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Cottage Industry Manuals

Techniques for Making Bamboo Furniture

EASTERN AFRICA BAMBOO PROJECT

funded by



executed by



supervised by



ETHIOPIA

Ministry of Agriculture and Rural Development
Federal Micro and Small Enterprise
Development Agency

KENYA

Kenya Forestry Research Institute

COTTAGE INDUSTRY MANUALS

TECHNIQUES FOR MAKING BAMBOO FURNITURE

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Table of Contents

I. INTRODUCTION	1
II. SOME EXAMPLES OF BAMBOO FURNITURE	2
III. BAMBOO ARMCHAIR MAKING	6
A. Material Requirements	6
B. Component of a Bamboo Armchair.....	6
C. Bamboo Armchair Frame Making.....	7
1. Raw materials	7
2. Steps to Make a Bent Mortise	8
3. Assembly of the Frame	15
4. Assembly of Cross Supporting Poles.....	21
5. Assembly of the Supporting Frame.....	25
6. The Back Frame and the Armrests.....	28
7. The Seat Surface	38
8. Installing the Second Armrest.....	44
9. The Backrest	49
10. Polishing and Varnishing.....	57

I. INTRODUCTION

Bamboo has been used as a building material for thousands of years. It is used for the buildings and the furnishing alike.



Throughout Asia, bamboo has always been a popular material for furniture making. It is used more and more in hotels and schools, as well as in private houses, traditional tea houses and restaurants.

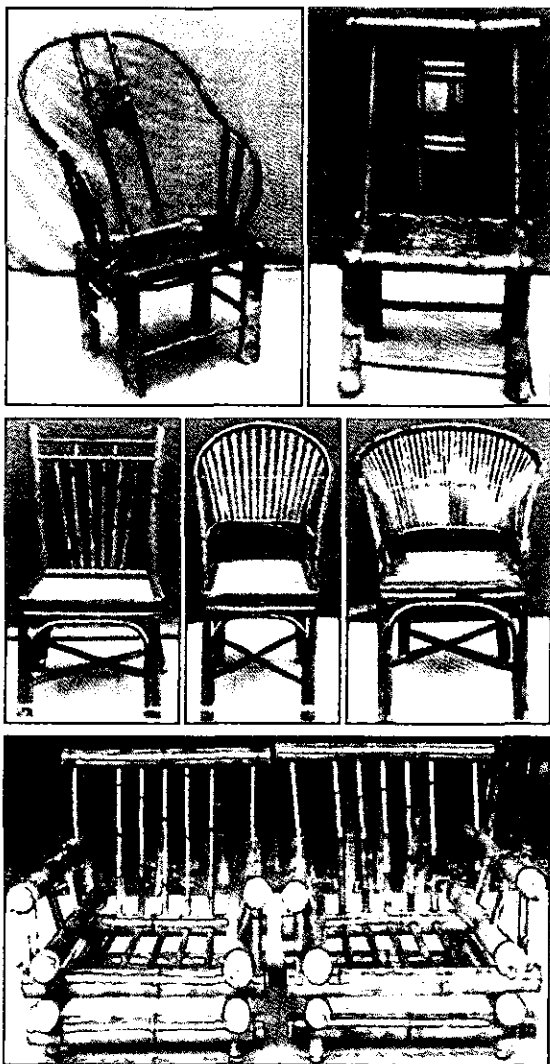


Simple designs, such as those in the picture below, have been evolving at a rapid pace and bamboo furniture is becoming more sophisticated and very fashionable. These guidelines focus of bamboo armchair making.

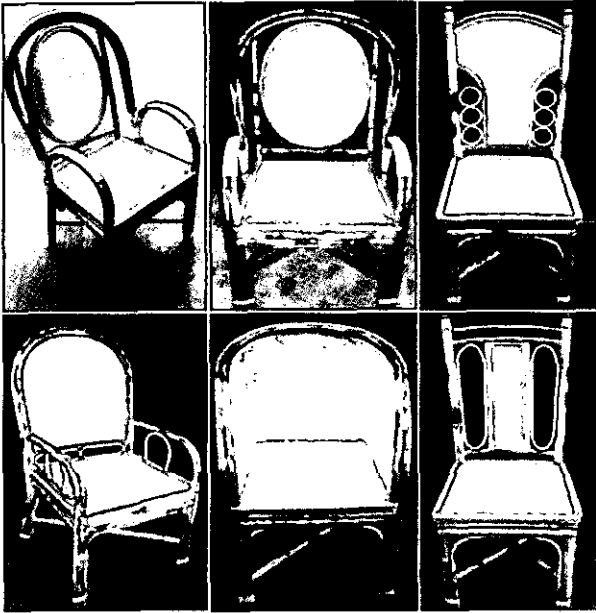


II. SOME EXAMPLES OF BAMBOO FURNITURE

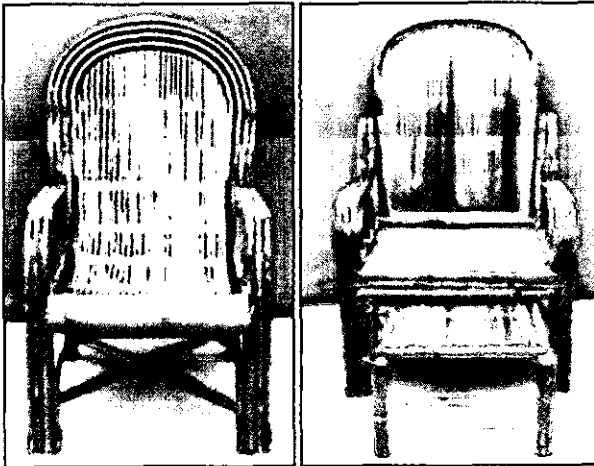
Chairs



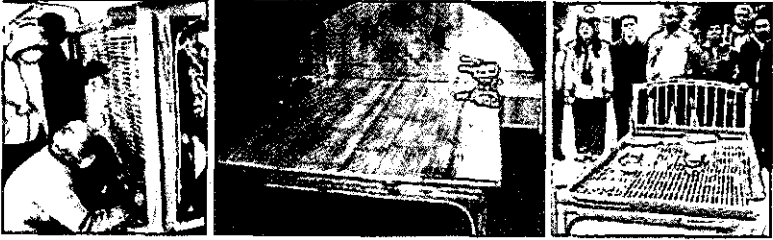
Bamboo Mat Chairs



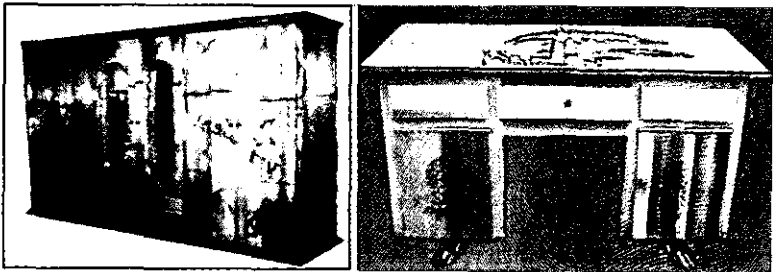
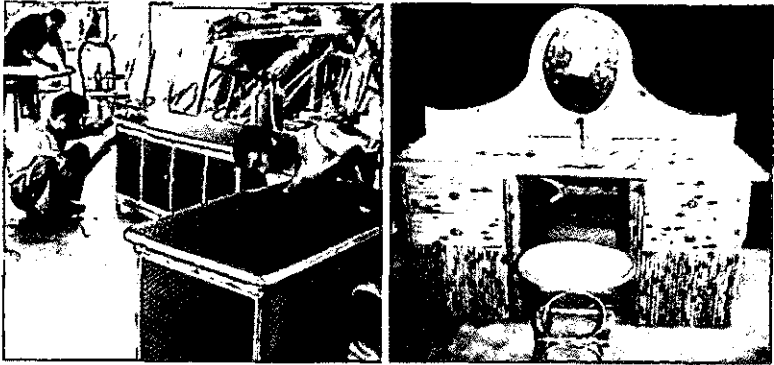
Relaxing Chairs



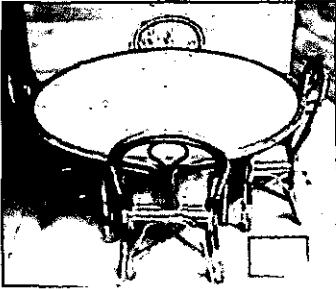
Beds



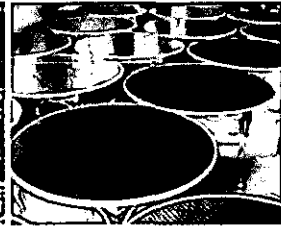
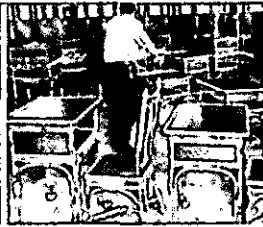
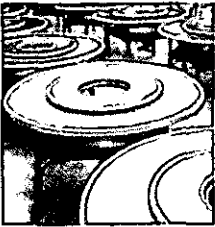
Cabinets, Wardrobe, and dressers



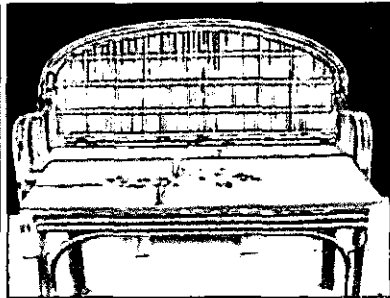
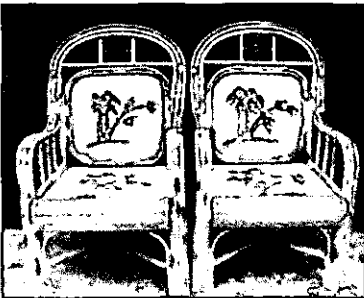
Round and Rectangular Tables



Bamboo Mat Tables and Desks



Sofa Sets

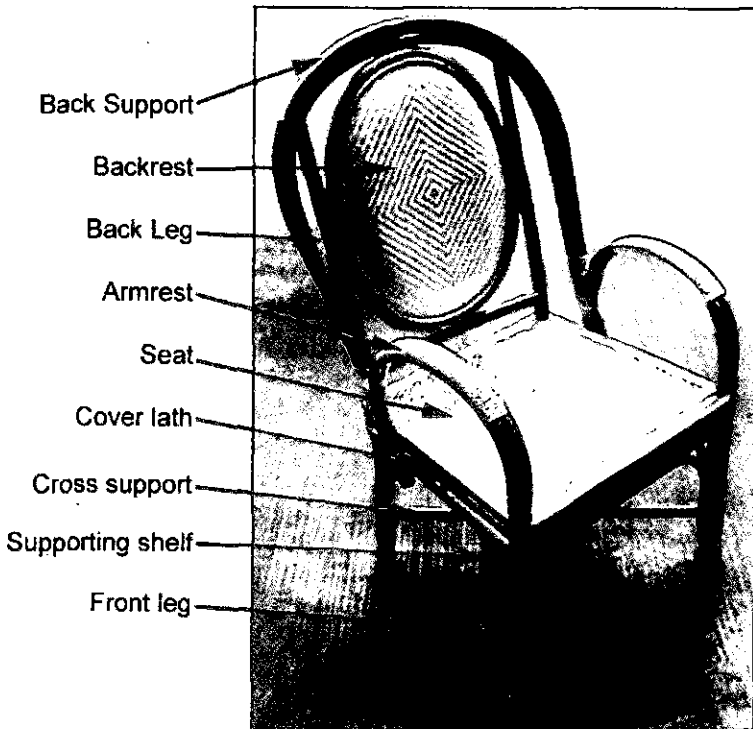


III. BAMBOO ARMCHAIR MAKING

A. *Material Requirements*

- Bamboo poles with the diameter of less than 3 cm.
- Rattan skin
- Foam
- Bamboo mat

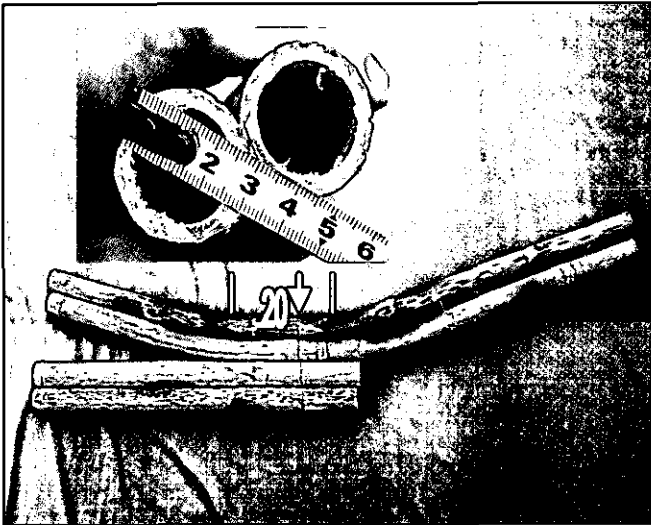
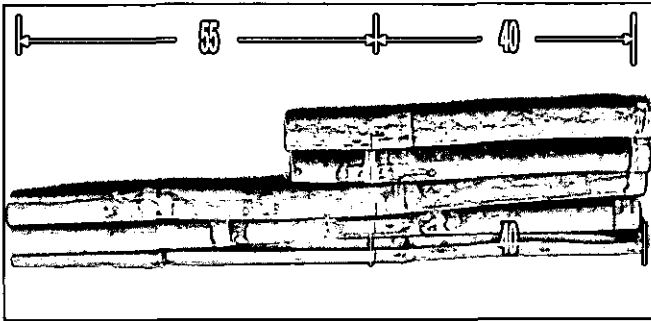
B. *Component of a Bamboo Armchair*



C. *Bamboo Armchair Frame Making*

1. Raw materials

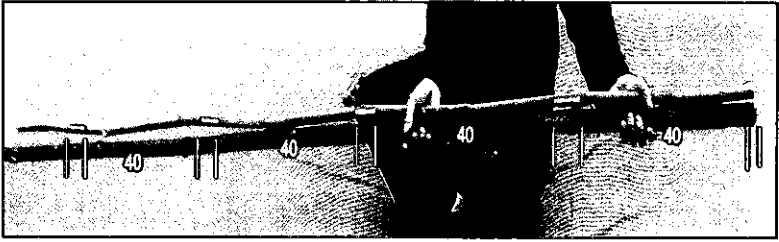
- Choose bamboos culms with diameters of 1.5-3 cm. (Note: the unit of measurement used in all the pictures is in centimeters)
- The moisture content of the culms should be less than 10%.



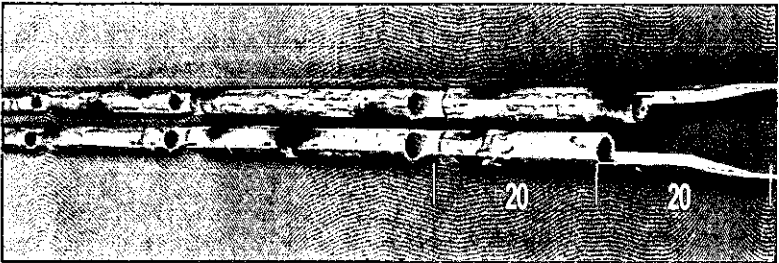
Materials for front legs and back legs

- Strengthen the leg poles and heat bend them to the required curve
- Scrape off the skin of the poles
- Use a sample bent mortise as a jig for selecting material

- The grooves on the bent mortise should not overlap with the nodes of the culm



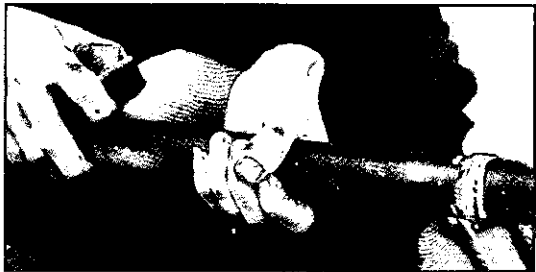
Sample bent mortise is used as a ruler



Finished bent mortise with grooves and pins on both ends

2. Steps to Make a Bent Mortise

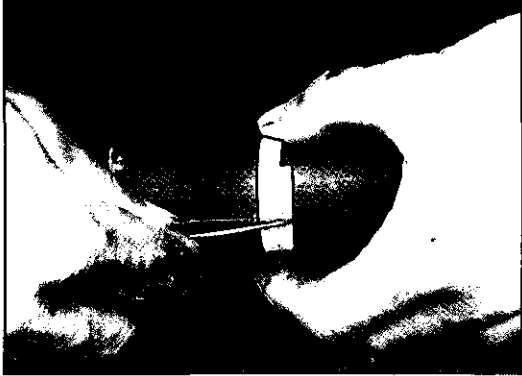
- Remove the outer nodes with hand plane



- Scratch a straight line on the bent mortise as the reference line



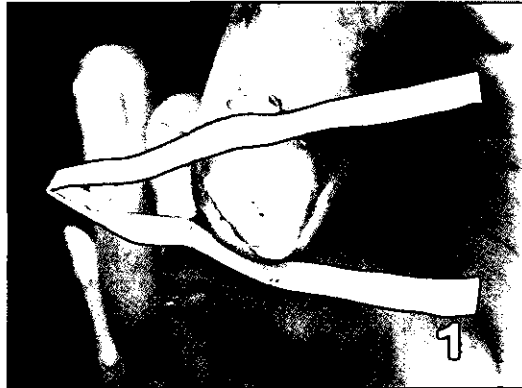
- Cut a paper strip and fold it around the leg pole with overlap.
- Make a cut on the overlap to get the circumference of the leg pole.



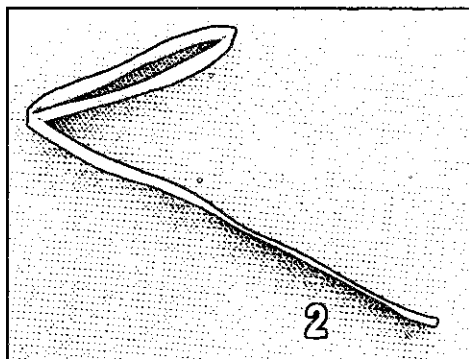
➤ The groove length can be calculated using the following formula:

$$\text{Groove length} = \text{circumference} \times 9/16$$

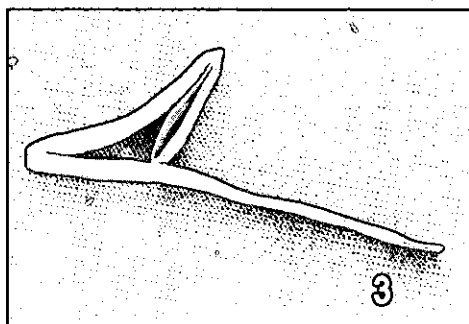
- (1) Fold the strip into half to make a fold line on the 1/2 of the strip



- (2) Fold the right half into half to make a fold line on the $\frac{1}{4}$ of the strip



- (3) Fold the right quarter into half to make a fold line on the $\frac{1}{16}$ of the strip



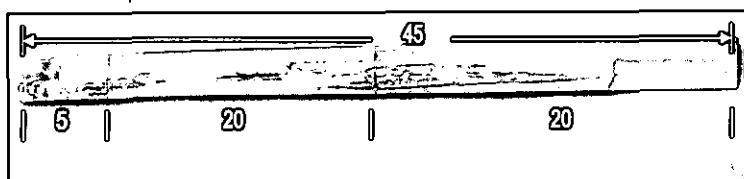
- (4) Make the left end meet the $\frac{1}{8}$ fold line to make the final fold line



- (5) The longer part of the strip after the final folding corresponds to the correct groove length



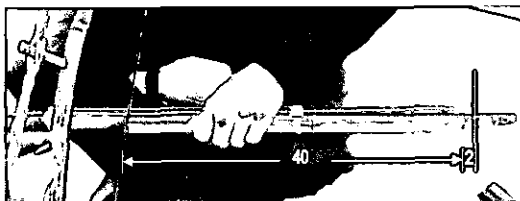
➤ Make a Template Stick



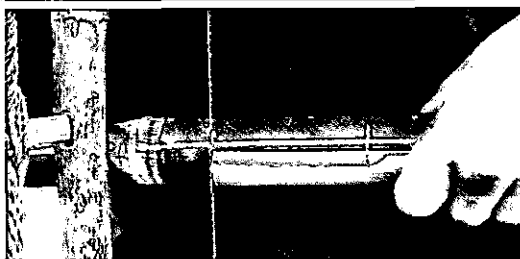
- Mark the lengths of the grooves on the ruler, it is better to choose leg poles with similar diameter



- Mark the culm along the reference line



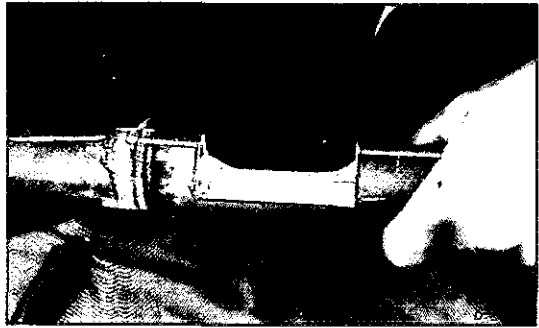
- Cut the grooves. Make sure the grooves do not overlap with the nodes.



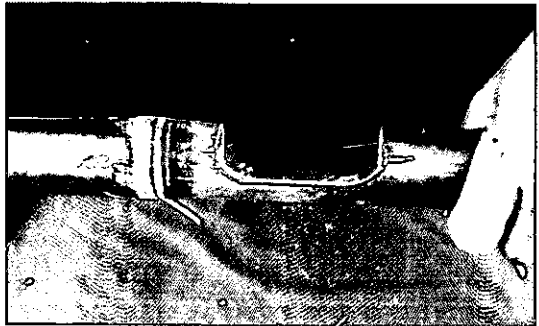
- Cut off half of the culm diameter.



- Shape the groove to a half round



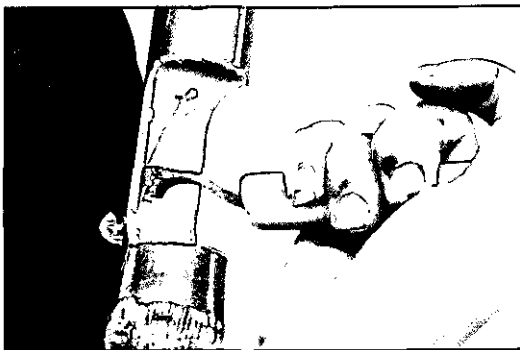
- The groove should be parallel shaped



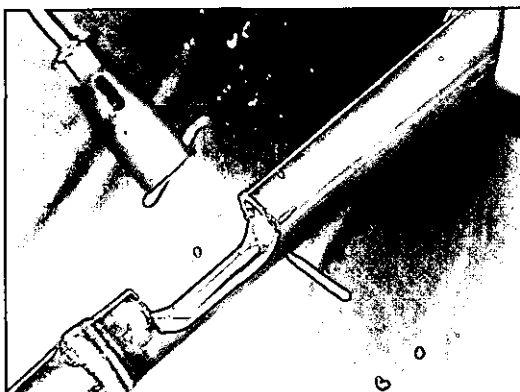
- Remove material from the grooves perpendicular to groove length on both ends.



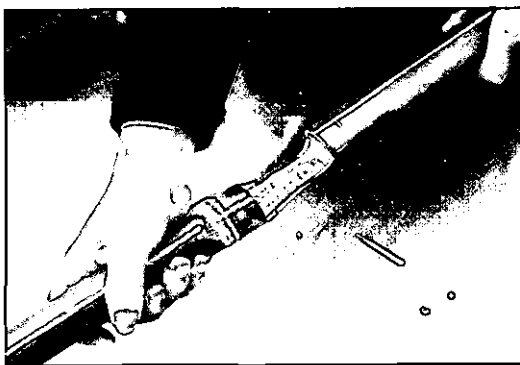
- Then remove material from the grooves along the culm length.



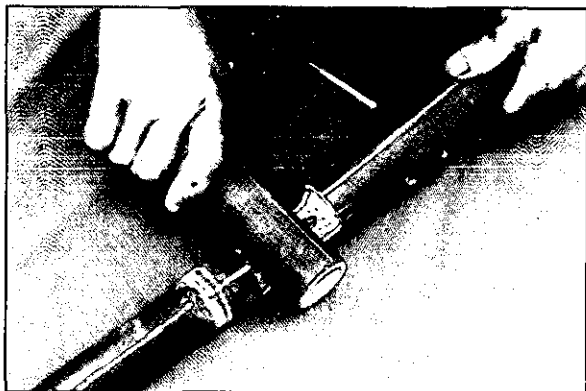
- Apply heat from the inner side of the groove.



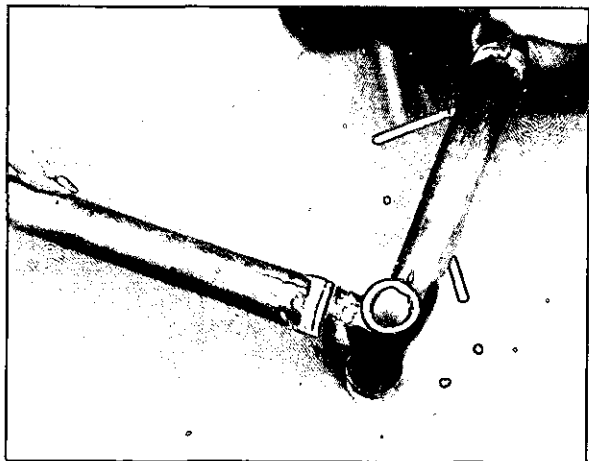
- Heat until the groove can be bent without cracking.



- Position the leg pole into the groove.



- Bend the mortise around it. Maintain the position until the mortise cools down and is fixed in the bent position.

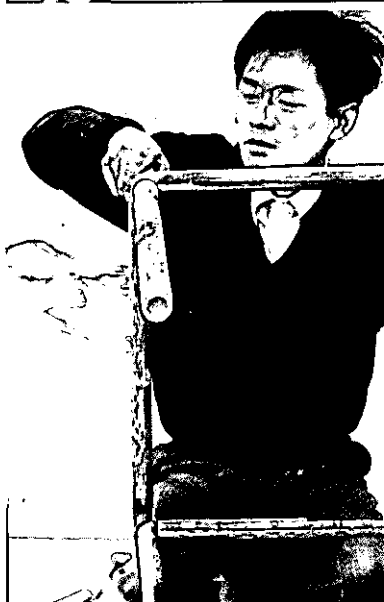


3. Assembly of the Frame

- Position the first front leg



- Position the other front leg



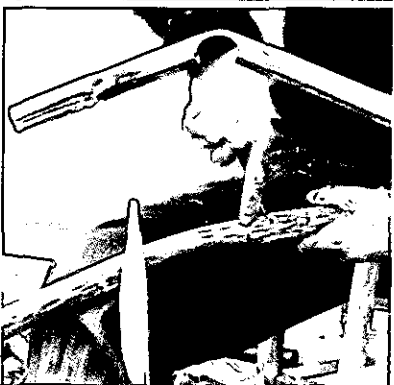
- Make a mark under the bent groove of the back leg.



- Cut a hole on the mark to match the joint pins.



- Shape the hole to fit the pins.



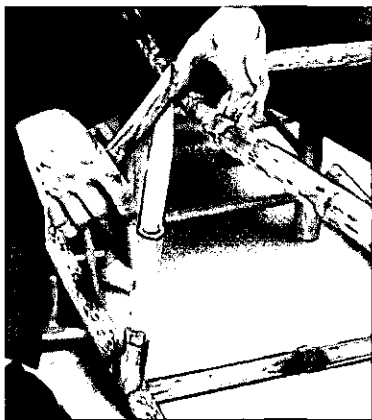
➤ Position the left back leg.



➤ Position the right back leg.



➤ Insert the pin into the hole.



- Bind the opening with a string.



- Make a mark under the right back leg under the first bent groove.



- Cut a hole on the mark to match the joint pin of the second bent mortise.
- Insert the pin into the hole and overlap the joints as shown below.



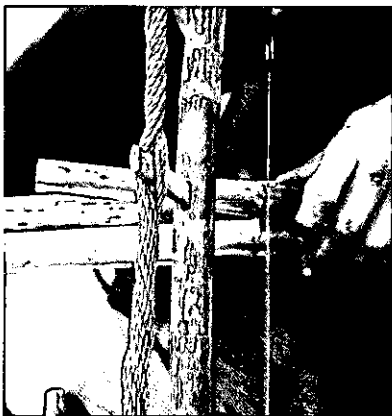
- Overlap the joints.



- Fix the four legs into the second bent mortise.



- Cut off the extra part of the bent mortise.



- Overlap the pin joints.

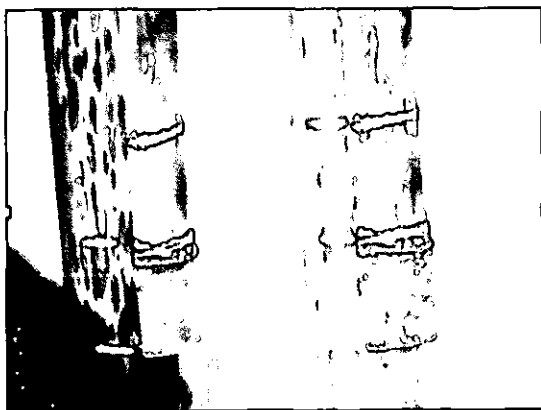


- Drill 1 or 2 holes through the joints and fix them with bamboo nails.

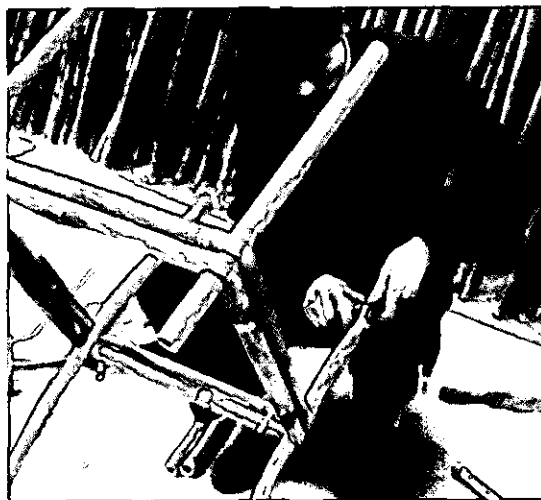


4. Assembly of Cross Supporting Poles

- Make marks on the 4 legs for the cross supporting poles.



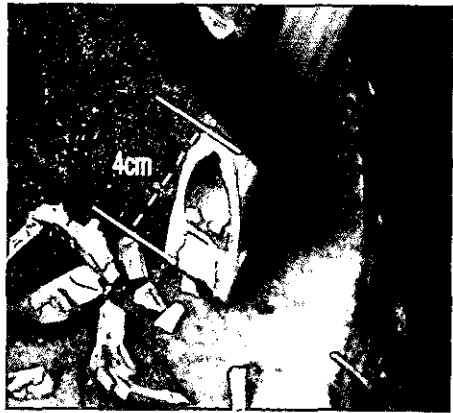
- Carve out holes on the marks with a width of 5 cm.



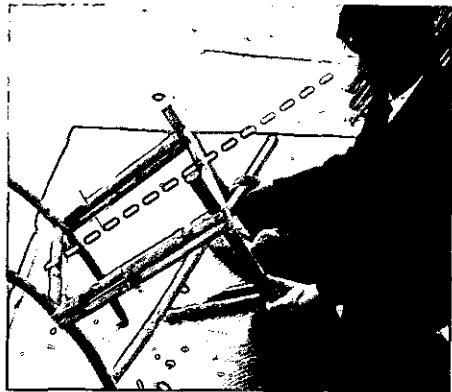
- The holes should have a half round shape.



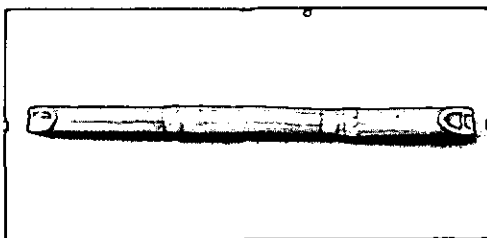
- Cut a pin on each end of the supporting pole.



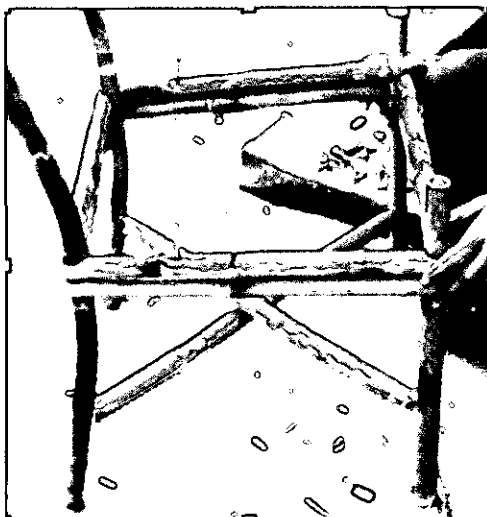
- Adjust the frame by moving the supporting pole.



- The 2 pins should be on the same side as the supporting pole.



- Fasten the cross supporting pole to the frame.



- The surface of the seat should be leveled horizontally after fastening the cross supporting pole.



- Drill through the pins and the legs.



- Fix the pins and the legs using bamboo nails.

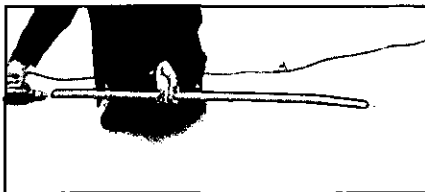


- Fix the crossing point of the two supporting poles with a bamboo nail.



5. Assembly of the Supporting Frame

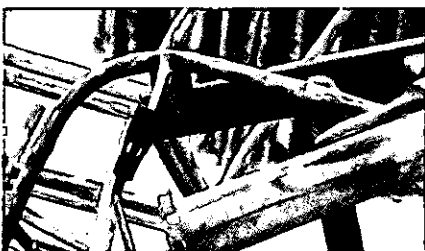
- Perforate the inner nodal walls using a drilling machine.



- Fill the culm with sand.



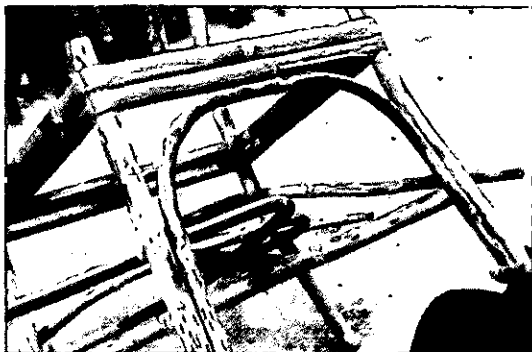
- Apply heat evenly on the bending portion by using blow torch.



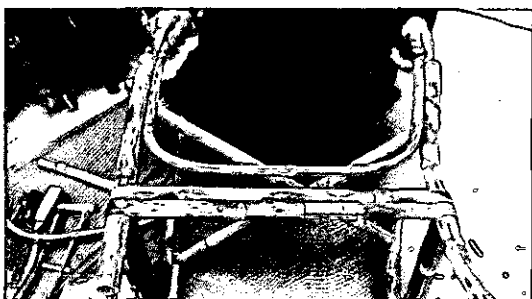
- Cool the bend with water to fix the position.



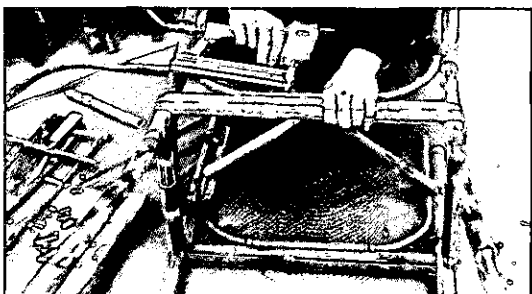
- The supporting pole should completely fit into the space between two legs of the armchair.



- Position the supporting frame between two leg poles.



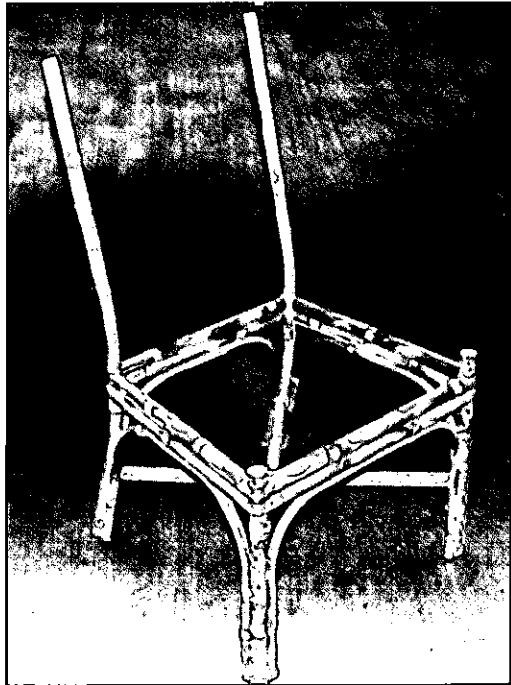
- Fasten the supporting pole on the bent mortis with bamboo nails.



- Fasten the supporting pole and leg pole together.

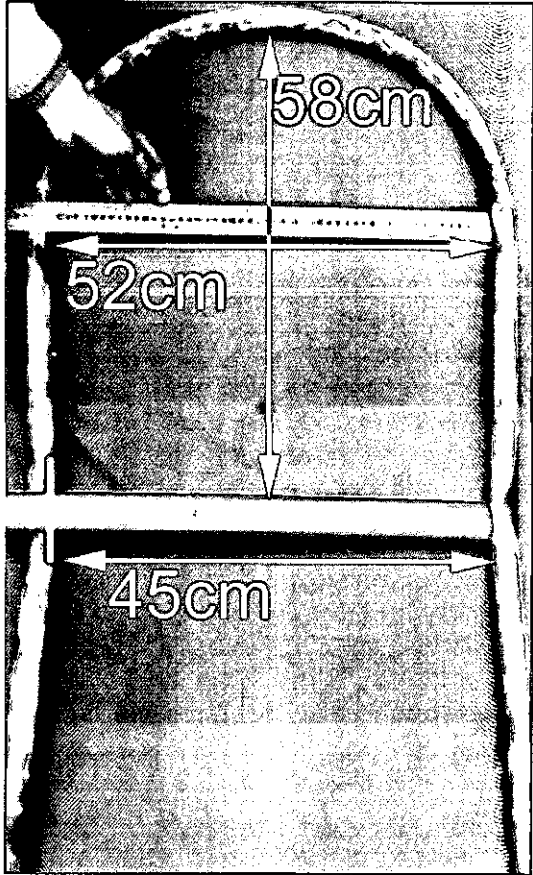


- The chair frame is more stable after installing the cross supporting pole and the supporting frame.



6. The Back Frame and the Armrests

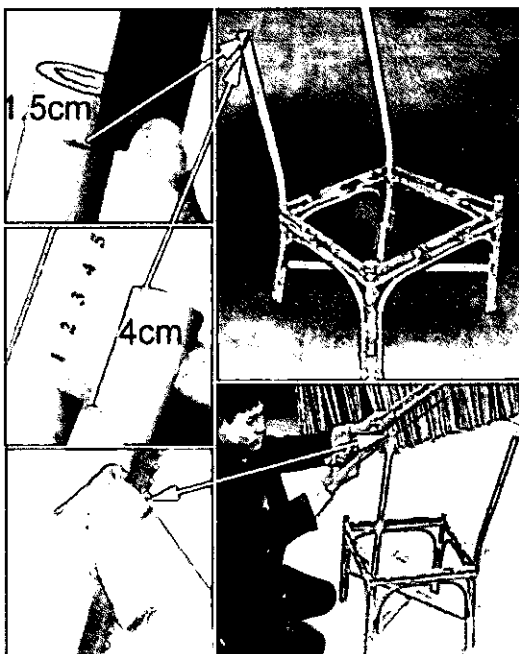
- Measurements of the Back Frame.



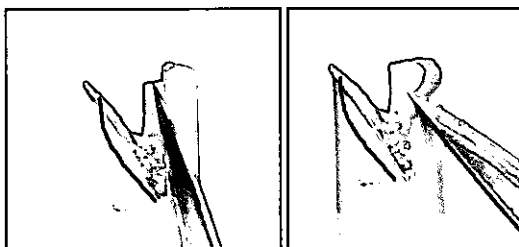
- Make marks on 1.5 cm (top of the pin) and 4 cm (the bottom of the pin)

- Cut a nick at the marking place;

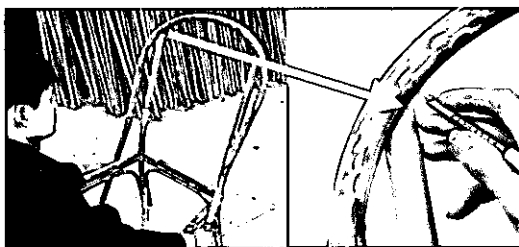
- Shape half of the top end of the frame to a pin.



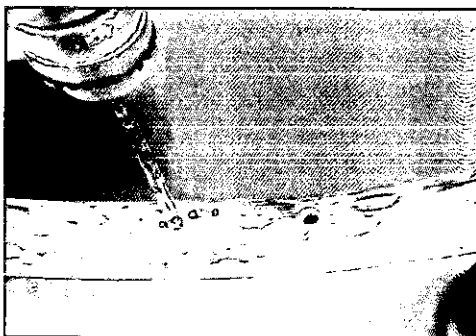
- Cut off the extra materials from the nick.



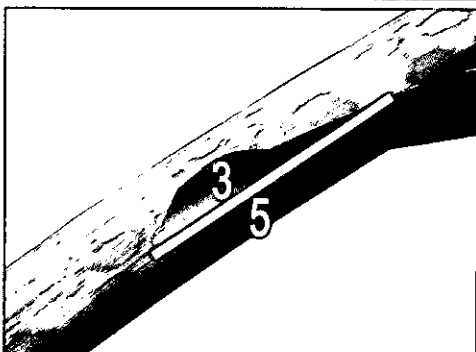
- Position the back frame to the framework and mark the inserting points on the back frame.



- Drill holes at the marked points.



- Cut off the material between the holes to make nicks that fit the pins, the nicks start at the $3/5$ position of the back frame pole.



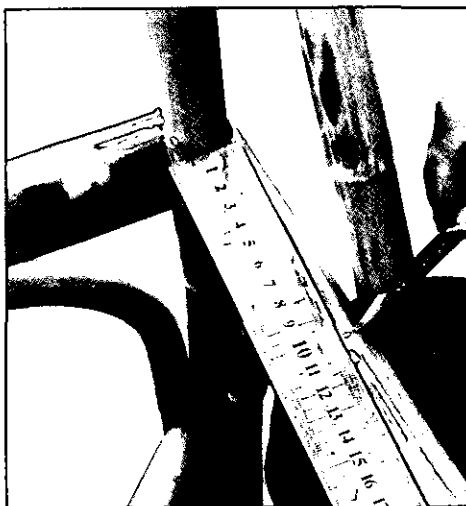
- Insert the pin to the nick.



- The pin and the nick should fit tightly together.



- Make a mark at the 10cm position from the back leg on the seat surface.



- Position the back frame pole at the marking place.

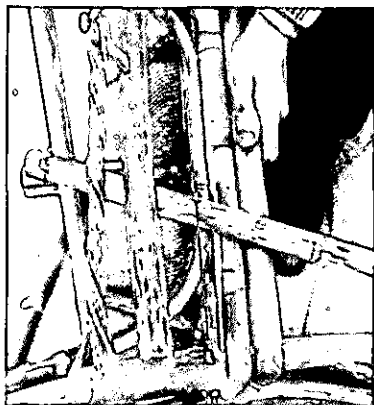
- Drill through the back frame pole and the seat from the outer side.



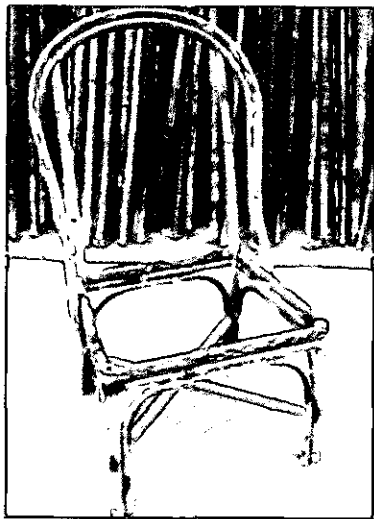
- Join the back frame pole and the seat together with screw.



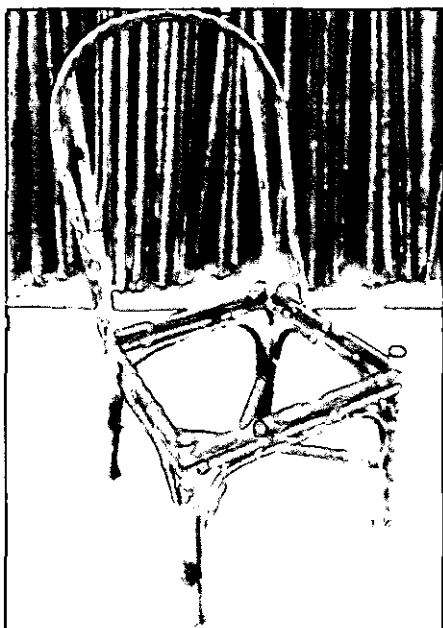
- Saw off the extra part of the back frame pole at the second bent mortise place.



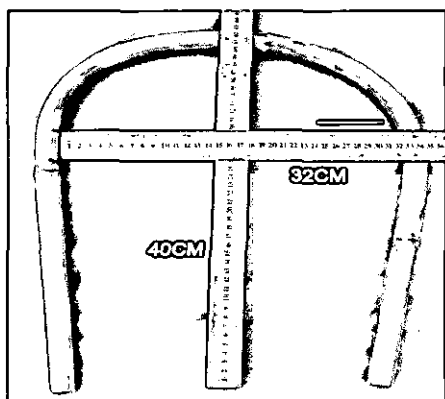
- Fix the first back frame.



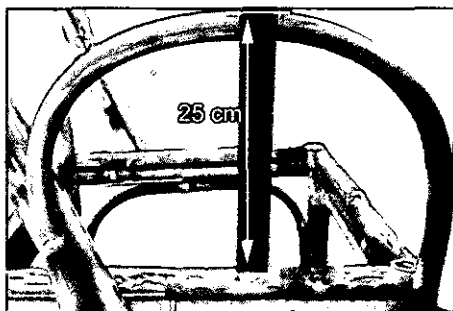
- Fix the second back frame.



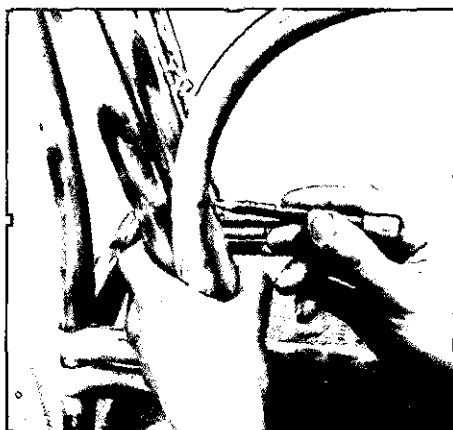
- The sizes of the different parts of the armrest.



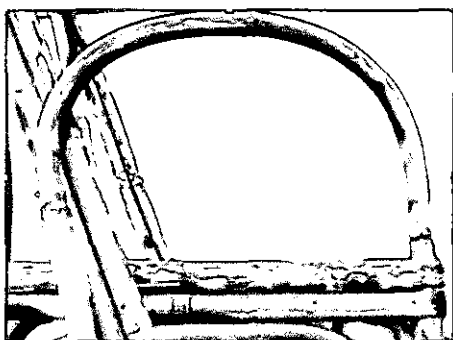
- Position the armrest to the framework and make marks at the jointing places of the back frame and the seat surface.



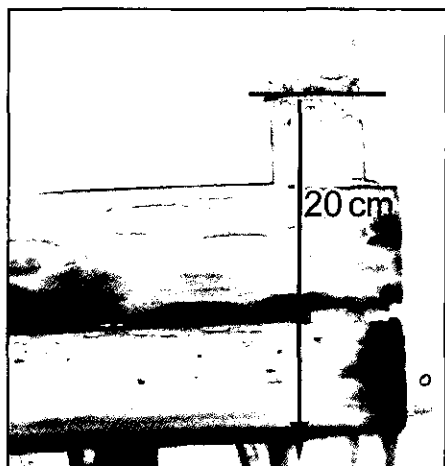
- Make a pencil mark at the overlap.



- Shape the front end into a thinner stick.



- Insert the thinner stick into the hole of the front leg.



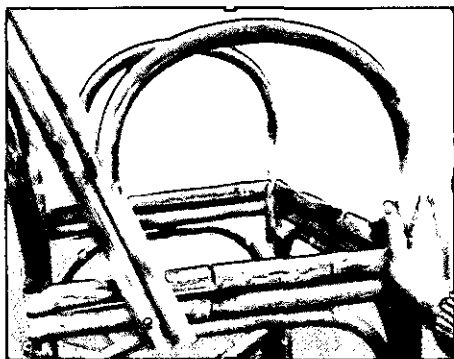
- Cut off the extra part of the armrest (at the pencil line).



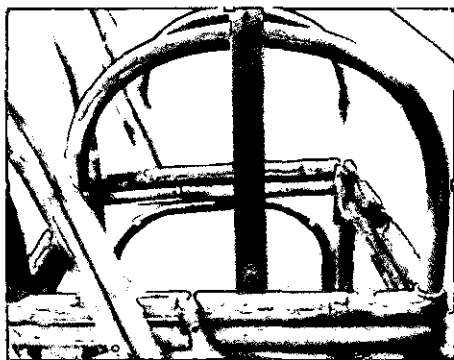
- Shape the back end of the armrest into a slope.



- Fit the slope to the backrest pole.



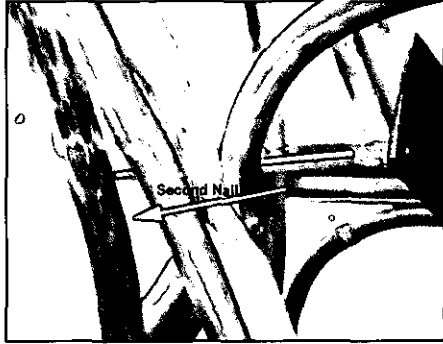
- Adjust the height of the armrest.



- Drill through the armrest and the back frames.
- Fix the armrest and the back frames with bamboo nails.



- The armrest and back frames should be nailed at two places to secure the stability.

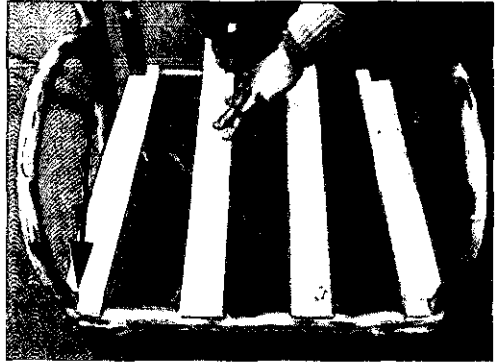
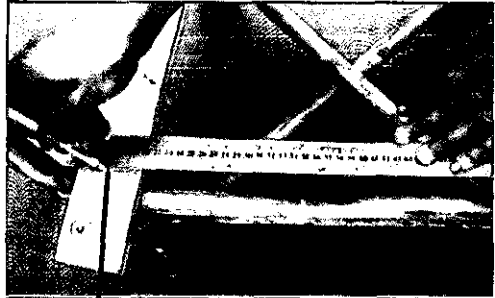


- The armchair framework after fixing the back frames and the armrests.

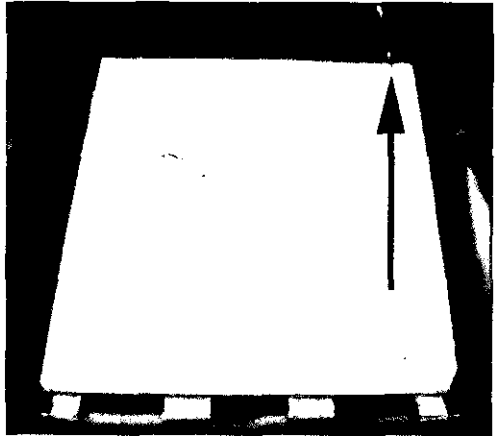


7. The Seat Surface

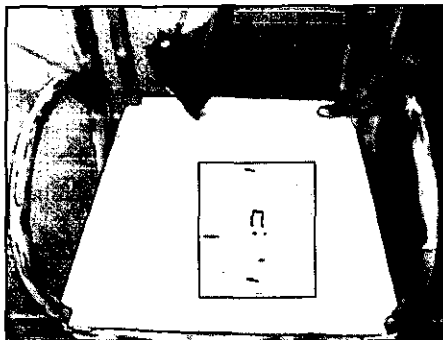
- Place wood bars on the seat and mark the size.
- The size of the wooden bars should be 6 cm wide by 1.2 cm thick.
- Cut the bars to the right size and fix them on the seat.



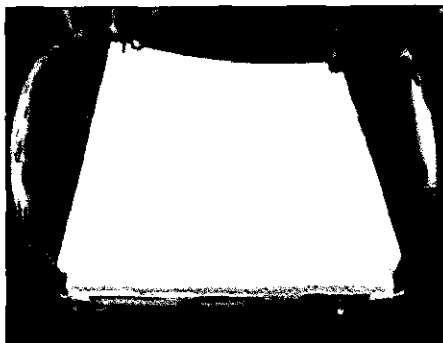
- Place a piece of plywood of the suitable size on top of the bars.



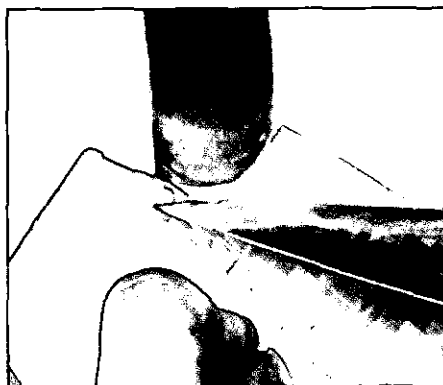
- Fix the plywood on the bars with nails.



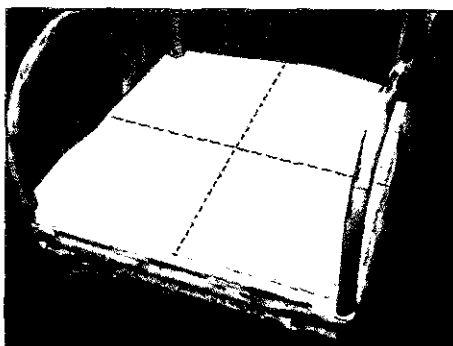
- Place a piece of 1.5cm thick foam on top of the plywood to make the seat softer.



- Place a bamboo mat on top of the foam and shape the corners.



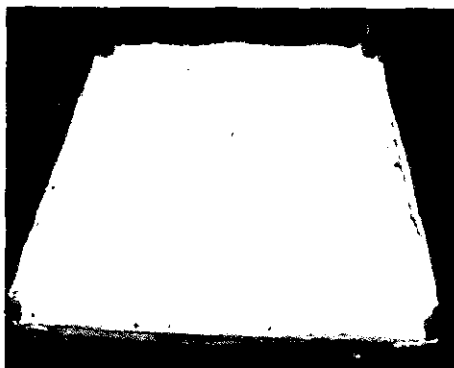
- Measure the bamboo mat so that it exactly fits the size of the seat.



- Fix the edges with nails.



- The bamboo mat should be completely flat after it is fixed to the seat.



- Cover the edges with bamboo lath of 3.5cm wide by 0.3 cm thick.



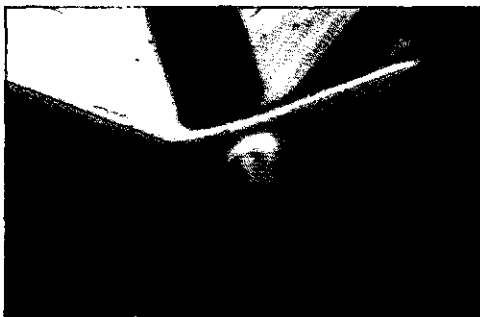
- Shape the joint corner to fit the leg pole.



- Cover the outer side of the seat with bamboo lath.



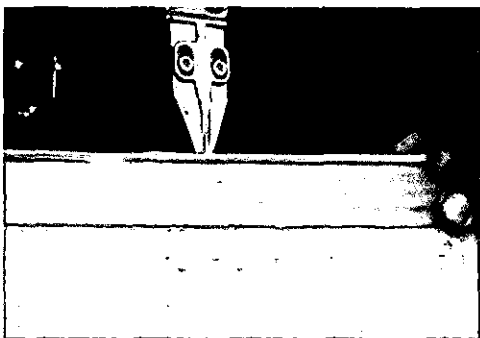
- Pare the thinner side of the bamboo lath with a knife to make it soft so that it can easily bend around the corner.



- Corner of the seat after applying covering lath.



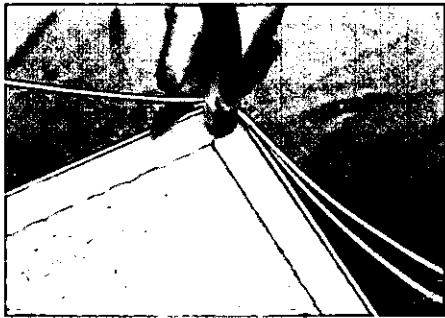
- Fix the covering lath with nails.



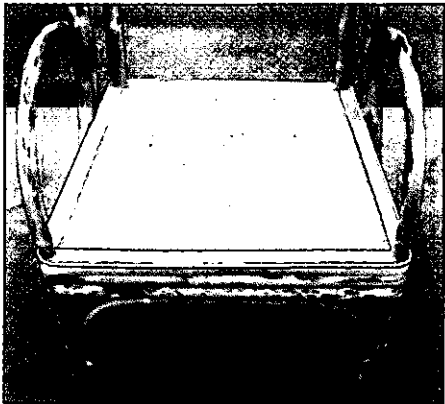
- Pare off the extra material off the covering lath.



- The corners should be shaped with extra care and attention to detail.

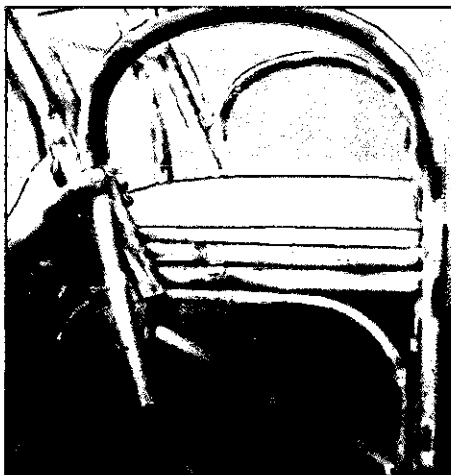


- Bamboo armchair after installing the seat.



8. Installing the Second Armrest

- Bend a bamboo pole identical to the first armrest.



- Cut off extra parts from the joint section.



- Shape the joint section into a slope.



- The slope after shaping.



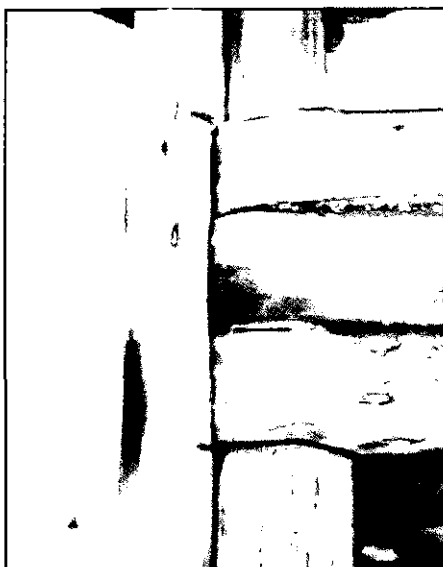
- The second armrest should be a perfect match of the first armrest.



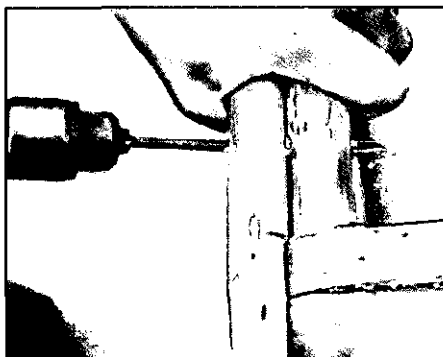
- Mark the other side of the armrest at the covering lath and bent mortise sections.



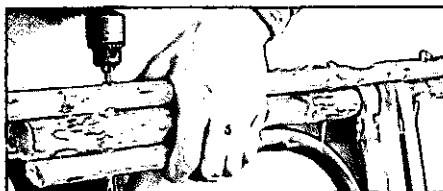
- Make a groove between the marks to embed the bulge.



- Fix the second armrest on the back legs.



- Nail at different places to make it more stable.



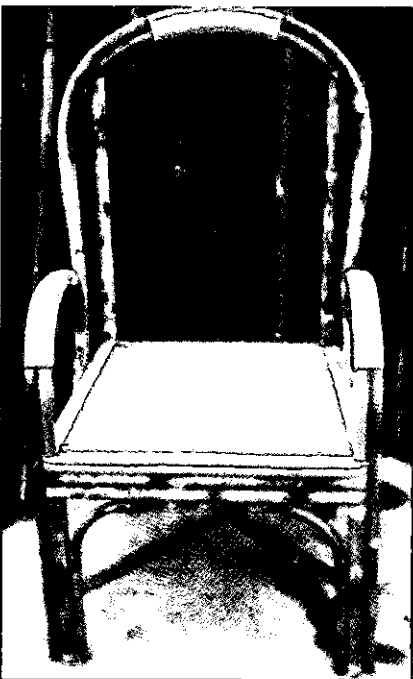
- The second armrest should be shorter than the back leg.



- Wrap the main parts of the armrest and back frame with rattan skin (or bamboo strips).

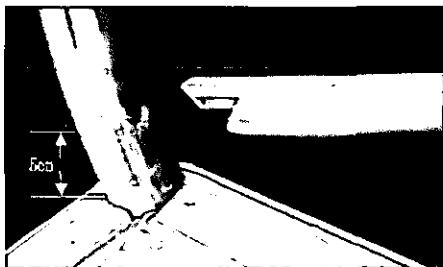


- The armchair after installing the second armrest.



9. The Backrest

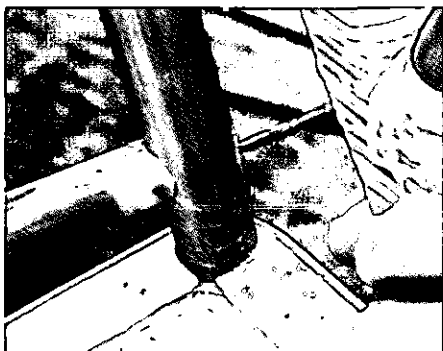
- Drill a hole 5 cm above the seat on one back leg.
- Prepare a bamboo pole with one end shaped into a pin.



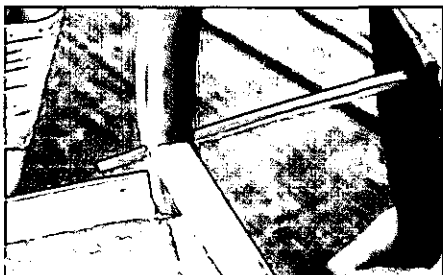
- Insert the pin into the hole and shape the other end to fit the other back leg.



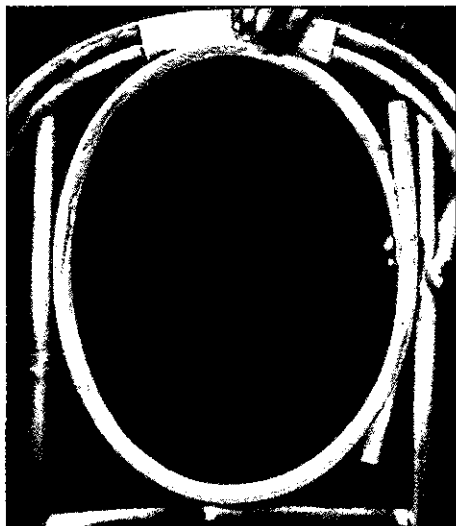
- Fix the pole into the joint of the back leg.



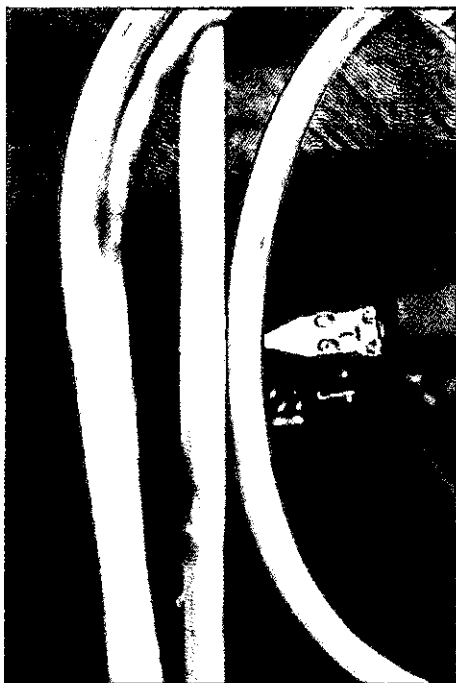
- Fix the inserted pin using a bamboo nail.



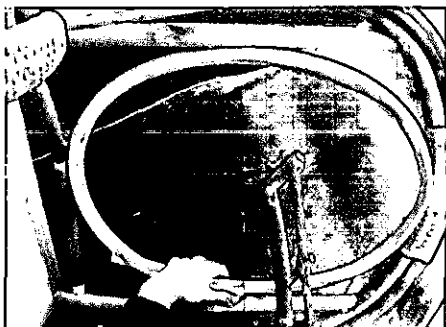
- Bend a rattan cane into an oval shape to fit the space between the back legs.



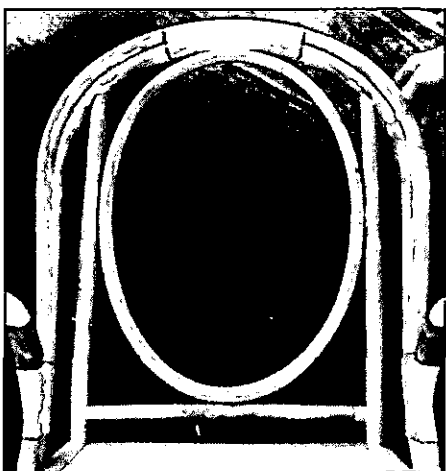
- Fix the oval shaped piece with nails on four sides.



- Cut off the extra part.



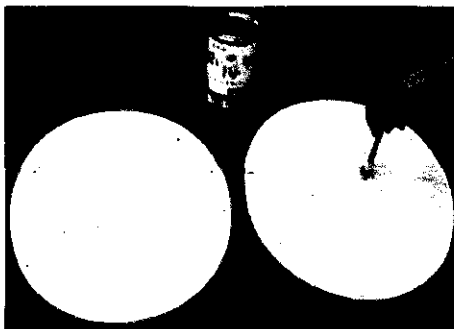
- The backrest after fixing the oval shaped rattan on the armchair.



- Use plywood to fill the hollow area of the oval.



- Cover the plywood with bamboo mat.



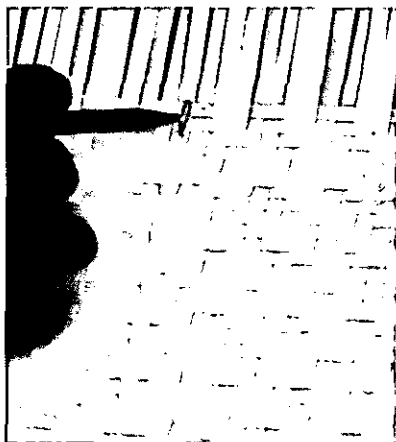
- Glue the bamboo mat to the plywood.



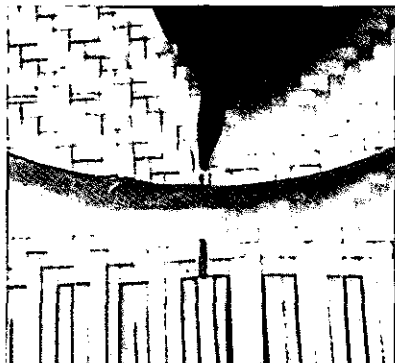
- Apply pressure so that they stick properly.



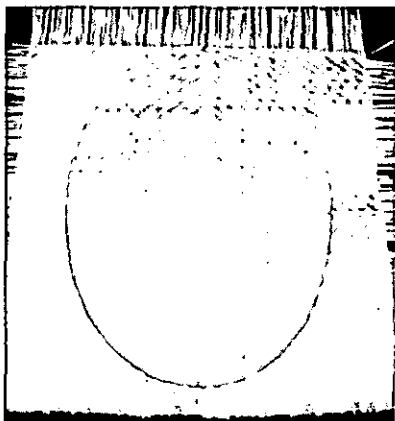
- Mark the center of the mat.



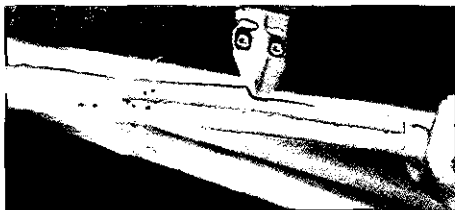
- Place a layer of foam on the other side of the plywood and cover the foam with bamboo mat.



- Glue them together.



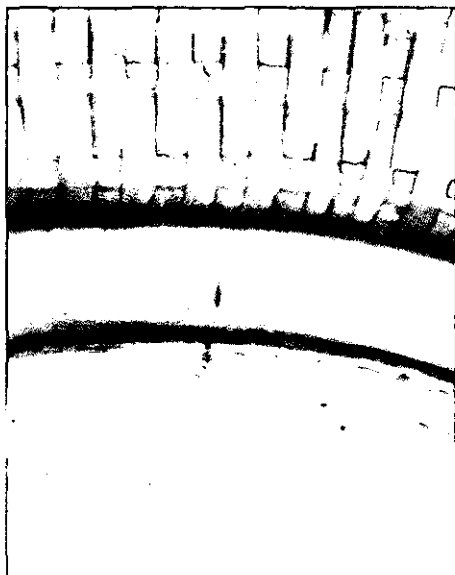
- Prepare a cane with a diameter of 8mm and fix it into the rattan oval.



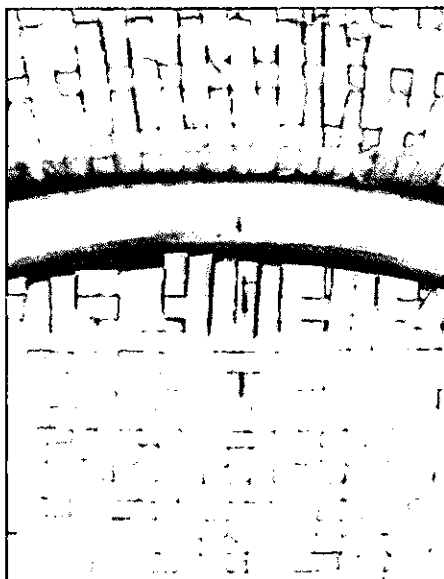
- Fix the cane into the inner side of the rattan oval.



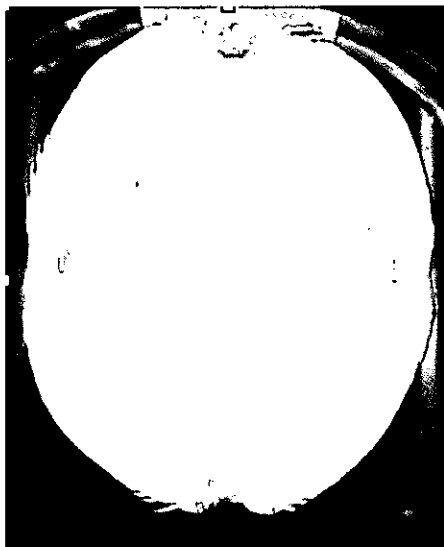
- Make a pencil mark in the middle of the top section of the rattan oval.



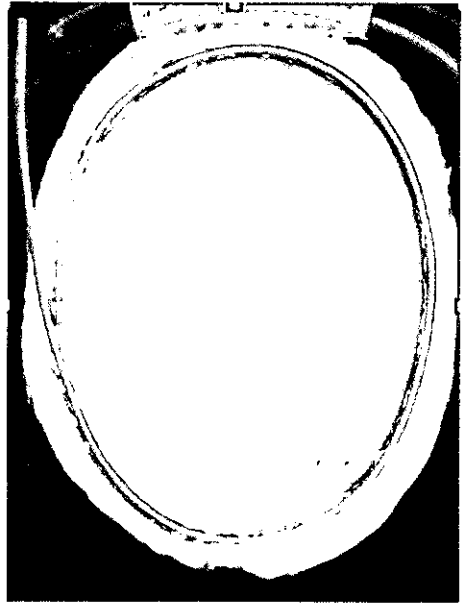
- Fill the oval with a disk and overlap the two marks.



- Temporarily fix the plywood on the rattan oval.



- Place a piece of cane all around the inner perimeter of the oval.



- Cut off the extra materials from the edge.



10. Polishing and Varnishing

- Use a mixture of latex and plaster to fill the nail holes.



- Polish the armchair with fine sand paper.



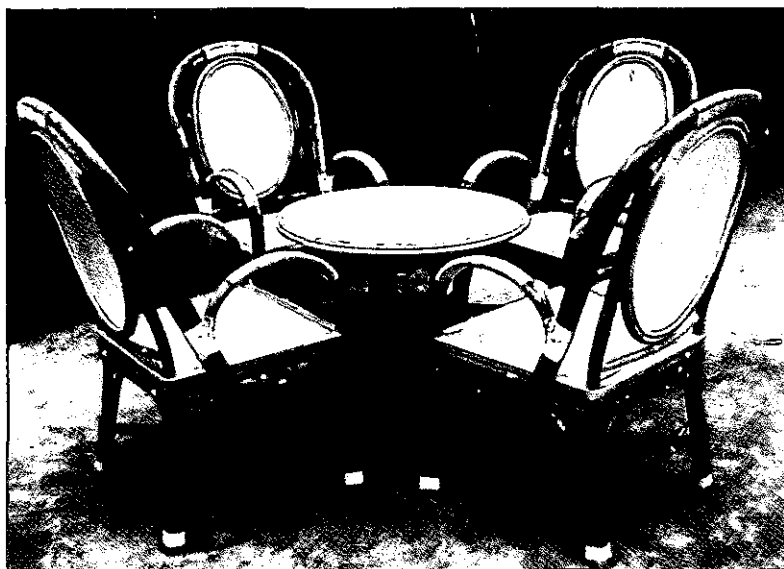
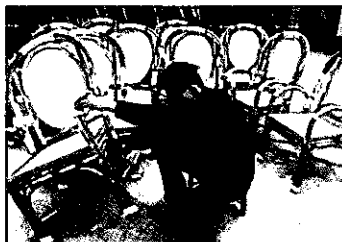
- Brush off and dust after polishing.



- Apply 2 layers of varnish to the armchair.



- ➔ Production in larger batches will increase productivity.



A set of delicate and elegant bamboo armchairs

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