

## CONSTRUCTION of WESTERN STYLE MOULD and DECKEL for HAND PAPERMAKING

by Marilyn Sward

The mould or surface upon which paper is formed and the deckel or edge for containing the paper in its pulp form is the basic piece of equipment necessary for hand papermaking. Purchasing a mould and deckel may range from \$30. - \$500. for an 8x10 surface. Materials and methods of construction vary widely.

All materials used for this project should be water resistant and not subject to rust or corrosion. Brass, copper, stainless steel, galvanized steel, polyester screen, Devcon glue and 2 part marine epoxy are such materials. Woods include clear pine treated with polyurathane, or oak mahogany and maple treated with water seal or tung oil.

NOTE: THE INNER DIMENSIONS WILL BECOME THE SIZE OF THE FINISHED SHEET  
STEPS FOR MOULD

1. Using Egg-crate reinforcing, cut to 1" larger than desired paper size with a jig saw and file rough edges. Moulds larger than 8½x11 need this. Wood strips and hardware cloth may also be used, egg crate is easier.
2. Cut four wood strips larger than needed and rip this wood to form a ledge as deep as the egg crate and ½" wide. Note it is extremely important that egg crate sit below the top edge of the mould.
3. Cut and join the strips to fit snugly around the egg crate. Make the corners in the best way you know ie. lap joints, miter, or butt joints. Glue together with marine epoxy and screw for butt joints. The underside may be reinforced with "L" brackets and ½round dowel.
4. Glue egg crate to inner "lip" of the frame and place weights on top overnite.
5. Seal the mould with water seal or polyurathane

STEPS FOR DECKEL

1. Construct a second wooden frame to fit over the mould. Again you may be as simple or complex as you know how. The corner joints may be lap, mitered, or butt. The inner edges must line up with the mould

and the deckel should be no more than  $\frac{1}{2}$ " off the surface of the mould. The wood strips may be ripped to form an overlapping lip. This should fit snugly, but not too tight, removal from the mould must be easy. The top surface may be beveled down toward the outside edge.

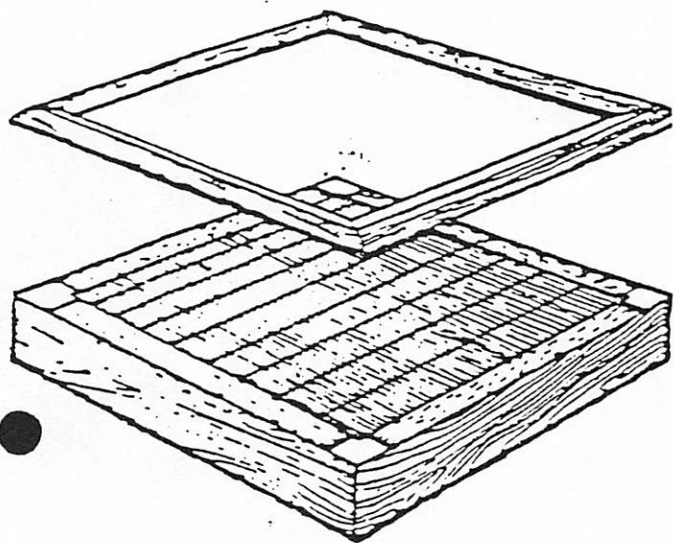
2. A deep box deckel may also be constructed to align with the mould on all edges. This frame may be 4" - 6" deep for use in pouring techniques. Weather stripping is attached to the bottom surface that comes in contact with the mould. Window closures are attached to the box and the mould to form a tight clamping fit.
3. Sand and seal the deckel.

#### MOULD SURFACE

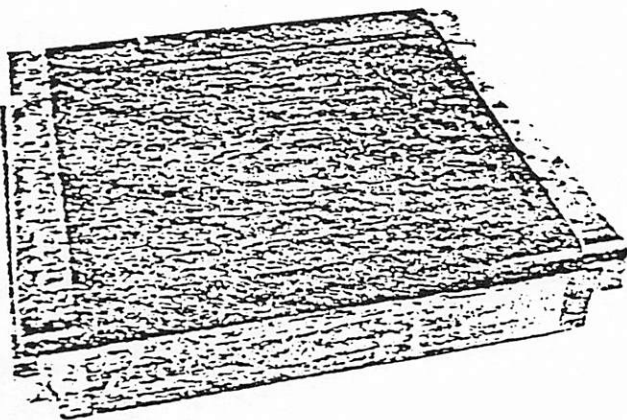
1. Cut galvanized 4x4 mesh 1" smaller than exterior of mould. It should rest on the wood surface over the egg crate. Tack it down smoothly for sewing.
2. When both surfaces are smooth, begin in the center of the mould and draw monofilament line up from the underside to the surface and back down catching wire top mesh and attaching it to egg crate. Tie securely with square knots on the bottom surface. A small dot of epoxy on the knot helps. At 2-4" intervals fan out across the surface securing the mesh to the crate with these knots. Tap down rough edges into wood frame when sewing is complete.
3. Cut 40 mesh surface or 50 mesh heat shrink to fit exterior dimensions.
4. Prepare a piece of aluminum foil and a flat board larger than the mould.

## THE MOLD AND DECKLE

The mold is a most important piece of equipment for the paper-maker's use. It is the tool that actually makes the sheets of paper. Usually rectangular in shape, the mold consists of a screen with a wooden edge resembling a small version of a modern window screen. On top of this is usually placed a second, separate wooden frame called the deckle. The deckle is used when the pulp is to be confined within the surface area of the screen. It aids in determining the size of the individual sheet.



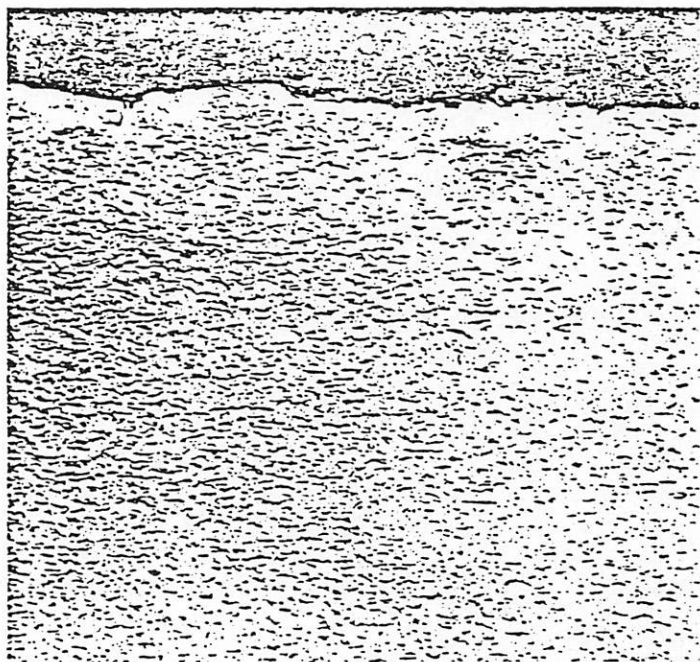
A mold and deckle. The deckle is fitted over the mold to prevent excess pulp from spilling over the sides of the mold as it is drawn from the vat.



Handmade mold and fitted deckle. The wood is mahogany.

The mold and its screenlike material are best made from mahogany and brass or bronze wire. In the Orient early molds were made using cloth and eventually fine strands of bamboo. However, lacking this most precious material, Europeans designed the "rigid" wire mold consisting of the two parts mentioned above. The deckle must fit exactly and be raised off the surface of the screen to properly contain the thin layer of fibrous pulp preventing it from running over. The thickness of the deckle is determined by the substance of the sheet to be formed. The term "deckle-edge" refers to the distinctive irregular edges of a sheet of handmade paper. No matter how tightly the deckle fits, a small amount of the thinner pulp will creep under the frame. When the sheet of paper is dry, the serrated edge is seen. Normally, this edge is trimmed with a blade or paper cutter. This also takes away much of the handmade paper look. Bookbinders and artists today often retain this deckle feature, a sure sign of quality and fine craftsmanship in handmade paper.

Almost all sheets of paper are made with the "wove" or "laid" finish. By holding a sheet of paper to a strong light you will almost immediately see the laid finish which is characterized by faint lines caused by the manner in which the sieve of the screen was fashioned. The laid screen was actually sewn into the mold frame by a series of intricate and painstaking techniques usually best accomplished by the mold specialist. Wove paper, however, is perhaps best made when the mesh of the



A thin piece of handmade paper showing the deckled edge characteristic of hand-molded paper. This particular sheet was made out of dried bamboo leaves.

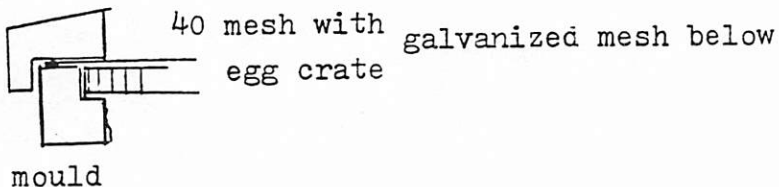


5. Coat 40 mesh surface with epoxy by brushing across the mould surface with a brush or roller(rubber) in 4-6" wide strips and carefully lay the mesh surface down on the epoxy as you go. With the 50 mesh heat shrink surface only the edges of the mould are coated with epoxy.
6. Cover glued surface with aluminum foil and board. Turn over and cover with weights overnite.
7. Trim edge with a sharp knife and finish with 3/8" brass strips. Use hair dryer on heat shrink surface to make tight fit.

If you have gone to all this hard work you may want decorative corners and a name plate of personal water mark. Congratulations!

SIDE VIEW of MOULD & DECKEL

deckel



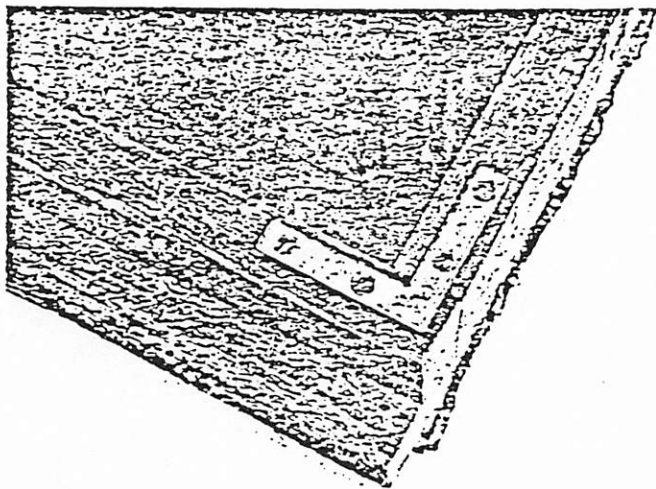
Special thanks to  
information from  
Lee McDonald and  
Karen Stahlecker

### Method 1

A rectangular wooden frame with a piece of fabric nailed or stapled across it makes a good mold of useful shape. Without the aid of the deckle, the paper is allowed to dry on the surface. Several molds make several sheets of paper during one session. On a warm day the paper is placed outside to dry and will do so after four or five hours of direct exposure to the sunlight.

Wood for the frame should be 1-by-2-inch pine strips clear of any knots or irregularities. Two 3-inch strips and two 13-inch strips are joined together to make the frame. The corners are mitered at 45-degree angles and screwed with  $\frac{1}{4}$ -inch flat-head wooden screws. Flat L-shaped metal braces should be applied to the underside for greater strength and rigidity. These must be brass, as should all hardware used throughout the mold-making process. "Foxing" can occur anywhere and invariably shows up in the handmade sheets.

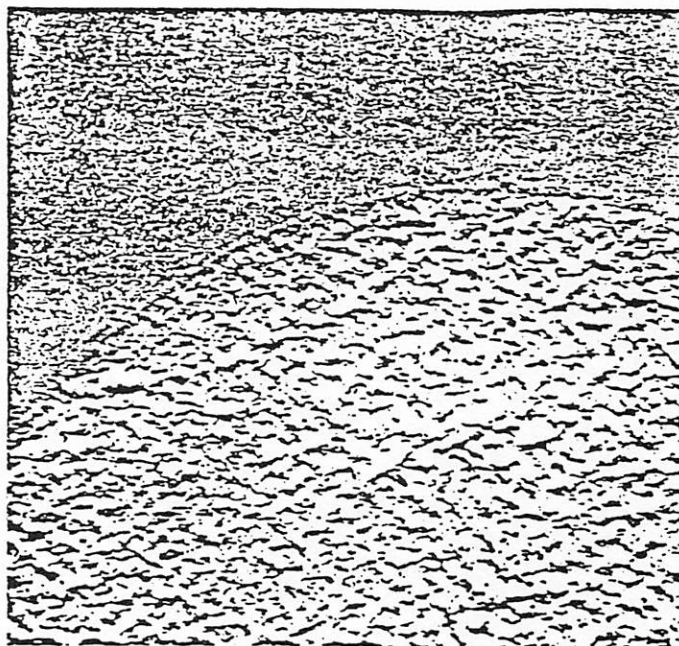
Once the frame has been secured, material is stretched tautly over the frame's edge, fastened with brass nails, or staples, and then excess material is trimmed off. This simple mold may be used with a good degree of success. If extended life is to be obtained from the mold, copper or brass strips should be placed on top of the mold's edge to further minimize fraying. Small strips of  $\frac{1}{4}$ -inch dowel may be placed on the underside of the frame to gently support the screen material. When the mold is lifted from the vat, a strong suction draws the fibrous material towards the middle of the mold where the least resistance occurs. The result is paper of uneven surface and thickness. In your search for suitable material, consider any fabric such as printmaker's tarlatan, coarse cheesecloth, burlap and other open, yet durable, material.



Detail showing position of an L-shaped flat brace. In a nonmitered corner the brace helps to secure both pieces of the mold frame.

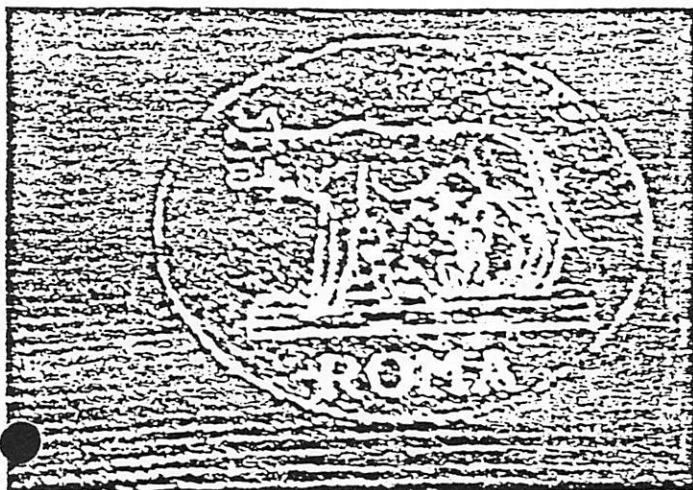
### Method 2

The basic design of a more professional mold of the wove type may interest the more serious papermaker. The rectangular frame of the mold is made of mahogany or oak of the required size of the sheet. On top of the frame, brass or bronze woven wire is placed and securely fastened with small brass brads approximately  $\frac{1}{2}$  inch in length and spaced every  $\frac{1}{4}$  inch. On the underside of the frame, wedge-shaped ribs are spaced  $1\frac{1}{4}$  inches apart parallel to the shortest side of the frame. The wedge shape makes it easier to draw the mold from the vat then it would be if it was flat. The wire mesh is secured by copper stripping around the frame and additional brass brads. Flat L-shaped braces are then fastened to the bottom four corners. If a watermark is desired, make it of very fine brass wire, sew the wire shape to the mesh with very fine wire thread, and trim waste ends. Wire which is too thick will weaken the structure of the paper and is undesirable in cases where the paper is to be printed.

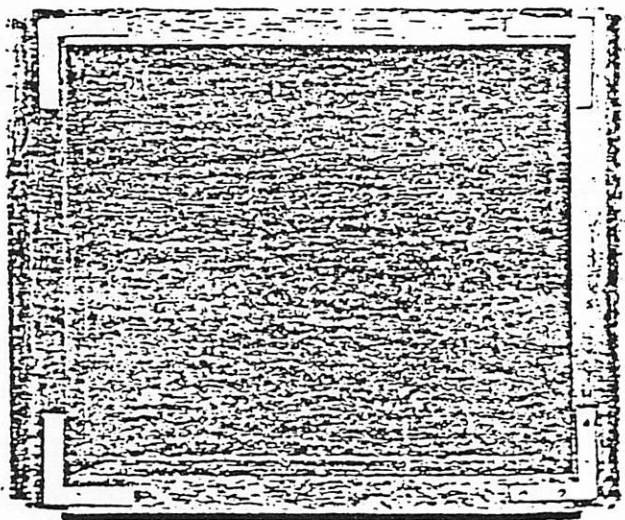


An example of paper formed with the use of a round sieve with 30-mesh screen. The pulp is poured into the sieve and allowed to dry in this position.

mold is made using finely woven cloth or wire. This type of mold imparts to the paper sheet a mottled effect which evinces no lines or other marks characteristic of the mold. The use of woven cloth or other material is actually as old as papermaking itself. The Chinese used a woven fabric on their first molds, but it was not until the eighteenth century that the famous printer and type founder, John Baskerville, demanded sheets of paper with no visible lines and a smooth surface. At present, handmade papers are fashioned using both types of finishes, each providing the papermaker with its own particular look and surface.



A section of paper from Fabriano revealing laid lines and watermark.



Bottom view of a simple mold which may have fabric or wire stretched over the top of the frame to support the pulp.

The wove mold is the easiest to make, often being fashioned out of handy and interesting fabrics found in a yard goods store. Here the material is tautly stretched and stapled onto the wood frame using brass staples (steel staples rust). You may wish to experiment with ready made plastic screen door mesh available in hardware stores. This material, by virtue of its plastic composition, will not rust and is inexpensive. Like the fabric, plastic mesh should be reasonably open in its weave. Material that is too fine makes paper that is very thin and irregular in thickness. The center of the mold holds more pulp making this area of the paper too thick while the peripheral areas are too thin. When selecting cloth or plastic screen, look for material that is approximately 30 mesh, which means 30 strands of material to the inch. This will give your paper an even, consistent appearance and should be the most trouble-free size to use.

Ideally, the best molds with the longest life are those that are fashioned out of woven brass. This wire may also be 30 mesh. Other mesh sizes will work well too (the author has and continues to use screens with 60, 80, and even 100 mesh for papers of great delicacy). Here, as in other instances, you should experiment to find what you like best. Woven brass wire is relatively expensive, and not always easy to find. A 12-inch square may cost as much as \$4.00 to \$6.00. When a full roll of five feet is purchased the price per square foot usually drops. This length will enable you to make three to five small molds and, for the serious papermaker, is a good investment.

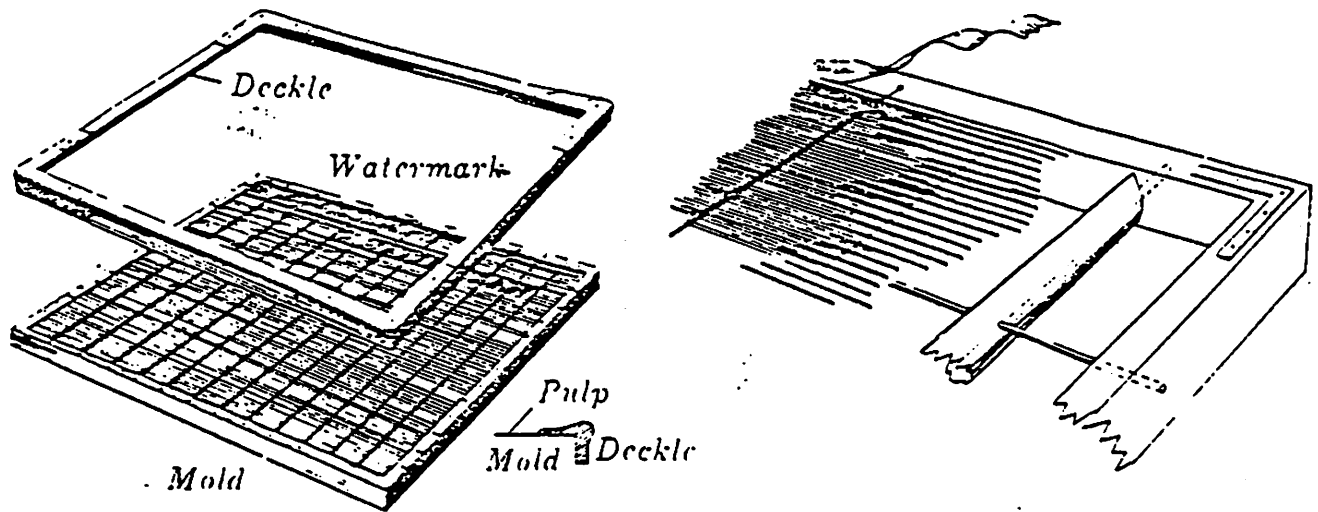
In contrast to the high cost of brass wire, it should be emphasized that good, quality paper can be made with even the most crude and primitive of materials provided sound and proper techniques of construction are followed.

Once the decision on material is made it will be necessary to build a frame to support it. The frame is made of wood which will withstand the alternating soaking and drying that occurs when the mold is in use. Traditional molds are made of mahogany or teak. The unique properties of these woods make them ideal for use in water without benefit of varnishes or sealers. Other woods such as pine, fir, ash, or walnut will stand up to repeated use and, for the hobbyist, are perhaps more desirable because they are cheaper and more readily available. Whatever material is used, it must be free of knots and warpage. A mold that is true will give years of reliable service. The following are two simple methods of constructing practical molds and decks.

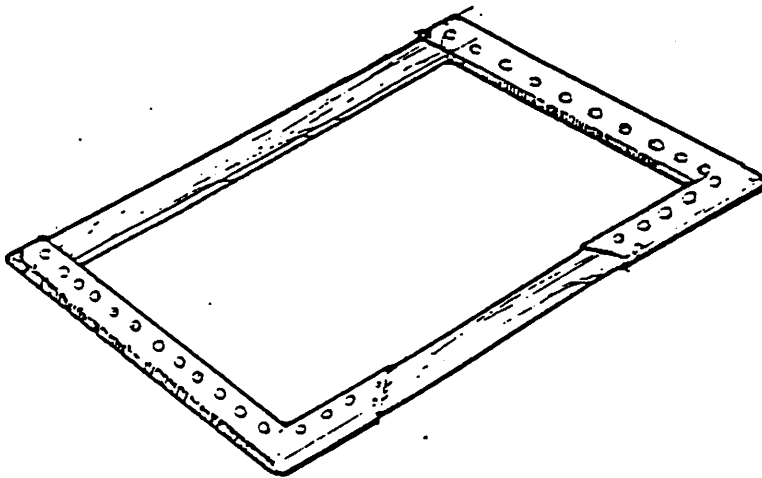


### The Deckle

The deckle is the removable wooden frame which fits the mold exactly and creates a raised edge. A suitable deckle may be constructed of picture frame molding of approximately 1 inch width with a recessed underside. The molding is cut with a miter box and fastened together so that it can easily rest upon the mold. All four corners are capped with copper stripping and secured with small brass brads. If glues are to be used in construction of either the mold or deckle they should be insoluble in water. Animal-hide glues and synthetic glues created with water repellant properties are usually available in hardware stores.



Two views of a more professional mold and deckle typical of the ones fashioned in Europe by master craftsmen. Only the finest materials are used to give extended life to the product. (Quentin Fiore, *Industrial Design*, 1958)



A simple deckle fashioned of teak and copper strips. Brass brads are used to fasten the copper to the wood.

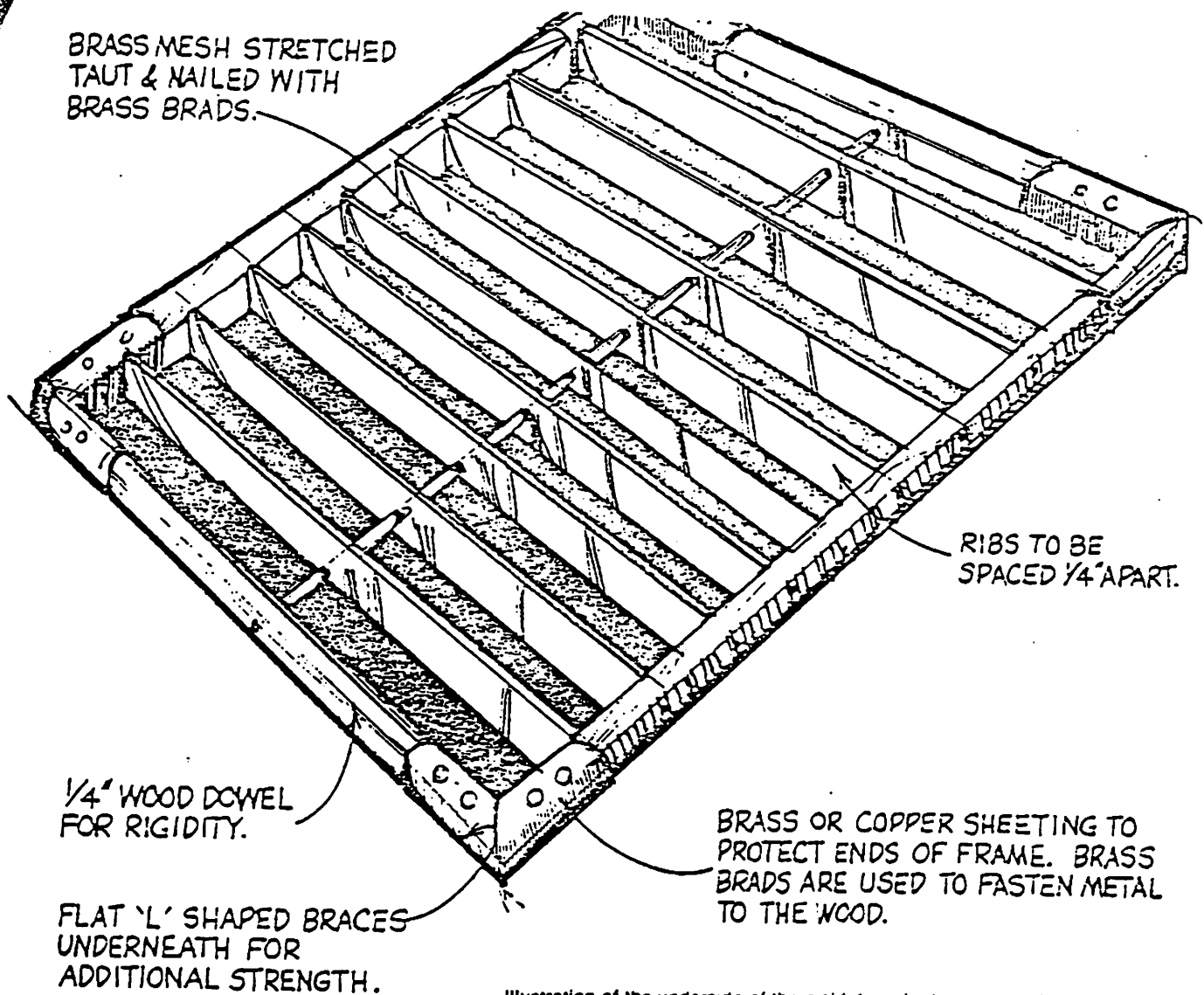


Illustration of the underside of the mold described in method 2. The small ribs help to keep the screen taut and should be slightly flared to ease the draining of water. A strip of thin dowel pierces the ribs to keep them spaced and fixed in their respective positions.



## TOOLS AND MATERIALS LIST FOR CONSTRUCTING A STURDY MOLD & DECKLE

(Materials which are difficult to find in the local hardware store or lumber yard are marked LSM and are available by mail from Lee Scott McDonald, major supplier to the hand papermaker in this country.)

Better quality, knot-free wood (fir, pine, mahogany, etc.)

Plastic "egg crate" (Usually available from lumber yards or lighting stores, this white, plastic grid is often used to cover florescent light fixtures.)

Waterproof, two-part epoxy (I use Devcon, other brands are fine as long as they are waterproof--DO NOT USE 5-MINUTE EPOXY--it is not waterproof.)

Backing Wire--Either: a.) galvanized steel 4x4 mesh woven screen from a hardware store OR b.) the synthetic 6x6 mesh polyester from LSM.

Monofilament fishing line--14 lb. test.

Thompsons Water Seal and/or polyurethane wood sealers

40-mesh polyester woven screen (LSM)

Contact Cement--must be water resistant, solvent-type e.g. Elmers or Weldwood

3/8" brass edging (LSM)

solid brass or solid copper nails

Brass flat corner braces for top of deckle (optional)

### TOOLS REQUIRED

Saw or saws for woodworking

Drill & bits for some methods of assembling wooden mold & deckle

tin snips to cut galvanized steel backing wire

scissors to cut polyester screen

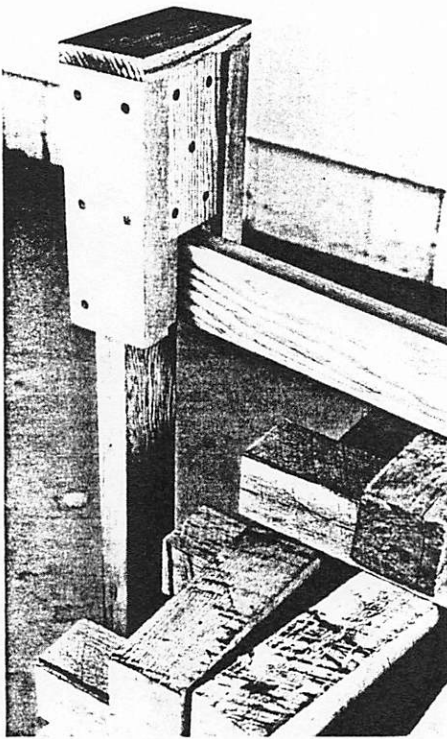
brushes for water seal &/or polyurethane

staples & staple gun for some permanent & temporary attachments

sharp awl

hammer

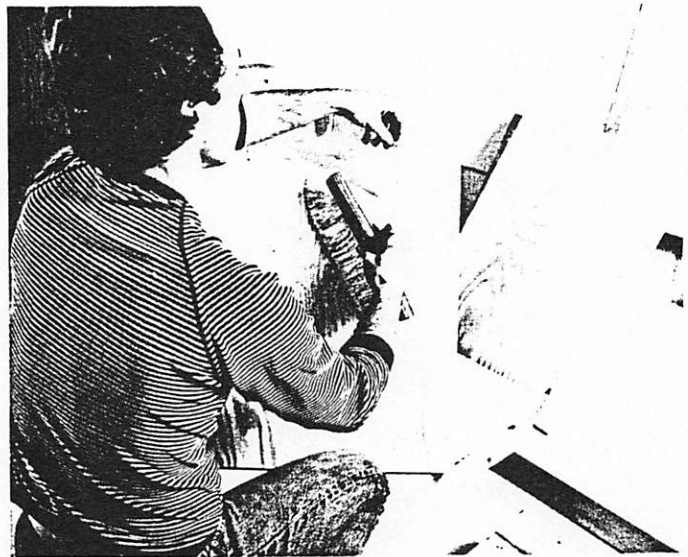
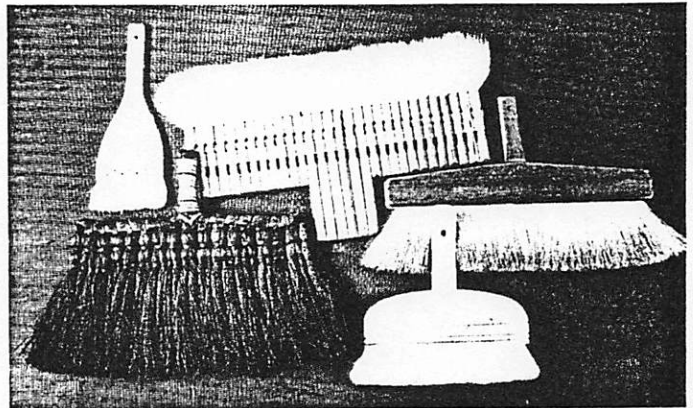
screw driver



*A closer view of the top of the press.*

*An assortment of brushes can be used to press the sheets to the boards.*

*After twelve hours, the papers are separated, or "parted," from the stack. Each pulp reacts differently at parting. The sheets in a "dry" stack may bond together. Those in a wet stack may tear easily. Fine reeds or threads may be added along the edge of each sheet when forming the stack to aid in separating them later. The separated sheets are brushed onto a flat surface, of wood or metal, to dry. When dry, the sheets are peeled away from the board.*



The stack of newly formed sheets is allowed to stand overnight before being pressed. During this period water and neri gently seep out of the stack. In fact, in the final dried sheet of paper there is virtually no trace of neri. It is unclear whether it becomes another compound or its viscous nature pulls it all out of the sheets as one unit.

### *Pressing*

The Oriental press can be a very simply constructed machine. In its most simple form it can be several large rocks placed on a board on top of the stack of paper. Others can be simple levers made from tree trunks with the stack of paper as the fulcrum. Hydraulic and screw presses are also used.

Gentle pressing is extremely important to prevent the fresh sheets from sticking to each other. The sheets are usually left in the press for twelve hours, and the pressure is increased gradually during this time.

### *Drying*

After the sheets are removed from the press, they are carefully separated from each other in the stack and brushed onto large drying boards with wide horsehair brushes. These boards are then carried out into the sun to dry and, depending on the weather, the paper is peeled off and ready for use in one hour or less. This process can be shortened even further by brushing the papers onto heated metal plates. This creates a very smooth surface on the side of paper in contact with the metal plate and makes the paper more crisp than when it is board dried.

Most Oriental papers are absorbent. If a less porous, smoother surface is needed, a small percentage of kaolin, china clay, ground sea shell, or rice powder may be added to the pulp mixture. The finished paper can also be rubbed with a smooth stone or leaf to polish its surface.

*The stack of papers on a board is placed in the press. This press, modified by Tim Barrett of Kalamazoo Handmade Papers, is based on an ancient Oriental design. By adding water to a bucket, pressure can be gradually increased over a twelve-hour period. Oriental papers are pressed at approximately 18 pounds per square inch, as opposed to 150 pounds per square inch for European papers.*

