" x 30 3/8"	81 1/2"	1/4" to 5/16"	6 - 4 1/2"
17	3	.135 - .160"	12" x 96"	1 13/16" x 97 1/2"	21 3/4" x 32 7/8"	87"	1/4" to 5/16"	7 - 4 11/16"
18	3	.135 - .160"	12 3/4" x 102"	1 7/8" x 103 1/2"	23 1/8" x 34 1/2"	92"	1/4" to 5/16"	7 - 4 7/8"
19	3	.135 - .160"	13 1/2" x 108"	1 15/16" x 109 1/2"	24 1/2" x 36 7/8"	97 1/4"	1/4" to 5/16"	7 - 5 1/16"
20	3	.135 - .160"	14 1/4" x 114"	2" x 115 1/2"	25 7/8" x 38 1/2"	102 3/4"	1/4" to 5/16"	7 - 5 1/4"

Notes:

1 - Leave 1/16" exposed end of tack inside lap to clinch. The #1 tack = 3/16" long, #11/2 = 7/32" long,#2 = 1/4" long, #21/4 = 9/32" long, #21/2 = 5/16"long, #3 = 11/32" long

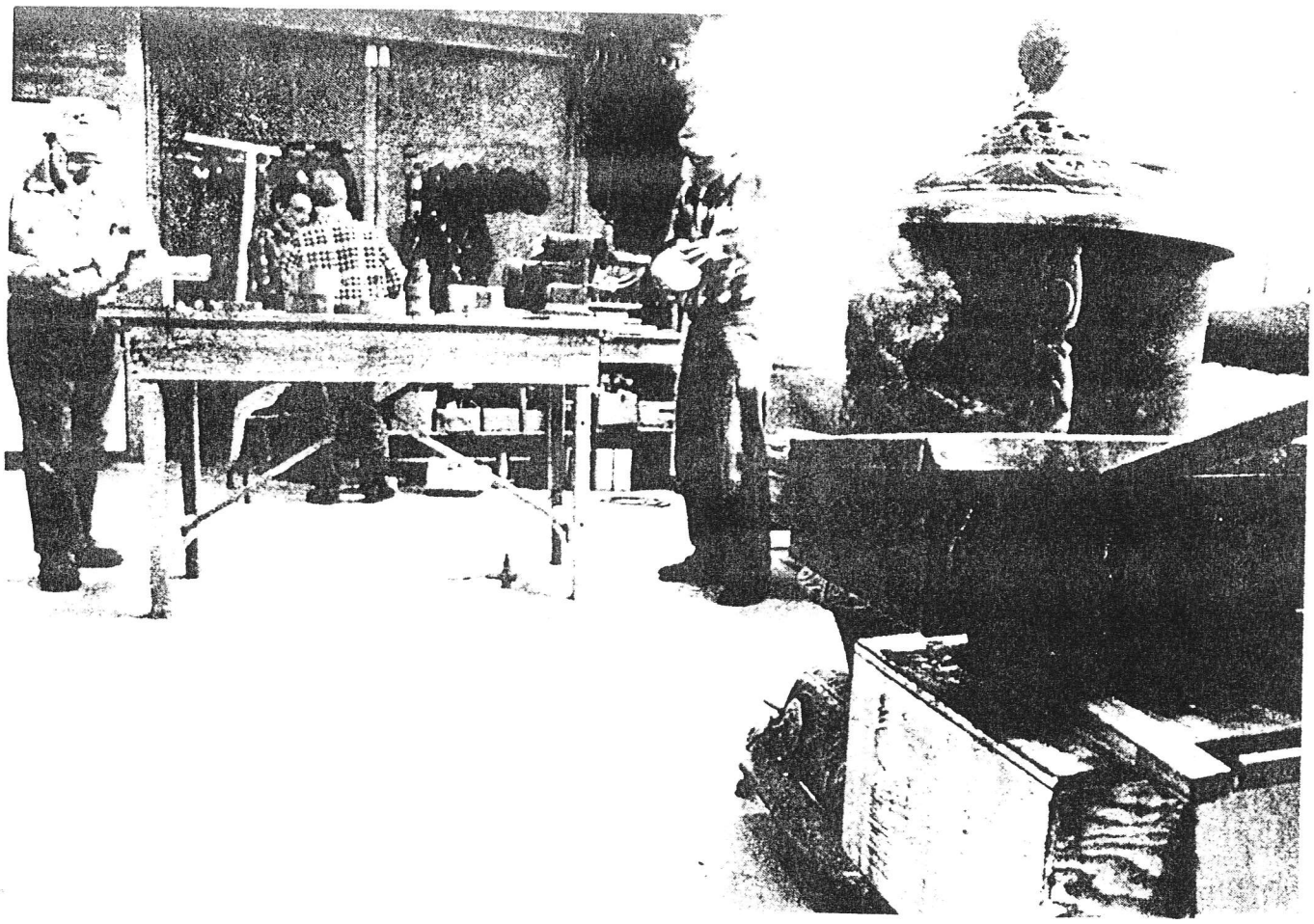
2 - Use 3/64" pilot hole for #3/4 copper tacks, 3/64" or 1/16" pilot hole for #1, 11/2, & 2, 1/16" pilot hole for #21/4, and 5/64" pilot hole for #21/2 and #3 copper tacks.

3 - Actual band length minus lap. Mark this length on band before soaking as an aid in accurate sizing of oval.

4 - Peg pilot hole size: #000 & 00, glue (no pegs). #0 & #1, use 1/16" hole #2 and larger, use 5/64" hole.

John Wilson, Boxmaker 1997 ©
500 E. Broadway Hwy.
Charlotte, MI 48813
(517) 543-5325
Supplies - Classes - Finished Boxes

6/6/97



Inside the Home Shop, the hot water is ready for soaking hands. You can put yourself into the picture. Follow the instructions and patterns in the booklet. Let me hear from you if you have any questions.

Best wishes.

John