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UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
Vienna International Centre, P.O. Box 300, 1400 Vienna, Austria
Tel: (+43-1) 26026-0 · www.unido.org · unido@unido.org

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DEVELOPMENT OF INDUSTRIALLY-PRODUCED LACQUERED FURNITURE FOR EXPORT

SI/CPR/85/802

THE PEOPLE'S REPUBLIC OF CHINA

Terminal Report*

Prepared for the Government
of the People's Republic of China
by the United Nations Industrial Development Organization
acting as executing agency for the United Nations Development Programme

Based on the work of P. Borretti,
Consultant in Panel Furniture

United Nations Industrial Development Organization
Vienna

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1.1	Project number	:	SI/CPR/85/802/11-51/31.7.A
1.2	Project title	:	Development of industrially-produced lacquered furniture for export
1.3	Expert	:	Pietro Borretti, Consultant in Panel-furniture Design
1.4	Duration of mission	:	Two months (1 March - 30 April 1986)
1.5	Duty station	:	Nanjing with travel within the province
1.6	UNIDO substantive backstopping section	:	Agro-based Industries, Industrial Operations Department
1.7	UNIDO backstopping Officer	:	Mr. Antoine Bassili, Senior Industrial Development Officer
1.8	UNIDO/UNDP contacts in Beijing	:	- Mr. Albertus W. Sissingh, Senior Industrial Development Field Officer - Mr. Paolo Sabbatini, UNDP Programme Officer
1.9	Government counterpart Agency	:	Ministry of Light Industries, Nanjing Woodworking Factory of the Nanjing Second Light Industries Bureau
1.10	Main contact	:	Mr. Yang Wenja, Chief Engineer
1.11	Counterparts	:	Technician/designers: - Mr. Wu Chen Fa - Mr. Lia Ming Chiang - Mr. Wang Si Son - Mr. Chiang Wei

1.12 Development objective of the project : To maximize the contribution of the Chinese furniture industry to the socio-economic development of the country, through:
(a) increased employment opportunities
(b) increased foreign currency earnings

1.13 Immediate objective of the project : To demonstrate the development of lacquered furniture for export, whose manufacture would involve the utilization of both modern production techniques and traditional hand-crafted decorative elements.

1.14 Additional tasks : On reporting to the duty station, the consultant was asked by the management of the Nanjing Woodworking Factory to provide additional assistance outside the original scope of his terms of reference, in connection with the establishment by the company of a model, large-scale furniture plant in 1987. The new factory is expected to manufacture, among other products, lacquered furniture for export. The following tasks were carried out by the consultant in this respect as reflected in the workplan:

(a) Selection of tool maintenance equipment for the new furniture plant (see Annex IV);

(b) Training of the factory's technical staff on the criteria for the selection of cutting tools for the woodworking equipment purchased for the new plant;

(c) Recommendation on managerial assistance required for the establishment of the new plant (see Annex III),

Other additional activities:

(a) Visit on 25 April to a comprehensive furniture exhibition held by the manufacturers of the Beijing province, showing current furniture trends;

(b) Holding of a meeting in Beijing to brief members of the Beijing Woodworking Industry Corporation on the findings and activities of the mission.

1.15 Workplan : A schedule of work was agreed upon with the Management of the Nanjing Woodworking Factory on arriving at the duty station, and was subsequently cleared by the SIDFA Mr. A.W. Sissingh. The workplan is attached as Annex I.

2. BACKGROUND

The People's Republic of China is credited as having developed in the course of its civilization furniture making skills of the highest standards, as well as a wide typology of furniture which influenced furniture trends (chinoiserie) in Western countries since the late 18th century.

In particular, China has developed an age-long tradition in the production of lacquered furniture; however, its furniture industry has yet to apply modern, mass production techniques in the manufacture for export of this type of high class furniture.

Lacquered furniture in panel form seems to offer considerable opportunities towards developing an export potential in terms of high-class furniture, in view of the fact that China lacks high value tropical timber in sufficient quantities while, on the other hand, has developed its own wood-based panel industry and is even producing high technology panels like MDF,[1/] eminently suitable for lacquered furniture.

A model, large-scale furniture plant is expected to be set up in Nanjing by the existing furniture manufacturing company which the consultant was attached to during the mission. The plant will aim at both domestic and export markets and is expected to produce an estimated yearly output of 150,000 units of panel furniture and 100,000 chairs. The furniture factory will be part of a woodworking complex for the manufacture of sawnwood, particleboard and plywood.

This report deals with the work carried out by the consultant to demonstrate the potential of developing modern lacquered furniture for export to be eventually manufactured in the new Nanjing furniture plant. The following requirements were set for the development of such furniture items during the mission:

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1 / MDF*) is a new type of wood-based panel which retains most of the working properties of solid wood. Four plants have recently been established in China to produce this material in order to lessen the dependence on imported timber.

*) Medium Density Fibreboard

(a) the furniture should be suitable for mass-production;

(b) it should utilize industrially-lacquered MDF panels;

(c) it should recall aspects of the Chinese design heritage;

(d) it should incorporate traditional hand-crafted elements; and

(e) it should be in knock-down form.

3. ACTIVITIES AND FINDINGS

3.1 Review and analysis of existing data and documentation

Difficulties were encountered in carrying out this particular activity as there seemed to be no readily available publications in China on traditional furniture. Therefore the consultant found very valuable for the purpose of the mission the two books he had brought with him — namely the Chinese Domestic Furniture by G. Ecke, 1944, and the Chinese Household Furniture, by G.N. Kates, 1948 — as they provided ample historical and technical information on the subject. The former is possibly the only publication todate — and the only original source — providing dimensioned and detailed working drawings of a number of traditional Chinese furniture. Of interest was also found a report provided later by UNIDO, Chinese Conventional Furniture[1/], prepared by Wang Shi-Xiang on the occasion of the UNIDO Seminar on Wood Based Panels and Furniture Industries held in Beijing in 1981.

During the mission, however, the Management of the Nanjing Woodworking Factory provided the opportunity of catering first-hand information on Chinese furniture by arranging visits to restored historical buildings in Suzhou and Yangzhou displaying traditional furniture in original interior settings.

Two visits were paid to the Nanjing Museum which provided a general insight into Chinese traditional design elements as reflected in a wide range of arts and crafts. Sketches were made and photos were taken during the visits of design details of interest to the project.

Extensive visits were also paid to showrooms in Nanjing, Suzhou and Yangzhou dealing with a wide assortment of crafts products. Through these visits it was possible to observe lacquered products and traditional folding screens utilized as room dividers.

1/ Document ID/WG.335/1/Rev.1

To offset the problem of lack of specialized publications on crafts of interest to the project, the consultant visited bookstores going through art books with the aim of studying as many design elements as possible (especially in connection with traditional furniture) of the type relevant to the product development scope of the project.

3.2 Visits to workshops

The visits to the showrooms were followed by visits to typical workshops in Suzhou and Yangzhou engaged in the manufacture of lacquered and wood-carved furniture as well as other typical traditional crafts. The main purpose of the visit was to get acquainted with the various types of lacquering processes.

The following workshops were visited in Yangzhou:

(a) Zhongjian Furniture Factory
Typical plant for the production of furniture for the local markets; machinery available, but working methods and furniture construction based mainly on handcraft system;

(b) Yiangzhou Lacquer Handcrafts Factory
It specializes in Beijing type of solid lacquerware carving;

(c) Yangzhou Jade Factory

(d) Yangzhou Embroidery Screens Factory

(e) Yangzhou Scrolls Workshops

The following workshops were visited in Suzhou:

(a) Suzhou Carved Lacquer Factory
Main product: lacquered screens of coromandel and mother-of-pearl inlay type; export-oriented with USA as main market, manpower 300.

(b) National Embroidery Research Centre
It carries out research, training and production concerning embroidery screens. Manpower 320.

(c) Suzhou Carved Blackwood Furniture
Excellent reproduction of Chinese traditional furniture. Although machinery is available, traditional hand-made wood-jointing techniques are utilized to a large extent; export-oriented,

Main markets: South East Asian countries. Sawnwood consumption: 1,000 m^3 per year. Timber imported mainly from Thailand. Manpower: 300.

3.3 Decorative techniques of folding screens

No publications could be found providing information in this respect. Thus during the visits to showrooms, workshops, and the museum, emphasis was given to identifying and studying decorative techniques employed in traditional folding screens, in view of the potential of this particular type of furniture as a source of reference in the development of panel-based furniture by the project.

The following decorative techniques could be identified in this respect:

(a) Porcelain tiles inserted in a solid-wood framing; highly suitable for incorporation in MDF-made panel furniture;

(b) Beijing carved-lacquer panels inserted in a solid wood framing. The process consists in building up on a core panel of plywood a body of solid red lacquer, of 5 to 8 mm in thickness, consisting of tens of slow-drying layers. The final lacquer body is then deep-carved by chisel.

Because of the complexity of the process and the cost of lacquer material, the screens decorated in solid lacquer are most exclusive and expensive.

Inserts of Beijing carved lacquer could be utilized in MDF-made panel furniture.

(c) Coromandel lacquer

This technique involves the following steps:

(i) building up on a plywood base a core body made of several layers of putty material (each layer taking days to dry);

(ii) applying several coats of slow-drying finish lacquer;

(iii) carving of the lacquer body;

(iv) hand-painting of the carved surfaces.

Experiments would have to be carried out to determine to what extent lacquer surfaces industrially applied on MDF panels could be hand-carved so as to provide a substitute to time consuming and costly traditional lacquering methods.

(d) Inlay technique

The most common of inlaid material, is the mother-of-pearl. Other material include jade, ivory and rhino-horn. The material is generally inlaid into the surface of lacquered flat furniture panels. However mother-of-pearl decorative patterns are also inlaid in solid wood furniture panels and/or frames.

It is regretted that none of the workshops dealing with the mother-of-panel technique visited during the mission could give the consultant the opportunity to observe the actual inlaying process. It has not been possible, therefore, to determine whether or to what extent the manual inlay technique could be combined with industrially lacquered MDF furniture panels.

(e) Relief decorative

This process offers a particularly good potential for combination to industrially-lacquered furniture panels, in that it consists of applying, on pre-lacquered surfaces, design in relief made generally of soapstone but also including materials such as rhino-horn, ivory and jade.

(f) Line engraving

This process consists in engraving on pre-lacquered panels designs made of very fine, shallow chiseled lines which are subsequently painted. It will have to be determined as to what type of industrially-applied lacquer are best suited to being engraved by hand and/or machine.

(g) Lacquered panels decorated by surface painting

In this case, decoration is obtained by simply painting the given design direct on a pre-lacquered surface. Thus this process could be easily utilized on industrially lacquered surfaces.

(h) Embroidery inserts

Transparent embroidery inserts are made of a layer of transparent silk embroidered to very fine details and then placed between two glass sheets paintings. The resulting panel is then framed into the folding screen.

The embroidery-insert technique is generally utilized to produce small panels for shelf-display mounted on wood-carved stands. However, the embroidery-insert technique is particularly attractive when used in folding screens in that if offers a decorative pattern floating through the screen panels. An interesting feature of the process is that the embroidery decoration is double-faced, that is, it produces a pattern on both sides of the silk layer.

(i) Marble inserts

Marble inserts are generally utilized on the backrests of some traditional types of armchairs. Larger marble inserts were, however, also framed in the back and side panels of couches, as it has been observed by the consultant in reproduction of traditional paintings.

A unique Chinese feature in the use of marble inserts in furniture is that marble used for this purpose shows figurative shades simulating scenery such as mountains or other types of landscapes.

4. OUTPUTS

4.1 The guidelines

The following guidelines were chosen with respect to the demonstration objective of the project:

(a) Material to be utilized: MDF

(b) Type of construction: panel-based, of knock down or folding type; panels to be joined by wooden dowels;

(c) Processes: selected to test as many working properties of MDF as possible;

(d) Appearance: to reflect elements of Chinese traditional design and to incorporate hand-crafted elements;

(e) Market: to aim to market outlets of Western countries — Europe and USA;

(f) Types of furniture: single items of occasional type, such as bookshelves, side tables, nesting tables, etc., which could be bought as individual pieces, not in a set, and found place in overseas homes regardless of whether or not they are already fully furnished;

(g) Surface finishing: glossy finish of polyester type to be applied on the automatic finishing line of the new Nanjing Furniture Factory. Colour chosen: Chinese red as prevalent in details of traditional temples.

4.2 Furniture items developed

Only a limited period of time of two weeks (see attached Work Programme) could be allocated to the development of furniture designs, in view of the additional tasks the consultant was asked to undertake in connection with the establishment in 1987 of the new Nanjing Furniture Factory.

Some ten design ideas were developed in the two-week period by the consultant and preliminary scale drawings (shown in Annex VIII) were prepared by the consultant for five furniture items and one sample panel as follows:

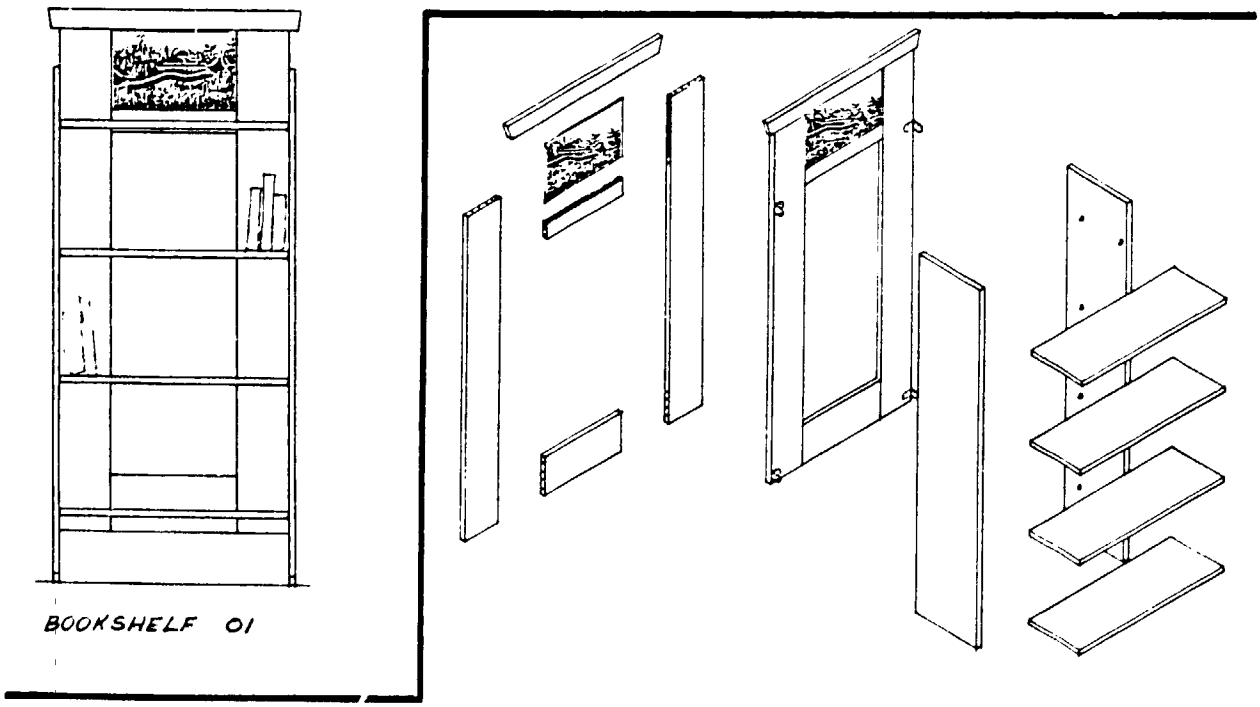
Item ref.	Description
01	Folding bookshelf
02	Folding bookshelf
03	Telephone table
04	Coffee table
05	Coffee table
06	Furniture panel with wood-carving insert

4.3 Prototypes produced

Four prototypes (items 01, 02, 03 and 06) were produced during the mission. All of them were machined by the four full-time counterparts of the Nanjing Woodworking Factory assigned to work with the consultant. All drawings were prepared by the consultant who also took the colour photos of the prototypes shown in Annex VIII.

4.3.1 Prototype 01 - Folding bookshelf

This prototype demonstrates the utilization, as a decorative element, of a porcelain tile framed into the back panel of the bookshelf, as shown in the following illustration:



The porcelain tile insert would be made by contract co-operatives and delivered to the Nanjing Furniture Factory for assembly with the industrially-produced components of the bookshelf.

The top of the back frame of the bookshelf reflects the yoke or double T design element which is a recurrent element in traditional timber-frame building components as well as in various types of traditional furniture, as shown in the following illustrations:

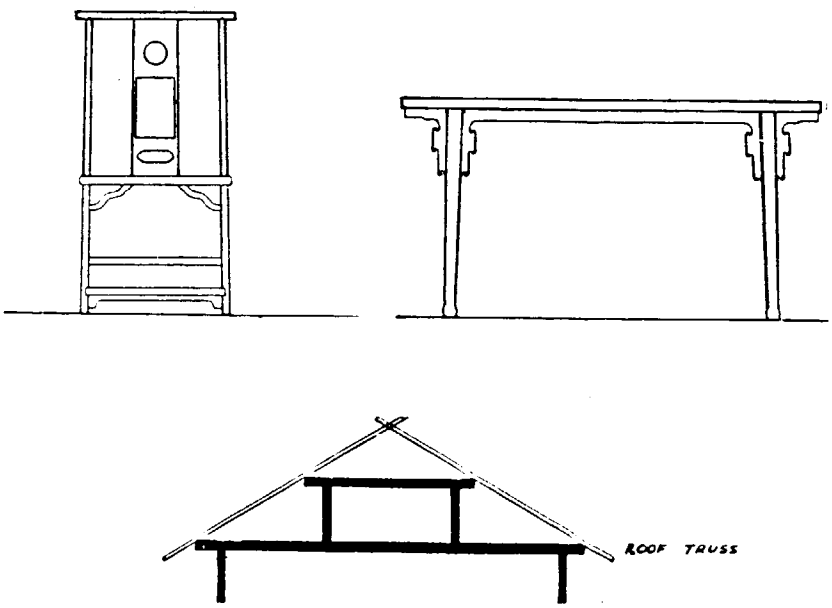
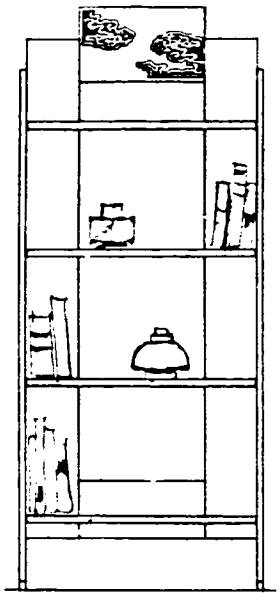


Illustration showing design feature (double T element) used as reference in the development of bookshelf 01

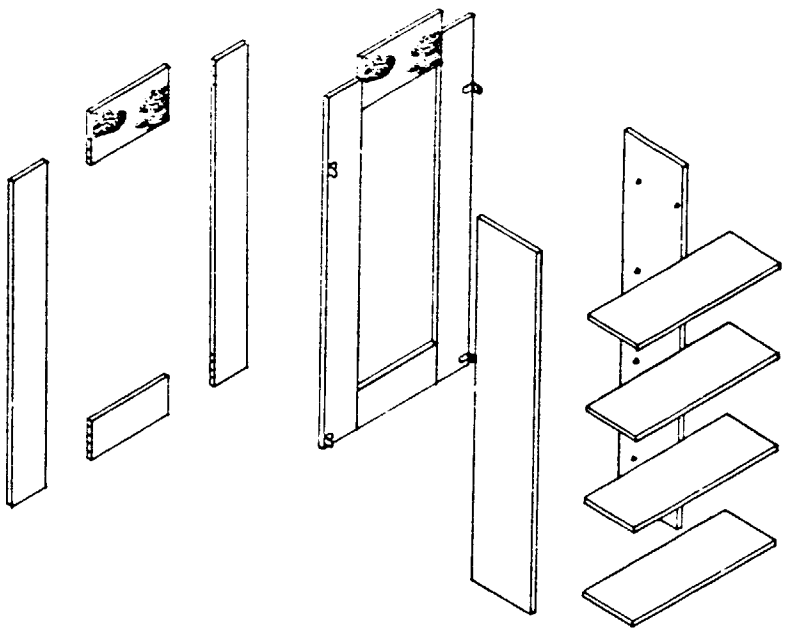
4.3.2 Prototype 02 - Folding bookself

This prototype proposes the utilization of the "coromandel" type of decoration on the top panel of the back frame of the bookshelf. See following illustration:

The side panels of the bookshelf are hinged to the back frame, thus allowing the bookshelf to fold flat for transportation convenience. The hinged feature was taken from the Chinese traditional multi-leaf screens.



BOOKSHELF 02



In this case, the panel would be pre-finished in the furniture factory and then delivered to the contract co-operatives for surface carving and painting . Finally, the panel would be returned to the furniture factory for assembly to the other components.

The top of the bookshelf presents a stepped profile, a design element in traditional architecture, chairs and couches as well as in folding screens. Illustrations to this effect are shown below:

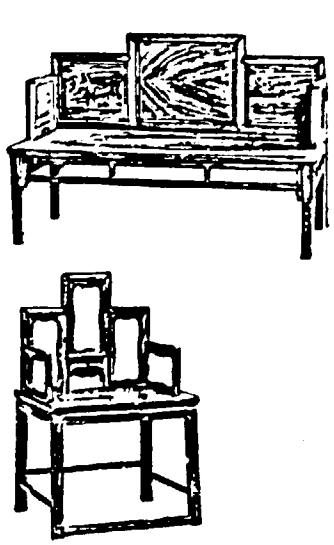


Illustration showing design feature (stepped profile) used as reference in the development of bookshelf 02

Illustration showing the design reference utilized by the consultant in the decorative pattern of the folding bookshelf 02

As with Bookshelf 01, the Bookshelf 02 is based on the folding concept, which needs no tool to be packed in the piece of furniture to tighten screws (in fact, there are no screws to be tightened).

4.3.3 Prototype 03 - Telephone table

This design demonstrate the utilization in furniture panels of decorative inserts (made of solid lacquer, porcelain tiles, marble, etc.) having rounded profiles. This is achieved by:

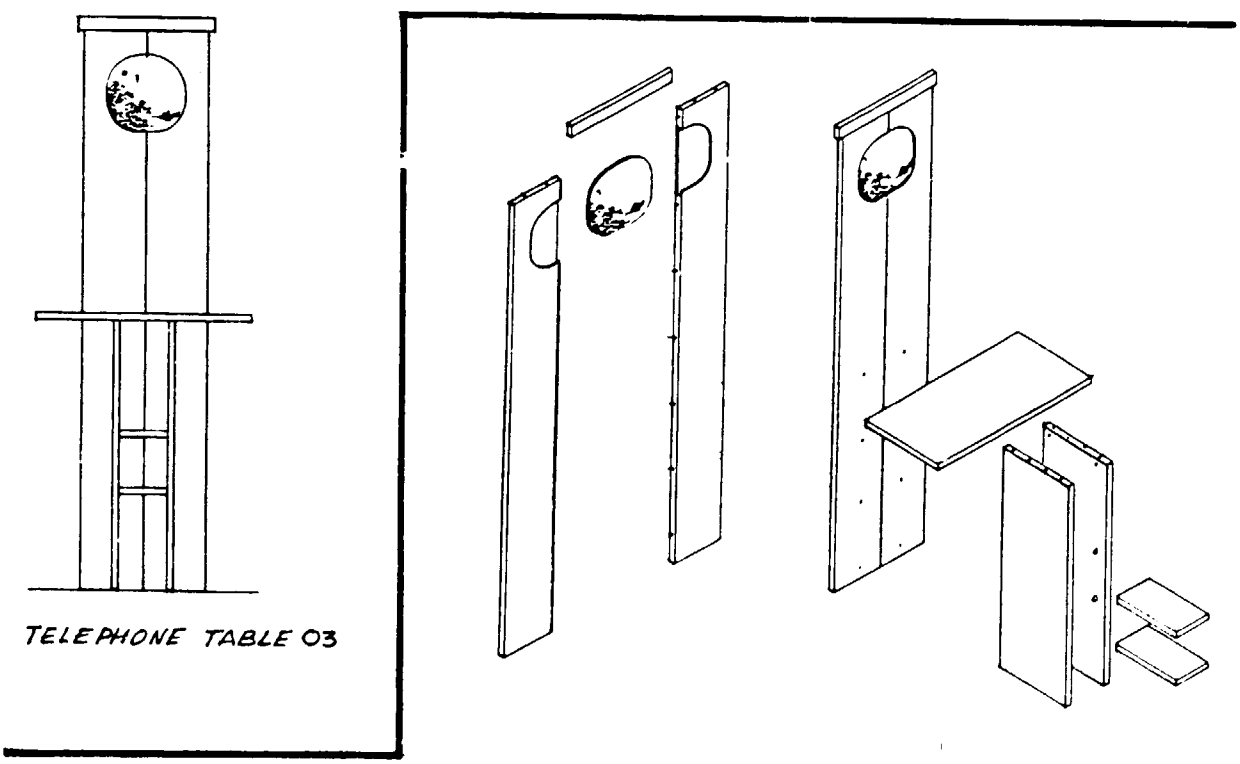
(a) splitting the furniture panel in two halves;

(b) recessing and grooving the two halves by router according to the profile of the decorative insert;

(c) inserting the decorative elements between the two halves of panel; and

(d) gluing the two halves toghether.

As with prototype 01, the decorative inserts would be produced by contract co-operatives and then delivered to the furniture factory for final assembly between the two halves of the back panel of the telephone table as shown in the following drawing:

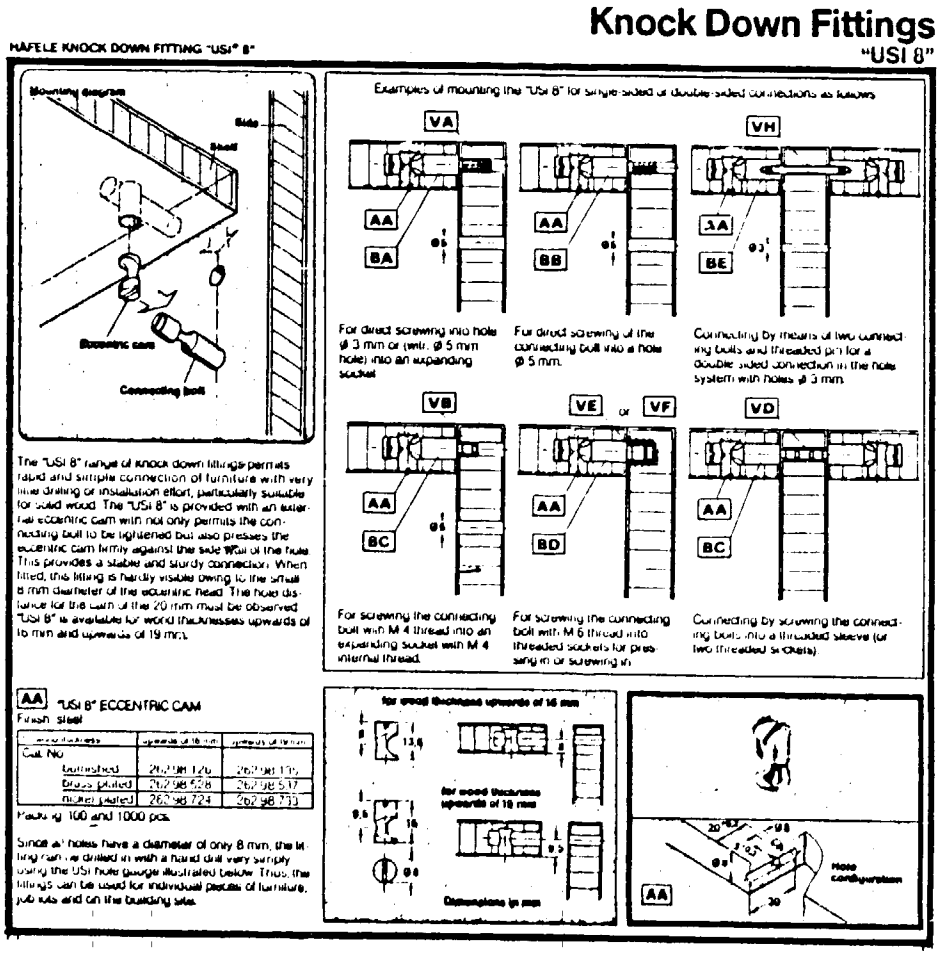


TELEPHONE TABLE 03

Full-round decorative marble inserts were traditionally utilized in the backrest of some armchair designs. However, for the purpose of this particular prototype, the decorative insert has been given an oval profile extracted from a Chinese scroll painting, which is also present on the side panels of a particular type of traditional side table [1/].

The structure of the table top and its vertical supports recalls the yoke or double T element also utilized in prototype 01.

This particular furniture prototype is assembled by jointing the various components with the aid of the new **"USI 8"** knock-down fitting which had been specified by the consultant for purchasing by UNIDO in sample quantities under this project and delivering to the Nanjing Wood-working Factory. The complete list of fittings provided through UNIDO is given in Annex V. Illustration of the **"USI 8"** knock-down fitting is given below:

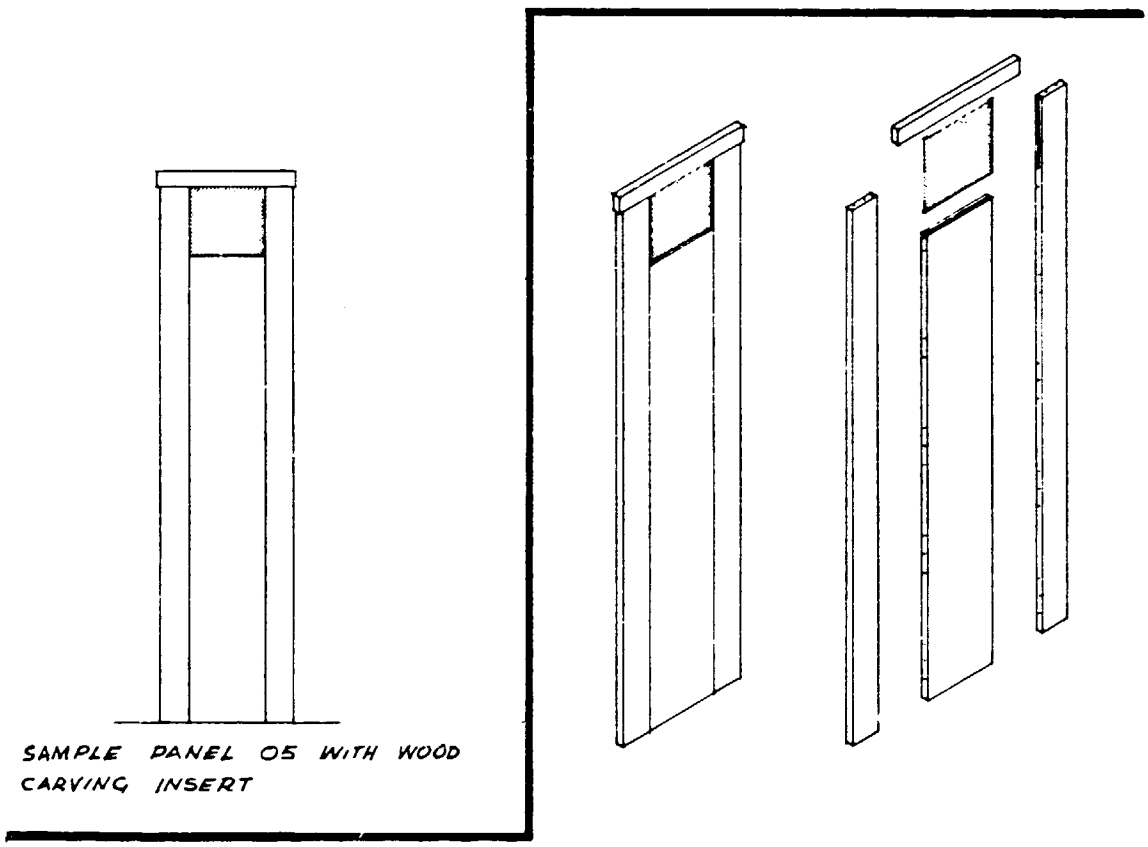


1/ Item N° 60 in Chinese Domestic Furniture, by G. Ecke, 1944

4.3.4 Prototype 06 - Sample furniture panel

This design was introduced to demonstrate the utilization of decorative inserts of square or rectangular shape (wood-carving, porcelain tiles, etc.) in narrow furniture panels such as those which might be used as sides of bookshelves.

A wood-carving insert was utilized in this particular case to show the potential of utilizing a very wide range of hand-crafted articles in combination with industrially-produced lacquered MDF panels. Illustration of the proposed structure is shown below:

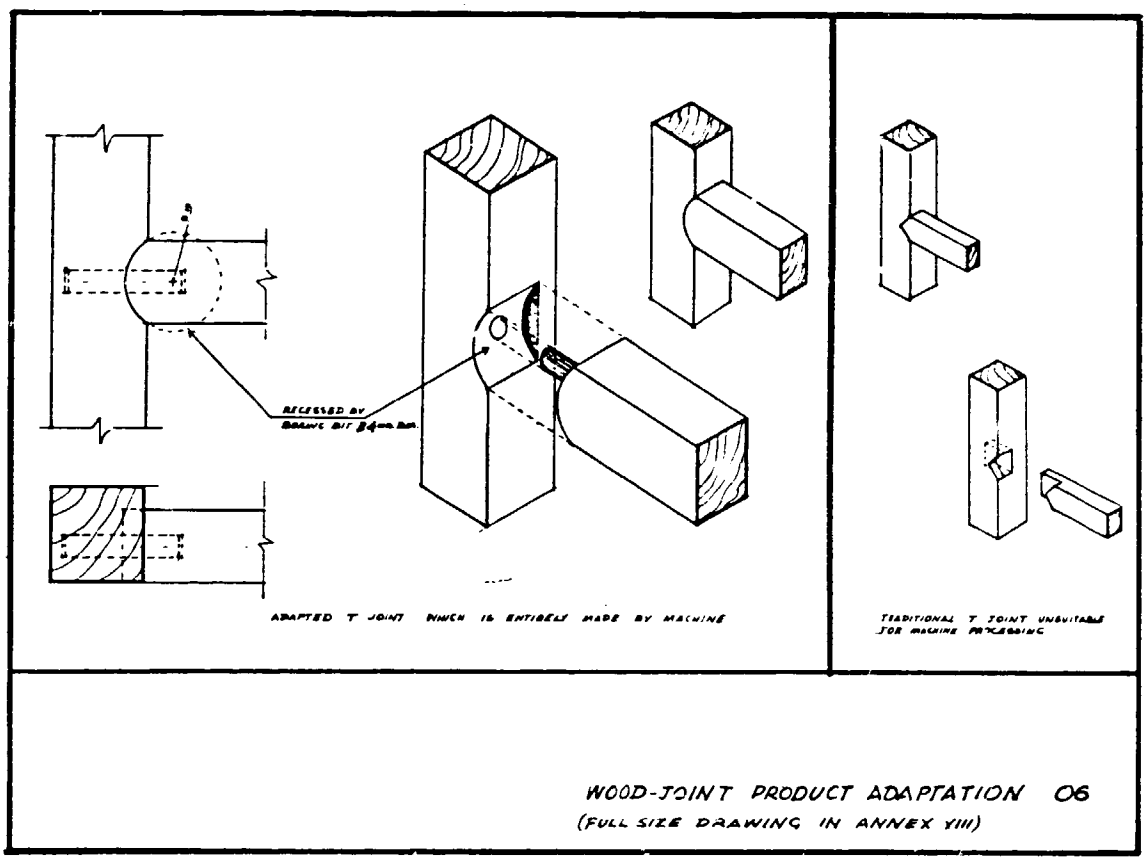


SAMPLE PANEL 05 WITH WOOD CARVING INSERT

4.3.5 Prototype 07 - Sample furniture joint for solid-wood construction

Although the objective of the project was to concentrate on the utilization of MDF panels, the consultant felt that a wide scope also existed in the development of designs combining the use of MDF material

with solid wood components. Having this in mind, the consultant set out to demonstrate how a particular type of Chinese traditional hand-crafted wood joint (T Joint) could be modified to allow full mechanical processing. Illustration is shown below:



WOOD-JOINT PRODUCT ADAPTATION 06
(FULL SIZE DRAWING IN ANNEX VIII)

4.4 Testing of working properties of MDF

In developing the demonstration furniture designs, the consultant endeavoured to cover as wide a variety as possible of MDF processing alternatives — from straight cutting to grooving, profiling and shaping.

A number of wood processing tests were conducted in this respect and, as an additional output, certain working properties were ascertained in connection with MDF board material produced in China. The results are briefly described below:

(a) Hand carving

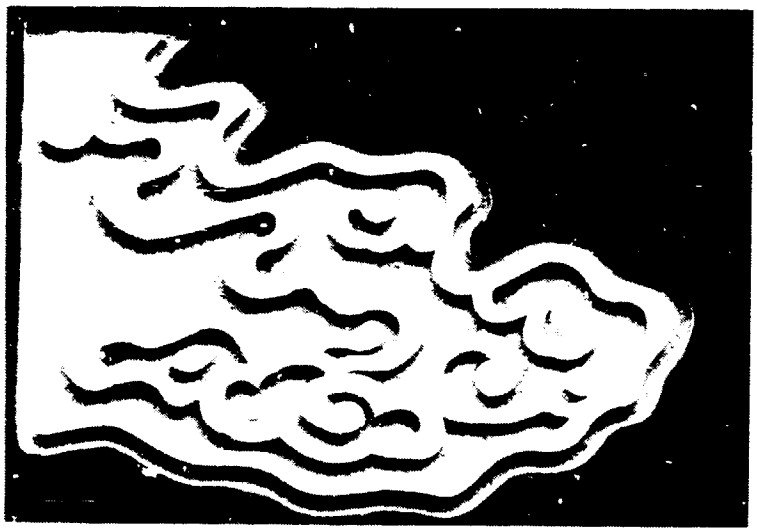
A small sample was made of hand-carved MDF by using standard wood carving tools. The carving properties of the material turned out to be as good as those of solid wood. Illustration is shown below:

(b) Machine routing and shaping

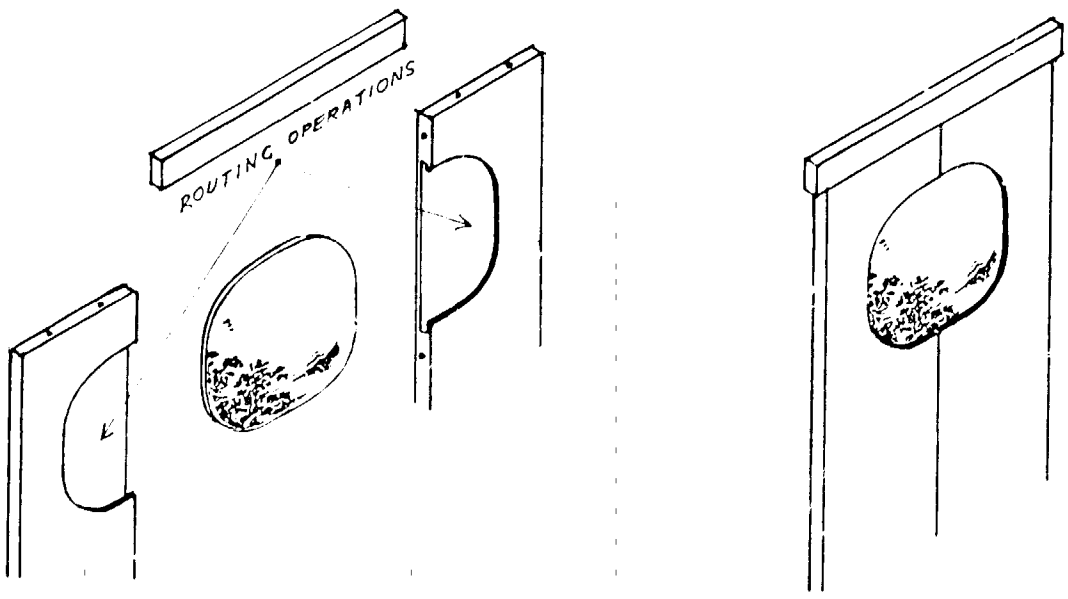
Three distinct tests were carried out in this respect:

(i) Routing of outer grooves of decorative pattern on lacquered surface prior to hand-carving operation. The pattern was to be produced on the top panel of the back frame of the folding bookshelf 02.

The panel was first finished with cellulose lacquer applied by hand on two coats of automotive filler — in the absence of other appropriate filler material. The subsequent routing of the outer contour of the decorative pattern resulted in a clean groove, in spite of the fact that the routing cutter had been sharpened by hand, in the absence of proper grinding equipment. Illustration of the routed panel is shown below:



(ii) Routing of recessed profile for housing a decorative insert in the back panel of telephone stand (prototype 03). The test resulted positive on all routed surfaces (bottom, edges, and groove) in spite of the fact that the router cutter had been sharpened to the required profile by hand. Illustration of the routed part is shown below:



(iii) Routing to contoured shape of sample-leg detail related tc design 04 (centre table) developed under the project.

A very positive test result was obtained. In fact, in this particular instance MDF offers better working properties than solid wood because MDF is not affected by chipped-grain problems resulting from counter-grain direction of cut. Illustration of the routed component sample is shown below:

5. CONCLUSION AND RECOMMENDATIONS CONCERNING THE ORIGINAL TERMS OF REFERENCE OF THE PROJECT

5.1 The main conclusion of this demonstration project is that there is considerable potential for promoting furniture exports by utilizing, in the manufacturing process, both modern industrial technology — as expected to be introduced by the new model Nanjing Furniture Factory — and traditional artisanal skills.

5.2 Chinese traditional arts and crafts as well as architecture offer an extraordinary wealth of elements for reference in the development of modern furniture which will reflect elements of the Chinese heritage.

By establishing a linkage between furniture components produced industrially at the model plant and components hand-crafted by contract co-operatives in the countryside, it would be possible to contribute towards transferring surplus rural workers to new jobs within local areas, which is a current priority of the Chinese Government.

5.3 In particular, there seems to be a wide scope for development of the industrial production of export furniture made of MDF components lacquered to a top, high-gloss finish by advanced finishing methods. These components would then be surface-engraved and painted by hand. Alternatively, the machine-produced components could be combined with decorative inserts made of porcelain tiles, embroidery under glass, Beijing carved solid lacquer, wood carving, etc..

5.4 An equally good potential seems also to exist for applying hand-made relief decorations of soap stone, jade, ivory, etc. on MDF panels pre-lacquered industrially at the new Nanjing Furniture Factory.

5.5 On the other hand the question remains as to whether or not MDF panels, industrially lacquered in the new Nanjing Furniture Factory, will be suitable for inlay in mother-of-pearl. An answer to this can be obtained only when the new factory is established and its finishing line becomes operational.

5.6 The investigation in this respect would have to start from an analysis of the original mother-of-pearl inlay techniques — a task that would best be undertaken in co-operation with the Shanghai Arts and Crafts Research Institute.

5.7 In the meantime, the suppliers of the finishing-line equipment for the new factory could be asked to provide sample panels finished with various types of materials to enable the selection of finishes which would provide the most suitable base for hand carving and engraving.

5.8 It is recommended that an initial range of designs for export furniture be developed (in addition to the designs already developed by this consultant) with the aim of testing main potential markets such as the United States and Western Europe.

This initial range of furniture designs could possibly provide the base for the long-term development of a world-wide market for Chinese modern lacquered furniture linking modern industrial wood-processing methods to traditional Chinese crafts.

5.9 From the point of view of a wide-market penetration potential, it is important that the furniture designs developed under such a programme should reflect a diversity of approach in interpreting and adapting Chinese traditional design heritage. It is therefore recommended that the design development task be entrusted upon three internationally-known furniture designers from major overseas market areas such as the USA and Western Europe.

5.10 The selected designers would spend three weeks each in China in order to study all possible aspects of Chinese traditional arts, crafts and architecture relevant to the design development task, and then return to their own countries to develop three furniture designs each within a period of two months.

5.11 The advantage of having the designers undertake the actual product development work in their own countries is that they would be able to involve themselves in the exercise with their respective designer/draughtsman teams — thus allowing the widest possible investigation of design alternatives before producing the final designs.

5.12 Under this proposed project, three Chinese industrial designers would join the respective overseas designers for a one-month period each to understudy the product development process and familiarize themselves with the approach, requirements and methods of modern product design.

5.13 As a preparatory activity to the mission to China by the three design consultants, a product/process consultant would undertake a six-week mission to prepare from available sources, a reference paper on Chinese traditional arts and crafts and architecture for the benefit of the designers. The reference material would be prepared in co-operation with the following institutions:

(a) Research Institute of Cultural Relic Preservation, Beijing;

(b) The Shanghai Arts and Crafts Research Institute;

(c) The Faculty of Architecture, Beijing University; and

(d) Beijing Forest Industry Institute.

5.14 Once the range of export furniture is developed, there would be a need to (a) train the staff of the Nanjing Furniture Factory in export marketing strategies and methods; and (b) recommend a suitable network of overseas sales outlets. A four-week mission is envisaged to be undertaken in this respect in Nanjing by a furniture marketing Consultant.

5.15 One product-distribution possibility could be to distribute furniture overseas in association with a well-established, prestigious organization with world-wide sales outlets, regardless of whether or

not it is already engaged in furniture marketing. For instance, one such organization might be Italy's Benetton, a fashion company whose aggressive marketing approach transformed its original artisanal workshop within two decades into a world-wide concern with US$500 million worth of sales in 1985 and 3,500 own outlets stretching from Norway to Japan.

According to the 13 January 1986 issue of the "Time" Magazine, Benetton plans to open 20 fashion shops in China and set up a Chinese manufacturing a Chinese manufacturing plant in China. All Benetton stores have been designed with a distinctive style by a leading Italian architect — who incidentally is also a well-known furniture designer -- and might provide an appropriate setting for the world-wide promotion of "made-in-China" furniture.

A draft project proposal concerning the above recommended follow-up activities is attached (Annex II).

6. RECOMMENDATIONS CONCERNING MANAGERIAL ASSISTANCE TO THE NEW NANJING FURNITURE FACTORY

A modern woodworking complex is to be established in 1987 in Nanjing for the production of furniture, particleboard, plywood and sawnwood. The construction of factory buildings for the plywood and chipboard plants has already commenced.

The furniture plant is expected to produce about 150,000 units of panel-furniture and 100,000 chairs per annum. This outputs will include furniture for both local and export markets.

A contract has already been signed with a foreign consulting firm for the supply of the woodworking equipment for the pilot furniture plant. The arrangement includes the provision of technical personnel (total 18 m/m) by the consulting firm for the purpose of:

- installation and commissioning of the equipment; and
- carrying out production trials with respect to the panel finishing line, panel wood processing and chair production.

The contractor is also expected to provide design-process specifications for a full range of a panel-furniture system and two solid-wood chair designs.

However no managerial assistance has been foressen by the overseas consulting firm to enable the management of the new furniture plant to develop comprehensive, operational managerial skills.

The existing furniture plant, to which the consultant was attached for the duration of the mission, is a semi-artisanal set up; therefore, its managerial staff — which is expected to be involved in the operation of the new factory — lacks the type of experience required for the operation of advanced industrial plants for the serial production of furniture.

Hence, in the opinion of the consultant, the most effective and rapid means of developing such skills would be to provide the new plant with managerial assistance on a turn-key basis, whereby a team of management experts would be attached to the new plant on a short-term basis with the responsibility of helping to attain a regular operative status.

The consultant left with his main counterpart, Mr. Yang Wenja, detailed notes on the outputs and activities such turn-key assistance could possibly encompass. The recommended priorities in the development of managerial skills for the new furniture plant are listed below:

(a) Organization structure and procedures;

(b) Production planning and control;

(c) Industrial engineering;

(d) Cost accounting;

(e) Adaptation of available microcomputer programme developed for the furniture industry and covering the full manufacturing/sales cycle.

As an alternative to direct assistance in attaining full operative status of the new plant, with the responsibility of actually introducing appropriate managerial methods, the consultant recommends that a training course be conducted by a consulting firm on key industrial management areas. The course would be conducted for the benefit of the managerial staff of the new Nanjing Furniture Factory as well as of other major furniture plants — thus contributing towards the development of the Chinese furniture industry as a whole. A Project Proposal Data Sheet is attached in this connection (see Annex III).

W O R K P L A N

ACTIVITIES	MARCH 1	MARCH 2	MARCH 3	MARCH 4	APRIL 1	APRIL 2	APRIL 3	APRIL 4
- Travel Addis-Rome								
- Rome-Vienna								
- Briefing Vienna								
- Travel Vienna-Beijing								
- Travel Beijin-Nanjing								
- Briefing & visit existing factory								
- Discussions new factory project								
- Travel to Yangzhou								
- Travel to Suzhou								
- Training designers								
- Trial panel paint								
- Sample wood-joints for industrial production								
- Selection of tool maintenance equipment & cutting tools for new factory								
- Visits to: - Showrooms & Museum - Nanjing Institute of Forestry - Architects Gao Minquan & Cai Guam Li - Arts & Crafts School								
- Development demonstration furniture								
- Training designers								
- Prototype making								
- Preparation of mission report								
- Preparation of proposal for managerial assistance to the new Nanjing Furniture Factory								
- Final meeting, Nanjing								
- Travel to Beijing & meeting at Ministry of Foreign Economic Relation + Debriefing at UNDP								
- Travel Beijing-Vienna								
- Briefing at UNIDO Vienna								
- Travel Vienna-Rome-Addis Ababa								

ANNEX II

ASSISTANCE TO THE FURNITURE INDUSTRY IN
THE PEOPLE'S REPUBLIC OF CHINA

DRAFT PROJECT PROPOSAL

Tittle:	Development of a range of designs of modern Chinese lacquered furniture for export
Number:	
Duration:	5 months
Primary function:	Pilot project
Secondary function:	Development of export potential
Programme:	
Subprogramme:	
Government implementing Agency:	Nanjing Furniture Factory, of the Nanjing Second Light Industries Bureau, under the Ministry of Light Industries, in co-operation with: - The Research Institute of Cultural Relic Preservation, Beijing - The Shangai Arts & Crafts Research Institute - The Beijing Institute of Wood Industry - The Faculty of Architecture, Beijing University
Executing Agency:	
Extimated starting date:	March 1987
Government inputs:	In kind
External inputs:	$US 132,100

PART I: THE PROJECT

A. Development objectives

The project is expected to contribute towards the fulfilment of the following long-term objectives:

1. The promotion of export-oriented industrial activities to help balance the expenditures in imported capital goods.

2. The promotion of employment opportunities in rural areas.

B. Immediate objectives

As a direct result of the project, at the time of its completion, the Nanjing Furniture Factory will have acquired a range of designs of modern lacquered furniture based on the utilization of advanced woodworking technology and traditional crafts.

C. Background and justification

The People's Republic of China is credited at having developed in the course of its civilization furniture-making skills of the highest standards, as well as a wide typology of furniture which influenced furniture trends (chinoiserie) in western countries since the late 18th century.

In particular, China has developed an age-long tradition in the production of lacquered furniture; however, its furniture industry has yet to apply modern, mass production techniques in the manufacture for export of this type of high-class furniture.

A two-month mission was undertaken in March-April 1986 by a UNIDO consultant aimed at assessing the possibility of developing export potential of high-class lacquered furniture to be manufactured in the new modern Nanjing Furniture Factory[1/] expected to be established in 1987.

1/ The Plant will aim at both domestic and export markets and is expected to produce an estimated yearly output of 150,000 units of panel furniture and 100,000 chairs. The furniture factory will be part of a woodworking complex for the manufacture of sawnwood, particleboard and plywood.

Under the project, designs were developed and prototypes were made of furniture items which served to demonstrate the possibility of combining industrial wood-processing techniques with the utilization of traditional crafts for the production of lacquered furniture for export.

This project is expected to produce a wide range of designs of lacquered furniture so as to provide an initial export promotion drive.

The designs will reflect elements of the Chinese heritage and consist of a combination of mass-produced components — to be manufactured in the new Nanjing Furniture Factory — and hand-crafted components to be provided by contract co-operatives based in the countryside. Thus the project is expected to contribute towards transferring surplus rural workers to new jobs within local areas, which is a current priority of the Chinese Government.

The designs will be developed by leading furniture designers from major, potential export markets (USA and Western Europe).

In view of the fact that China lacks high-value tropical timber, the furniture will be based on the utilization of MDF, a new type of wood-based panel (now being manufactured in China), which is highly suitable for lacquered furniture.

D. Outputs

1. Report providing a comprehensive review of aspects of traditional Chinese architecture, and arts and crafts which could be utilized as reference to designers engaged in developing modern furniture reflecting the Chinese heritage.

2. Reports providing detailed specifications on a range of nine designs of furniture items to serve as an initial basis to promoting the manufacture of modern Chinese lacquered furniture for export.

3. Report providing alternative marketing strategies for the export of furniture items developed under the project.

4. Trained marketing staff of the Nanjing Furniture Factory in furniture marketing methods practised overseas.

5. Three Chinese Industrial/Furniture Designers exposed to product development methods as practised overseas.

E. Activities

1. Activities to reach output 1

1.1 Visits by a consultant to the institutions listed below to study, for a period of three weeks, available documentation and, where applicable, processing methods on traditional Chinese arts and crafts and architecture:

(a) Research Institute of Cultural Relic Preservation, Beijing;

(b) The Shangai Arts & Crafts Research Institute;

(c) The Beijing Institute of Wood Industry;

(d) Faculty of Architecture, Beijing University.

1.2 Visit typical examples of traditional Chinese architecture, especially those displaying original traditional furniture.

1.3 Visit typical workshops involved in crafts of relevance to the project, namely those dealing with the following processes:

(a) Coromandel lacquer;
(b) Beijing carved lacquer;
(c) Mother-of-pearl inlaying;
(d) Line-engraving of lacquered panels;
(e) Embroidery glass inserts.

1.4 Prepare written and visual documentation (drawings, photos, etc.) on aspects of traditional architecture and arts and crafts, on the basis of activities 1.1, 1.2 and 1.3, considered to be relevant to the development of modern Chinese furniture. The report will be prepared

by the consultant at the UNIDO Headquarters in Vienna and cover a period of three weeks.

2. Activities to reach output 2

2.1 Missions to China by three leading overseas designers to study selected aspects of traditional Chinese architecture and arts and crafts, as identified in advance by the consultant who will carry out activities 1.1 to 1.4.
(Duration of missions: 3 weeks per designer, including travel to and from China)

2.2 Development of 3 furniture designs items and related specifications by each designer in their own countries. Duration of the activity is 7 weeks each.

3. Activities to reach output 3

(Mission to China of three weeks by a marketing consultant)

3.1 Train in furniture marketing techniques as applied overseas.

3.2 Identify alternative marketing strategies for the short-and long-term export promotion concerning modern Chinese furniture of lacquered type.

4. Activity to reach output 4

On-the-job training of three Chinese Industrial Designers for one month each at the design offices of the three overseas furniture design consultants expected to carry out activity 2.2.

F. Input

1. Government Inputs

1.1 Provision of counterpart staff for the period of the consultants' missions to China.

1.2 Salaries to government officials on fellowship training under the project.

1.3 Cost of internal travel undertaken by the consultants during their missions to China.

1.4 Cost of prototypes to be prepared on the basis of the specifications provided by the overseas design consultants.

2. External Inputs

2.1 Product/process consultant (6 weeks)

To produce output 1 of the project.

2.2 Three furniture design consultants (10 weeks x 3)

To produce outputs 2 and 4 of the project. The designers will be internationally known and familier with market trends of major export markets (USA and Western Europe). The designers will be carrying out as a group their two-weeks mission to China prior to the design development work to be carried out in their own country.

2.3 Marketing consultant (4 weeks)

To produce outputs 3 and 4 of the project. The consultant will be a specialist in furniture marketing with experience in main furniture market areas such as USA and Western Europe.

2.4 Fellowship (3 man/months)

Three Chinese Industrial Designers attached to the respective design offices of the three overseas furniture consultants for one-month each.

2.5 Other

The external contribution will also cover reporting and sundry costs.

G. Work plan

A detailed work plan will be included in the final project document.

PART II: SCHEDULES OF MONITORING, EVALUATION AND REPORTS

A. Monitoring

To be specified in final project document.

B. Progress and terminal reports

The preparation of a progress report will be required on the part of the following consultants on the completion of their fact-finding missions in China, prior to the preparation of the final reports:

- Product/process consultants,
- Furniture design consultants.

The marketing consultant will be expected to prepare his final report prior to his departure from China.

PART III: BUDGET COVERING THE EXTERNAL CONTRIBUTION

		m/m	$US
10.00	Project personnel		
11.01	Product/process Consultant	1.5	17,250
11.02	Furniture Design Consultant	2.5	28,750
11.03	Furniture Design Consultant	2.5	28,750
11.04	Furniture Design Consultant	2.5	28,750
11.05	Marketing Consultant	1.0	11,500
		10.0	115,000
15.00	Official travel		1,500
19.00	Total component		116,500
30.00	Fellowships		
	Furniture design training (three fellows on one month each to the respective Furniture Design Consultants overseas)	3.-	10,800 a/
39.00	Total component		10,800
50.00	Miscellaneous		
52.00	Reporting costs		4,000
53.00	Sundry		800
	Total component		4,800
99.00	GRAND TOTAL	$US	132,100

a/ Including estimated travel cost of $US 1,600 per fellow.

ANNEX III

PROJECT PROPOSAL DATA SHEET

1. Country: People's Republic of China

2. Project title: Training Course in Industrial Management Methods for the Furniture Industry

3. Duration: 2 months

4. Executing Agency:

5. Government Implementing Agency: Ministry of Light Industries

A. Development objectives

1. To contribute towards meeting efficiently the demand for diversified middle- and high-grade consumer commodities resulting from rising income.

2. To contribute towards the promotion of export-oriented industries to help balance the expenditures in imported capital goods.

3. To maximize the employment potential of the timber industry.

B. Immediate objectives

As a direct result of the project, the managerial staff of selected modern furniture plants in China will acquire an insight into advanced industrial management methods as applicable to Chinese conditions and requirements and focusing on the large-scale production of panel furniture.

C. Background and justification

Furniture has been singled out in China's 7th 5-Year Plan 1/ as one of the consumer goods whose manufacture should be modernized and rationalized. This is deemed necessary in view of the growth in consumer demand

1/ Beijing Review, No. 22, 1985, page 18.

for diversified and middle- and high-grade commodities resulting from rising income and changing buying habits. The People's Republic of China has an estimated 200 million households expected to reach over 300 million by the year 2000 1/.

Furthermore, in the course of a recent mission to the People's Republic of China by a UNIDO consultant, the possibility has been identified of developing an export potential based on the manufacture of modern lacquered furniture by the new Nanjing Furniture Factory 2/ expected to be established in 1987. This particular type of furniture would consist of MDF panels processed industrially and combined with components produced according to Chinese traditional handicraft techniques. The hand-crafted components would be produced by co-operatives based in the countryside — thus helping transfer surplus of rural workers to new jobs within local areas.

D. Outputs

1. Reports providing practical guidelines on the following industrial management topics, as applicable to the furniture industry and, in particular, to the new Nanjing Furniture Factory:

   (a) Plant organization;

   (b) Product development:

   (c) Industrial engineering (process engineering, methods engineering, time study and wage administration);

   (d) Cost-accounting;

   (e) Production planning & control;

   (f) Purchasing & Inventory control;

   (g) Preventive maintenance; and

   (h) Computer software applications.

1/ Ref.: UN ESA/P/WP-73, May 1981

2/ The Plant will be part of a new major woodworking complex manufacturing beside furniture chipboard, plywood and sawnwood. The estimated yearly output of the furniture plant is 150,000 units of panel furniture and 100,000 chairs.

2. The managerial staff of five major furniture plants in China trained in the practical aspects of the above management subjects.

E. Activities

The activities of the project will be carried out by a consulting firm, acting as a subcontractor, with specific experience in the development of the furniture industry. The activities are:

1. Visit by a team of specialists to the five Chinese furniture plants selected for participation in the project to study their operational conditions and requirements.

2. Preparation of the management outlines as per output 1, based on the findings of activity one and with particular reference to the needs of the new Nanjing Furniture Factory expected to be established in 1987. The activity is to be carried out at the sub-contractor's headquarter.

3. One-month intensive training to be carried out in Nanjing by a team of specialists provided by the subcontractor. The course will cover the topics covered by the documentation prepared under activity 2.

F. Inputs

Government contribution

- Cost of internal travel by the consultants,
- Cost of travel and living allowance incurred by the nationals participating in the course;
- Provision of training facilities

External contribution

	$US
- The services of an overseas consulting firm specialized in managerial assistance to the furniture industry	70,000
- Reporting cost	3,500
- Sundry expenses	1,000
Total external contribution	74,500

SELECTION OF TOOL MAINTENANCE EQUIPMENT
FOR THE FURNITURE PLANT OF THE NANJING
INTEGRATED WOODWORKING COMPLEX

Expendable Equipment	US$
1. One Power Drill	
- Two speeds for wood and metal boring	
- Typical equipment: BLACK & DECKER, mod. SPK - 2513 (FRG)	250
2. One Dial type set gauge (for measuring tooth set metric)	
- Typical equipment: VOLLMER, mod. MU-10-U (FRG)	53
3. Two Vernier calipers	
- Reading up to 150 mm (dial type)	
- Typical equipment: VOLLMER, mod. MW-10-U	70
4. Two Micrometer	
- Reading up to 25 mm	
- Typical equipment: VOLLMER, mod. MW-11-U	94
5. Two Protractor	
- Range up to 180^{c}	
- Length of leg: 150 mm	
- Typical equipment: VOLLMER, mod. MW-13-U	66
6. One General purpose tools set	600

Non-Expendable Equipment [1]	US$
1. One Automatic knife grinder	
- for knife length up to 600 mm	
- simultaneous sharpening of up to 4 knives	
- wet grinding	
- recommended model and supplier: Model V8C LOROCH (F.R.G.)	3,500
2. One Universal tool grinder	
- with attachments for griding following HSS and carbine cutters minimum and maximum wheel diameter 75:150 mm	
- Moulding cutters (bore dia. 30 mm)	
- Routing cutters	
- Boring and slotting cutters with plain and threaded shank (Thread M10)	
- Straight knives of length up to 120 mm	
- six sets of standard and diamond grinding wheels	
- typical equipment: GRIFO, model U-10-N with following accessories Ref. Nos. J-B-E-EL-E3-E (for thread M 10) -F-GG-GP-I-Y-IA-IR	9,000
3. One Automatic grinder for carbide tipped circular saws	
- for grinding of tooth front and back	
- six of each type grinding wheels	
- typical equipment: STEHLE, model 600 T	3,500

1/ - All motors to be TROPICAL-INSULATED and provided with OVERLOAD SWITCHES.

- Add to the cost of machines 8% for spare parts for two-year operation.
- Also to be added is the cost of electrical materials (cables, main switches, grounding system, etc.) for the installation of the equipment.

	US$
4. One Manual side grinder for carbide tipped circular saw	
- Six of each type grinding wheels	
- Typical equipment: VOLLMER DORHAN, model VODO L-600	3,300
5. One Brazing equipment for carbide tipped circular saws	
- Typical equipment VOLLMER DORNHAN, model VODO L-600	2,400
6. One Manual bandsaw setting machine	
- Bandsaw blade width up to 45 - 50 mm	
- Tooth pitch 3 to 24 mm	
- Centering adjustment for blade thickness	
- Additional raker set equipment	
- Typical equipment: VOLLMER, AN-S-1A	400
7. One Device for setting and balancing cutter blocks	
- Typical equipment WACO (Sweden), model SIBA	1,000
8. One knife balancing stand	
- For balancing loose knives in parts before mounting on cutterblocks	
- Typical equipment: ROBINSON, model ZX	500
9. One General purpose bench grinder	
- For off-hand grinding	
- Sliding attachment for precision sharpening of chisels, and knives of hand planers	
- Grinding wheels supply for two-year operation	
- Typical equipment: VOLLMER, model No. 2310	1,000

US$

10. One Automatic sharpening machine for circular saws and narrow band saws

- For circular saw dia. 100 to 600
- Band saw width up to 60 mm
- Bevel and straight grinding
- Hook angle from -10° to +30°
- Tooth pitch: 5 to 60 mm
- Feeding speeds: 30 to 80 teeth/min
- Tooth height adjustment: from 3 mm upward
- Built-in cams for standard and hooked tooth types

Grinding wheels for two-year operation

Typical equipment:
VOLLMER, model CNE 9,000

HARDWARE SUPPLIER: HAFELE KG
Postfach 160, D-7270 Nagold. WG
Telephone: (07452) 95-1 Telex: 765931

PRODUCT TYPE	PART DESCRIPTION	CATALOGUE No.	PCS	NOTES
1. KNOCK DOWN FITTING MINIFIX 15	CASING	262.25.114	100	
	"	262.25.123	100	
	"	262.25.169	100	
	"	262.26.111	100	
	"	262.26.120	100	
	"	262.26.166	100	
	"	262.26.193	100	
	CONNECTING BOLT	262.27.912	100	
	" "	262.28.919	100	
	COVER CAP	262.24.359	100	
2. KNOCK DOWN FITTING MINIFIX 10	CASING	262.20.119	100	
	"	262.20.128	100	
	CONNECTING BOLT	262.21.910	100	
	COVER CAP	262.24.304	100	
3. KNOCK DOWN FITTING RASANT	HOUSING	262.82.664	100	
	CONNECTING BOLT	262.80.964	100	
4. KNOCK DOWN FITTING USI 8	CAM	262.98.528	100	
	"	262.98.135	100	
	CONNECTING BOLT	262.98.948	100	
	HOLE GAUGE	262.98.895	1	
5. SHELF SUPPORT	BRASS PLATED PIN	282.04.524	100	
6. KNOCK DOWN FITTING TRAPEZ	INTERCONNECTING CASINGS	262.61.610	8	SAMPLES
7. KNOCK DOWN FITTING NORGE	RECESSED HOUSINGS	262.46.015	100	
	HOSPA SCREWS	015.31.684	100	
	TENSIONING CONES	242.46.711	100	
	HOSPA SCREWS	015.31.648	100	
	EXPANDING SOCKETS	042.98.051	100	
	CONE SCREW	262.46.917	100	

HARDWARE SUPPLIER: SISO A/S
26, NYROPSGADE DK-1602, Copenhagen

PRODUCT TYPE	DESCRIPTION	CATALOGUE No.	PCS.	NOTES
HINGE TYPE A	DECORATIVE HINGE SINGLE FLAP	21.116.20	20	
HINGE TYPE B	DECORATIVE HINGE SINGLE FLAP	21.120.20	20	
HINGE TYPE C	DECORATIVE HINGE	21.300.20	40	
HINGE	FLAP HINGE	23.463.20	12	
HINGE	CYLINDER HINGE	13.140.20	12	
	" "	13.180.20	20	
HINGE	PIN HINGE	14.108.19	12	
	" "	14.109.19	12	

LIST OF PERSONS MET

1. UNDP Office, Beijing	- Mr. Albertus W. Sissingh UNIDO Senior Industrial Development Adviser
	- Mr. Paolo Sabbatini Programme Officer
2. China National Interior Necessities Corp. Ministry of Light Industry	- Mr. CHEN DINGXIN Vice President
3. China International Centre for Economic & Technical Exchange, Ministry of Foreign Economic Relations & Trade Development Division Beijing	- Mr. ZHOU XIAOMIN Director of Project Division
	- Ms. QIU HONG Programme Officer
4. Nanjing Woodworking Factory	- Mr. Wang Yong Gao Manager
	- Mr. CHEN XIANKANG Director
	- Mr. YANG WENJIA Chief Engineer
	- Mr. YIN JIN LIN Vice Manager
	- Mr. ZHAO YU LING Vice Manager
	- Ms. WU CHUN FA Vice Manager
	- Mrs. LIU BAO-LING Head Technical Section
	- Mr. QIANG WEI
	- Mr. LI MIN*
	- Mr. WU CHEN FA*
	- Mr. LIU MING CHIANG*
	- Mr. WANG SI SON*
	- Mr. CHIANG WEI*

* Designers/technicians assigned as counterparts to the consultant

4. Nanjing Woodworking Factory (continuation)	- Mr. YOU CHONG JIOU* - Mr. ZHOU LIN* - Mr. SHENG FENG* - Mr. LIU HAIYAU* - Mr. MA YONG* - Mr. YIN LI* LI HWA
5. Foreign Economic Relations and Trade, Commission of Jiangsu Province	- Mr. ZHOU GUANGMING Deputy Division Chief - Ms. HAN XIAOCHUAN - Ms. YAO LIQUN
6. Nanjing Second Light Industry Office of Foreign Economic Relations	- ZHU FO XIANG Vice Director - HOU HUAN YING Vice Director - ZHU RUI LIANG
7. Nanjing Institute of Forestry	- Dr. WU DIRONG Vice Department Head Wood Science and Technology - Mr. LIU ZHONG CHUANG Associate Professor Wood Technology Division - Mr. SHI HAIHONG Research Officer - Mr. ZOU NING Research Officer
8. Nanjing Arts Institute	- Mr. PHAU ZOUN FA Department Head - PIN YOU SUN

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* Persons who attended training sessions on selection of cutting tools and tool maintenance equipment

9. Nanjing Institute of Technology	- Mr. GAO MINQUAN Assoc. Professor of Architecture
	- Ms. CAI GUAN LI Assoc. Professor of Interior Design
10. Zhongjian Furniture Factory Yangzhou	- Mr. TONG WING SHAN Manager
	- Mr. SHA CIANG CHING Assistant Manager
	- Mr. LIU HOUQI Executive Director
11. Yangzhou Lacquer Handcrafts Factory	
12. Yangzhou Jade Factory	
13. Yangzhou Embroidery Factory	- Mr. CHANG ZU CHING Manager
14. Yangzhou Scroll Workshop	
15. Suzhou Furniture Industry Corporation	- Mr. DU XIANGSHENG Manager
16. Suzhou Carved Lacquer Factory	- Mr. TONG JING KUN Director
	- Mr. UI KHAO YOU Production Manager
17. National Embroidery Research Centre, Suzhou	- Mr. CHAN CHAI CHIEN Director

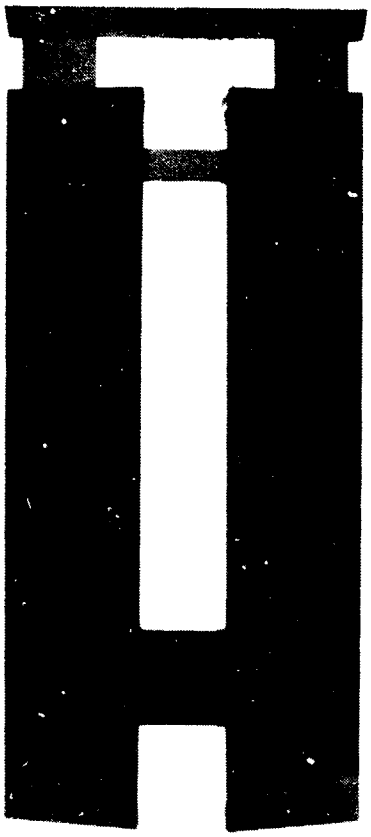
18. Suzhou Carved Blackwood Factory	- Mr. XIA RONG GUI Director
20. China National Arts & Crafts Imports and Exports Corporation, Jiangsu Branch	- Mr. ZHANG JYING PING Manager
	- Mr. GU MING KONG Sales Officer
	- Mrs. XU NIEN HUA Sales Officer
21. Beijing Furniture Industry Corporation Beijing	- Mr. WANG WANSHENG General Manager
	- Mr. XIE ZHONG-MIN Engineer
22. Beijing South Suburb Timber Factory	- Mr. WU DAJUN Deputy Head Technical Department
	- ZHANG WANXING Deputy Director
23. Beijing Western Suburb Furniture Factory	- Mr. LIANG XI TIAN

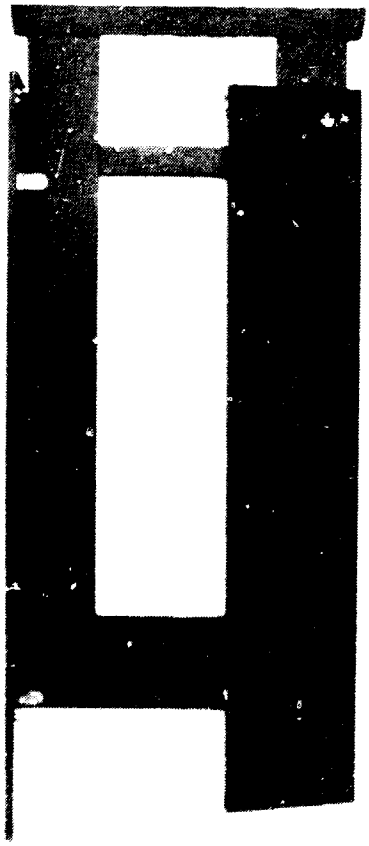
ANNEX VII

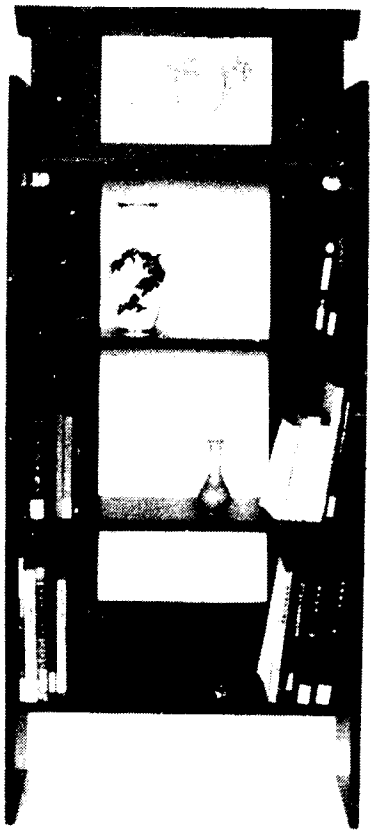
Drawings and photo documentation of furniture items developed by the consultant during the mission

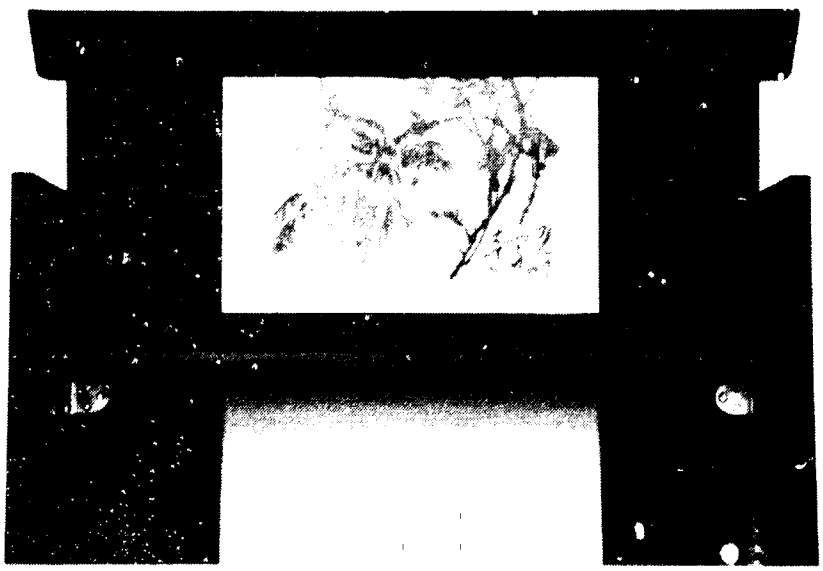
CONTENT

- Designs, drawings and photos by P. Borretti
- Prototypes by the counterparts of the Nanjing ..orking Factory









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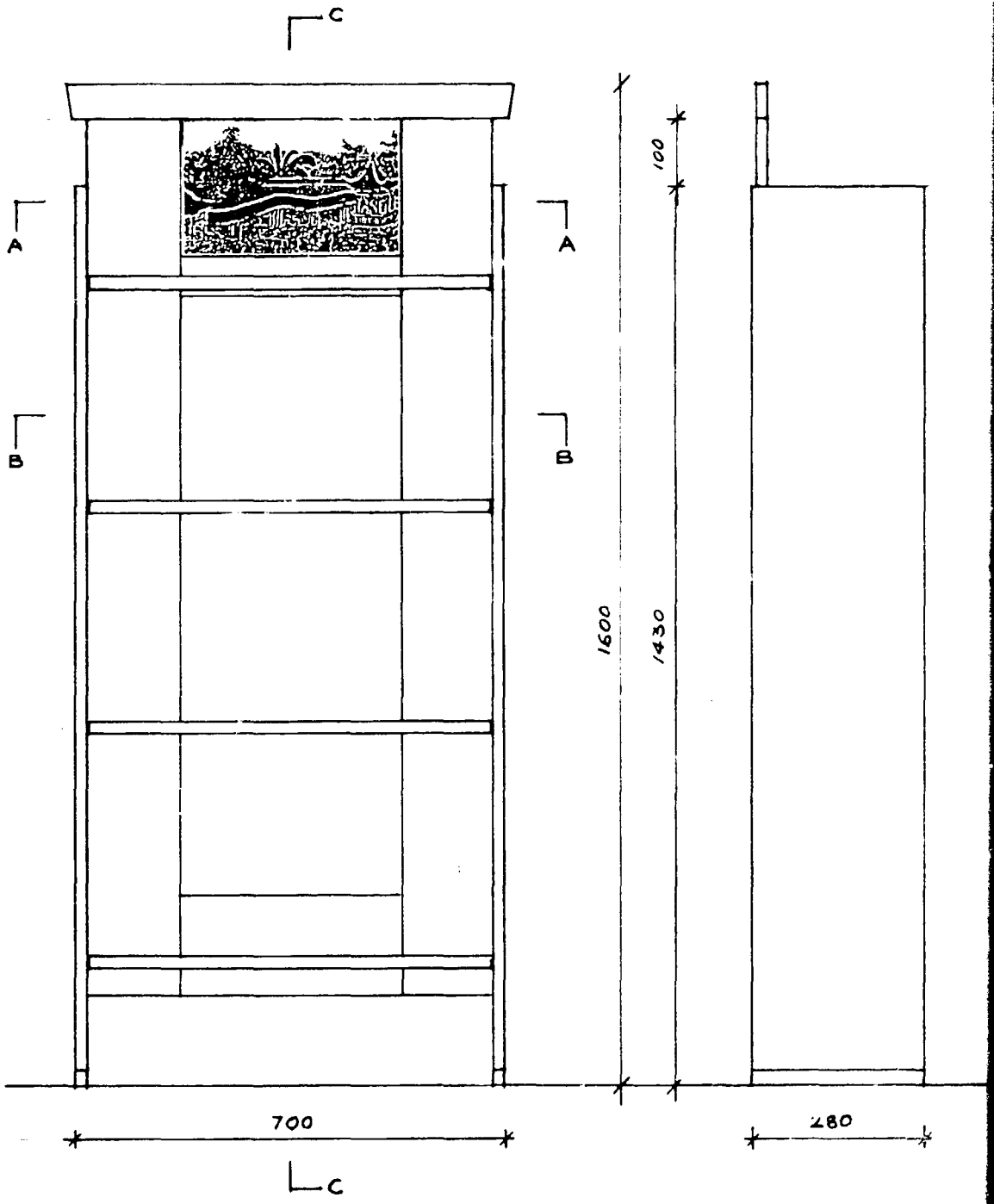
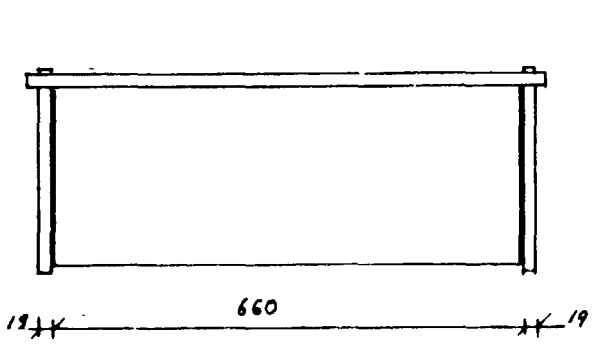
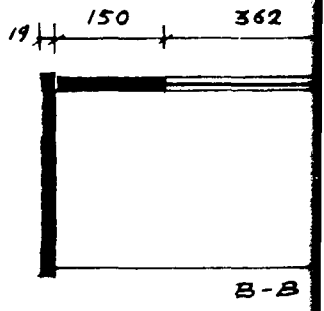


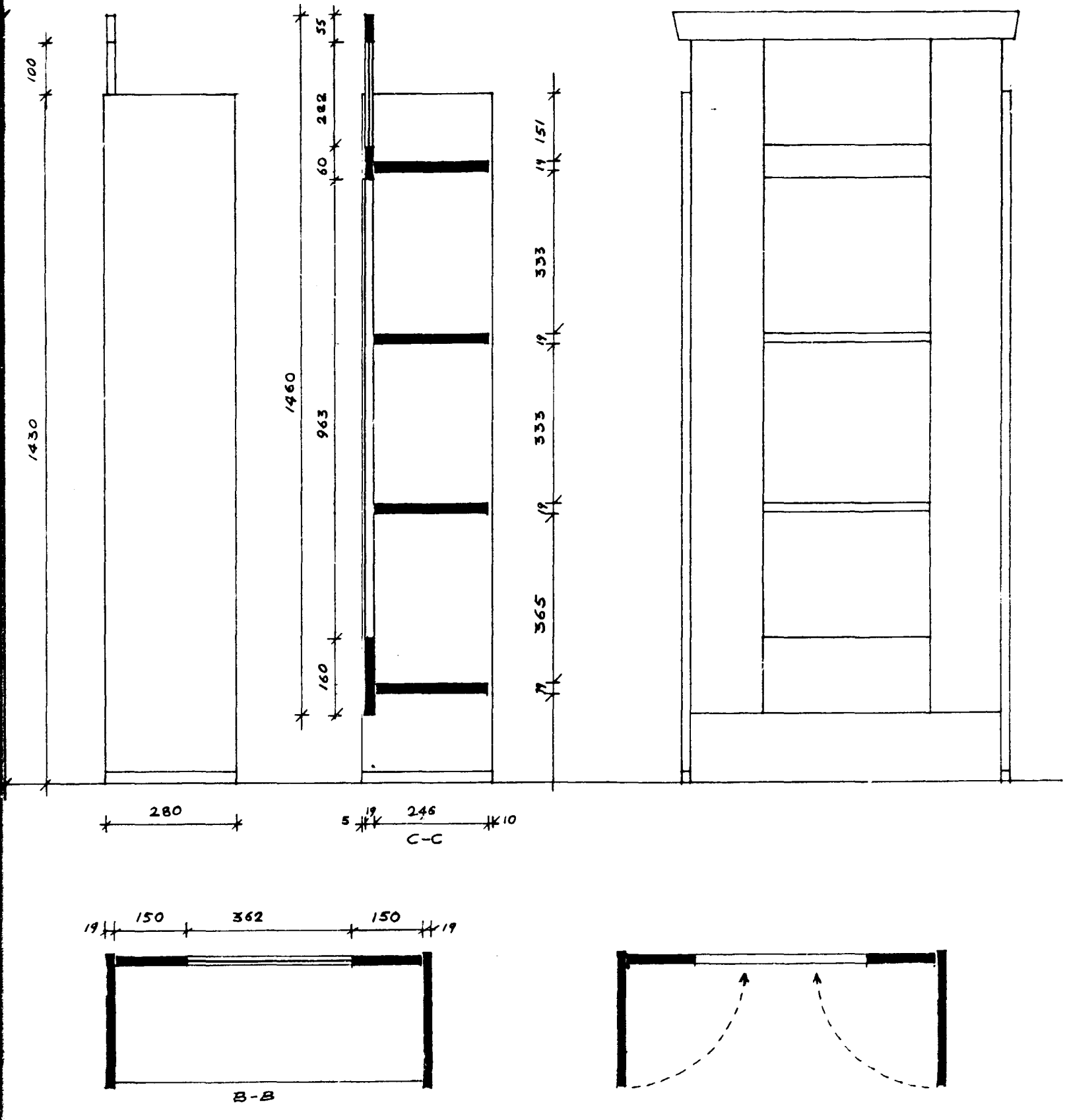




SECTION 1

SCALE 1:10

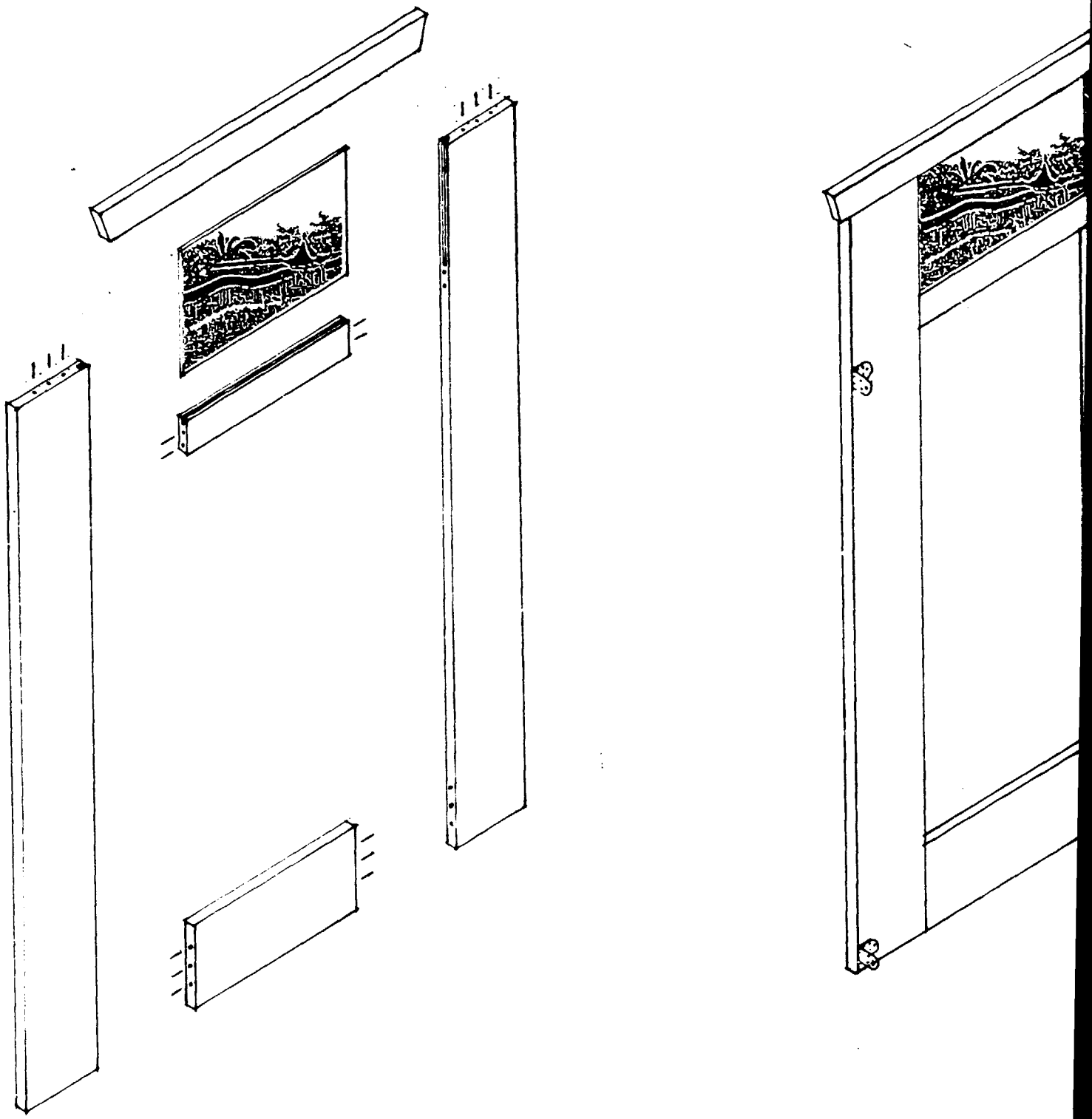
01-1



SECTION 2

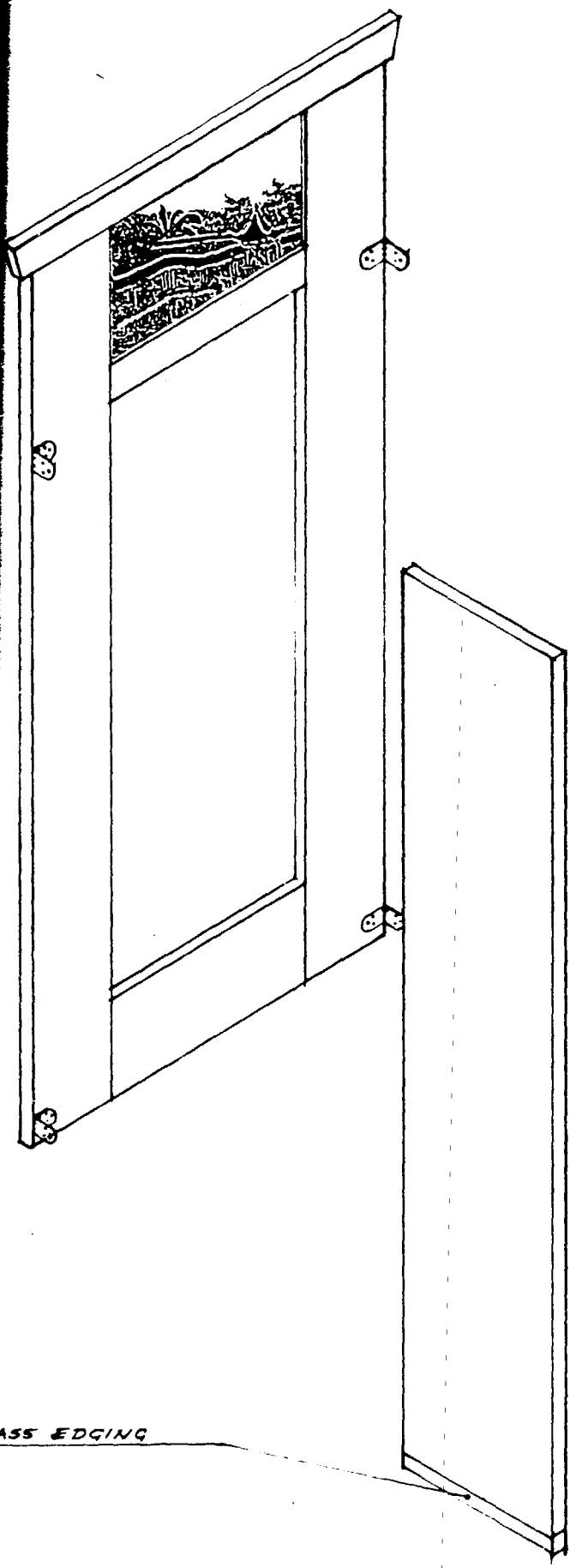
01-1 FOLDING BOOKSHELF 折迭式书架

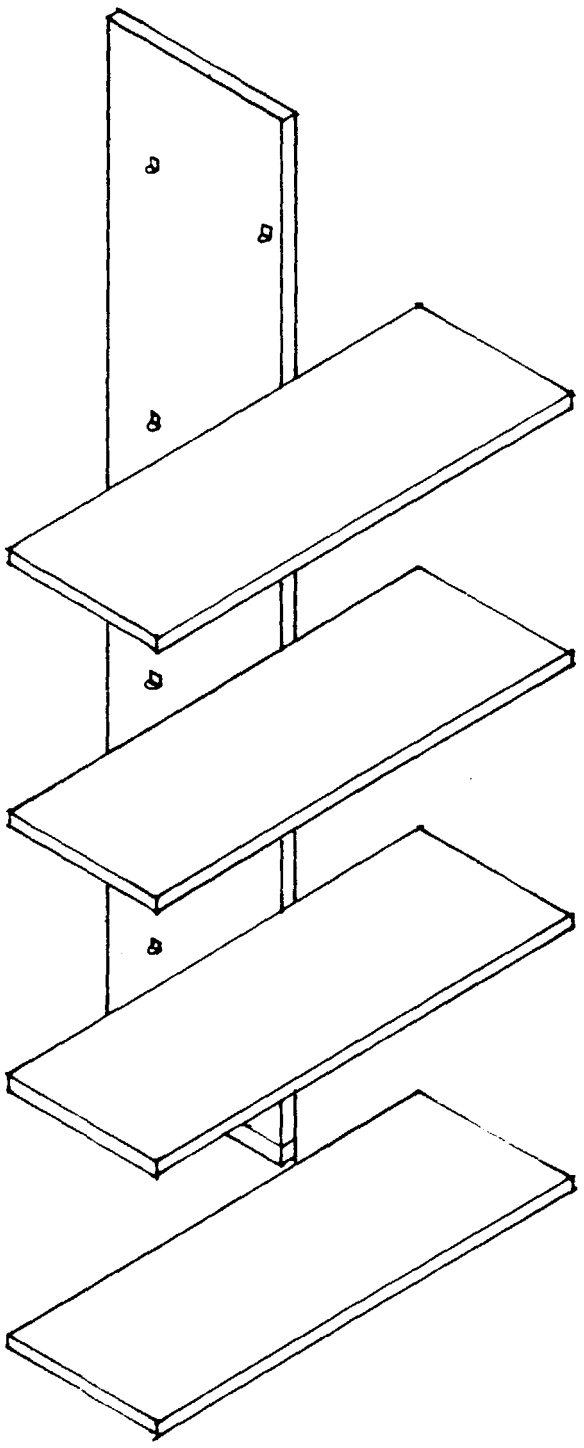
PB
4-86



BRASS EDGING

SECTION 1



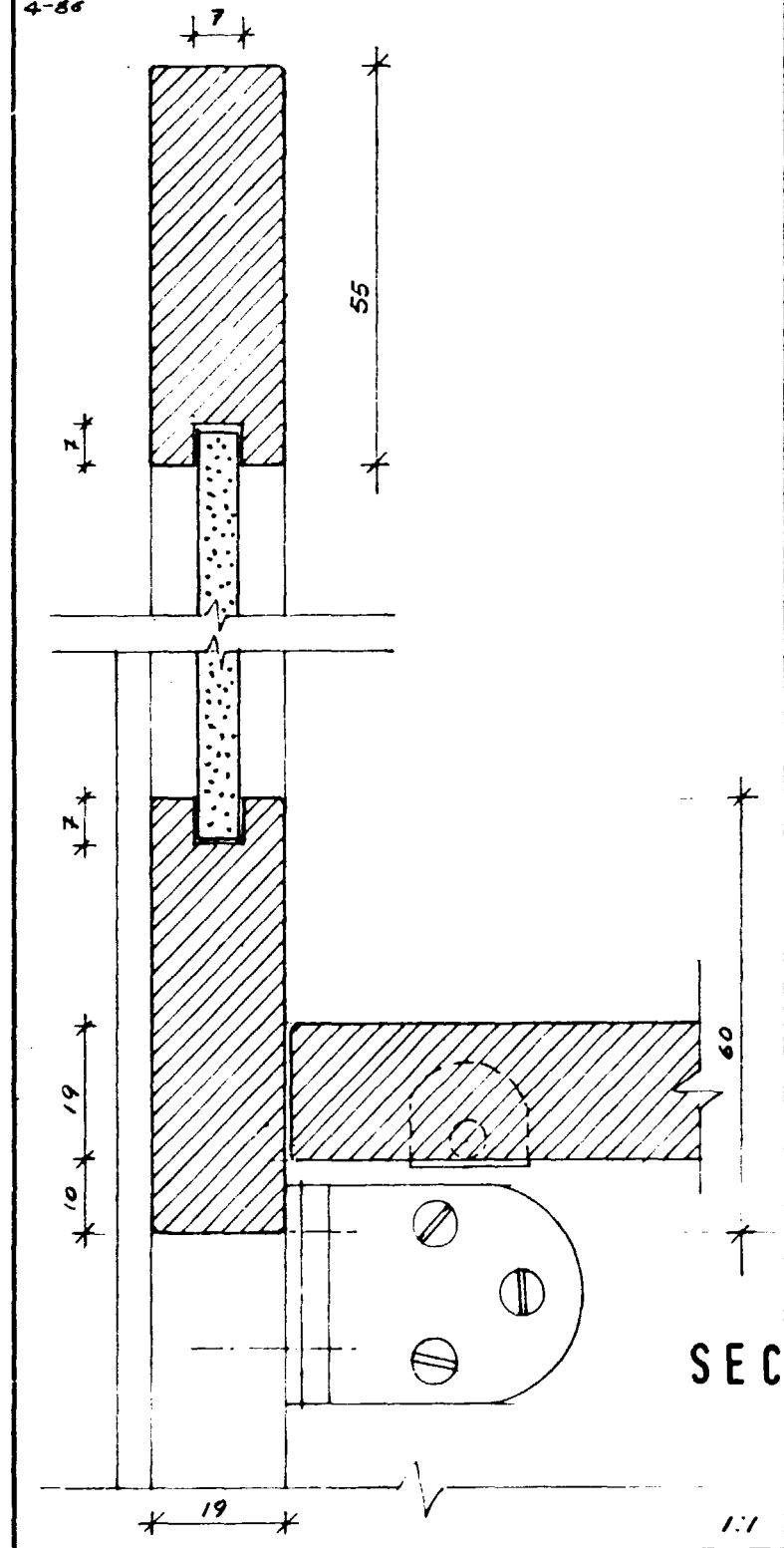


ASS EDGING

SECTION 2

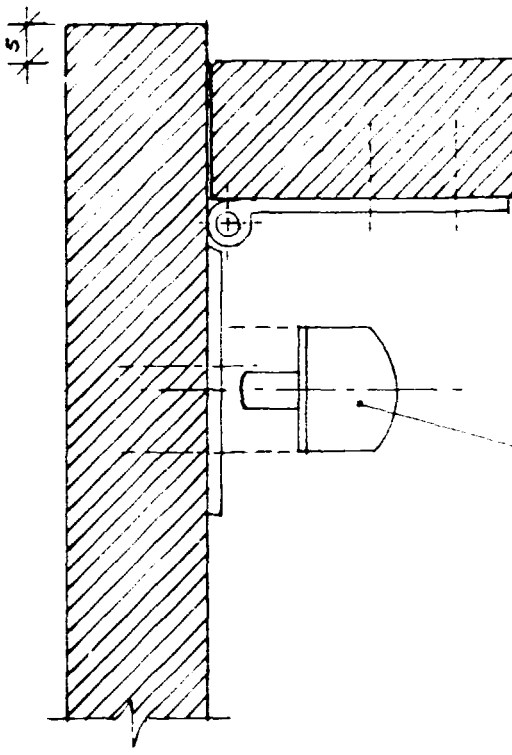
01-2 FOLDING BOOKSHELF 折迭式书架

P.B
4-86

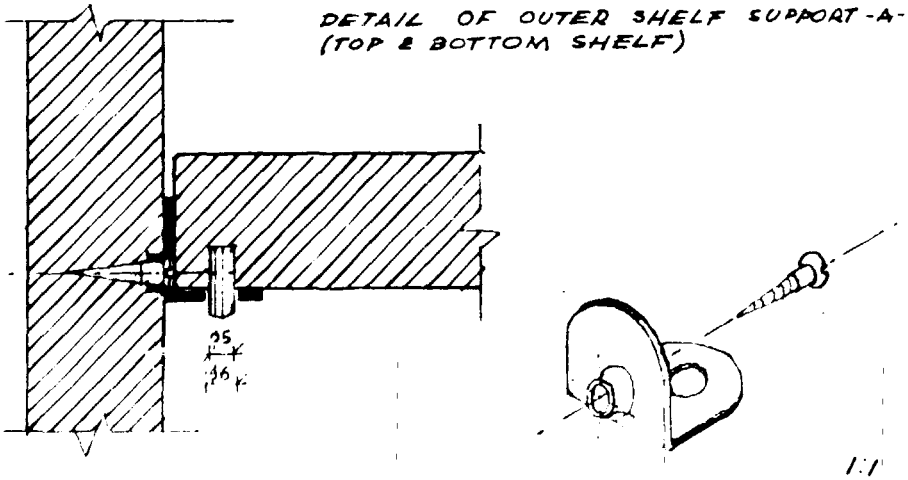


SECTION 1

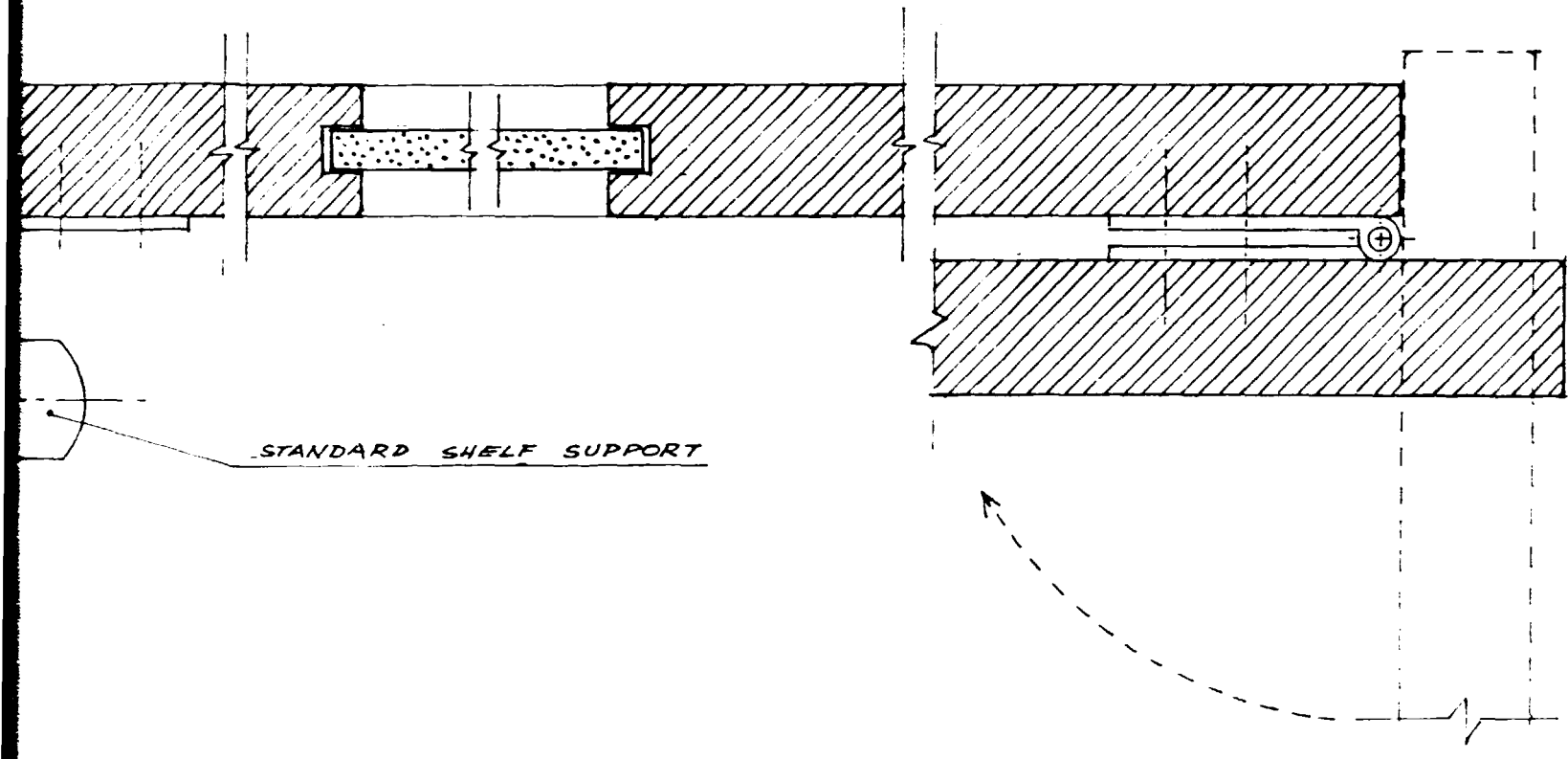
1:1



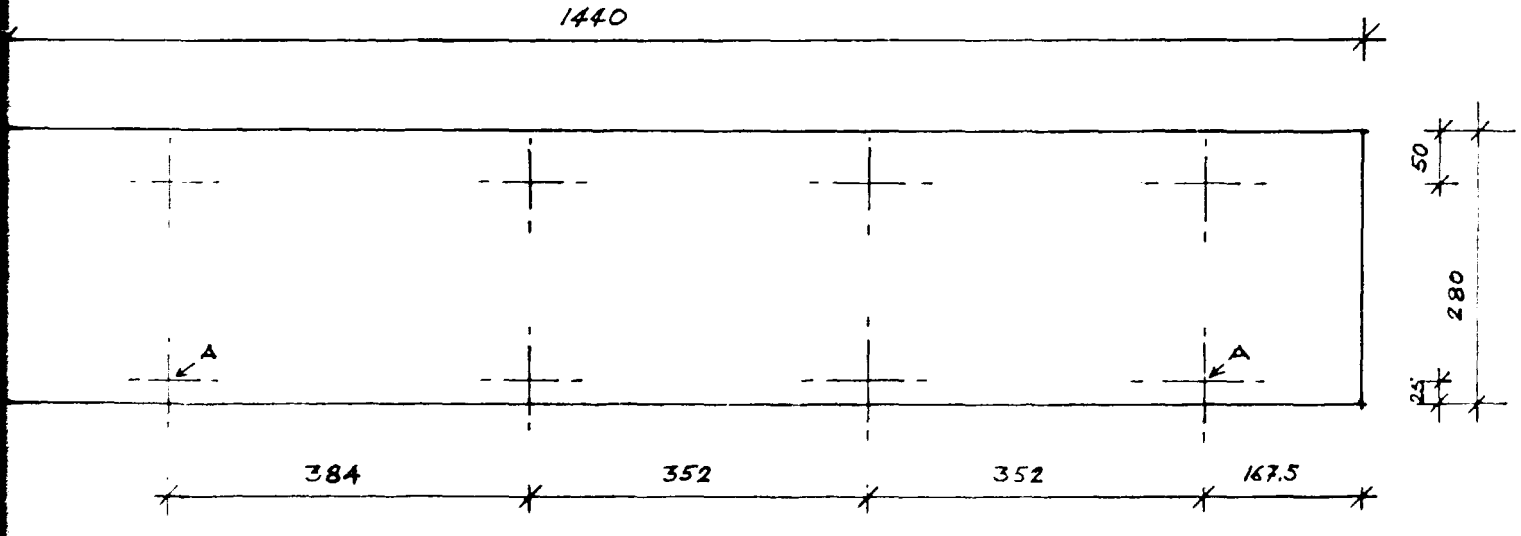
DETAIL OF OUTER SHELF SUPPORT -A-
(TOP & BOTTOM SHELF)



1:1



1:1

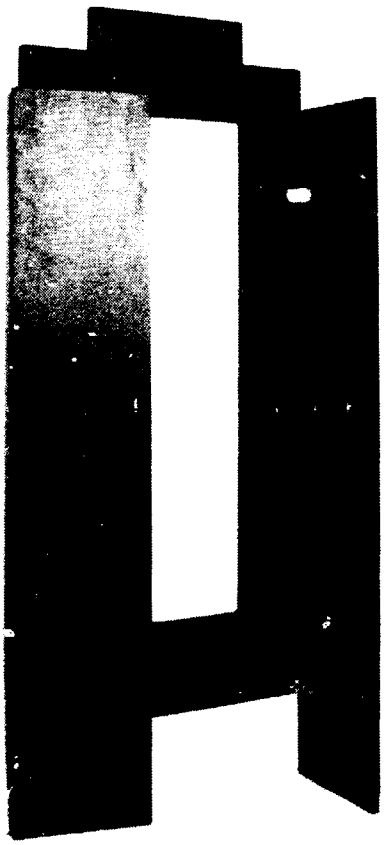


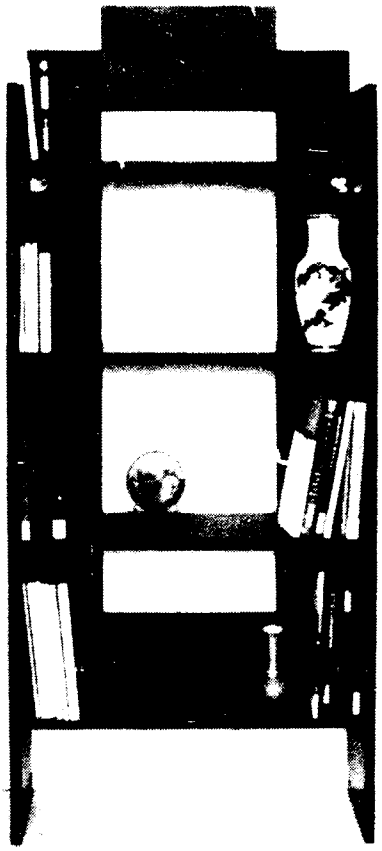
PLAN VIEW OF SIDE PANELS SHOWING CENTRE OF SHELF SUPPORTS

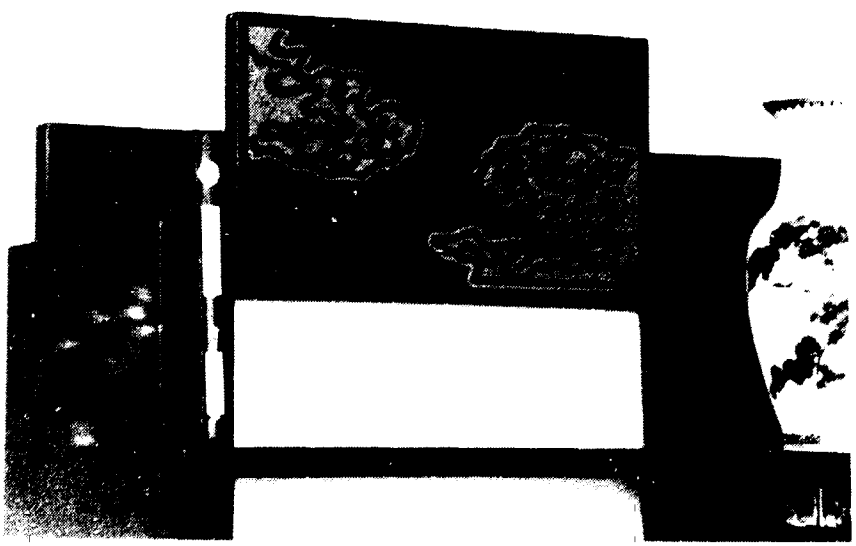
SECTION 2

01-3 FOLDING BOOKSHELF 折迭式书架

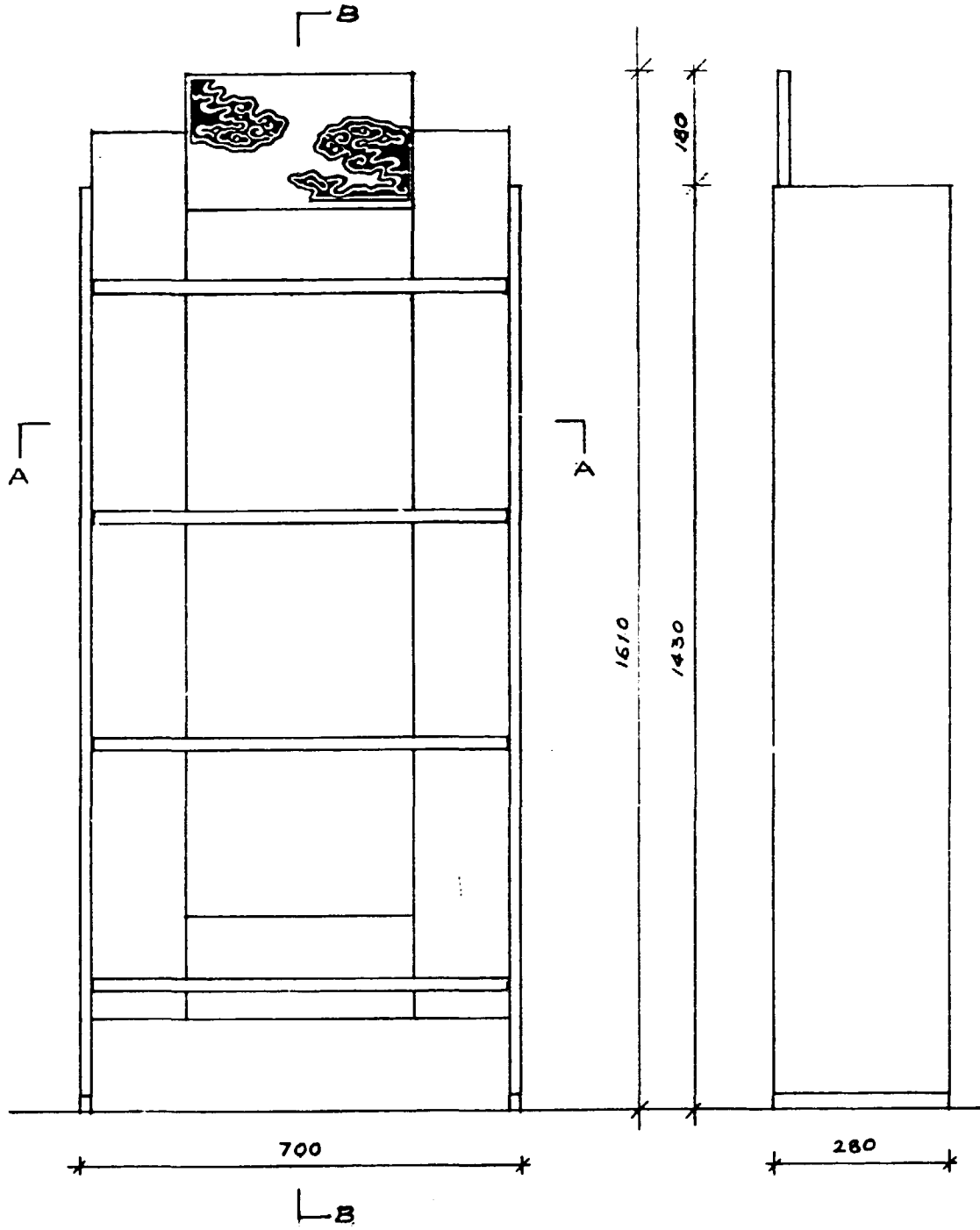
58/59-160



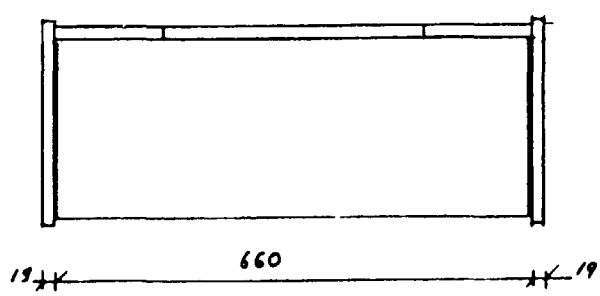


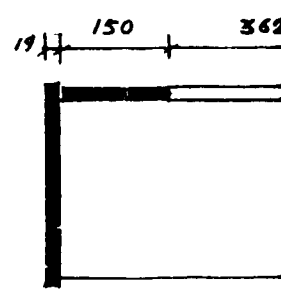


P.B.
4-86



FRONT ELEVATION

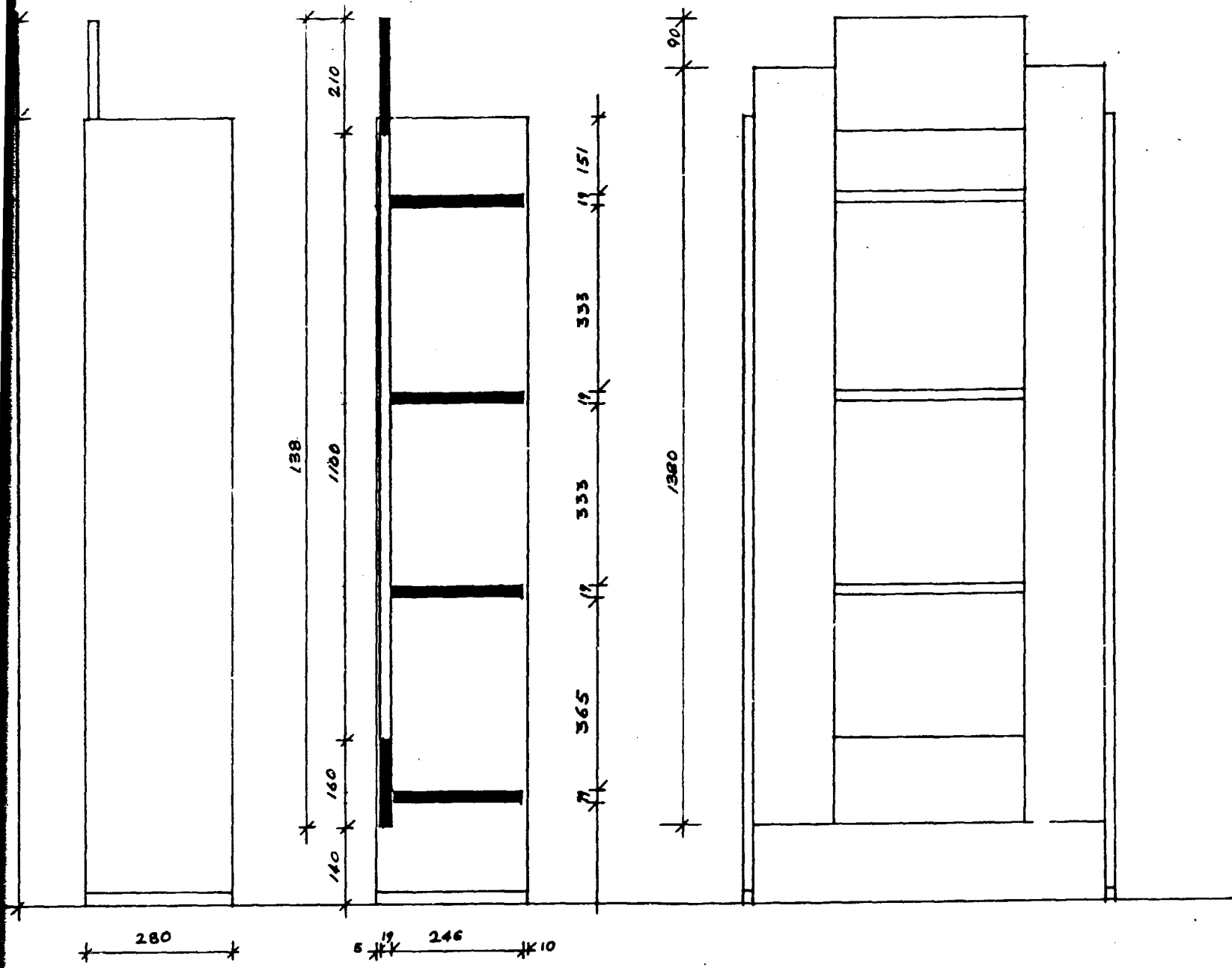




A-

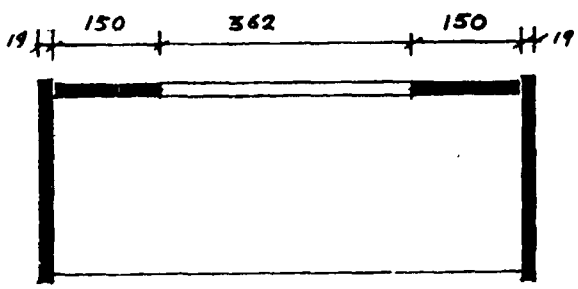
SECTION 1

SCALE 1:10

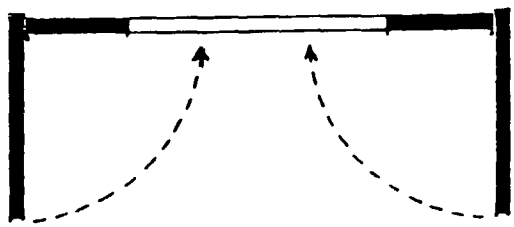


B-B

BACK ELEVATION



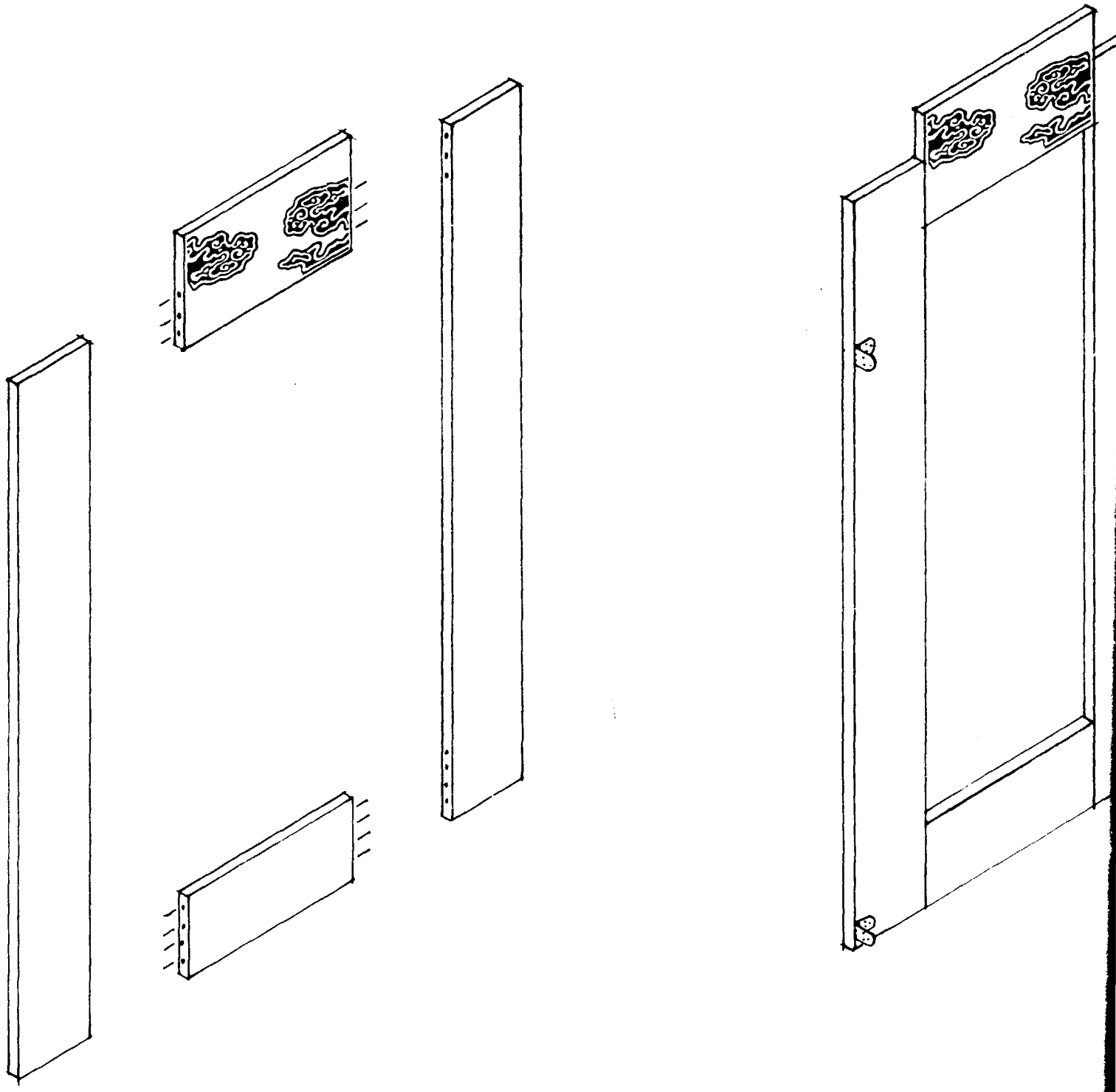
A-A



TO PACK THE BOOKSHELF FLAT
REMOVE SHELVES AND FOLD SIDES IN

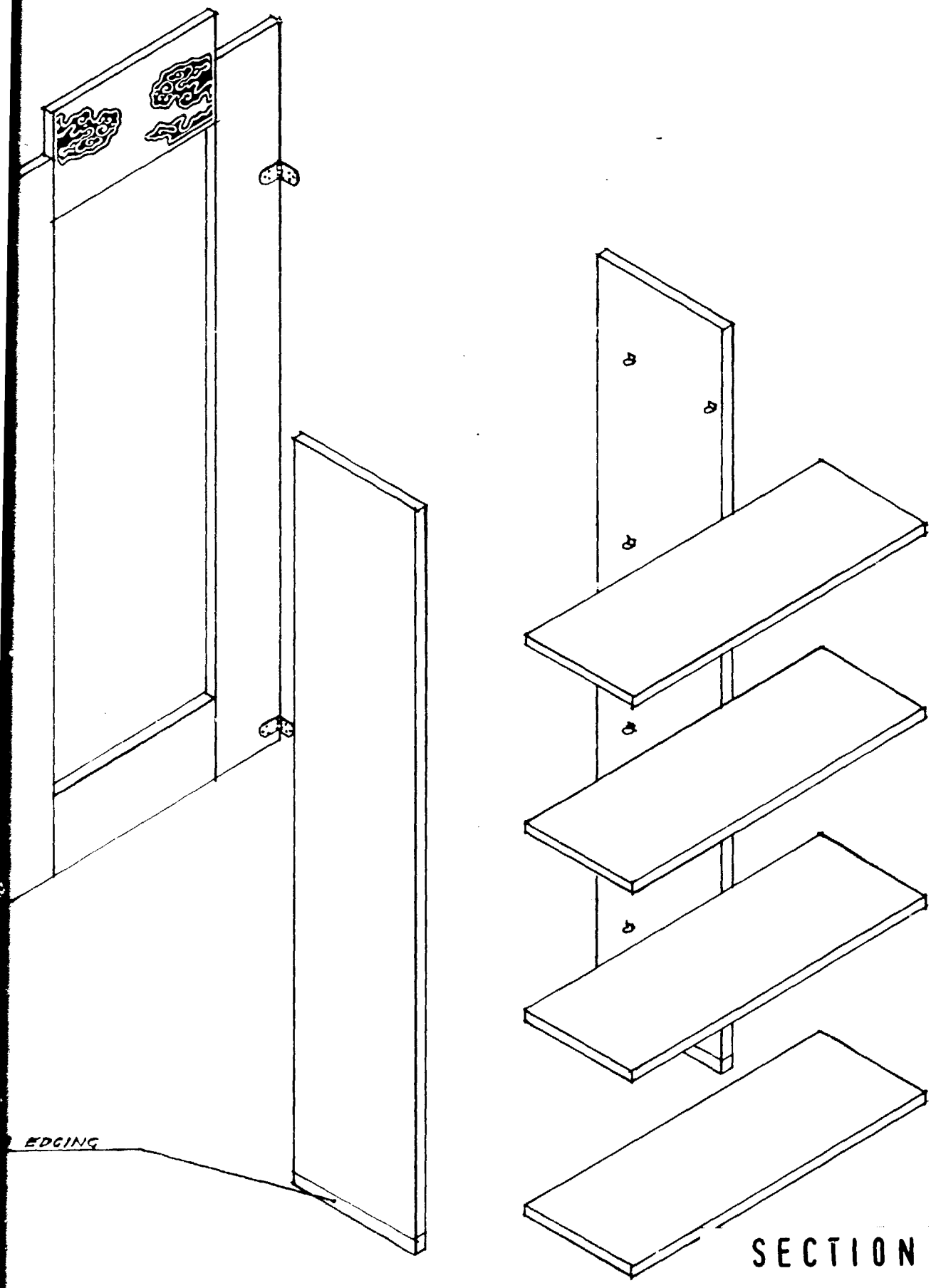
SECTION 2

02-1 FOLDING BOOKSHELF 折迭式书架



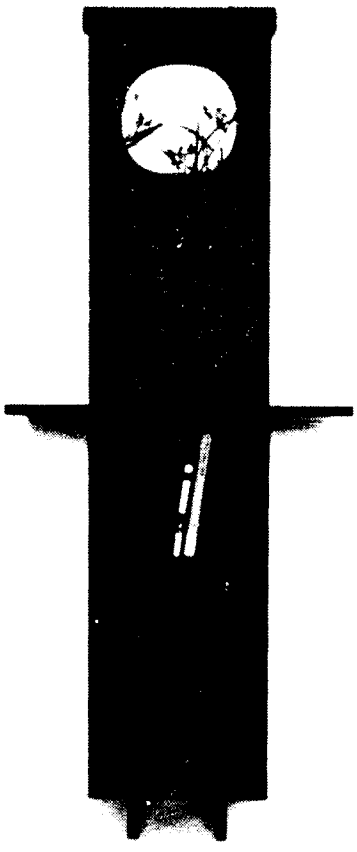
BRASS EDGING

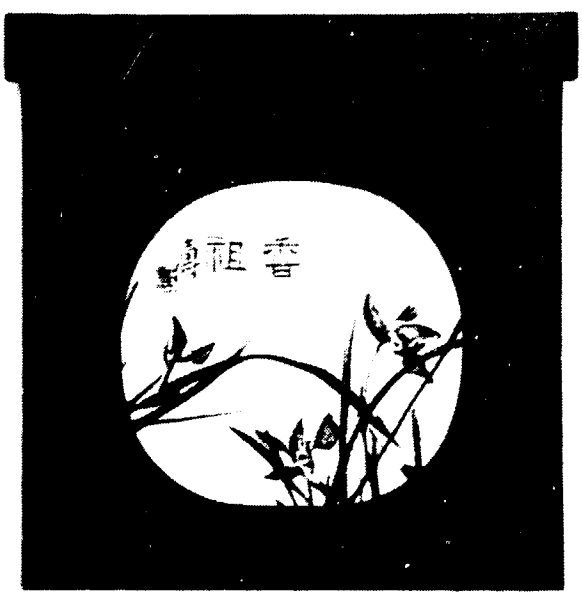
SECTION 1



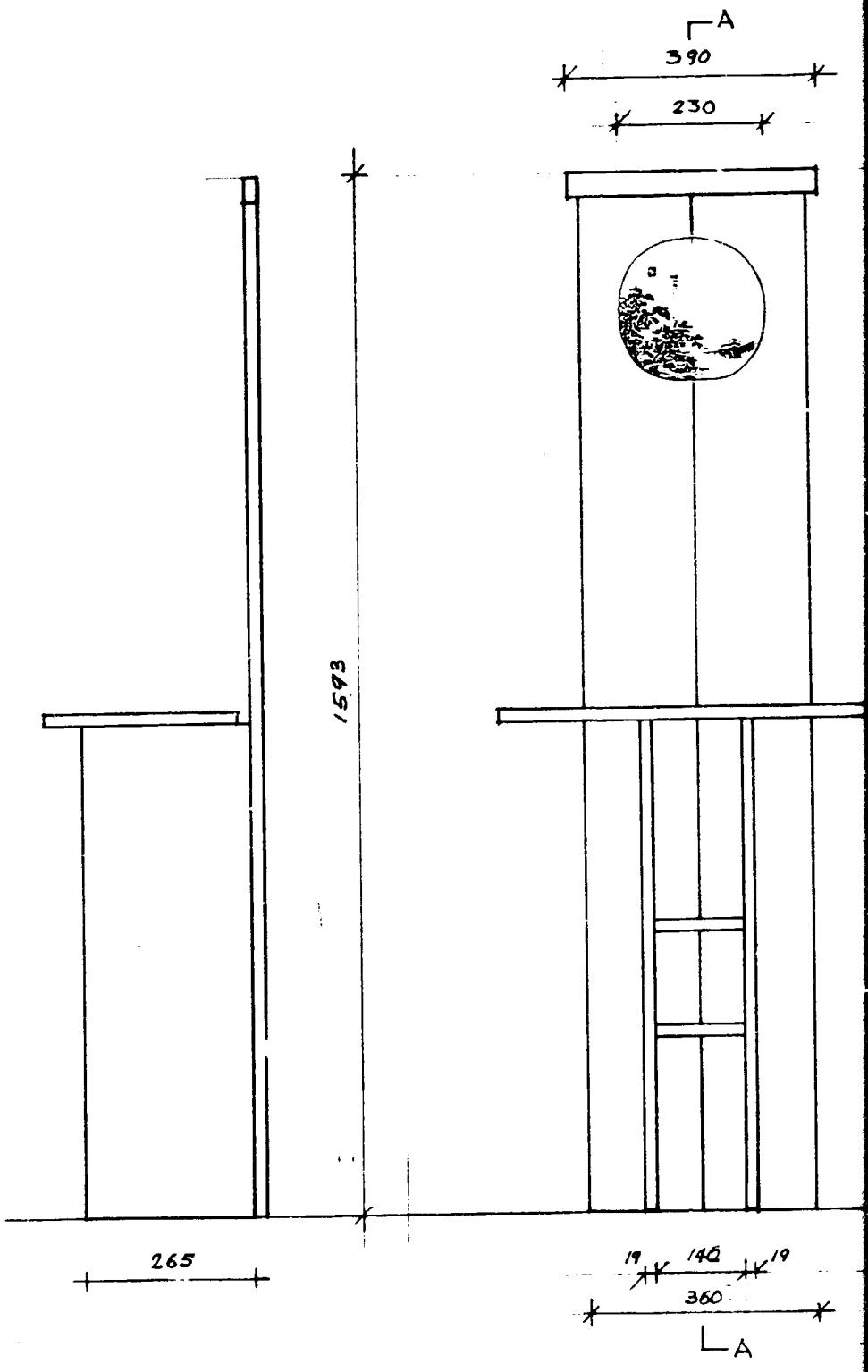
SECTION 2

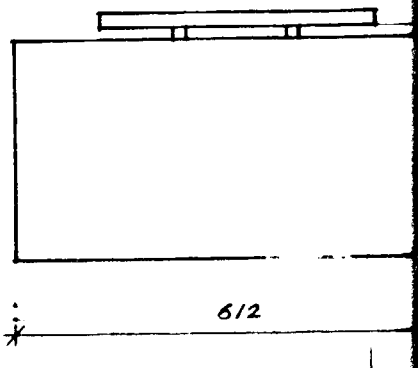
02-2 FOLDING BOOKSHELF 折迭式书架





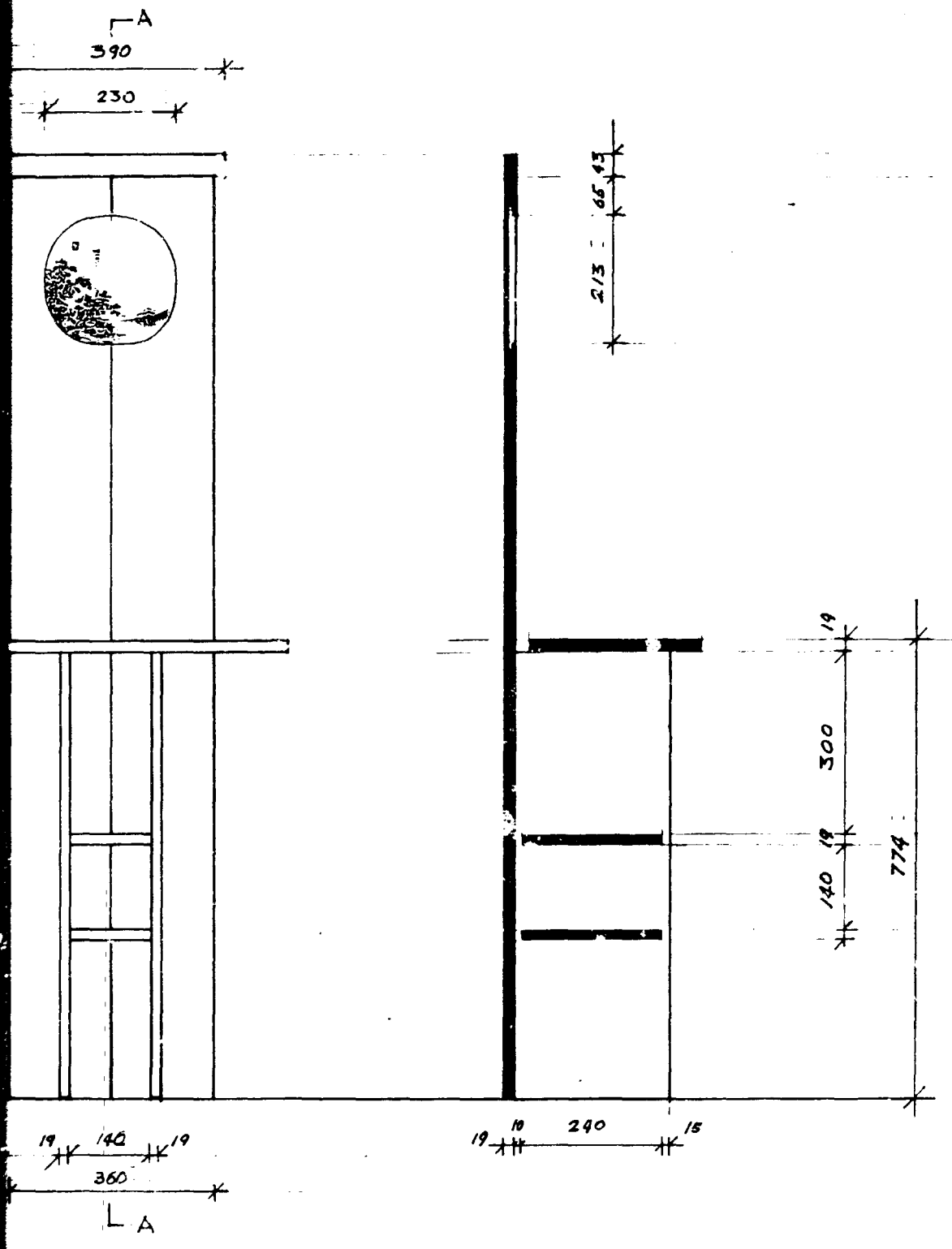
P.B.
4-86

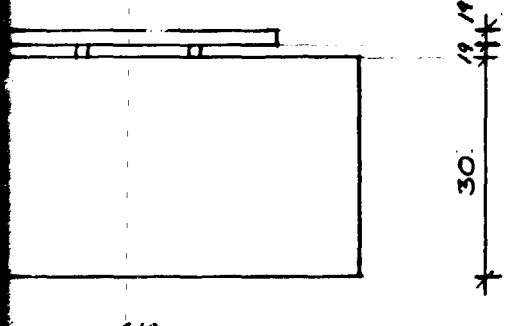




SECTION 1

SCALE 1:10



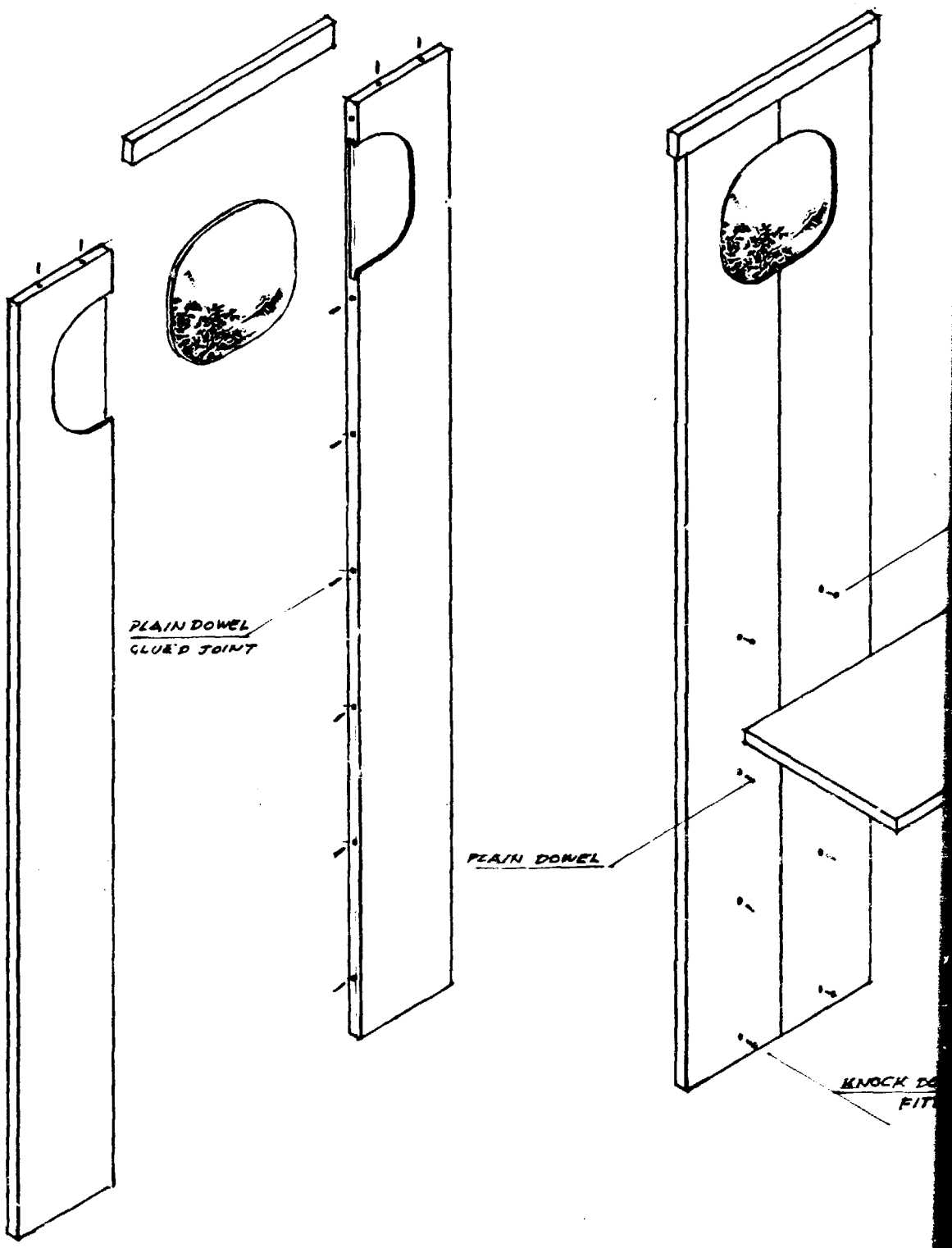


SECTION 2

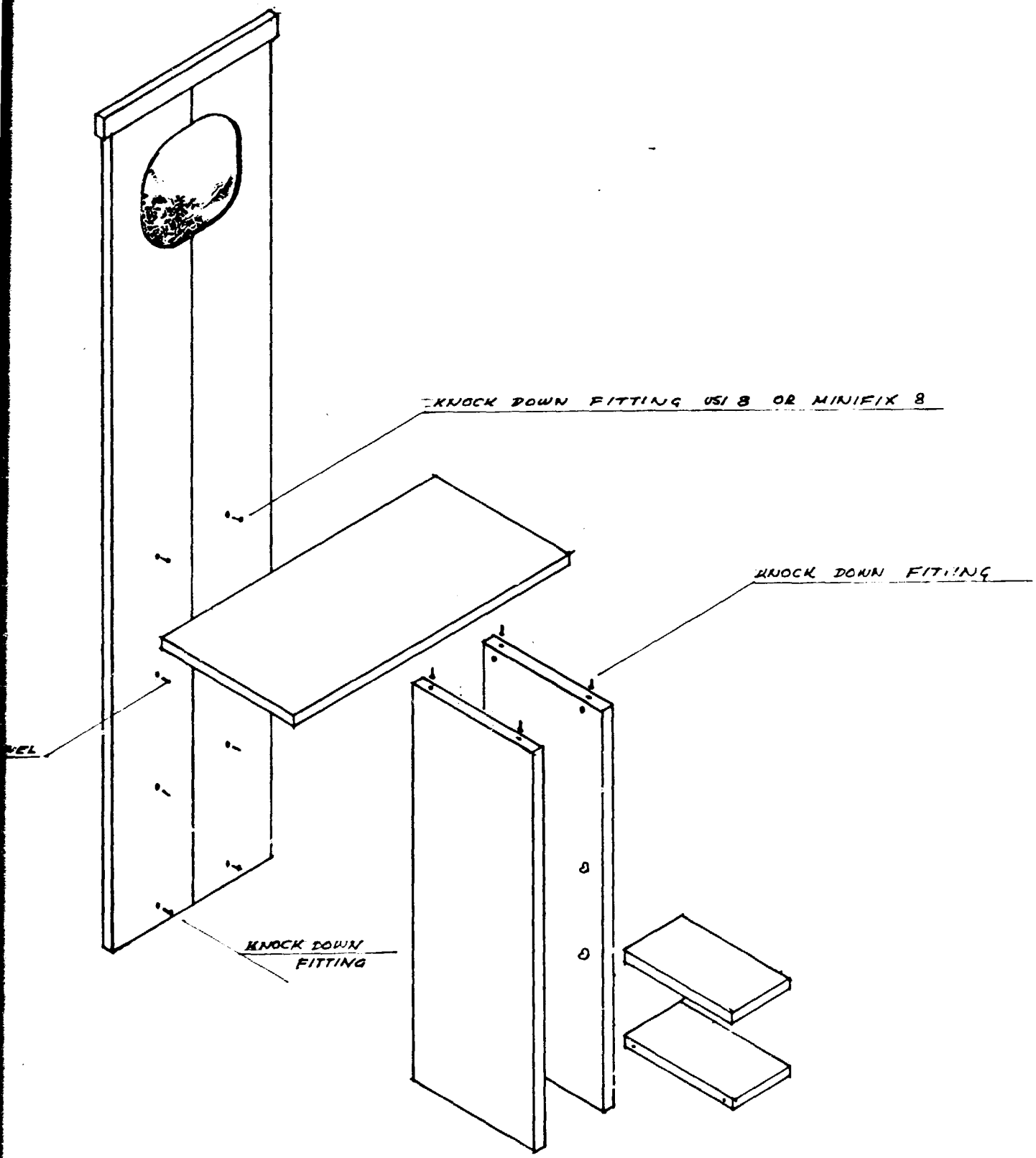
03-1 TELEPHONE TABLE

電話桌

P.B.
4-80



SECTION 1



SECTION 2

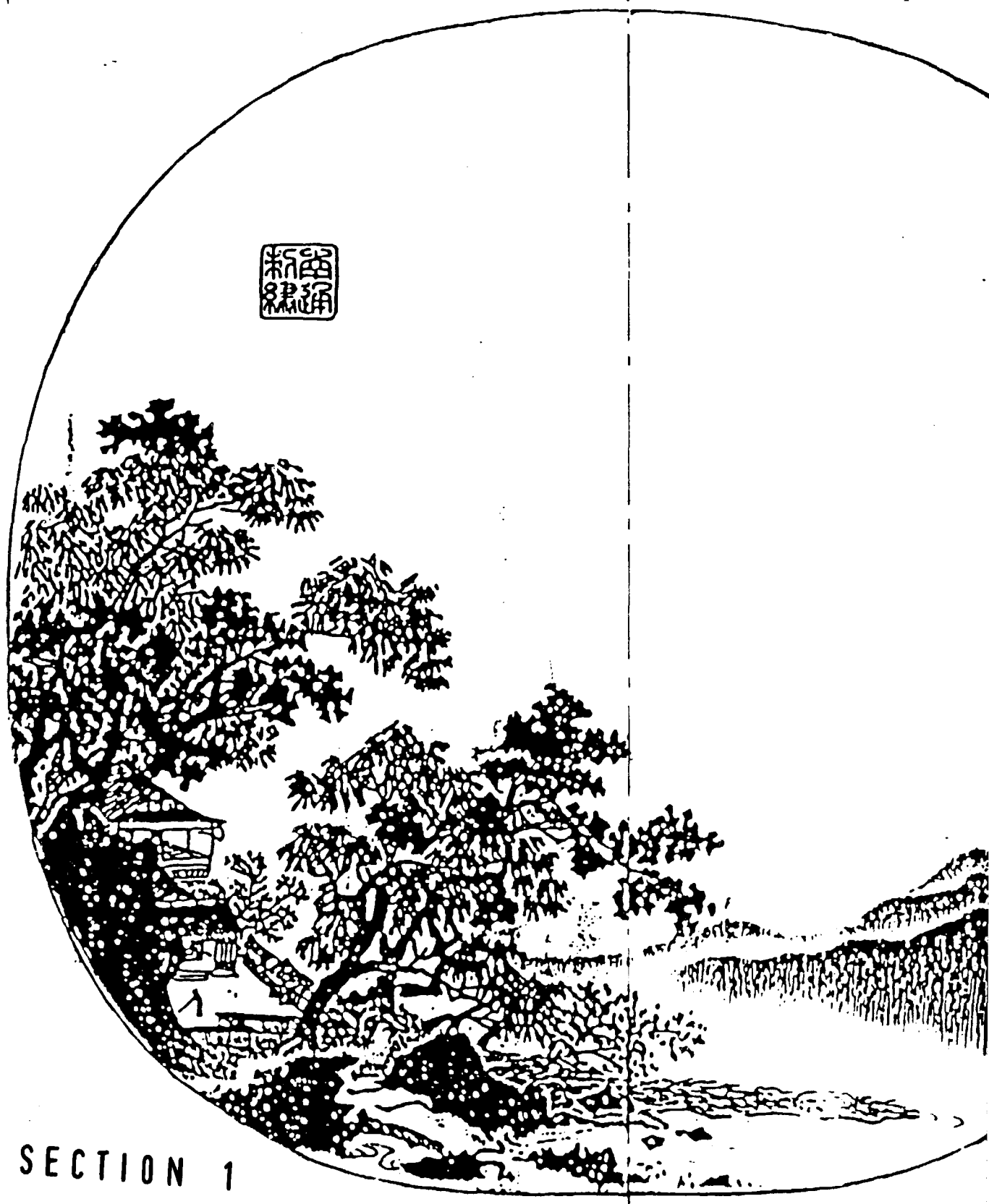
03-2 TELEPHONE TABLE

电话桌：

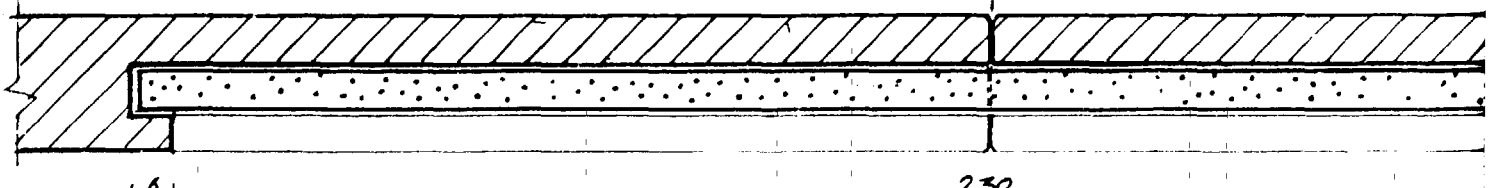
P.B.
4-86

240

225

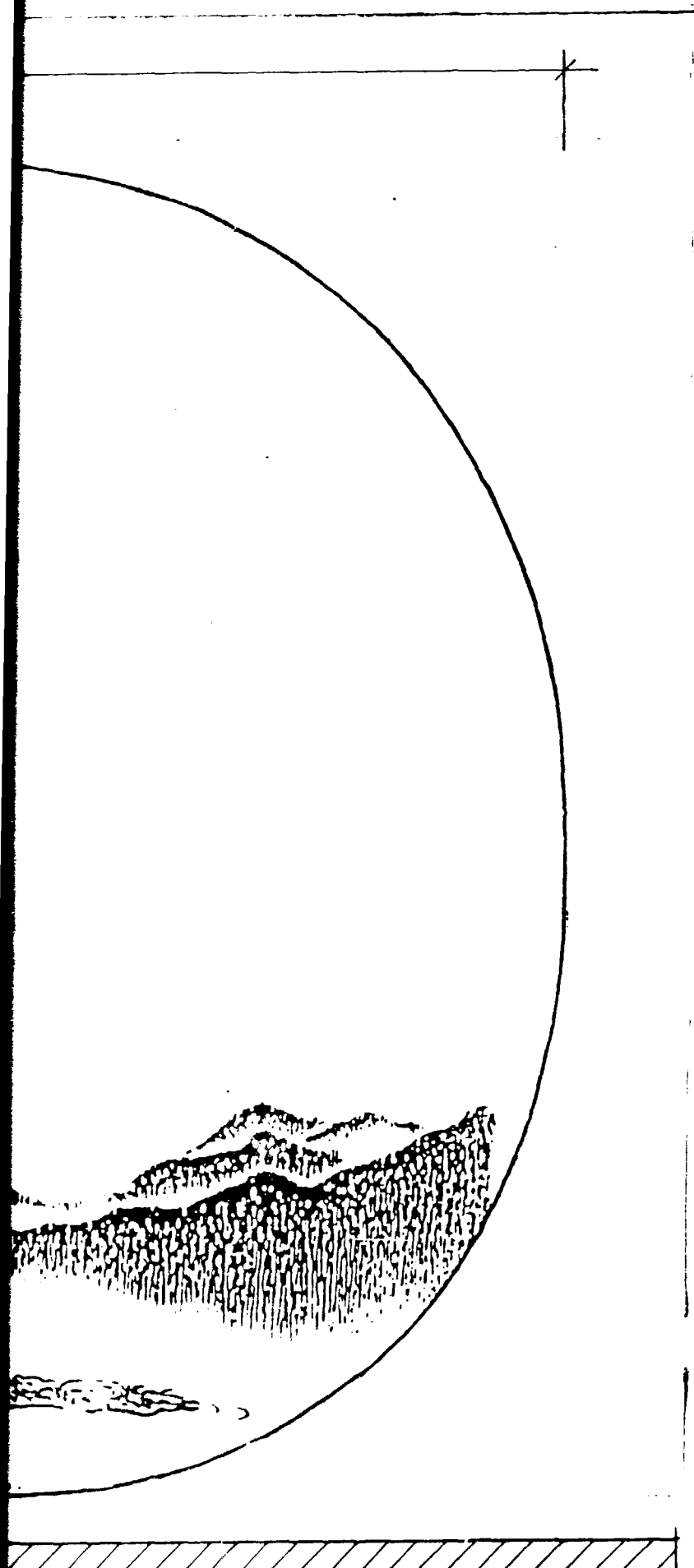


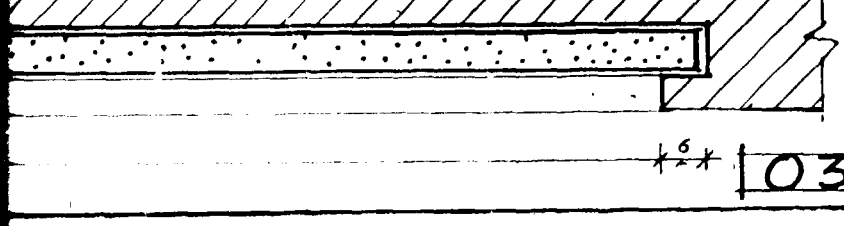
SECTION 1

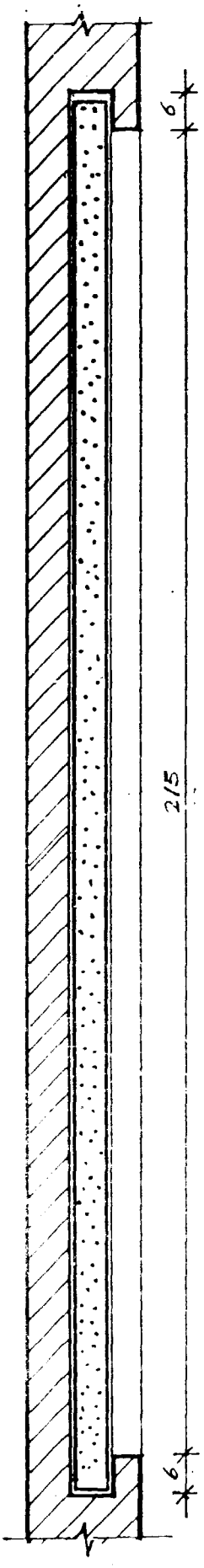


6

230



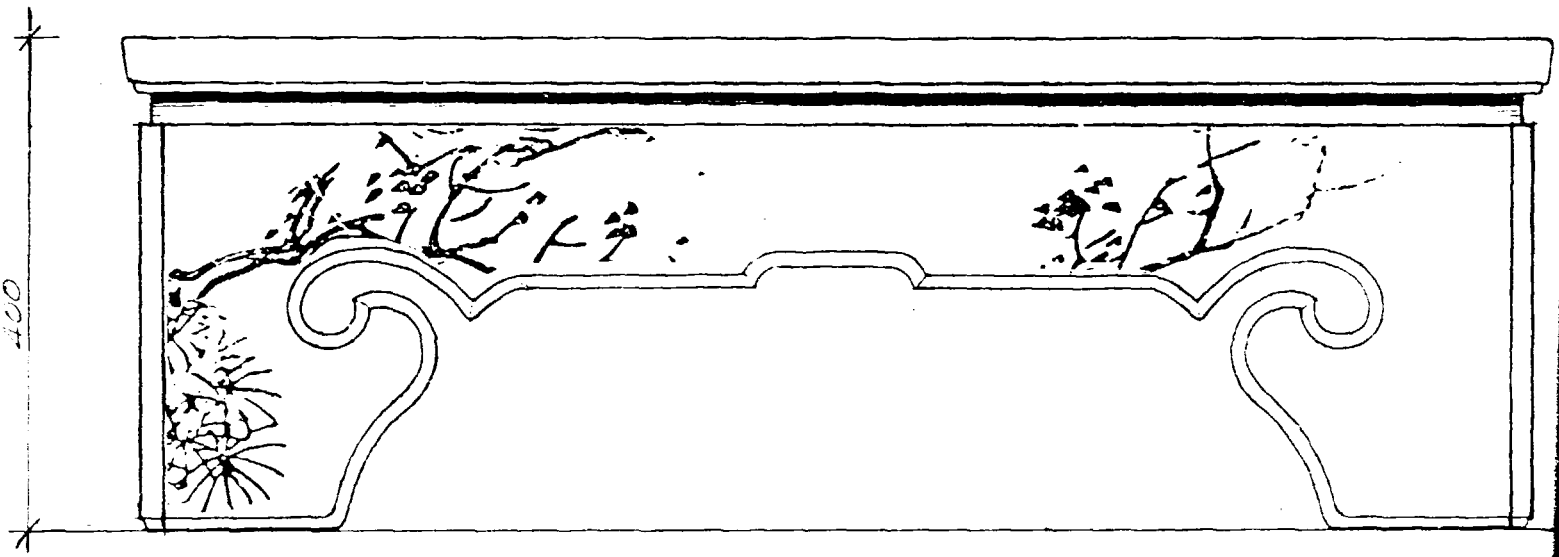


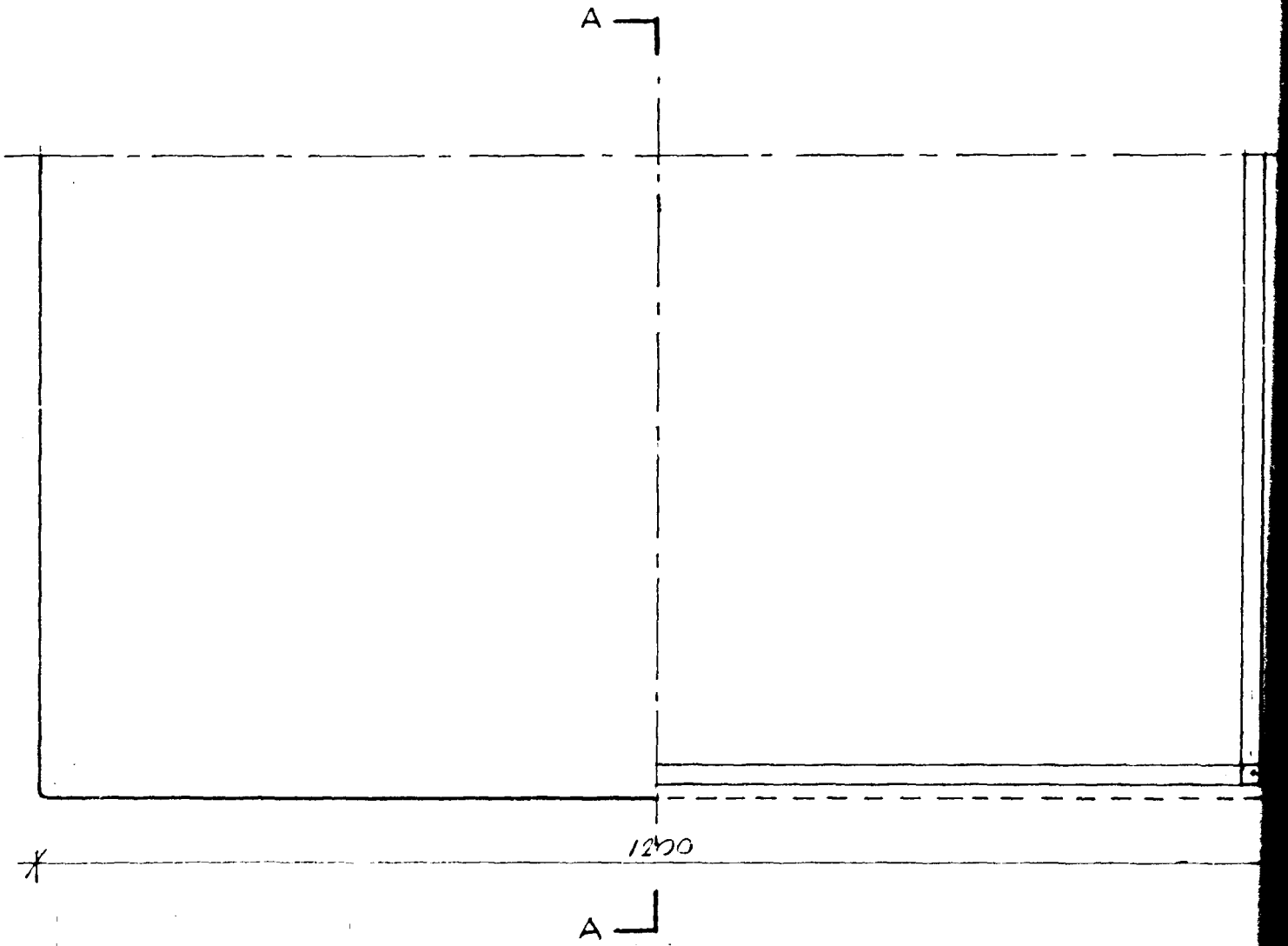


SECTION 2 电话桌

03-3 TELEPHONE TABLE

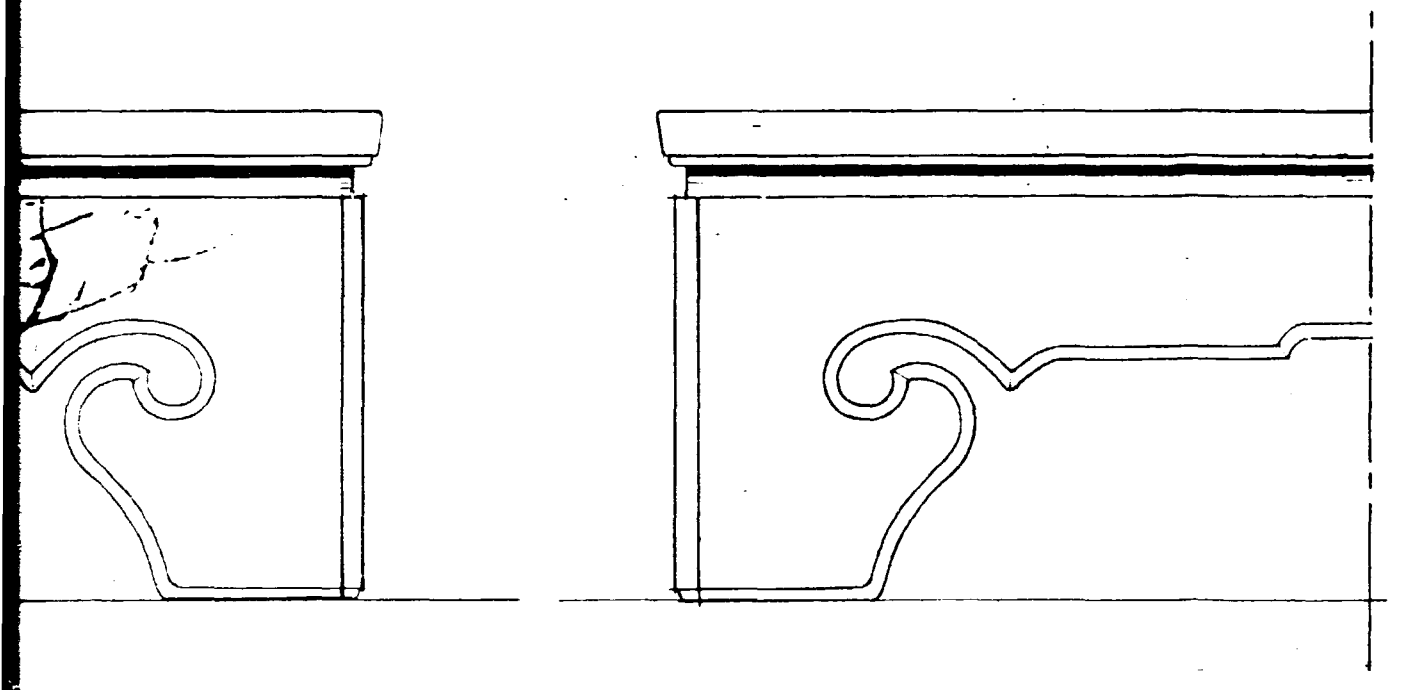
P.B
4-85

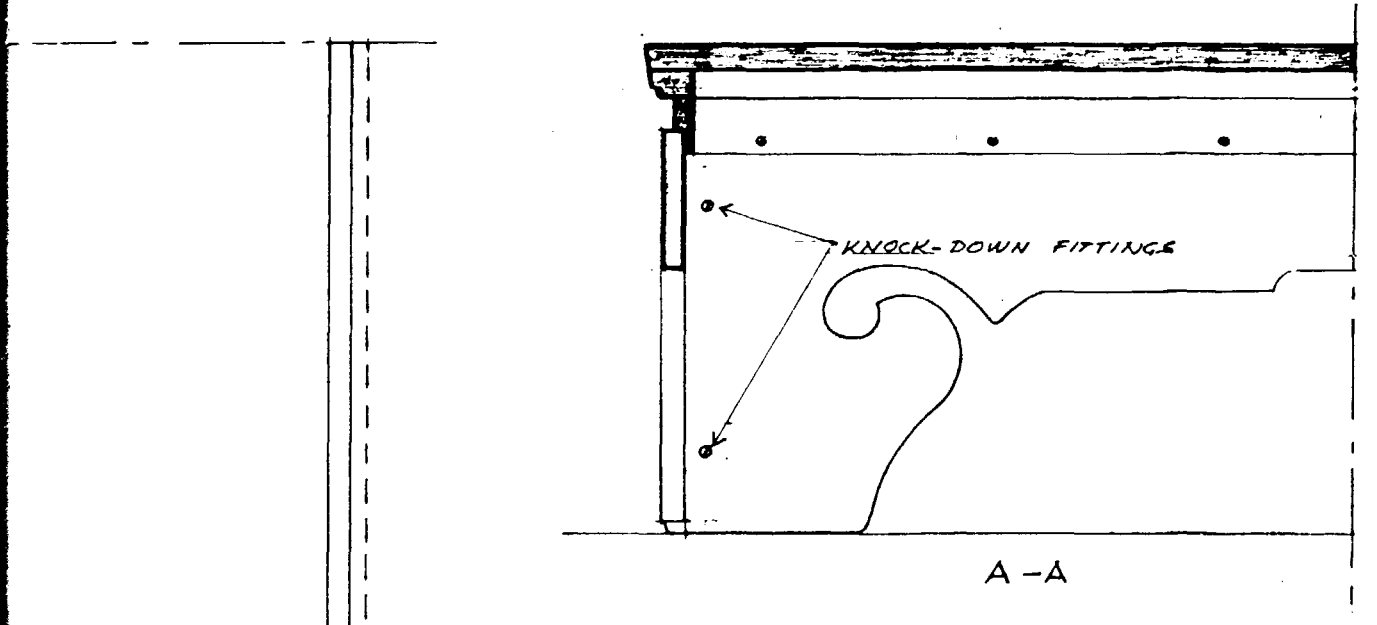




SECTION 1

SCALE 1:6





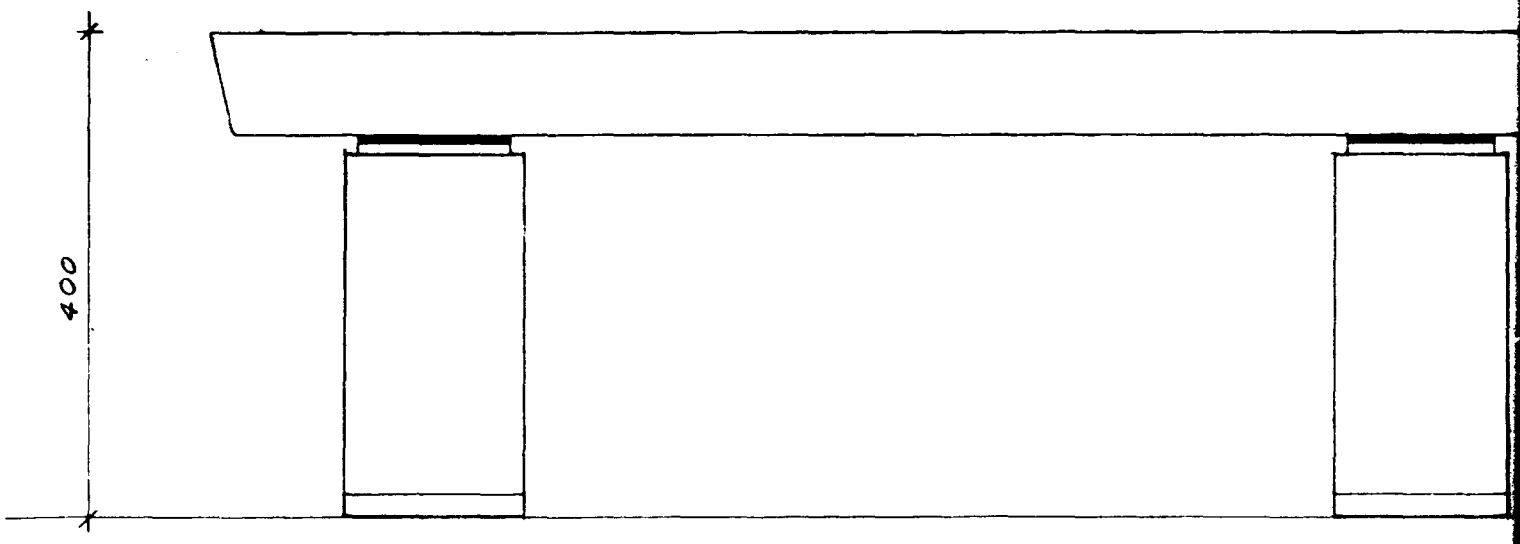
A-A

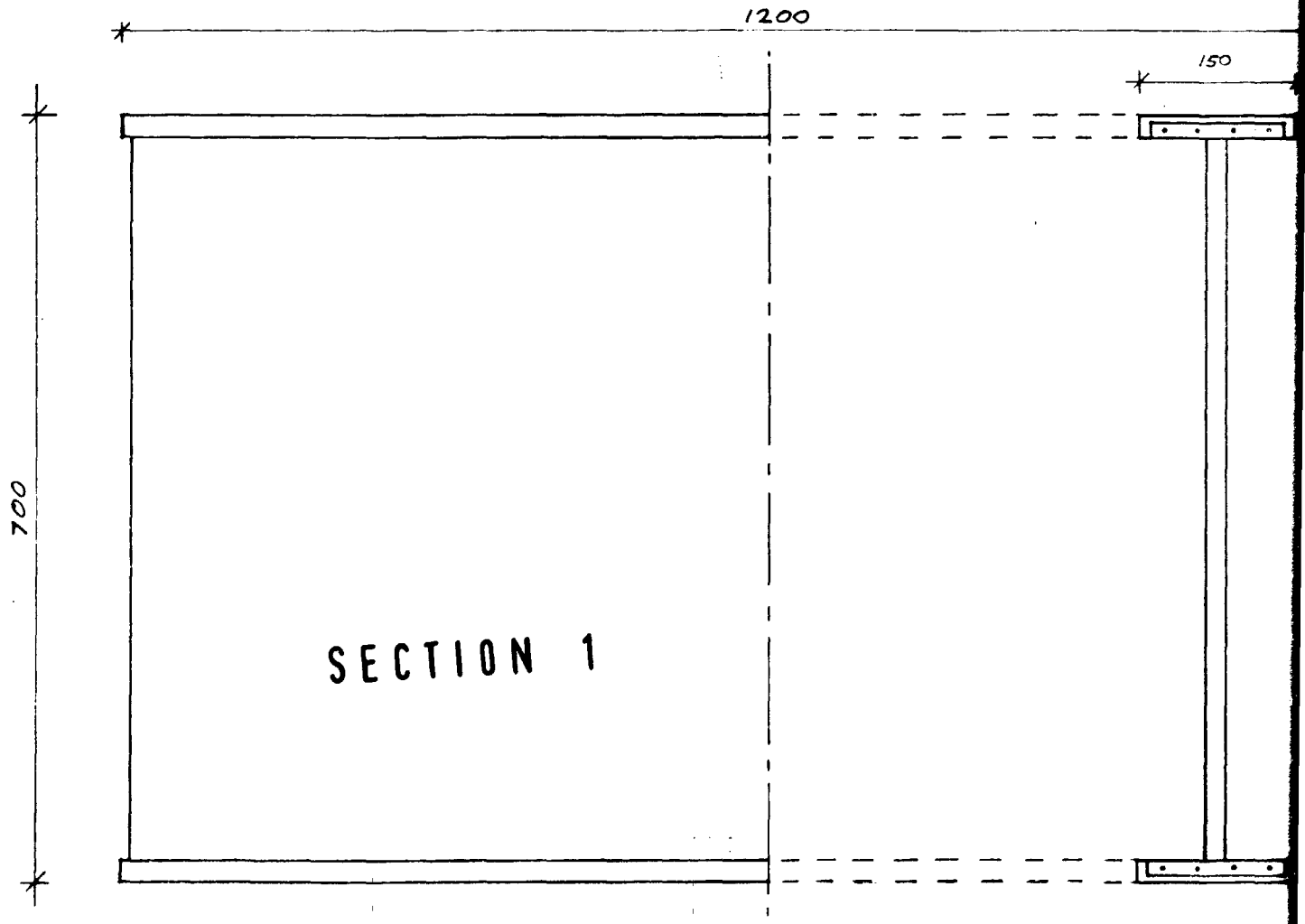
4 LEG PANELS FASTENED TO CORNER ELEMENT BY KNOCK-DOWN FITTING TYPE USI 8 (SEE PAGE 16 OF THE REPORT) OR MINIFIX 8.

SECTION 2

104 COFFEE TABLE

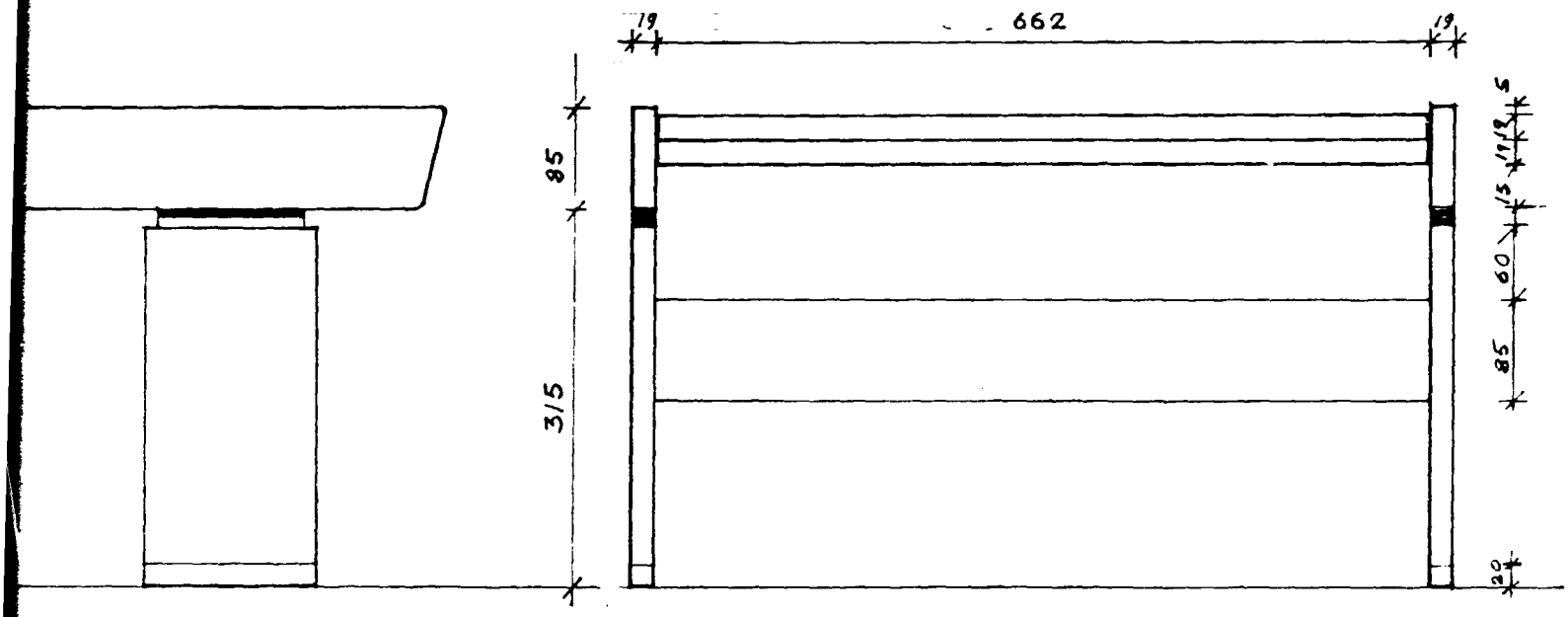
P.B.
4-86

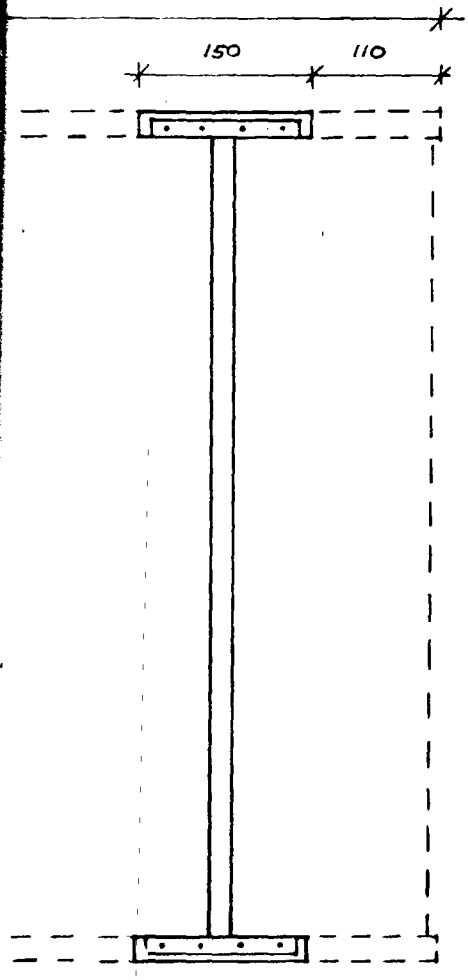




SECTION 1

SCALE 1:6





SECTION 2

05-1 COFFEE TABLE

葉 12

P.B.
4-86

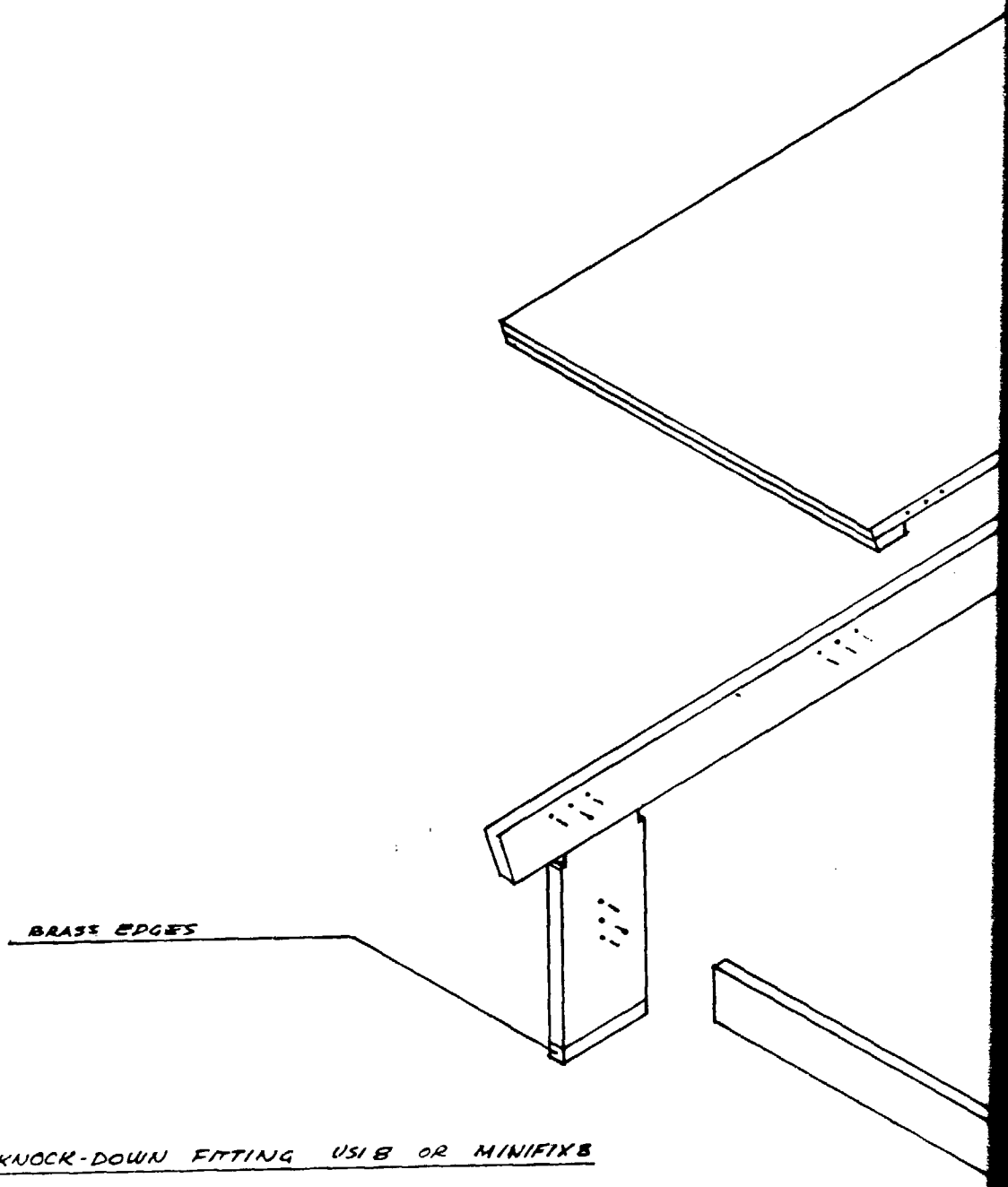
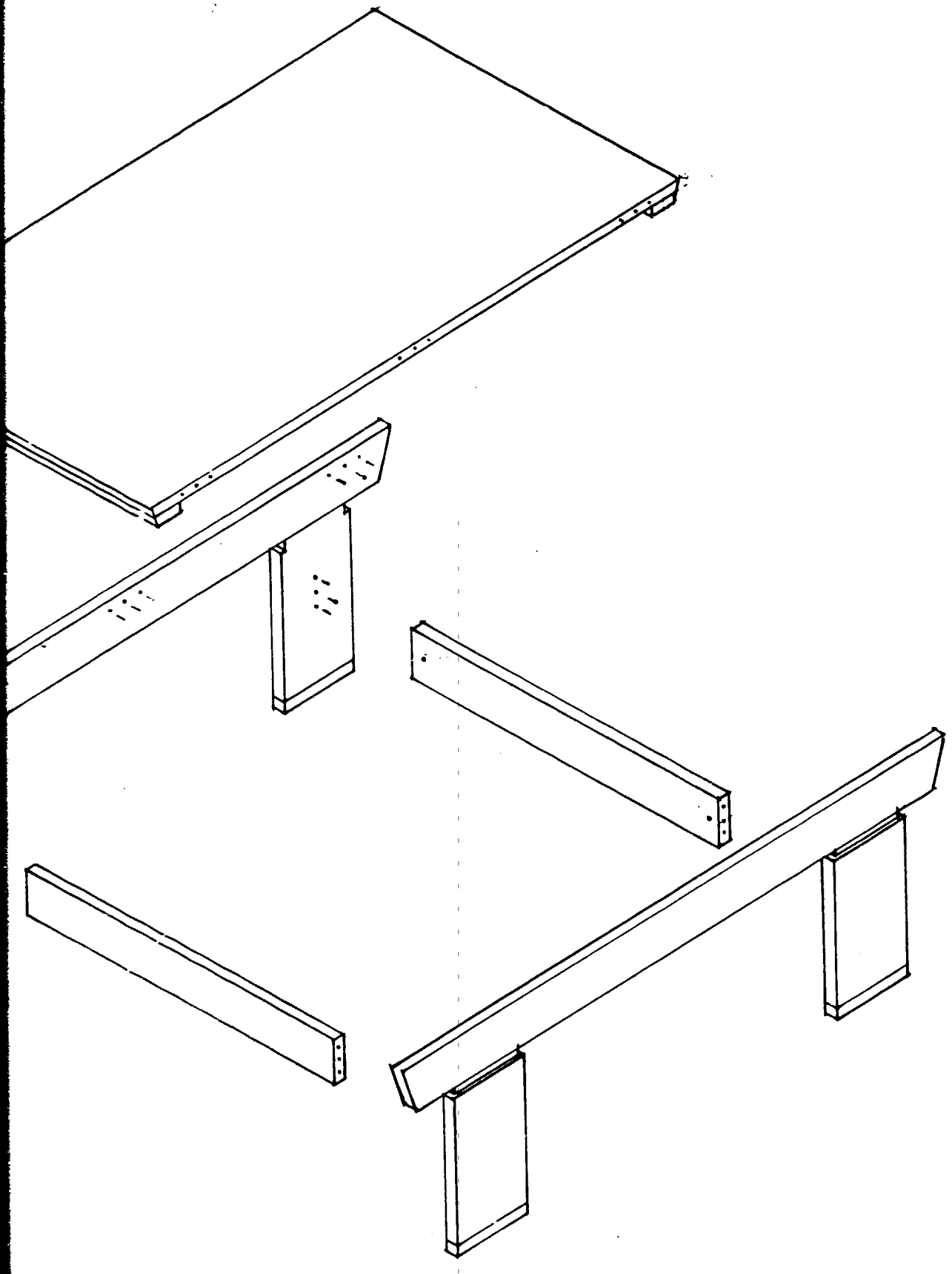
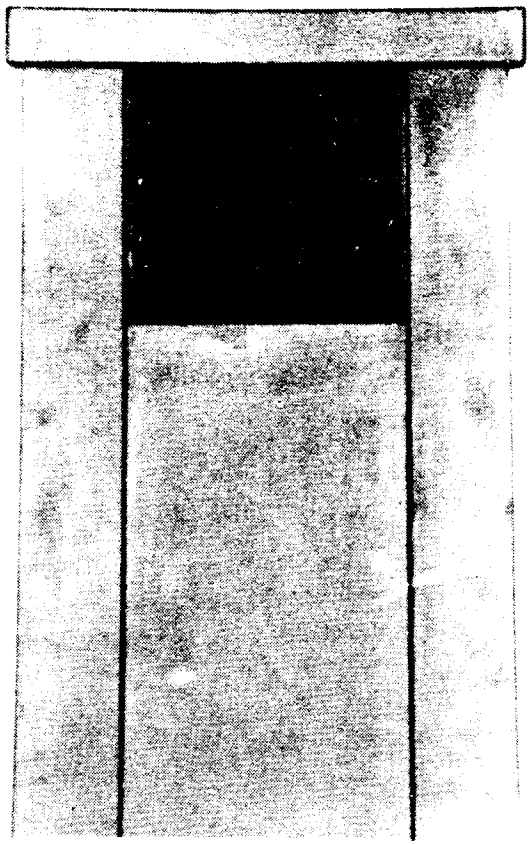


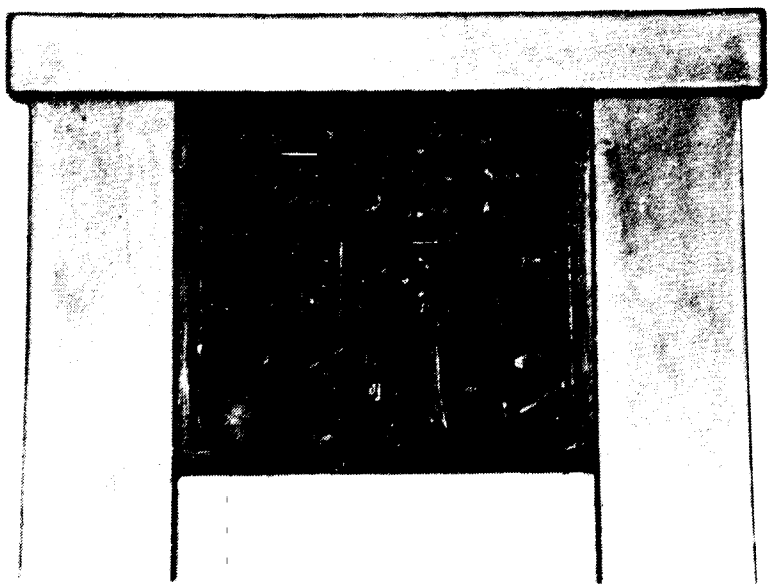
TABLE. ASSEMBLED WITH KNOCK-DOWN FITTING USI 8 OR MINIFIX 8

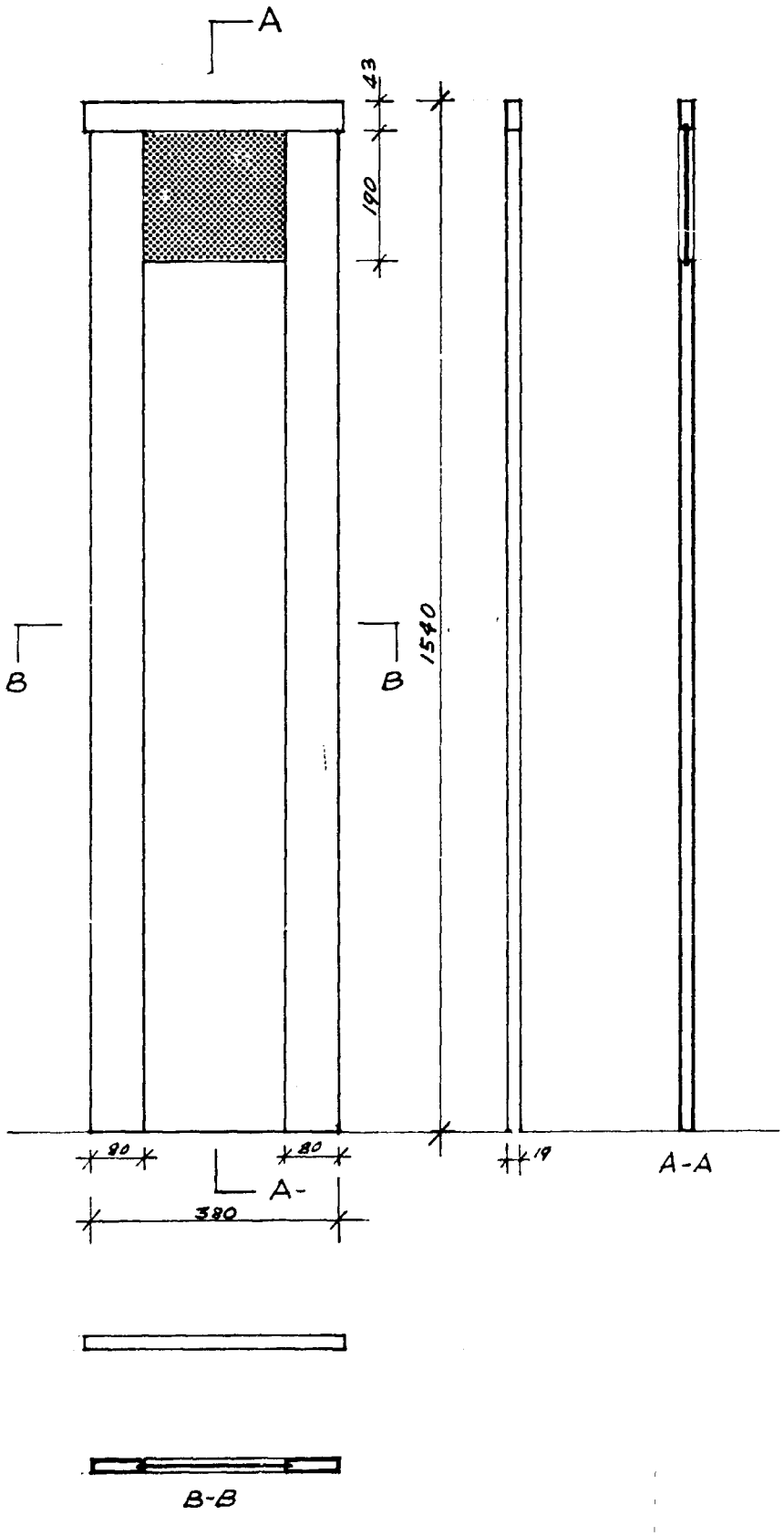


SECTION 2

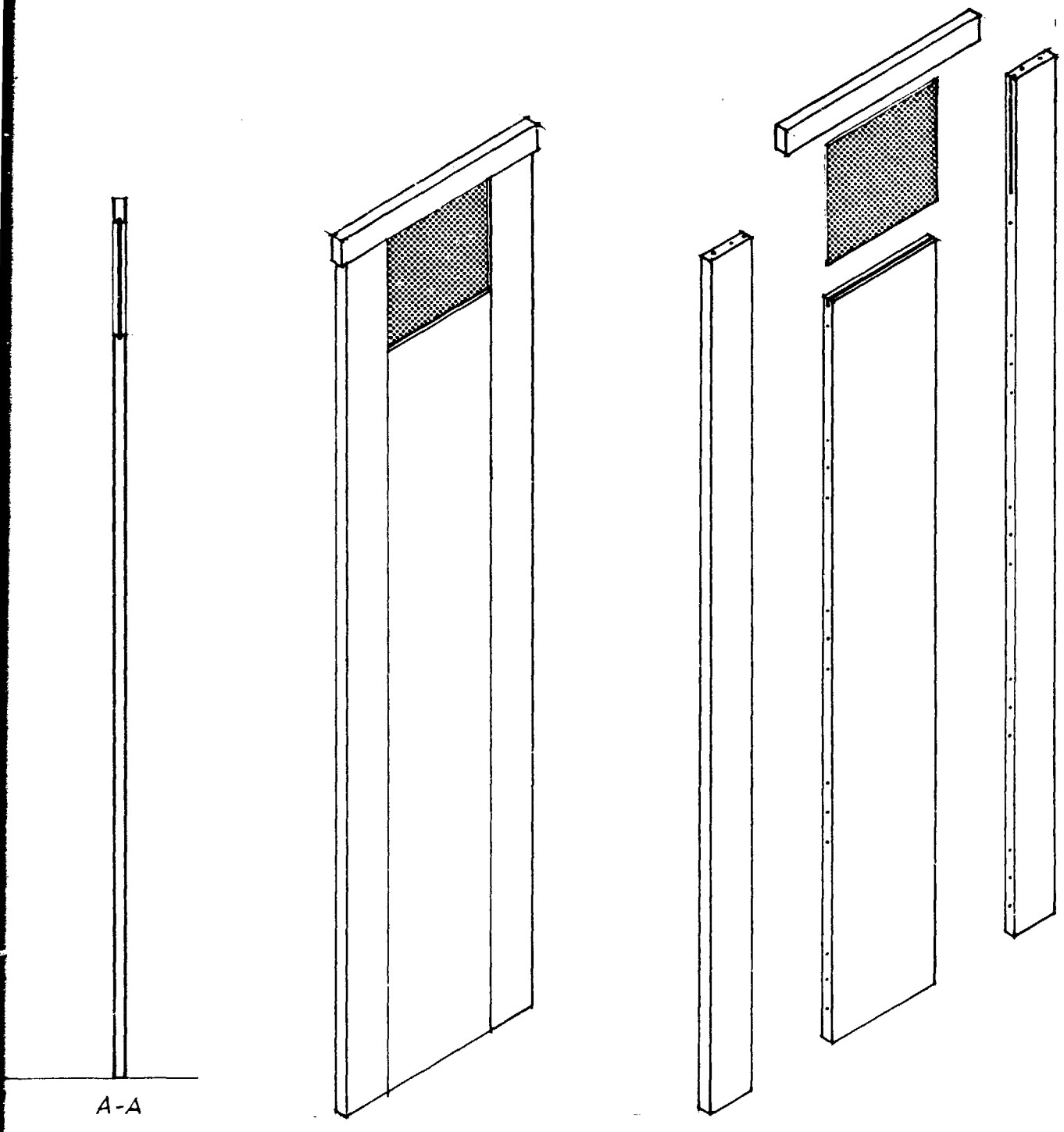
05-2 COFFEE TABLE







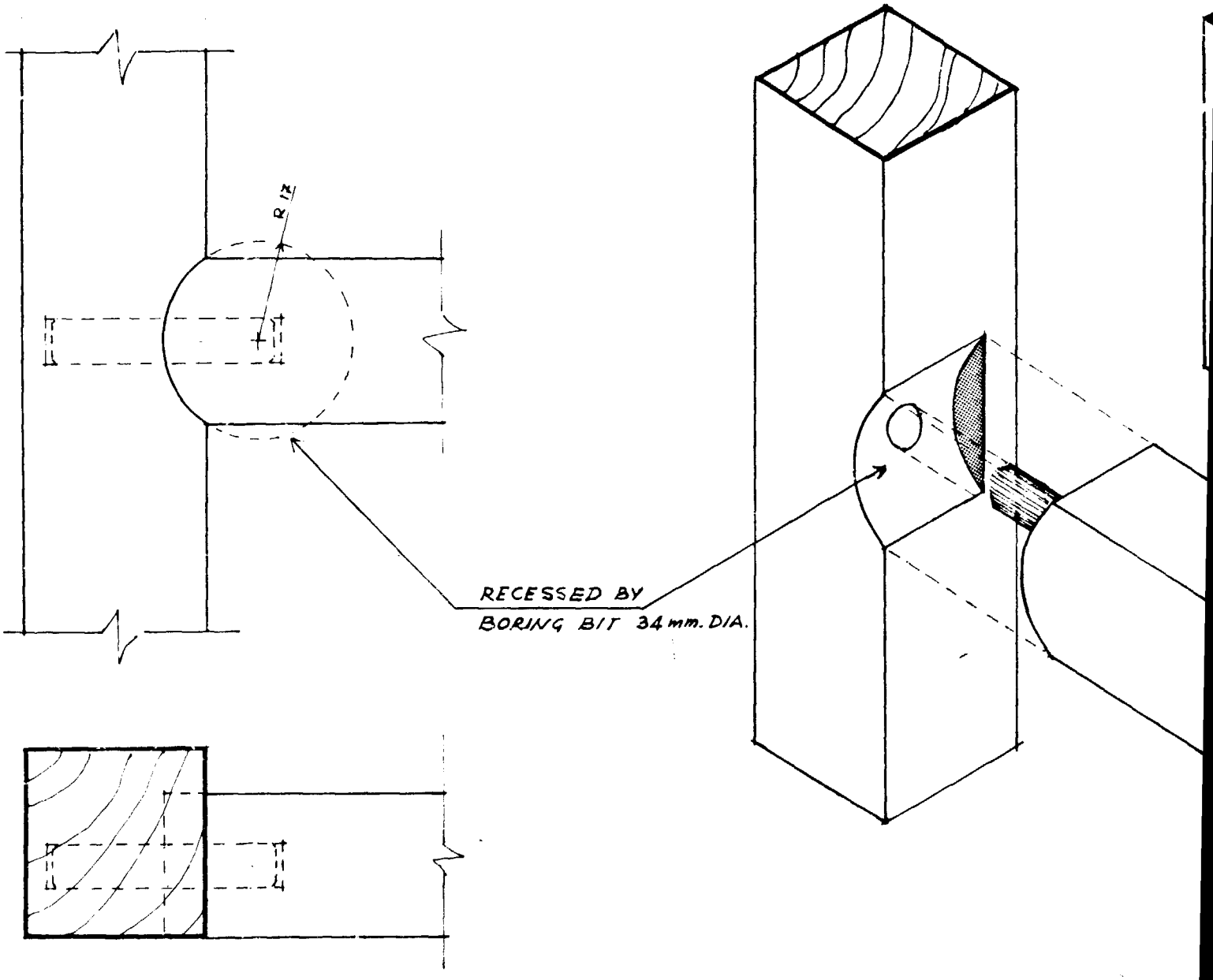
SECTION 1



SECTION 2

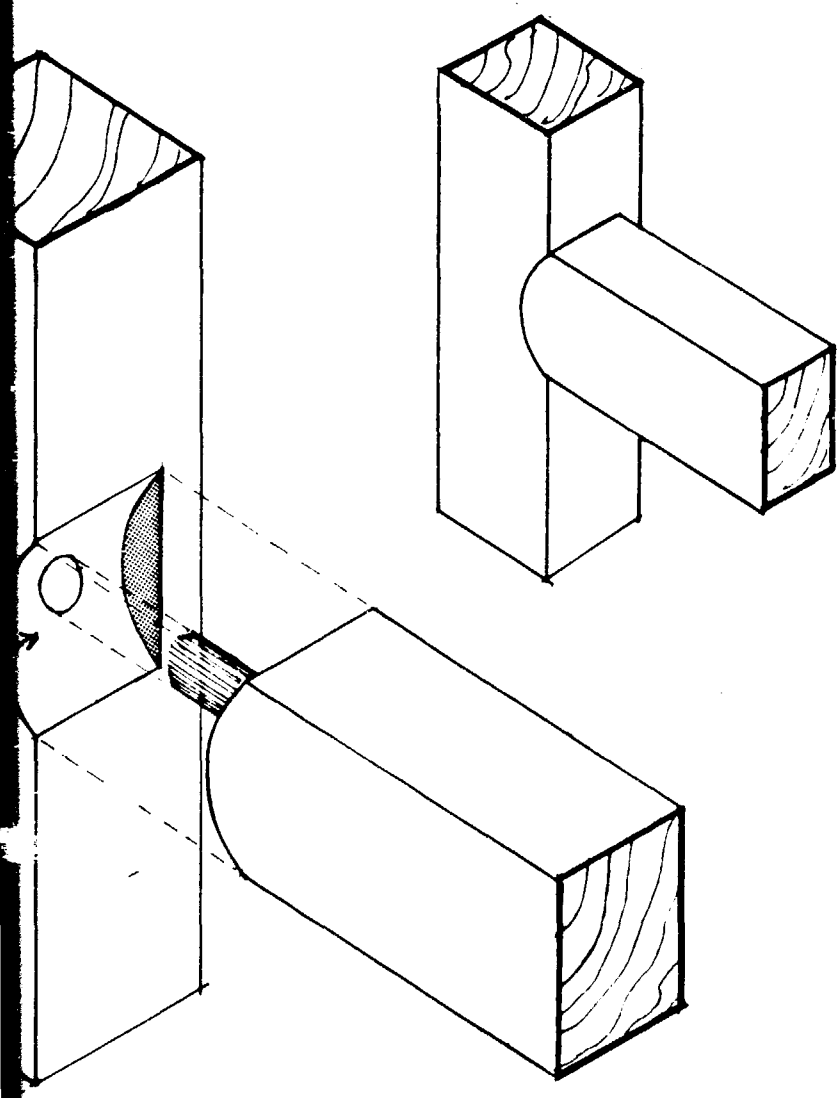
木雕刻插板的样品

SAMPLE PANEL WITH WOOD CARVING INSERT



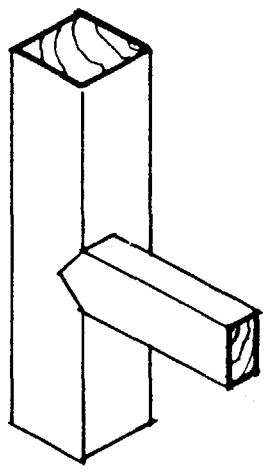
ADAPTED T JOINT WHICH IS ENTIRELY MADE B

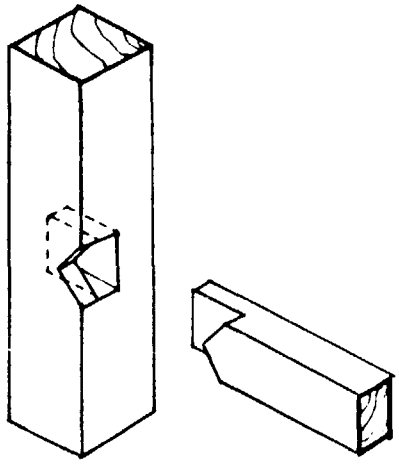
SECTION 1



IS ENTIRELY MADE BY MACHINE

SCALE 1:1





TRADITIONAL T JOINT UNSUITABLE FOR MACHINE PROCESSING

SECTION 2

07 WOOD JOINT ADAPTATION