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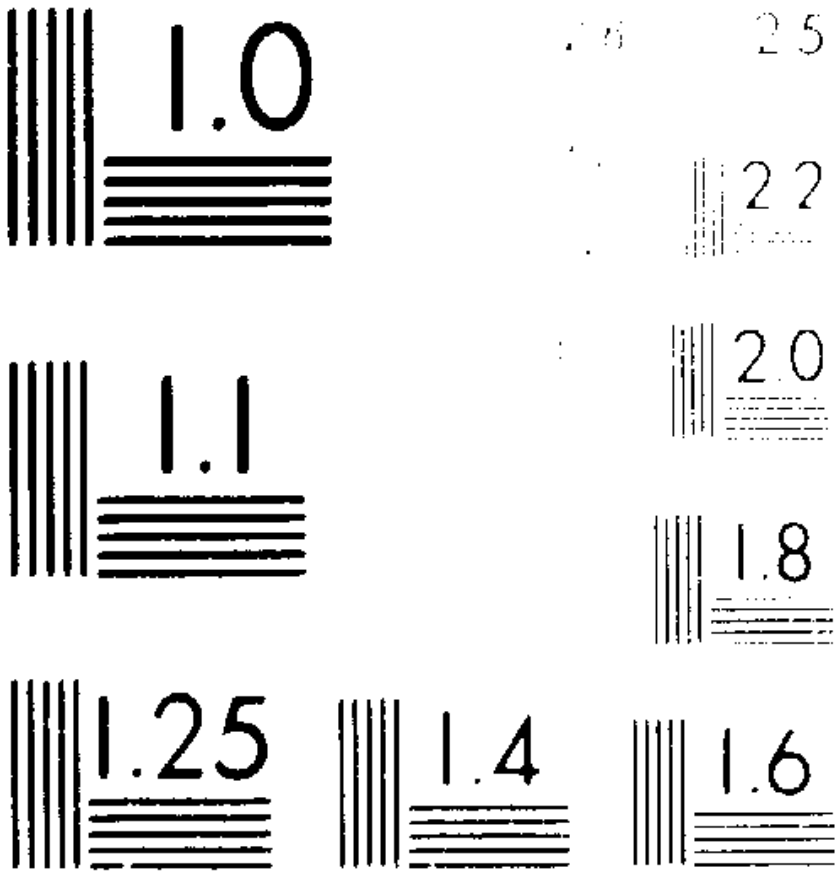
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CANE AND RATTAN PROCESSING
SI/SRL/78/802
SRI LANKA

Terminal report

Prepared for the Government of Sri Lanka by the
United Nations Industrial Development Organization,
acting as executing agency for the United Nations Development Programme

Based on the work of Jatong Chen and Weizhou Du, experts
in cane and rattan processing

United Nations Industrial Development Organization
Vienna

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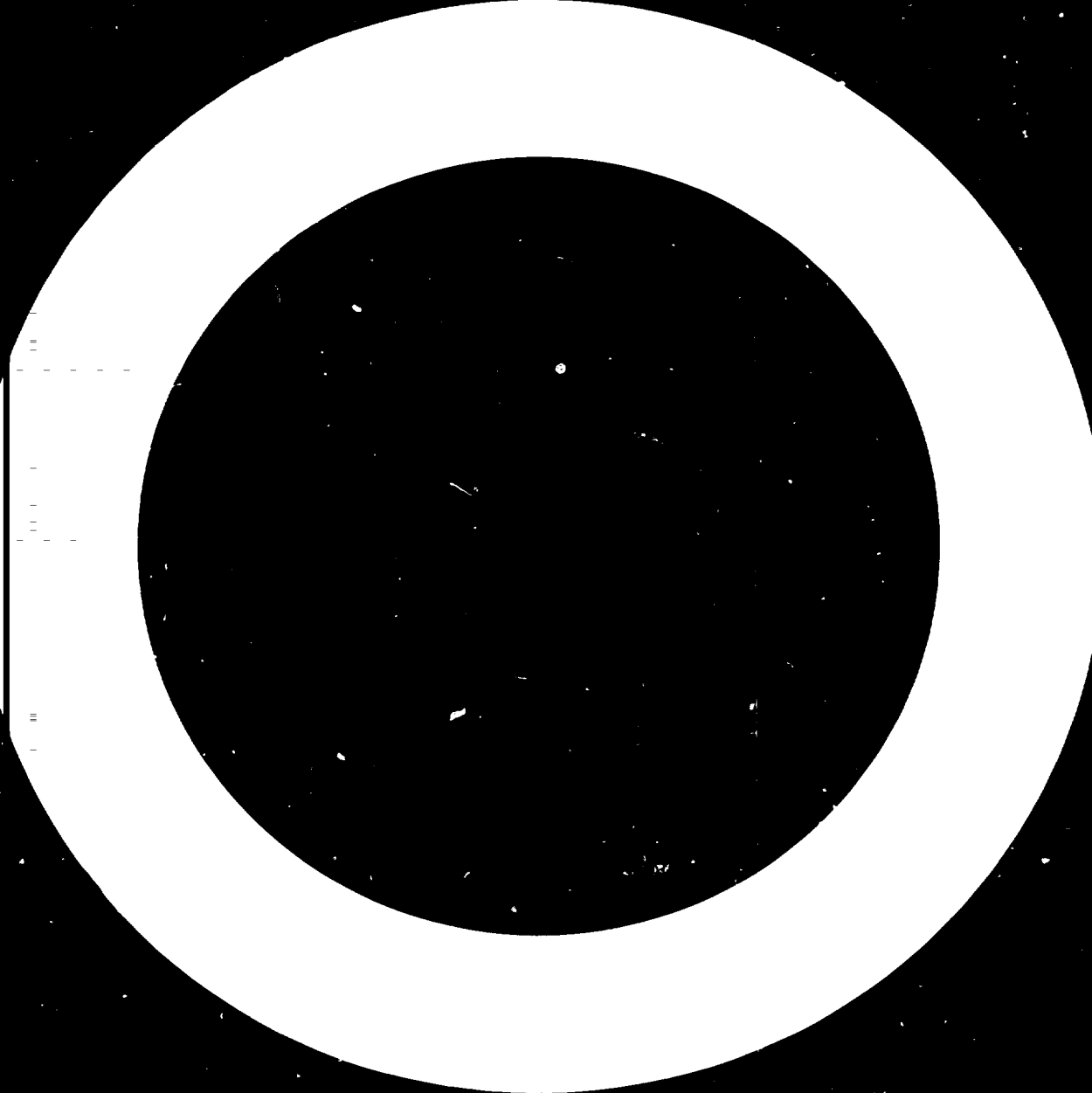
ABSTRACT

The Government of Sri Lanka requested assistance from the United Nations Development Programme (UNDP) to improve the processing of cane and rattan. Accordingly, the project "Cane and rattan processing" (SI/SRL/78/802) was established with the United Nations Industrial Development Organization (UNIDO) as executing agency.

On 13 June 1980, two experts in cane and rattan went on mission to Sri Lanka for three months each, accompanied by an interpreter. They were assigned to the Ministry of Industries and Scientific Affairs (Department of Small Industries) and their duties were to assist the local cane and rattan processing industry to increase production and improve the quality of the products, and to introduce appropriate processing techniques and quality control with a view to improving both the raw material used by the manufacturing industry and the finished product. In particular, the experts were expected to assess (a) the available resources both quantitatively and qualitatively; and (b) the present demand for cane and rattan products manufactured in Sri Lanka.

The experts were stationed in Colombo with extensive travel in the central and south-western parts of the country.

The experts made recommendations on growing cane, purchasing and processing the raw material, setting up a factory and training workers; these are contained in the body of the report.



CONTENTS

INTRODUCTION

The Government of Sri Lanka requested assistance from the United Nations Development Programme (UNDP) to improve the processing of cane and rattan. Accordingly, the project "Cane and rattan processing" (SI/SRL/78/002) was established with the United Nations Industrial Development Organization (UNIDO) as executing agency.

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I. FINDINGS

First of all, the experts made necessary on-the-spot investigations and studies mainly in Colombo, Batticaloa Kurunegala, Polonnaruwa, Anuradhapura and Kandy districts where the rattan industry is established. They investigated the cane resources in rural area and deep mountain forests. They inspected some typical cane and rattan processing workshops, such as the cane centres in Sittandandy Morakoddanchennat, Mawadirembu Senhaladi, Kanatoluwa, Udagama, Raja Ela and Pasyala. They saw the conditions under which the local cane was grown, and methods of harvesting, processing and weaving. They acquired knowledge of the local cane resources both in quantity and quality, the production capacity, variety of products and market demand.

In Sri Lanka. local cane is an uncultivated plant, belonging to Caiamus of Paimat, of which there are two varieties: big cane and small cane. The output of local cane is about 450 tons/year and 50 tons/year is imported from Singapore. So the total consumption of raw material is about 500 tons/year. But the supply of cane is not sufficient. Some workshops are held up at times for lack of raw material.

Compared with Indonesian cane, which is common in the international market, Sri Lanka cane is not as good in terms of durability, smoothness, colour, lustre, elasticity and length. But a variety of middle and high grade products can be produced if the processing method is improved.

Big cane grows mainly in the mountain area in Kandy and Polonnaruwa districts. Its diameter is 14-40 mm, but averages 20-25 mm, the average length is 15 ft; it is yellow-white. It is elastic and can be bent, which makes it suitable for furniture frames. Its defects are that the fibre is loose, the cane itself is fragile, easy winding, light-weight, the nodes are dense and high, and the surface is not smooth and needs polish.

Small cane is distributed over a vast area in Sri Lanka, growing wild in the central, east and south-west parts, the central and east parts being the main areas. Its diameter is 4-10 mm averaging 6-7 mm.

Its length is 10-40 ft, generally 12 ft. The cane is yellow-white, elastic, and can be split into various sizes of peel and round core according to the needs of weaving. It has many uses. Its short-comings are that it contains too much fat, wax, pentose, lignin and other compositions, thus being difficult to bleach. Its lustre is poor and there is viscosity on its surface. Furthermore, it is fragile, easy to break, the distance between two nodes is short (about 20 mm) and the nodes grow high, there is a 2 mm difference in diameter of the cross-section between the two ends of a 12 ft. length, and it is too short after cutting and inconvenient to process.

According to the data provided in Sri Lanka, at present there are about 1,800 persons privately engaged in cane and rattan processing, most of them at home. (There are only 11 workshops run by the Government with 172 employees.) There are about 500 employees in Batticaloa, 600 in Polonnaruwa, 150 in Pasyala, 100 in Kandy, 150 in Colombo and 300 in other places. The total annual value of cane products is about SRs 20 million. The method of cane and rattan production is a traditional manual operation. People use a knife with a hook to harvest the cane, peel the shell and leaves and cut the cane into specific lengths. They tie the cane into bundles and sell it by the piece.

Raw material is processed by hand with a small knife to split and break the cane piece by piece then the split cane is sent for thinning. Efficiency is low and the cores are damaged during the splitting and therefore wasted. Even the split peel is not up to standard and only suitable for rough products.

However, there exists in Sri Lanka a basic weaving skill. Most of the local products are chairs and baskets woven in different designs; there is also a small quantity of products shaped like animals woven with high skill from imported materials.

In Sri Lanka, the cane and rattan processing industry is a traditional handicraft and has a long history. Cane and rattan products are known for their lightness, coolness, attractiveness, comfort and durability, and have both artistic and practical value. The products are suitable for the climate of Sri Lanka, and become a must for every family. Rattan furniture and rattan-wood products are popular in hotels, offices and private homes. Cane and rattan products sell best in the domestic market, and the industry can not meet the domestic demand.

According to the Department of Small Industries in Colombo, some hotels with 6,000 rooms are going to be built shortly in Sri Lanka, so a large quantity of furniture will be required.

Technical training course

The main task of the experts was to help to improve the treatment techniques of raw materials, the processing before weaving, and the weaving skill. They introduced a complete set of processing technology aimed at making good use of local resources, increase the utilization of raw materials, heighten working efficiency, improve the quality of both materials and products, increase the variety of products and lower the costs. A technical training course was held and remarkable success was achieved in a short time. According to the wishes of the Government, the course was held in the Design Centre for National Handicrafts of the Department of Small Industries. The trainees were demonstrators from various government workshops all over the country and some were designers from the Design Centre. According to the original plan, the number of trainees should have been 12 but was increased to 25 (13 males and 12 females).

The course consisted of both lectures and practical work, combining theory with practice. At the request of trainees, lectures were given on cane and rattan, including the distribution of the cane and rattan resources in the world, growing characteristics, varieties, specifications in the use of cane and rattan, and processing technology for rattan products. In view of the characteristics of the local cane, the suitable production process and processing methods were recommended and proper directions given for producing chemicals for local cane bleaching. Data and diagrams were provided for the processing process and some simple and useful multi-use hand tools and equipment was introduced that had been brought from China such as a hand-operated rattan peel splitter and hand-operated rattan splitter. In co-operation with the Sri Lanka team, the experts made locally a batch of necessary tools and equipment, such as a cane sulphurizing cabinet, a cane-bleaching device, a working table and a variety of weaving tools and measures. The technology of plastic design, material structure, big cane heating and bending, branding, polishing and painting was taught as well as various weaving techniques that were not known.

Training methods

The trainees were divided into two groups and trained at the same time; one group (15 trainees) was for material treatment and semi-products processing, another group (10 trainees) specialized in furniture manufacturing. In training, theory was combined with practice, the stress being on practice. The experts demonstrated their teaching, then let the students practise. Key points on technique, quality control, operation regulation and safety in production were stressed in every process. During the course attention was paid to finding quick-learning trainees and they were given special training to enable them to teach the others. Important technical data was given in written form together with diagrams.

Improving working efficiency

The working efficiency for the main processes, such as peeling and core splitting, was increased ten-fold. Moreover, the working conditions have been improved, and the labour intensity lightened by the adoption of new technology.

Upgrading of products

Quality control and specifications of products have been standardized for every process. New intermediate- and high-grade products can be made Previously, there were only low-grade products. There used to be no bleaching or sulphurizing and the cane had a dull colour, poor lustre, weak flexibility, was easy to break, and also mildewed and got moth-eaten easily. Now, after bleaching and sulphurizing, the cane is bright-coloured, good bending strength and is free from mildew and moths.

Improving utilization of material

Previously, the core was spoiled and wasted during processing. Now, by processing with the new method, the core can be split into various standard-sized useful "round core" lengths. Round core constitutes 30 per cent of the whole raw cane. This means that when the new technology becomes popular, 150 tons/year of raw material can be saved. The material saved would be sufficient for 1,400 persons to weave various kinds of baskets, dishes and furniture, of which the value would equal SRs 25 million.

Processing technology

After training, the processing technology was improved (annex I) and technicians trained.

Cutting nodes (smooth the convex of the node)

Originally, the cane was smoothed by a small knife. Efficiency was low and the peel could be damaged easily. Now the cutting method has been changed so that the cane is smoothed by circling the knife once around the node. This has heightened efficiency and improved quality because peel damage is avoided.

Splitting peel

The original method of splitting the peel into a specified width and thickness was done by hand with low efficiency and invariable damage to the material. Furthermore, the split peel was not of a standard size and only the peel was utilized, the core was wasted. Using the hand-operated rattan peel splitter, the peel can be split evenly and the core used up. Efficiency is higher than before and quality has improved.

Splitting cores

Now that the hand-operated rattan splitter and the auxiliary cutting tools are used, the specifications can be adjusted at will. The operation is simply putting the whole cane or raw core into one end from the other end of the splitter and pulling out the splits of the splitter and pulling out the splits from the other end as standard-sized raw peels or round cores (annex II and III).

Thinning

By using the thinner, the size can be adjusted at will and production completed in one process. Its advantage is ease of operation, high efficiency and better quality.

Bleaching

Bleaching technology (annex IV) is a necessary technique in the modern cane and rattan processing industry and has great economic significance. There has been no such technology in Sri Lanka before; now

the gap has been filled through training. After bleaching low-grade material becomes high grade, beautiful and flexible. Also, the round core becomes white and the peel cream-coloured, similar to the first-grade natural colour. In addition, after bleaching the round core is useful material for weaving. So, bleaching technology heightens the utilization of material, adds new varieties and improves the quality of the final products.

Mottling

The old burning method has been discontinued and a mud-spreading method is now used. The advantage of this is that the working efficiency is raised and the natural pattern is gained. Furniture or plant-stands made of mottled cane have a unique style.

Furniture manufacturing

The old way of bending big cane was to clamp the material into a wooden frame and heat the bended area with a torch. This method was inefficient and labour-intensive, also it was difficult to control the size and the cane blackened easily. The new method is to use tools such as a wood bar for rattan whole bending, a blowlamp and working table, and the workers can sit. This method is more efficient and requires less labour.

Weaving

The experts introduced the bamboo shuttle, a tool knife for rattan peel weaving and flat awls for rattan chair weaving. These tools have improved efficiency remarkably. The workers were taught some fundamental, common but delicate and practical weaving skills which helped to raise the weaving level. These new methods are named "starting method for rattan chair weaving", and "joint method for rattan peel" and "chessboard pattern weaving method" etc.

Polishing and lacquering technology

After being scraped with a simple scraper, polished with an emery cloth and given a final lacquering, products look much better than with the old rough finish.

Rattan-wood structured products

The traditional method for processing these products was to drill holes round the frame and back of the chair, then do the weaving. This technique was old and practical but time consuming. The experts demonstrated the modern technique of inlaying a rattan net woven beforehand onto the frame of the chair, table or other furniture. This new method saves labour and the products look nicer. They also gave advice on the correct applications of cane and rattan in rattan-wood-structured products such as weaving peel and round core on various wood frames (e.g. boxes, tables, chairs, cabinets and screens). The rattan-wood structured products have a great future for development in Sri Lanka because there are rich resources of timber and a fundamental skill for wood processing.

Designing and creating new models

The workers were taught how to make new products such as an orchid-patterned armchair with teapoy, a stick rattan armchair with coffee table, a wood-frame inlay with a rattan net round table, a mottled cane plant-stand, car seat-backs, baskets and plates (annex V).

The trainees have learned new techniques, some can even work independently, however, owing to the time limit, they are not perfectly skilful and their work needs further improvement and consolidation.

II. CONCLUSIONS AND RECOMMENDATIONS

1. In order to preserve and develop local resources, laws should be passed that only the ripe cane can be harvested (big cane should be over 15 ft, small cane should be 12 ft) seedlings must not be injured.

2. A raw material purchasing centre should be set up in cane-growing areas. The purchasing of raw cane and rattan, according to standardized quality and specifications, should be under the control of the Government who can then distribute it to the consumers. Thus, it will be easy to manage the resources and make good use of raw material.

3. A processing centre for raw material and semi-finished products should be set up in the cane-growing areas. Materials should be processed locally and the semi-finished products sold to the manufacturers. This will popularize the advance processing method, increase utilization, improve quality and standardize specifications.

4. The purchasing method should be changed from counting by piece to counting by weight (including raw materials and semi-finished products such as rattan peel and round core).

5. Some good varieties, such as sampit and bandjermasin from Indonesia should be introduced and experimental cultivation carried on. Waste land should be used for the cultivation of cane in Batticaloa and other cane-growing areas.

6. The rich wood resources, which are of very good quality, should be fully used to develop the rattan-wood structured furniture industry. (There is not much big cane in Sri Lanka and the price is high, so it is better to use a wood frame instead of a cane frame.)

7. Sets of hand-operated rattan peel splitters and hand-operated rattan splitters and other auxiliary cutting tools for production should be imported. At the same time, these tools should be made from the model and popularized.

8. A rattan product factory should be set up and furnished with relatively advanced machines and equipment that can produce various

types of products.

Preliminary plans for the new factory:

Employment: 135 employees

Variety of products: rattan furniture, rattan sundry products, rattan peels and round cores

Material consumption: 125 tons/year of raw materials

		Number of items
Equipment:	B type automatic rattan splitter	2
	C type automatic rattan splitter	2
	D type automatic rattan splitter	2
	Automatic rattan scraper	5
	Automatic rattan polisher	1
	Automatic rattan peel splitter	2
	Hand-operated rattan peel splitter	5
	Hand-operated rattan core splitter	5
	12-mm bench type drill	1
	C 615 model lathe	1
	Electric kiln for heat treatment	1
	Necessary tools	1
	4-ton lorry	1
	Bus	1

Common building area: 2,000 m^2 (1,400 m^2 for workshop, 600 m^2 for warehouse)

Seasoning yard: 1,000 m^2

Power supply: Installation capacity 25 kW (excluding lighting and electric fan consumption)

Water consumption: Average 8 tons/day

Production facilities:

	Number of people
Raw material processing (including straightening, cutting nodes, washing and shedding film, sulphuring and selecting materials)	22
Semi-finished products processing (including splitting rattan peel, splitting rattan core, bleaching, selecting peel and round core, bundling and drying)	33
Finished products manufacturing (including furniture and weaving products)	60

	Number of people
The making of special cutting tools and equipment maintenance	5
Management	10
Others	5

A rough estimate of the breakdown of the total investment is given below:

	SRs
Buildings	1,000,000
Season yard	100,000
Equipment	2,000,000
Material for start up	1,000,000

It is estimated that within one year of normal production the following can be produced:

		SRs
Various types of furniture	(400 sets)	800,000
Various types of rattan products	(45,000 sets)	700,000
Various sizes of rattan peel	(43 tons)	2,100,000
Various sizes of round core	(33 tons)	1,700,000
Gross value of the product sale		5,300,000
Costs: Raw material		680,000
Auxiliary material (chemicals for bleaching etc.)		400,000
Salaries		810,000
Expenses	(50 per cent of salaries)	410,000
Total		2,300,000
Profit		3,000,000

It would be practicable to set up a new factory for which there is a need. The factory would play an active role in developing the cane and rattan processing industry. It would upgrade the products and increase their variety and the output. The high quality products would sell well and meet the market demand. Furthermore, the factory would provide employment for approximately 135 workers and the 70

tons of rattan peel and round core processed in the factory would provide work for 280 weavers. The total value of the final products would reach up to SRs 6 million.

When the new processing technology introduced by the experts is popularized throughout the country, 150 tons of materials will be saved yearly and these would be sufficient for the consumption of 125 tons of raw materials by the new factory. There would be no shortage of raw materials.

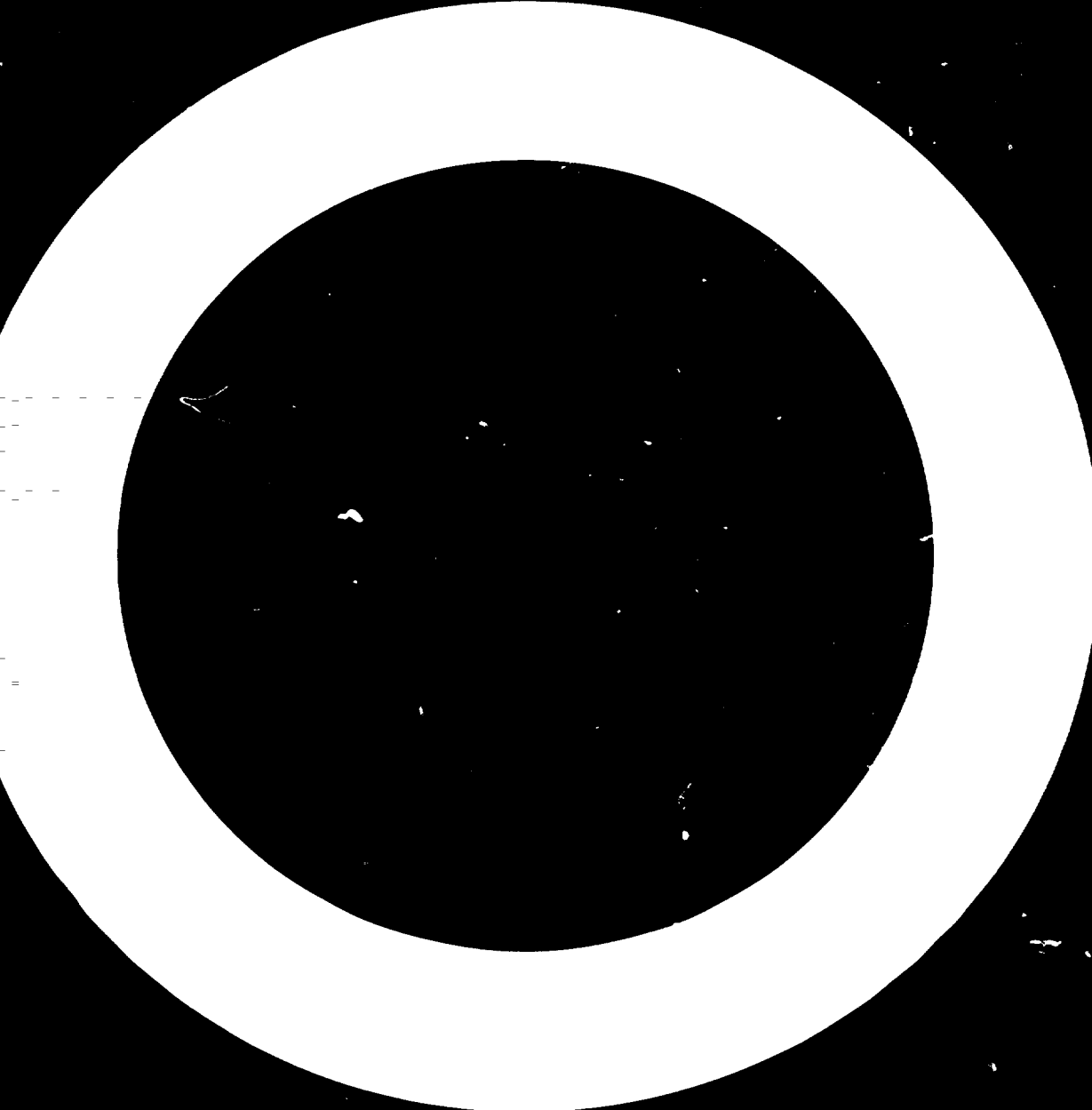
9. In order to ensure the speedy implementation of the planned factory the following measures should be taken:

(a) Some technicians should be selected and sent abroad to train and study, for instance, material processing and product weaving in China, furniture manufacture in the Philippines and cultivation in Indonesia;

(b) Some experts should be invited to render technical assistance and help to manage the factory, such as:

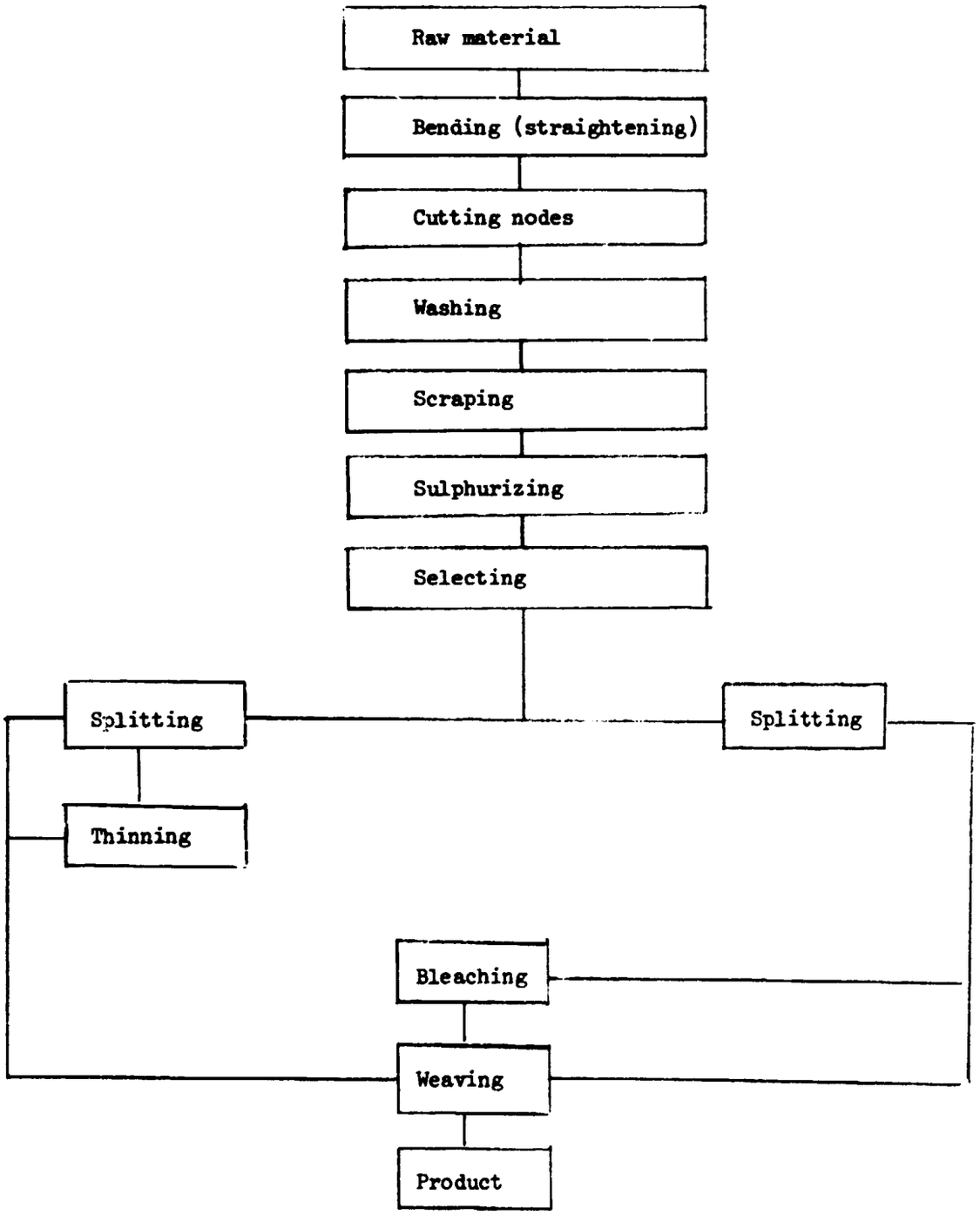
	Number of experts
Raw material processing	1
Equipment operating	1
Furniture manufacturing	2
Products weaving	1
Special cutting-tool making and equipment maintenance	1
Interpreter	1
Total	7

(c) International organizations should be requested to provide the necessary funds for machines and equipment, foreign experts to help establish the factory, and sending of trainees abroad.



Annex I

PROCESS FLOW CHART



Annex II (Tables 1 and 2)

PEELS AND CUTTING TOOLS

Table 1. Splitting cores with different tools (mm)

Size of Product	6-hole		7-hole		8-hole		9-hole	
	Material	Diameter	Material	Diameter	Material	Diameter	Material	Diameter
1.5	4	1	4.5	1.5	5	2	5.5	2.5
1.75	4.5	1.2	5.2	1.7	5.7	2.3	6.3	2.5
2.	5.7	1.3	6	2	6.7	2.7	7.3	3.3
2.25	6	1.5	6.75	2.25	7.5	3	8.3	3.8
2.5	6.85	1.7	7.3	2.6	8.6	3.4	9.4	4.3
2.75	7.3	1.8	8.3	2.75	9.2	3.7	10.	4.6
3	8	2	9	3	10	4	11.	5.0

Table 2. The number of peels and the angle of the splitting knives

Peels (mm)	3	4	5	6	7	8	9	10
Angle	120°	90°	72°	60°	51.56°	45°	40°	36°

Annex III

PEEL SPECIFICATION

Product	Specification (mm)		Material (Diameter in mm)							
	Width	Thickness	3	4	5	6	7	8	9	10
No. 1 thick peel	1.7-1.9	1.1-1.2			3.5	4	4.1-4.5	4.6-5	5.1-5.5	5.7-6.2
No. 2 thick peel	2.3-2.5	1.2-1.4			4	4.5-5	5.5-6	6-6.5	6.6-7.5	7.6-8
No. 3 thick peel	2.9-3.2	1.2-1.6			4.5-5	5.5-6	6.5-7	7.8-8	8.5-8.8	9-9.7
No. 1 thin peel	1.7-1.9	0.58-0.62								
No. 2 thin peel	2.3-3.2	0.6-0.65								
No. 3 thin peel	2.9-3.2	0.68-0.72								
No. 4 thin peel	4-5	0.8-0.9	4.5-7	5.5-7	7-8.5	8.6-10				
No. 5 thin peel	5-6	1-1.1			8.5-10	10.5-12				
No. 6 thin peel	6-7	1.2-1.3			10.5-11.5	12-13.5				
No. 4 thick peel	3.5-4	1.5-2	4-4.5	5-5.5						
No. 5 thick peel	4.1-5	1.6-2	4.8-5.8	6-7						
No. 6 thick peel	5.5-6	1.6-2.5	6.5-7	7.5-8.5						

Note: Specifications for the core flake refer to the peel. Specifications for the round core (ø mm):

1.5	1.75	2	2.25	2.5	2.75
3	3.5	4	4.5	5	5.5
6	6.5	7	7.5	8	9
10	11	12	13		

Annex IV

CHEMICALS USED FOR BLEACHING AND SOFTENING

Material	1.5-2 mm core	2.25-2.5 mm core	2.75-3 mm core	No. 1-3 peel	No. 4-5 peel
Process 1					
Clean water (submerge) (h)	1	1	1	1	1
Duration (h)	8	8	8	8	8
Temperature	Room temperature	Room temperature	Room temperature	Room temperature	Room temperature
Sulphuric acid (%)	6	6	6	6	6
Process 2					
Clean water (submerge) (h)	1	1	1	1	1
Duration (h)	40-80	40-80	40-80	40-80	40-80
Temperature	60°-70°C	60°-70°C	60°-70°C	60°-70°C	60°-70°C
Hydrogen peroxide (%)	10	11	14	14	15
Sodium peroxide (%)	6	18	8	6	6
Sodium silicate (%)	17	18	20	20	20
Process 3					
Clean water (submerge) (h)	1	1	1	1	1
Duration (h)	4	4	4	2	2
Temperature	Room temperature	Room temperature	Room temperature	Room temperature	Room temperature
Sodium nitrate (%)				0.15	0.15
Oxalic acid (%)				1.5	1.5
Sulphuric acid (%)				1.5	1.5
Fluorowhite (%)	0.06	0.06	0.06		
Process 4					
Clean water (submerge) (h)			1	1	
Duration (h)			4	4	
Temperature			Room temperature	Room temperature	
Boric acid (%)			0.1	0.1	
Sodium bisulphite (%)			0.2	0.2	

Notes:

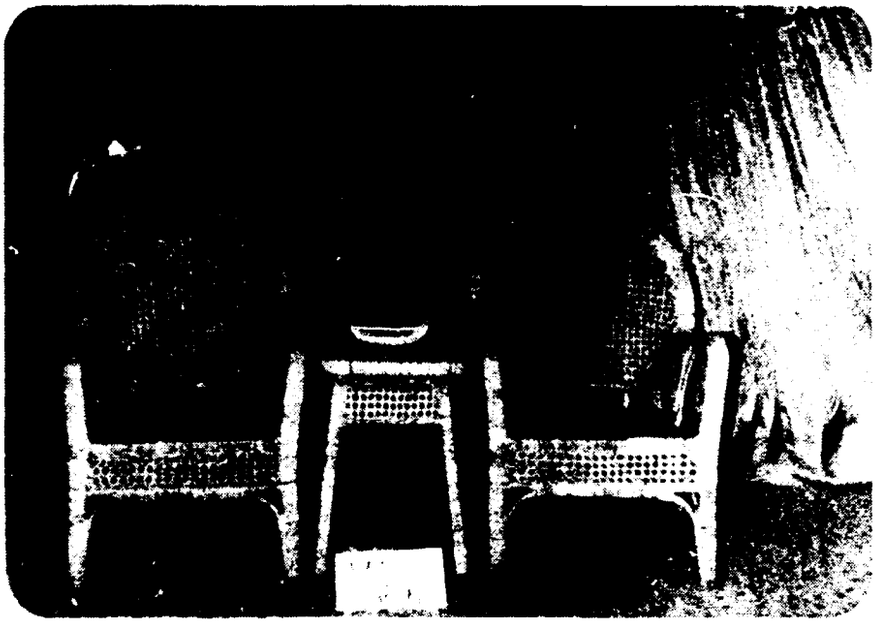
1. The consumption indicates the proportion of the cane materials and chemicals.

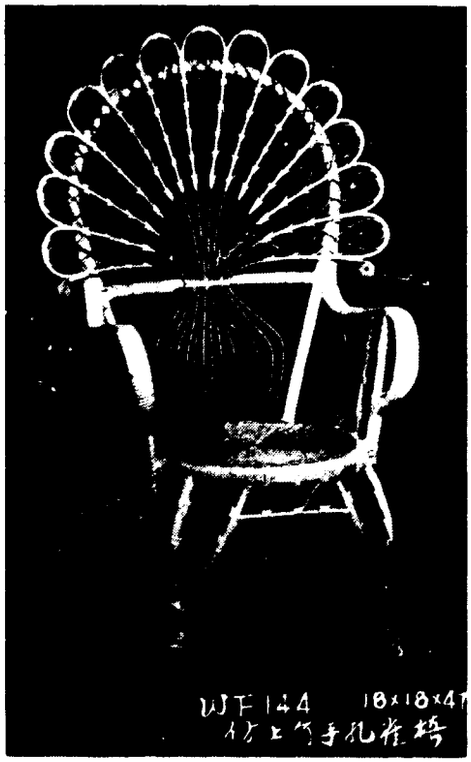
2. Generally the water should be 10 times the weight of the cane materials.

3. Purity of the sulphuric acid should be over 92%, sodium silicate be 41 BC, sodium peroxide should be 96-98% and hydrogen peroxide 50%, flurowhite is VBL type. The purity of oxalic acid should be over 98%, sodium nitrite over 96% and boric acid over 95%; the sodium bisulphite should contain 60%-62% SO_2.

Annex V

PRODUCTS THAT CAN BE MANUFACTURED
BY SRI LANKA TRAINEES AFTER TRAINING

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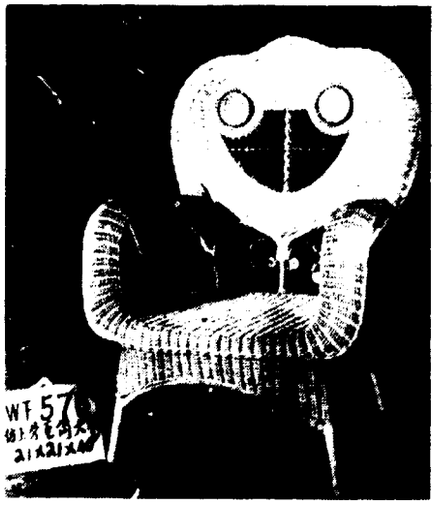
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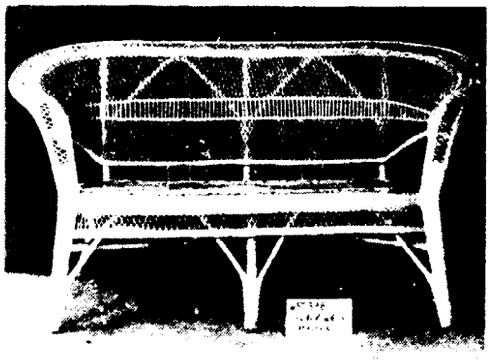
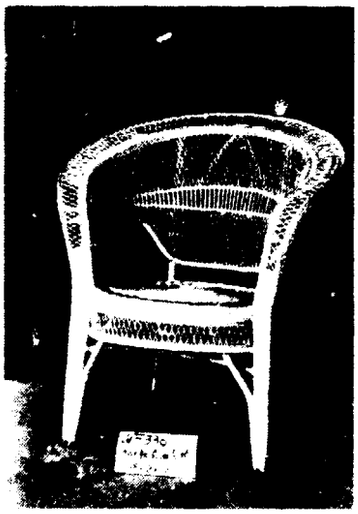
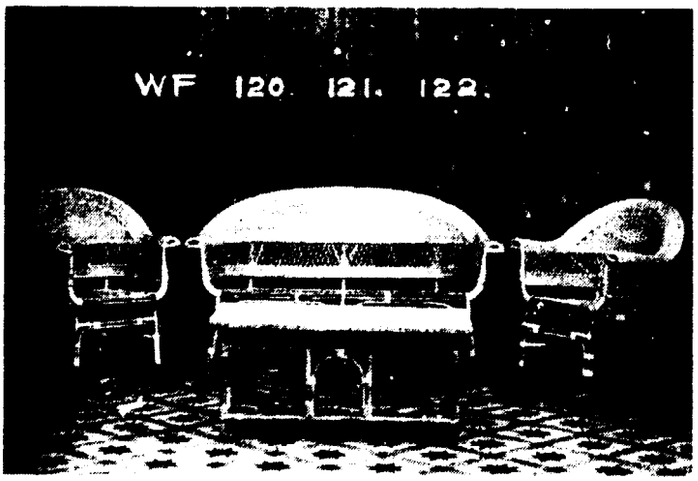
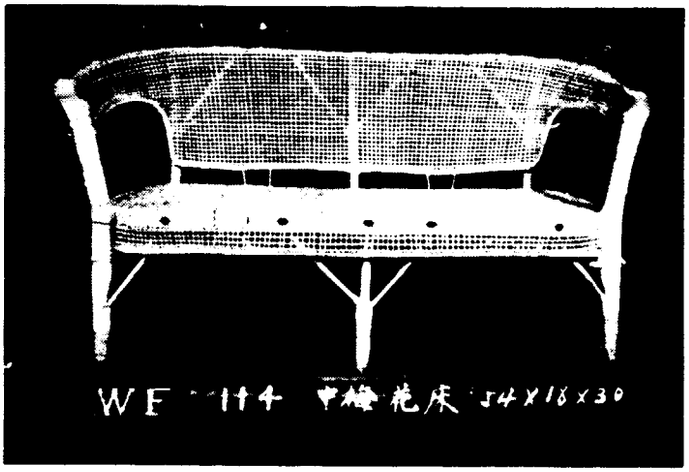


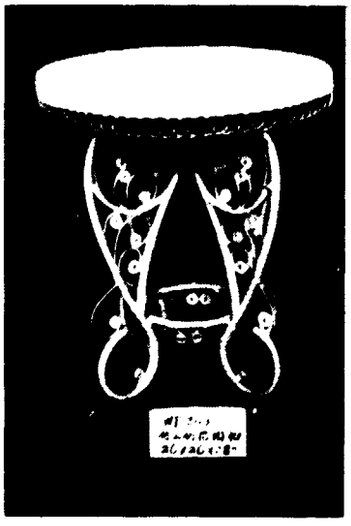



WF 120. 121. 122.

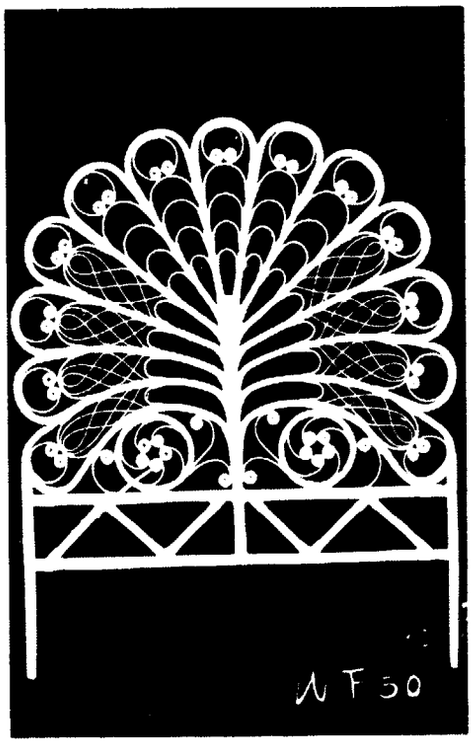

WT64《套》


WF 114 中檢花床 54X18X30

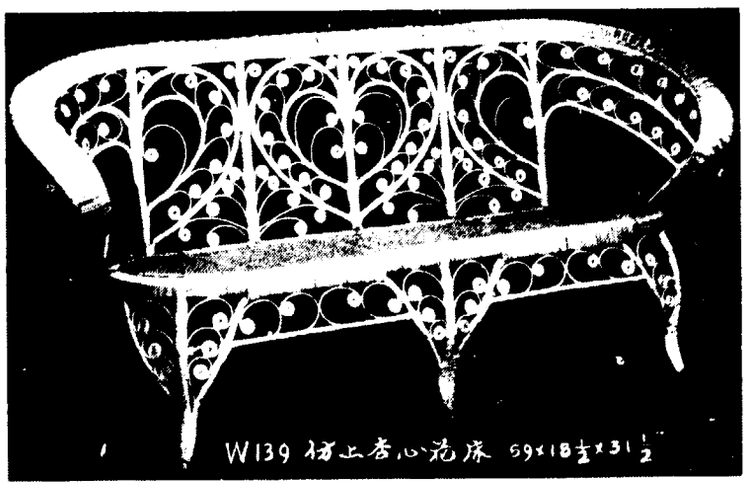

WF 115 中上二格皮方格 30X18X11

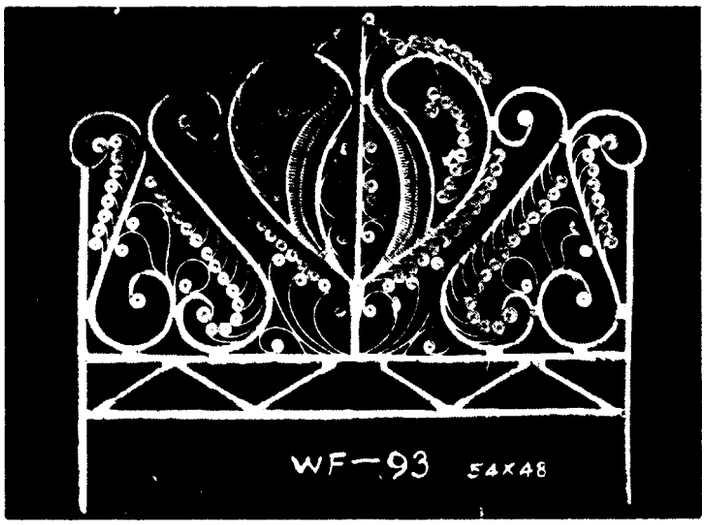


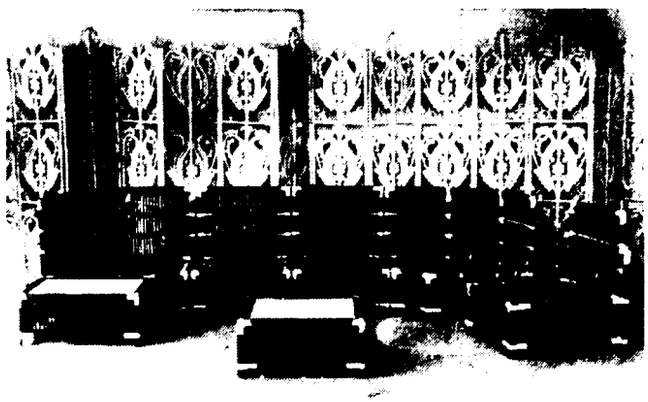

WF 411

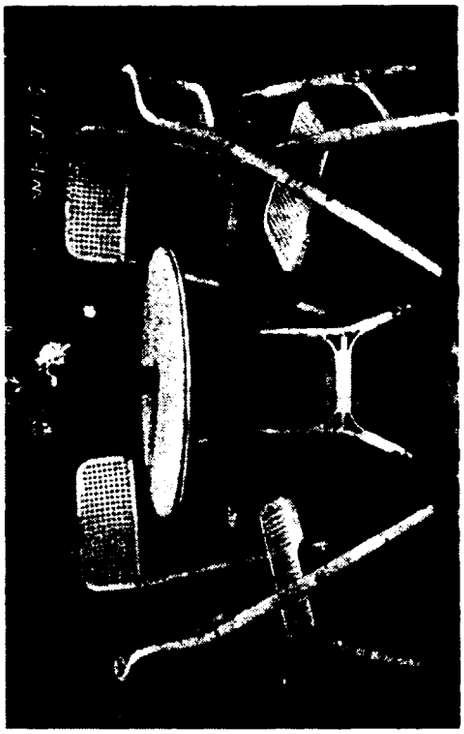

WF 50

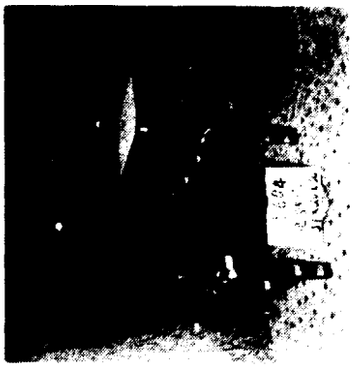

WF..75


W139 桥上香心花床 59×18½×31½

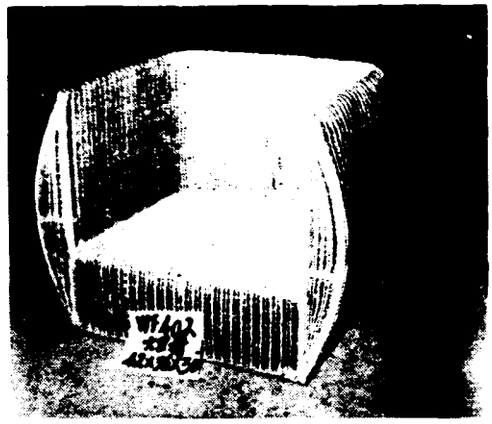

WF-93 54x48

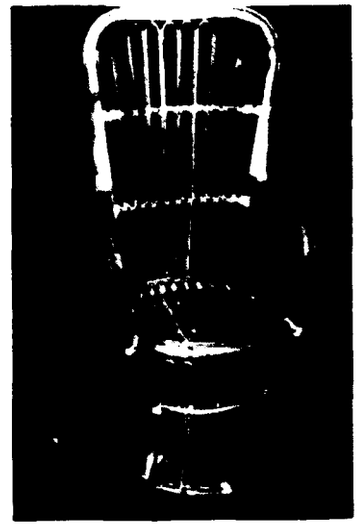


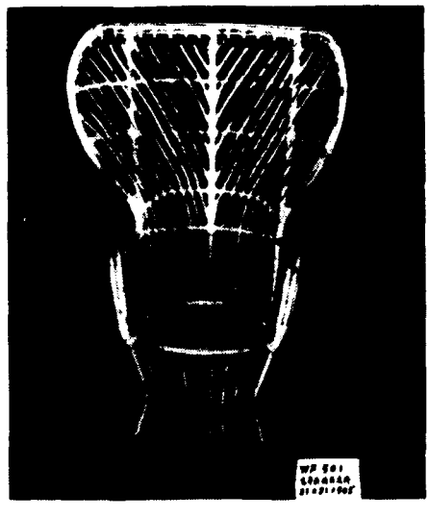


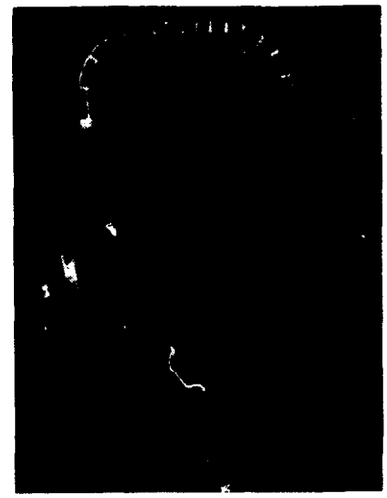


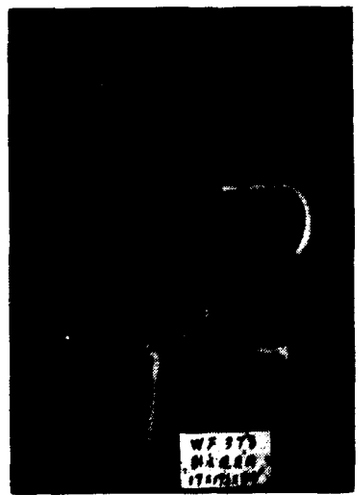

WF. 72

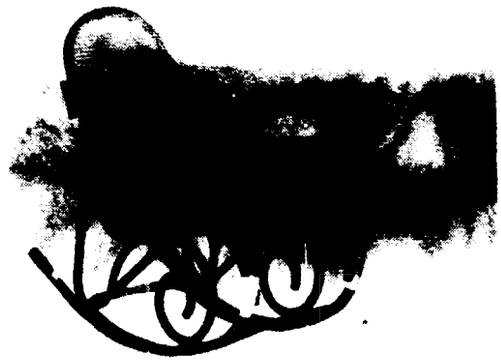




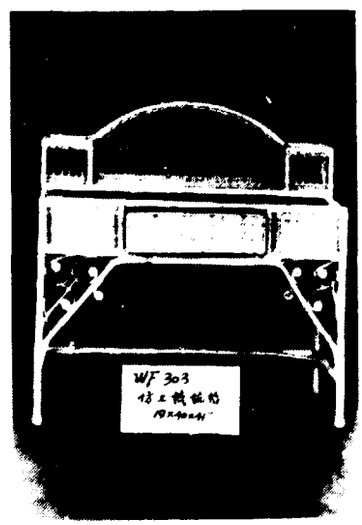


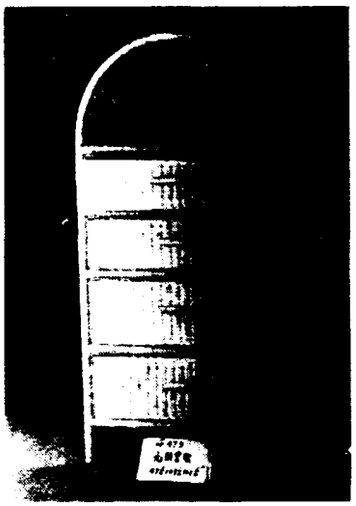


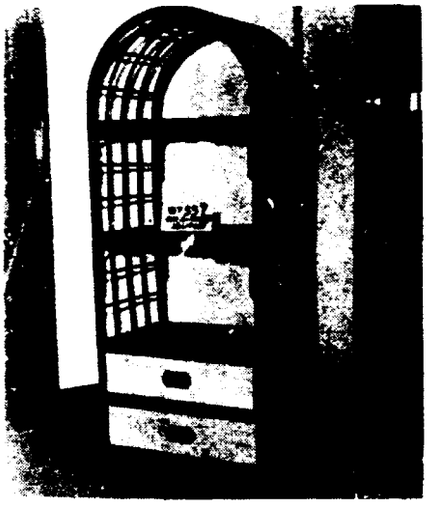


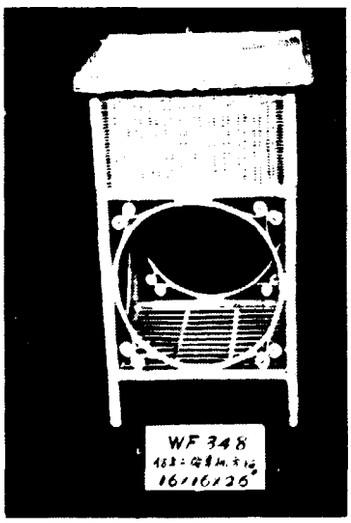



WF 340A


WF 303






WF 348