

Making Modern Danish Furniture

ROLF SCHÜTZE

Revised Edition



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Rolf Schütze



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Foreword

Making Modern Danish Furniture is intended to be an inspiration and a guide for those who wish to make their own furniture and who have a carpenter's bench and ordinary hand-tools at their disposal. Further, the book has been laid out so that it can be used in school woodwork classes and at night schools, where it will be possible to work on rather larger projects.

The book begins by running through the materials, finishing methods and joints that are used in modern furniture. There follows a series of sections dealing with the common types of furniture, each section being introduced by practical advice on the design and function of the furniture in question. These are followed by examples, in drawings and in photographs, accompanied by detailed descriptions and instructions. The dimensions on the drawings are limited to what is necessary for the project to work satisfactorily; this means that there are a lot of measurements on some, few or none on others, where the proportions are primarily a matter of personal taste and requirements. This opens up the possibility of the book's being not simply a collection of designs, but an expression of the concept of 'modern woodwork' which specifically aims at laying equal stress on the design and the manual activity. Those who want to work directly from the designs in the book can work out any missing measurements in the drawings from the accompanying lists of materials and descriptions.

The designs in this book have taken shape through long years of working with school pupils, old and young, both in woodwork lessons and as spare-time occupations. Most of them are new, but corresponding designs from *Furniture Making* are still included in revised or entirely remodeled forms.

Making Modern Danish Furniture is concerned with traditional furniture in modern guise, constructed with natural wood as the principal material. Those who seek more unconventional paths in design and materials will find ideas in *Young Furniture*.

Rolf Schütze

IN GENERAL

For Each Design There Are:

Drawings in projections or obliques. Oblique is a technical method of drawing which gives you a spatial view. The drawings are made using two geometric axes. The measurements along one axis are shown in full scale while along the other they are shown at half scale.

The solid lines represent external outlines of the piece and also the cutting lines. The dotted lines are used to show hidden outlines, or cutting lines where necessary, and to show where a drawing has been foreshortened for lack of space.

Cross-hatching is used only to make the drawing clear and does not indicate the side or a cut end of the wood.

Measurements are given only where they are essential for the design to be carried out satisfactorily. A complicated thing like the Danish chair (p. 45), where even a small error in one dimension can ruin the whole aesthetic effect and practical usefulness of the piece, has all its measurements marked, whereas the coffee table (p. 55), which should be made in line with your personal requirements, appears without measurements.

Readers who prefer to work to exact dimensions will always be able to find the sizes on which the designs are based in the sections giving practical advice and the lists of materials. The dimensions have been retained in their original form for some of the drawings that appeared in the original edition. Dimensions on the drawings are given in inches (with millimeter equivalents in brackets).

Suggestions for the possibilities in a piece of furniture and how to build it.

List of materials which, where not otherwise noted, gives cut measurements in inches (with millimeter measurements in brackets) for each furniture project.

In buying the raw material an extra waste allowance must be added for squaring and planing the wood. (The hobbyist must also keep in mind that stock lumber sizes are those before cutting, thus dressed sizes are fractions of an inch smaller. Order large enough stock to obtain the "dressed" or finished size called for in the directions. Wood may also be obtained at the lumberyard cut to a specified "dressed" size.)

Procedure will give the order of steps to follow in making the piece. On the basis of experience gained from working with older students who made these models, a number of remarks have been included which may be helpful to the less experienced woodworker.

Materials and Tools

Wood Most of the designs can be carried out in good-quality pine, but harder woods such as ash, oak and teak can of course also be used. It is most important that the wood should be dry – and that can be quite a problem these days – so a little store kept in a dry room will always be a good investment.

Wood can be bought in various forms:

1. Rough planks which you can dry yourself and then dress by hand or by machine, at home or in a workshop.
2. Planks planed to a thickness which you can cut up yourself to the required length and breadth.
3. Ready-cut pieces in long lengths, cut and planed to standard thicknesses and widths. You have to shorten these yourself and dress the end surfaces if necessary. You can do this by putting several pieces of the same length together so that you have a longer length to plane.

Wood that is to be dressed by machine must be absolutely dry, otherwise it will shrink later and so get out of true and become so warped that it is useless.

Tools In addition to a carpenter's bench and the usual hand tools found in a woodworking shop or hobby shop include a grooving plane and a rabbet plane for making desk drawers, and a lot of long and short screw clamps will be useful on the many occasions when many different parts of a piece of furniture are being glued together or when you want to assemble larger pieces. At a pinch you can borrow these.

An electric drill on a stand, used with the drill guide described later in the book, can be of great help in boring holes for screws and dowels. You may also be very glad of an electric saw. Stick saws are light, easy to handle and not so dangerous.

Glue For assembling furniture a polyvinyl acetate glue – also called PVA – or synthetic resin glue is used.

For veneering use contact cement. There is a further discussion of this in the section on veneering.

Stain is not used as much today since the natural color of the wood is much preferred. The warm golden color of pine can be stained to a grayish-brown tone using chemical stain, discussed in a later section.

In color staining the pigment is applied directly to the wood but may result in an undesirable distribution of color depending on the degree of absorbency of the wood and may turn the natural, positive grain of the wood to negative. Chemical stain, however, has an advantage over ordinary color stain as its coloring qualities result from a reaction of the chemical compound of the stain with the acid in wood.

Oil and Lacquer are preferred for surface treatment if the wood is to withstand wear and cleaning. The type of finish used will depend on how great the wear will be on a particular piece.

Oiling is the most handsome and easiest method of finishing. Using the popular "teak oils", a surface that is both hard-wearing, and water and alcohol resistant can be obtained. An oiled surface is also simplest to care for. Oiling is particularly suited to dark woods, as it brings out their grain and glow.

Lacquering is a more demanding job, but by using a self-hardening plastic lacquer you will achieve a mirror-like and durable surface resistant to most spilled liquids (except its own solvent). A matt "natural wood lacquer" will retain the cool tones of light-colored woods.

Directions for oiling and lacquering finishes are given on the following pages.

FINISHING

Chemical Staining of Pine

Materials I – Potassium dichromate ($K_2Cr_2O_7$). The true color will appear gradually upon exposure to light.
II – Pyrogalllic acid.

Description I – Potassium dichromate alone – on poor wood will give a cool, grayish-green to grayish-brown color; on hardwood, a warmer, golden-brown to brown color.
II – Used in combination with Pyrogalllic acid it will create a dark, nutbrown color.

- Directions* Light – One coat of 2% to 3% Potassium dichromate.
 Medium – One to two coats of 5% Potassium dichromate. After staining, expose surface to full sunlight which aids in obtaining the desired effect. Do not allow any shadow to fall on the surface or it will not stain evenly, but streak.
 Dark – One application with 5% Potassium dichromate; and when dry, one application with 5% Pyrogalllic acid.
- Finishing* *Of large areas* – Light and dry rubbing with sandpaper No. 00 and/or rubbing with steel wool No. 0 until excess stain is removed.
 Of small areas – Dry rubbing with steel wool No. 0.
- Result* A beautiful and natural surface which is, however, susceptible to grease stains and is best used for articles not requiring much handling.
- Further Treatment* If the surface is going to get hard wear and require frequent cleaning, it must be oiled or lacquered. This in time will cause a color alteration in a warmer and darker direction and may make the positive grain of the wood turn to negative.

Smoking Oak Wood

The expression "smoked" or "pickled" oak is often used in describing furniture. The process is similar to the chemical staining of pine as a chemical is applied to the oak wood (here in the form of a vapor) which in combination with the strong acid content of the wood forms a dye.

Materials Ammonium hydroxide (spirits of hartshorn).

Description The wood will attain an "antique" gray color. The strength of the color depends on the acid content of the wood, the strength of the stain, and the duration of the process.

Directions Suspend the piece of oak in a tightly closed smoke chamber. This can be made of corrugated cardboard or heavy wrapping paper. Arrange one or more bowls of Ammonium hydroxide on the bottom of the box. The volatile fumes will react on the wood.

After about 24 hours the process should be finished, but it can be stopped sooner should a lighter color be desired.

- Note:*
- Instead of using a smoke chamber the wood can be simply brushed with Ammonium hydroxide but the result will not be as attractive.
 - Ammonium hydroxide vapor has a very pungent odor and may irritate the eyes and lungs. It is therefore to be used with extreme caution and a window should always be kept open for ventilation.
 - Ammonium hydroxide will also quickly lose its effectiveness if the container is not kept tightly closed.

Laboratory Pine Stain

When a very dark and extremely hard-wearing and resistant surface on pine is desired, stain it with Laboratory Stain A and B. This is a commercial product in the form of two separate formulas applied alternately to the wood giving it a deep, dark finish.

Material Laboratory Stain A and B.

Description The wood attains a deep black color which penetrates far below the surface and is not readily affected by most spilled chemical liquids.

Directions Brush wood alternately with the two stains until the black color is obtained. Each stain must be brushed on at least three times. The wood must be allowed to dry completely between each application.

After the last application, remove any excess stain by brushing the surface and polishing with steel wool.

Finishing Surfaces stained this way may be oiled, varnished, or lacquered.

- Note:*
- The two stains must not be mixed.
 - Keep the open stain dish away from material that is not to be treated, as the vapor can also produce some color.

Oiling

Material Teakwood Oil, An-Teak oil or similar, also linseed oil varnish.

Description Vegetable oil lacquer dries in 24 hours and hardens in a matter of weeks. It provides very good protection against scratches and is little affected by water spots or alcoholic liquids.

Oil finishing is easy to do. It is best suited to natural woods; light woods become a yellowish-brown color.

- Directions*
- I – Saturate wood with oil. (Oil that is not absorbed must be wiped off.)
 - II – After 24 hours, repeat the oiling. Then using garnet paper No. 180–220 polish wood while oil is wet. Wipe off the sludge.
 - III – 48 hours later, at the earliest, repeat step II.
 - IV – As a final treatment, gently polish the dry surface with steel wool No. 0.

- Note:*
- Small surfaces can be polished with plain steel wool.
 - Polishing of light colored wood must always be done with clean sandpaper No. 0 or 00, in order not to force soil into the wood grain.
 - Polishing dark stained wood must be gently done with fine steel wool to avoid rubbing through the stain.
 - Pine, stained dark, is not suited to oil finishing.

Lacquering

It is very difficult to give general instructions on lacquering because there are so many different ones and new ones are always coming on to the market, with varying characteristics and uses. It is therefore important to read the instructions on the label carefully. Two types of lacquer

are used for the designs given in this book. One is glossy or semi-glossy (A) and one matt and almost invisible (B). Both can be bought in various makes from all oil and colormen.

Lacquer A

Material Self-hardening plastic lacquer, glossy (Arborit, Dyrup).

Description This is a quick drying lacquer which attains great resistance to wear and is not affected by moisture. It is best suited to darker woods, as it tends to give light woods a warm golden-brown tint.

Directions

- I – One application of thick lacquer. Rub until lacquer begins to dry.
- II – After 24 hours, smooth surface using a joiner's scraper and dry polish with sandpaper No. 00 (garnet paper 180). Wipe away dust. Repeat Step I.
- III – Steps I and II may be repeated if necessary.
- IV – After 24 hours, polish in grinding oil with garnet paper 240–280. (Teakwood oil or diluted linseed oil varnish can be used as a substitute.) If garnet paper does not polish lacquer satisfactorily, go over it with steel wool No. 0 in oil. Wipe off.

Note: – Small or narrow surfaces can be polished with steel wool alone. On light colored wood the polishing can be done dry. On dark wood, where polishing sediment particles can be seen, polishing must be done in oil or wiped off afterwards with oil.

Lacquer B

Material Self-hardening plastic lacquer, matt (Traelak naturel, Dyrup).

Description Quick-drying lacquer containing a substance which reflects the light rays and thus gives the wood a lighter color and also delays the yellowing of the wood.

Directions

- I – One application of thick lacquer.
- II – After drying off (one hour) polish lightly with sandpaper No. 00 or garnet paper.
- III – On outer surfaces (table tops or armrests) I and II can be repeated, or one coat of lacquer A can be applied. (The color is not changed on top of matt lacquer.)

- Note:*
- The lacquer can be used only on light woods (pine, oak, ash or elm) since dark woods will be colored gray.
 - Durability and resistance to water and grease are not quite so great as with lacquer A.
 - It is very easy to use, and the rapid drying means that lacquering is finished in a very short time.
 - The finished product does not have a "lacquered" look.

VENEERING

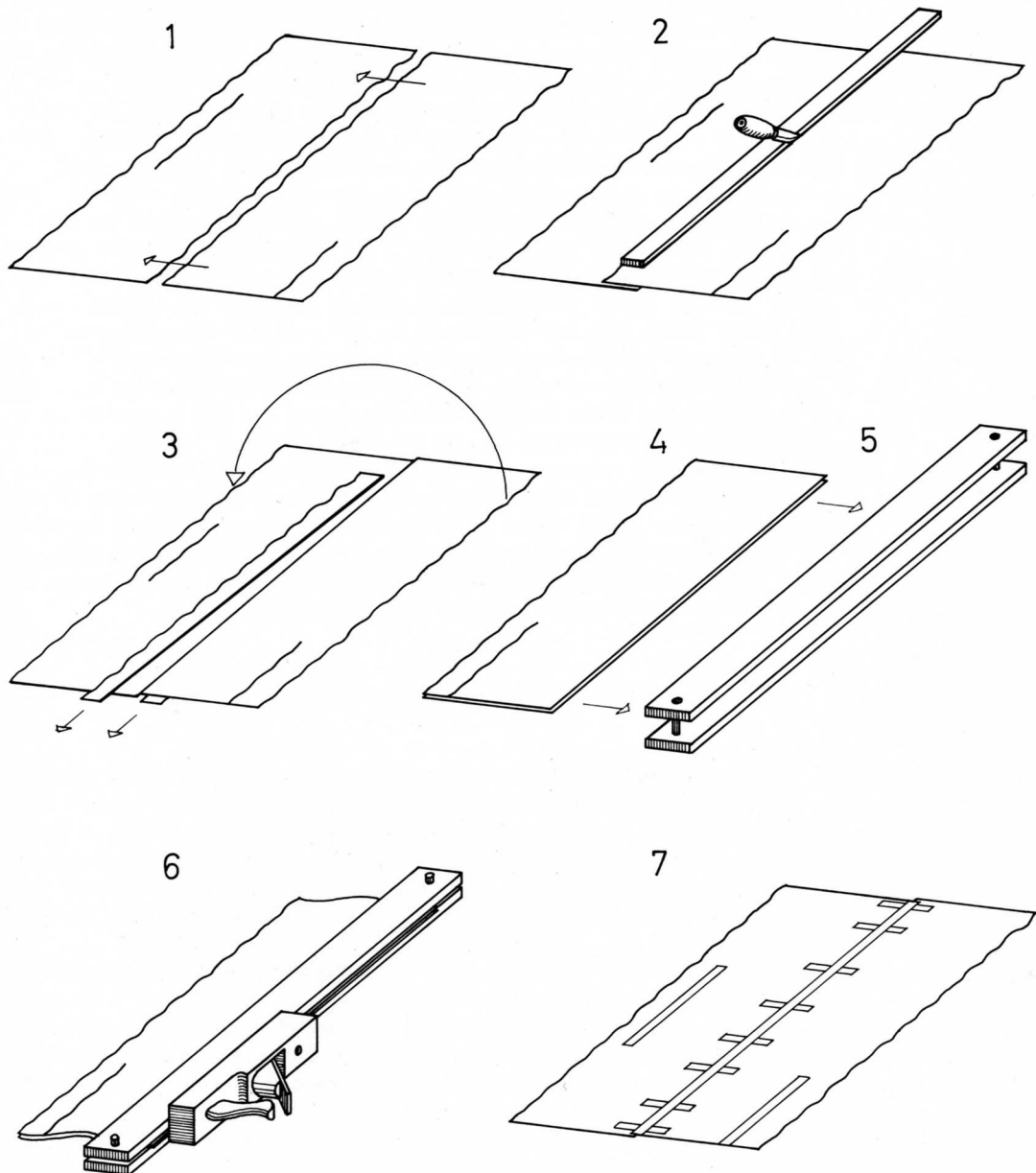
Table surfaces in the past were made of solid pieces of the desired wood which were joined together. Today a laminated plywood or chipboard covered with veneer of the desired wood is nearly always used. This is now inexpensively bought but not difficult for the hobbyist to make and provides a better surface because it will not expand, contract, or warp as do solid planks, with the changing moisture content of the air. Laminated plywood consists of a number of glued strips of wood arranged between two layers of veneer, glued with the grain perpendicular to the center wood pieces. The piece is cut in such a way that the strips lie lengthwise and the veneer therefore lies across. Chipboard is of poorer quality and is made of compressed and glued wood chips.

Until recently it was only possible to veneer large surfaces with special equipment. Today, with contact cement, the hobbyist can veneer large sheets of wood in his own workshop, though he may prefer to buy a board ready veneered, which can be supplied to whatever measurements he wants.

The veneer must be thin, smooth, and supple. If thin, watery glue is used, both sides of the plywood sheet must be veneered so that the pull of the veneer, when dry, will be counteracted. By using contact cement, which does not contain water, veneering can be done on one side only.

Joining If the plywood sheet to be veneered is too broad to be covered by a single width of veneer, two or more lengths of veneer can be joined together. This is done as follows:

JOINING OF VENEER



1. Select two pieces of veneer which when joined give a natural, continuous grain appearance. (Joint must not be visible.)
2. Lay the two lengths side by side with one overlapping the other far enough so that a lengthwise cut with a knife or veneer saw along a straight line will cut through the double layer. This will make two straight, even edges which match each other when placed together.
- 3 and 4. Remove the scrap pieces and lay the two pieces of veneer one on top of the other with the straight-cut edges at the same side,
- 5 and 6. and lay them in a pair of joining boards with the clean-cut edges projecting $\frac{1}{25}$ " (1 mm) or so beyond the edges of the boards. These should be two precisely similar boards planed to $\frac{7}{8}$ " $\times$ $4\frac{3}{4}$ " (22 $\times$ 120 mm) and about $11\frac{3}{4}$ " (300 mm) longer than the longest piece of veneer to be joined. The boards are held together at both ends by a pair of $\frac{3}{8}$ " (10 mm) dowels glued to the bottom board and fitting into matching holes in the top. The sides are precisely adjusted and the boards pressed together. Now plane the edges of the veneer down to the edges of the boards. This can be done by turning the plane on to its side and sliding it along a support while the veneer and the boards are pressed or clamped together.
7. Remove the joining boards and lay the veneer out on a flat surface with the planed edges toward each other and the right sides of the wood up. If the edges close up tightly, they can be held together by veneering tape or ordinary adhesive tape across or along the join. If there are tears or scratches in the veneer, these can be dealt with in the same way.

Veneering Read and follow the directions for using contact cement carefully. Usually the following method can be used:

Spread glue on the veneer and wood sheets with a brush, a putty knife, or an applicator which can be made from a piece of Masonite with the edges beveled off at an angle to make it sharp. (The glue will be easier to spread if it is thinned. In most cases a cellulose thinner can be used.)

The surfaces must remain dust-free until the glue is dry enough so that it is not sticky to the touch.

As the two wood surfaces will stick together if they touch, place an isolating layer over the wood surface while the veneer is put into place. A clean piece of cardboard or strong brown paper will serve the purpose.

When the veneer is in place, slowly pull down the isolating middle layer, at the same time press down on the veneer with the palms of the hands.

After the veneer is pressed into place, turn the piece over, veneer side down, and lay it on a flat surface. The overlapping veneer is trimmed around the edges with a veneer saw or knife.

Turn the piece over again. Now the veneer must be carefully but firmly pressed or pounded all over until it adheres over the whole piece. A hammer can be used for this, preferably a veneer hammer with a broad head which should be pressed hard down and drawn backwards and forward over the veneer.

Check the result by tapping your hand over the veneer. You will clearly hear the resonance of any air space between the veneer and the sheet of plywood and a light blow with the hammer will make the necessary contact.

When the veneer is entirely adhered, remove the tape strips and the piece is ready to polish.

THE JOININGS USED IN FURNITURE MAKING

Dowels and Mortise and Tenon

Assembly with dowels or mortise and tenon can generally be used interchangeably as desired. The joining method one selects will depend on the degree of facility attained in working with wood. The fastest and easiest assembly is with dowels which can be purchased pre-cut to any length or in long rods to be divided later as needed. A drill which corresponds in size to the dowel must be used; in dry conditions you should be able to press the dowels into the holes by hand. Should the holes be cut too large treatment with glue will make the holes smaller and the dowels thicker.

In order to achieve good results the wood must be carefully measured and the markings for the dowels and holes must match exactly on both pieces and the drilling must be done exactly at right angles.

Mortise and tenon joints are more complicated and demand more skillful use of the saw and chisel. During the work, however, there is an opportunity to correct any incipient lopsidedness.

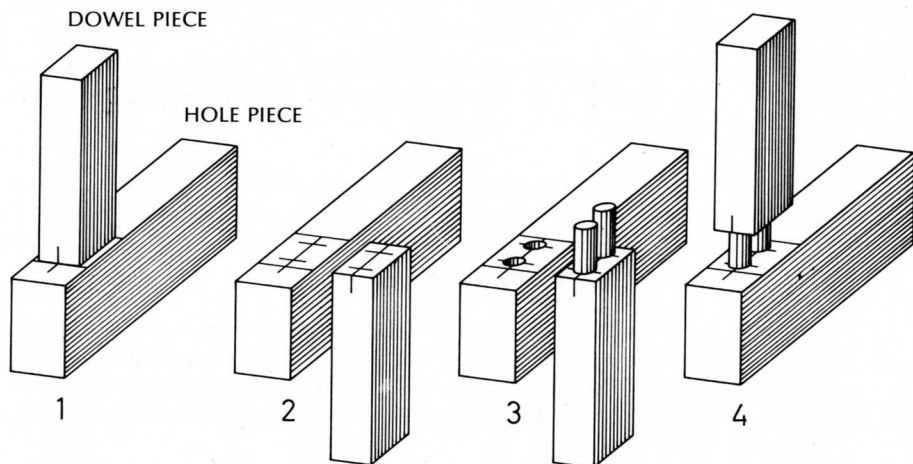
Joining with Dowels

1. On the piece of wood where the holes are to be made (hole piece) copy the outline of the piece containing the dowels (dowel piece). Make sure you have them in proper relation to each other to avoid a bad fit. (See drawings on following page).
2. Draw a center line to locate the position of the holes on each piece. Draw a cross line to center each hole, using the same measurements and direction on each piece.
3. Bore holes. To start them more easily, use an awl. The holes must be at right angles to the surface of the wood and it is helpful to have an assistant make sure the drill is kept to the perpendicular. It is even better to use the mechanical "drill-guide" described later in this book. Bore holes and glue dowels into dowel piece. To prevent splitting, fasten piece to the back vise of the workbench.
4. Try the dowel piece to see if it will fit into the hole piece. If the dowels do not fit they can be sawn off, a new hole bored (in the same place) and new dowels set in.

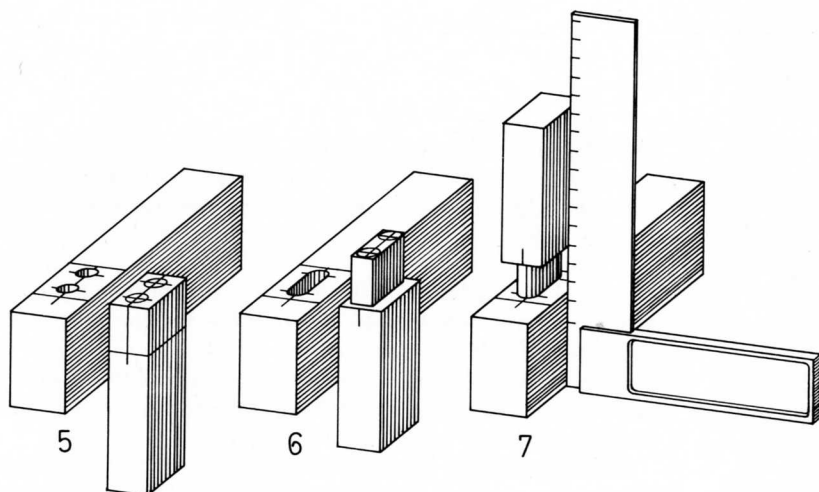
Joining with Mortise and Tenon

- 1 and 2. (Opposite page) Begin by drawing lines on the pieces of wood just as was done for the dowels. But here you must plan to have an extra allowance of wood for the forming of the tenon which protrudes.
5. (Opposite page) Mark holes on mortise piece as in dowel step 3, but instead of drilling holes, use drill blade only to lightly trace position of mortise holes to establish the equivalent size of tenon.
6. Saw tenon in a roughly rectangular shape. Keep saw blade at a tangent to the outline of the arc. You may want to define the rectangular shape of the tenon with pencil lines but it should not be necessary. Remove sharp corners of the tenon with a chisel. Remove the space between the two holes drilled in the mortise piece only, to receive the complete tenon.
7. While cutting out mortise, check the size, fit, and perpendicular by inserting tenon a few times and placing an L-square against the two pieces. The tenon should fit the width of the hole and be tight lengthwise. If the hole has been made too big a bit of veneer can be glued on to the tenon.

ASSEMBLY WITH DOWELS



MORTISE AND TENON JOINT



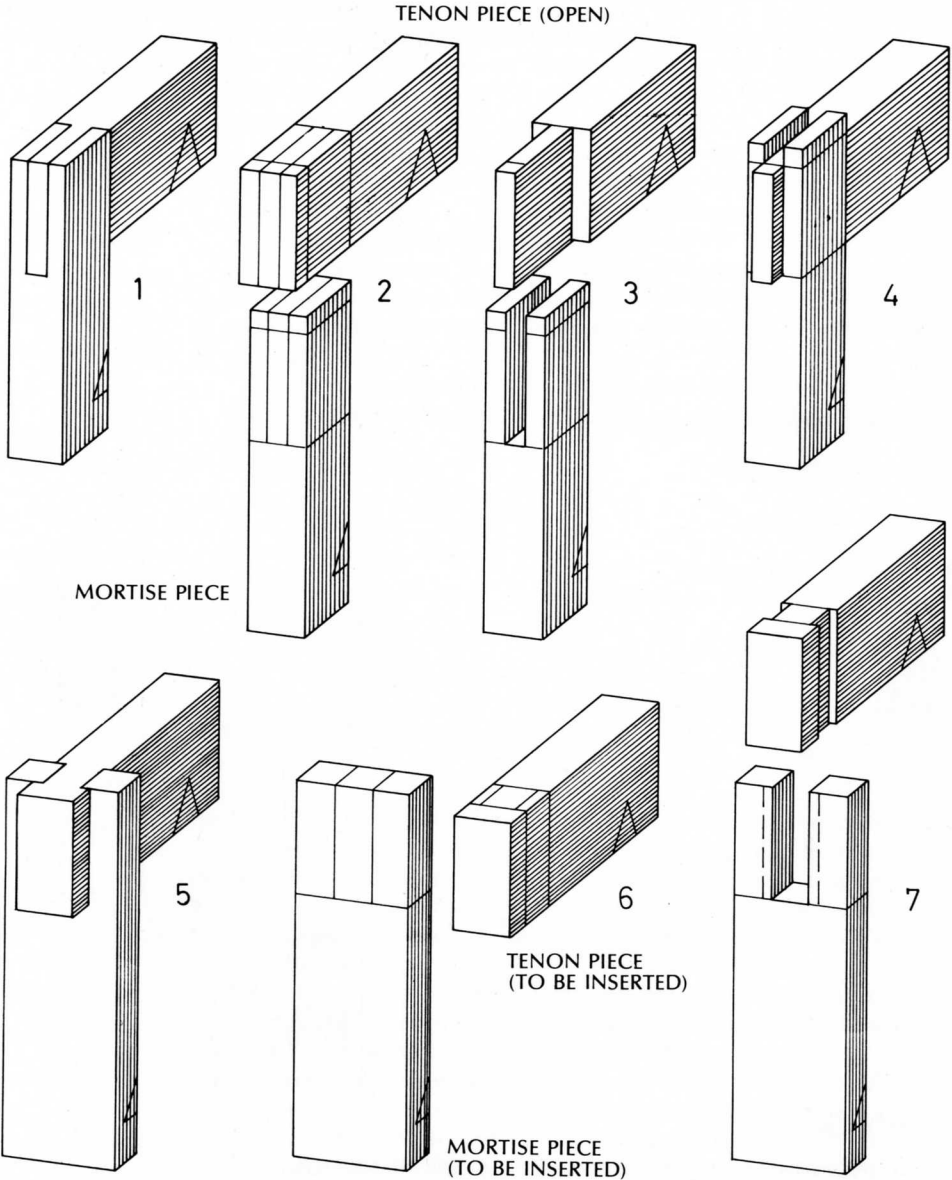
SHOWN IN OBLIQUE

Assembly with Open and Inserted Mortise and Tenon

- Open Mortise and Tenon*
1. The *open mortise and tenon* is the most common method of assembly for frames. It is a rectangular tenon fitting straight into an opposite, matching mortise piece.
 2. Draw measurements for the length of the tenon on both tenon and mortise pieces on narrow inner surfaces. Square edges. Mark off the tenon dimensions on both mortise and tenon pieces. Extend the lines to show on all surfaces.
 3. Saw out tenon and mortise. In cutting the tenon piece saw along outside edge of pencil line; for mortise piece saw along the inner side of the pencil line, so that they will fit together. Saw off excess wood from tenon piece. Clean out mortise hole using a chisel, working from both sides.
 4. Try to fit the frame pieces together. Sand the inner, narrow surfaces, glue pieces and assemble, keeping edges at right angles. Fasten in a vise until glue is dry. Saw off excess wood and sand the exterior surfaces.

- Inserted Mortise*
5. The *inserted mortise* is used in making tables where it forms the joint between the table top framework (rail) and the legs. In this book it is used in many constructions, the studio bed and bookcases for example.
 6. With pencil lines, indicate the length of the mortise to equal the length of the tenon. Mark this on the mortise section and extend lines to show on the other surfaces of the wood.
Then draw the width of the mortise to equal the width of the tenon less the two saw cuts. Extend these lines from the inner, narrow surface to outer surfaces.
Mark position of mortise on the tenon section and draw a perpendicular line through the two saw cut lines. Mark off the tenon's width to equal the width of the mortise and extend these lines to the narrow surface.

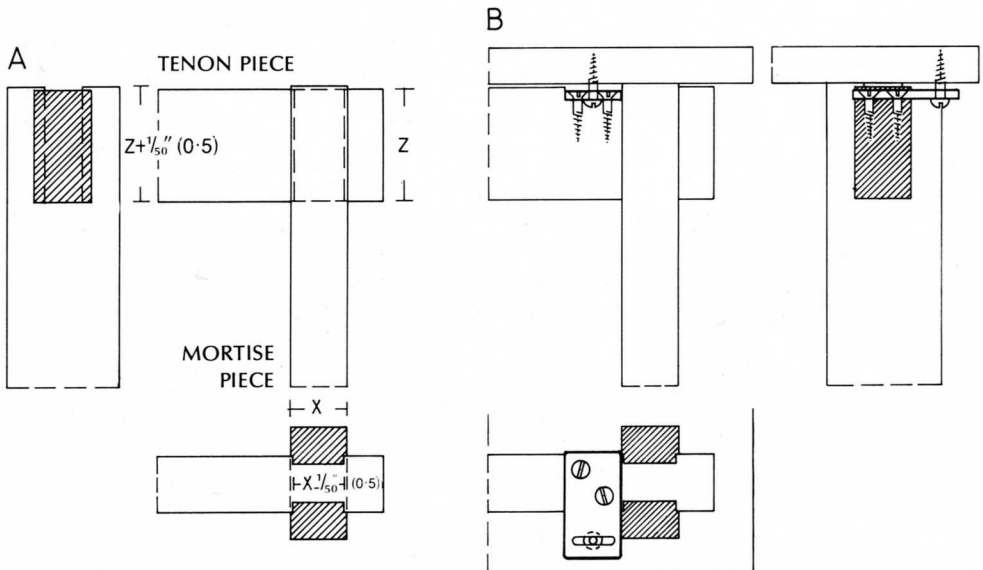
ASSEMBLY WITH OPEN AND INSERTED MORTISE AND TENON
SHOWN IN OBLIQUE



7. Saw the mortise along inner edge of pencil line. Remove waste wood with a chisel.

Form tenon by making the two saw cuts and chisel out the necessary amount. The tenon's thickness ($X - \frac{1}{50}''$) ($X - 0.5 \text{ mm}$) should be about $\frac{1}{50}''$ (0.5 mm) less than finished width (X) of mortise. (See projection A.) Tenon width should however be exactly right to fit mortise slit.

INSERTED MORTISE AND TENON
SHOWN IN PROJECTION



SEPARATE JOINT
AND ATTACHED TABLE-TOP SHOWING JOINT IN CROSS-SECTION

8. Try the two pieces together. If width of tenon ($X - \frac{1}{50}$ " ($X - 0.5$ mm)) is correct, the joint will be so tight that the tenon must be hammered down into the mortise; if it is too tight, the thickness of the mortise piece must be planed down. To prevent possible splitting fasten a C-clamp just under the mortise.

Separate joint pieces and sand all surfaces to prepare for final assembly. Brush glue on tenon and mortise and hammer pieces together. Place a C-clamp at the center of the mortise so its two sides are firmly pressed against the tenon.

If this construction joint is in the base of a table, for example, it is best used as shown in projection A by sawing the mortise $\frac{1}{50}$ " (0.5 mm) longer i.e. $Z + \frac{1}{50}$ " ($Z + 0.5$ mm) than the width of the tenon (Z). When the junction piece connecting the table rail (tenon piece) to the table surface is slightly depressed, one is able to get the flat end surfaces of the table legs to press hard against the table surface by tightening the assembly screw. In this way a good support is obtained.

The principle appears in projection drawing B, in which the junction pieces can either be ordinary cast iron or made of $\frac{3}{16}$ " (8 mm) plywood or hardwood.

Other Methods of Joining

Besides the wood joints described here, some of the designs in this book use few screws and a good deal of glue. But as you must have powerful and adequate means of applying pressure if glue is to give good results, you will have to use screws in many instances, or a combination of screws and glue, unless you own such a device, or can borrow one.

Many of the larger pieces of furniture are partly assembled with carriage bolts or machine bolts, so that they can be dismantled and packed away. The bolts, which make very strong joints and can be tightened later if necessary, can be replaced by special assembly or coupling screws such as are used in the furniture industry. But as these can be hard to obtain, need special keys for tightening them and are not really much more effective than bolts, we have not considered them here.

AUXILIARY TOOLS

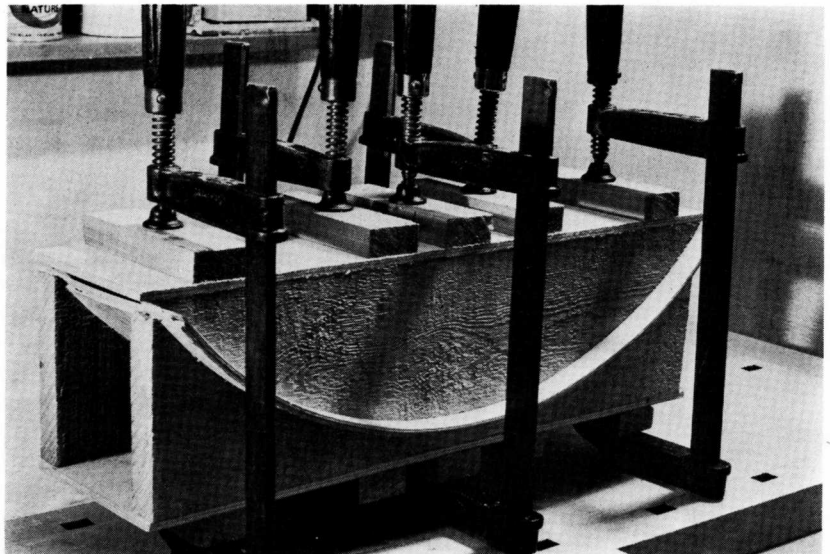
Form Press

Description The form press is an auxiliary tool which is used in forming a curved back for a chair.

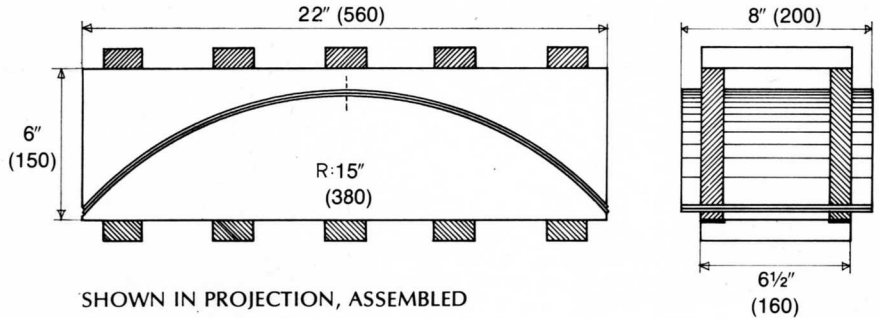
It is made of two side pieces sawn lengthwise on a curved line, then connected at top and bottom by means of 10 cross pieces. The new curved inner surfaces are joined by two thin plywood pieces glued on to follow the curved form. Any plywood construction pieces which are to be curved are then placed between the two parts of the form press for shaping.

<i>Materials</i>	Side pieces	2 pcs. $\frac{7}{8}$ " $\times$ 6" $\times$ 22" (22 $\times$ 150 $\times$ 560 mm)	
			finished measure.
	Cross pieces	10 pcs. $\frac{7}{8}$ " $\times$ 1 $\frac{3}{4}$ " $\times$ 6 $\frac{1}{2}$ " (22 $\times$ 44 $\times$ 160 mm)	finished measure.
	Plywood	2 pcs. $\frac{3}{16}$ " $\times$ 8" $\times$ 24 $\frac{3}{4}$ " (4 $\times$ 200 $\times$ 619 mm),	exterior grain lengthwise.
	Nails	1 $\frac{1}{2}$ " (37 mm) finishing nails.	

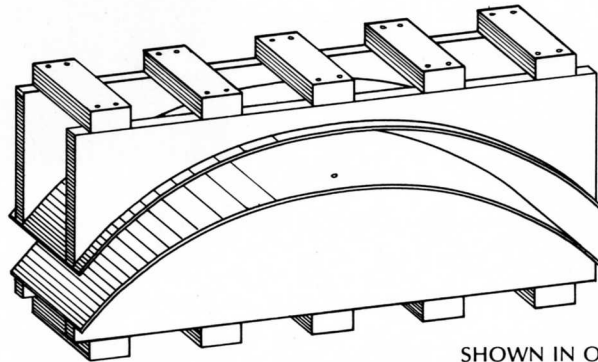
The form press in use.



FORM PRESS



SHOWN IN PROJECTION, ASSEMBLED



SHOWN IN OBLIQUE, SEPARATED

Procedure Square the wood to the desired size. Using a compass with 15" (380 mm) radius draw an arc on the two side pieces.

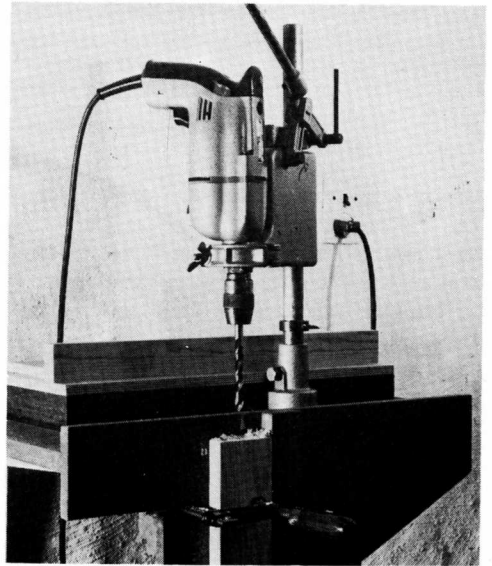
Cut apart on the curved line (saw carefully at right angles to the wood). Keeping side pieces parallel and well spaced, attach cross pieces. Glue and nail cross pieces into place.

Lift off top of form press and brush the four narrow curved edges of the top and bottom with glue.

Lay plywood pieces in position on glued edges, pressing against the curved edges. Insert one or two small nails at the center of the curve to hold pieces in position.

Fasten the form together using five C-clamps. After 24 hours clamps can be removed and the two halves separated. Sand surfaces with rough sandpaper, and the press is ready to use.

*The drill guide.
The adjustment is done
by shifting the slide and
swinging the drill round
until it is exactly over the mark.*

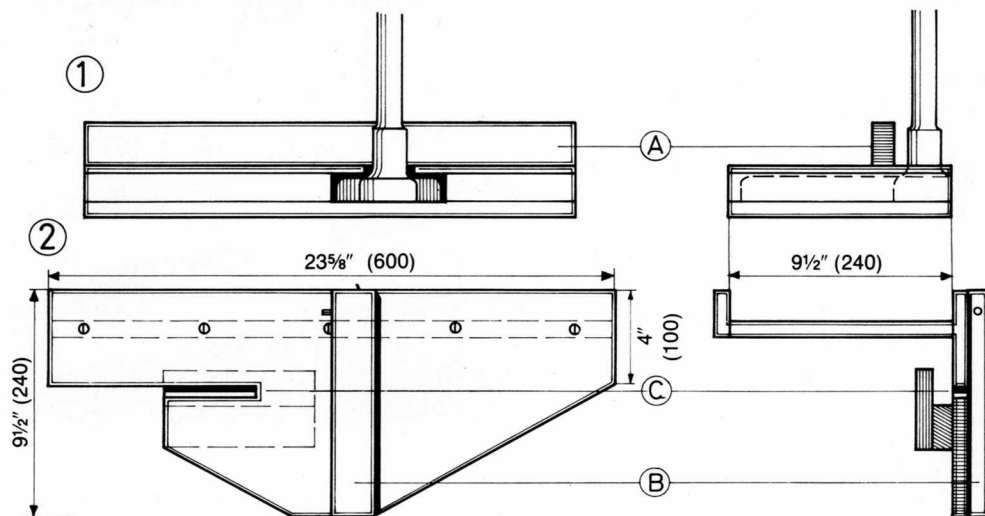


Drill Guide

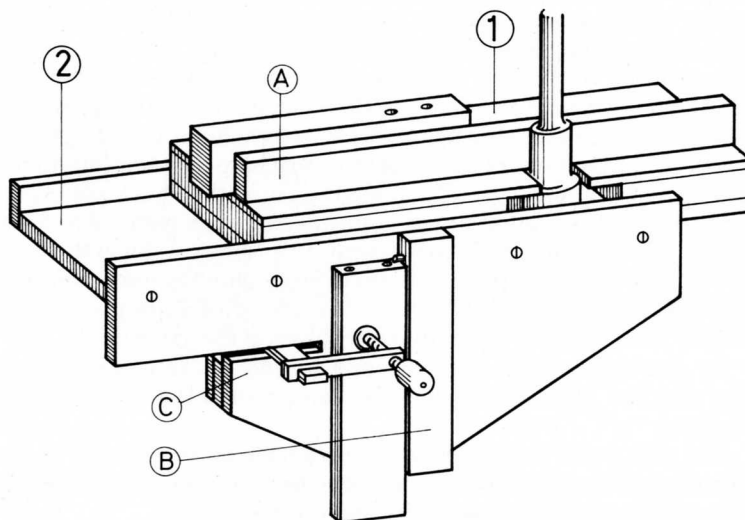
Description Dowel joints, which can be used for many of the designs in this book, are a good and quick means of assembly, but the dowels and the drill must fit together and the holes must be drilled exactly at right angles. This last can be difficult, but if you have an electric drill and the stand that goes with it, a drill guide such as is shown here can be of great help. It consists of two parts: (1) a slide intended for drilling the sides of pieces of wood and (2) a slot for holes in end surfaces. The width of the slide must fit exactly into the slot, so that it can be taken in and out without getting stuck.

Materials To construct the drill guide you need $\frac{5}{8}$ " (16 mm) to $\frac{3}{4}$ " (19 mm) chipboard and $\frac{7}{8}$ " $\times$ $1\frac{3}{4}$ " (22 $\times$ 44 mm) wood plank. The measurements depend on what make of drill and stand are to be used, but some of the main measurements are shown on the diagram.

DRILL GUIDE
FOR DRILLING IN SIDE AND END SURFACES OF WOOD FOR DOWELS AND SCREWS,
SEEN IN PROJECTION, SEPARATED



AND IN OBLIQUE, ASSEMBLED



The drill guide is here adjusted for drilling in side surfaces.



Procedure The slide can be made from a piece of chipboard, on which the stand for the drill is screwed down with the upright at the extreme edge. On either side of the foot of the stand, and of the same height as it, two blocks of wood are glued, and on top of these a sheet of wood with a cut-out for the drill stand. Another piece of wood (A) is glued on to this to act as a guide, against which the piece to be drilled is laid. By swinging the drill more or less out to the side, you control the distance of the drill from the guide piece. While the check on the drill stand may limit the depth of the hole, a piece of scrap wood should always be placed under a plank that is to have holes bored right through.

The slot, which as mentioned before must have the same interior breadth as the slide, consists of a chipboard base with a back plate glued on and a front plate with a vertical guide piece for the material to be drilled, which is fixed with a little screw clamp. This rests in a slot in the front plate and is supported by a pair of distance pieces glued to the underside of the plate. A pin or little stud at the top of the side of the guide piece may help to ensure that the piece to be drilled is always at the same height.

By moving the slide with the drill to and fro and swinging the drill out over the front of the slot, you can position the drill wherever you want it.

The drill guide can be mounted on a table or on a couple of brackets fastened to the wall, but it can also be portable, though it must be fastened firmly during use.

DESIGNS

CHAIRS – GENERAL POINTS

The chair is the most common piece of furniture in the home and is found in countless shapes. Fashion and seating customs have ranged over the years from a light Classic appearance to Baroque resembling an organ façade or altarpiece rather than a functional piece of furniture to sit on. Today the chair must **not only** be attractive, comfortable, and give the body proper support, it must be easy to move about. A good relationship between chair and table is also demanded. This will be discussed further in the section on tables.

Seat A comfortable seating height is one which maintains an even pressure on the entire surface of the body. If the seat is too high, the pressure will be too far forward at the thighs and will make the legs ache. If it is too low, the pressure will be too far back and cause stress and tension in the back muscles.

The average chair seat is about 17" (440 mm) high but taller persons will need another inch, or 18" (460 mm) from the floor, especially for a desk chair.

The seat does not need much shaping and dimensions of 16" (400 mm) square, approximately, are sufficient. Inclining the seat slightly downward at the rear will transfer some of the weight of the body to the chair back.

Back The function of the chair back is to support the body so that the vertebral column is forced forward into its normal position and thus prevents an improper and uncomfortable body slump.

The best positioning of the chair back is usually with its lower edge about 6" (150 mm) above the seat and with a slight backward inclination so that neither the top nor bottom edge will cause discomfort to the occupant (100 degrees).

Crossbars The crossbars hold the chair together and the greater the distance between them and the seat, the more stable the chair will be. But here both the

aesthetic and practical must be considered. The lowest crossbar between the front chair legs must, for example, be placed high enough so that one can tuck one's legs under the chair without obstruction.

Armchairs

An armchair is part of the usual comfortable living-room arrangement including a sofa and coffee table. It is nice to maintain a uniform seating level in a room, which is usually determined by the height of the sofa.

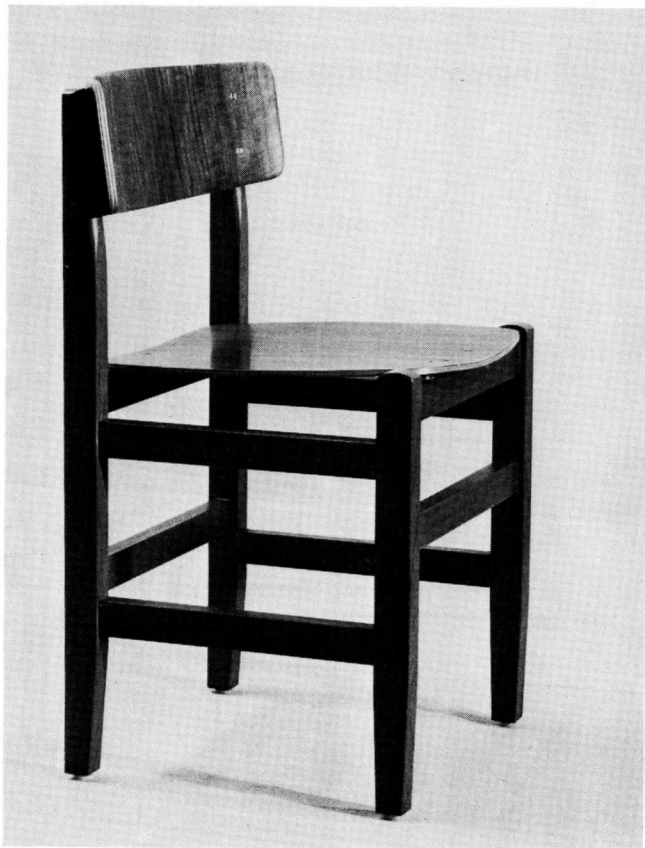
Seat Apart from its relationship to other furniture in the room, the height of the armchair will depend on the seat construction. It can be made with a solid bottom, covered by a loose cushion thick enough and supple enough so that the rigid bottom is not noticeably felt, or it can be made of material stretched taut over strong crossbars at the front and back of the chair, but the chair must be low enough so that your legs do not rest on the solid front of the seat. Here it will need only a thin cushion since the seat material will be flexible. In the first case the seat itself is not of great importance, but in the latter it must be positioned so that the legs do not rest on the front edge of the seat when someone is seated in the chair. Generally a height of about 12"–14" (300–355 mm) at the front, and about 2"–4" (50–100 mm) lower in the back, should be suitable for most lounge chairs. A seat 20" (500 mm) square is sufficient.

Back The angle of its back to the seat is of vital importance in making the chair comfortable. This is easiest to attain (as in the classic Safari chair) by making the back movable so that it follows the body's inclination. If, on the other hand, the back piece is rigid, it must be at the correct angle to the seat (110–115 degrees) or a back pillow will be necessary.

Armrest Armrests are intended for comfort and therefore it is important that their height above the seat permits the arms to lie naturally and relaxed upon them. If they are too low you will have the feeling of falling, and if they are too high they will not be restful. A height of about 8" (200 mm) above the seat at the front is standard.

The armrests should be long enough so that the hands can also rest on them with a few inches to spare.

*Chair dowelled
together.
The seat and back
are of shaped and
veneered plywood.*



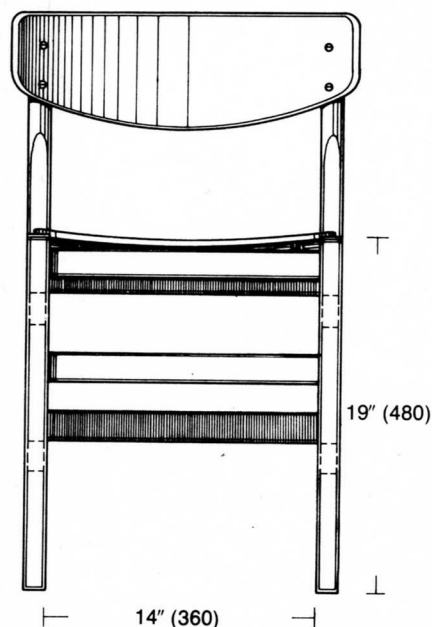
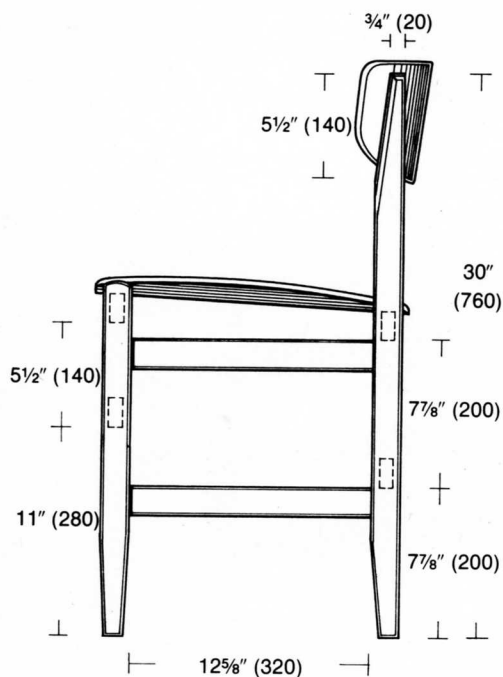
A Standard Design

Description Making an ordinary chair implies such great technical difficulties that often woodworkers and hobbyists hesitate to undertake the project. The chair shown here, however, is a very simple project for the beginner. The frame consists exclusively of straight pieces doweled together. All have square corners and as they are not flush, each section of the chair can be individually completed, and its surface finished, before the chair is assembled.

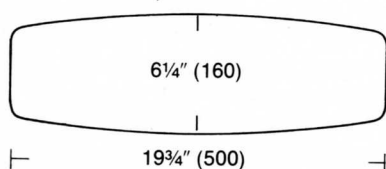
The seat and back are made of plywood which, prior to forming, can

CHAIR

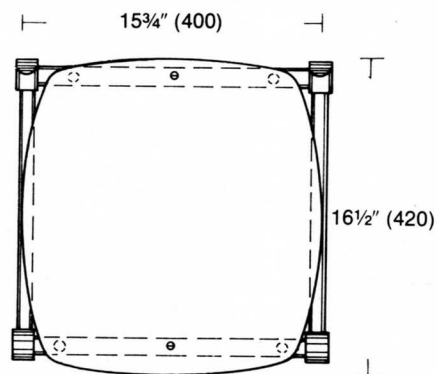
SHOWN IN PROJECTION



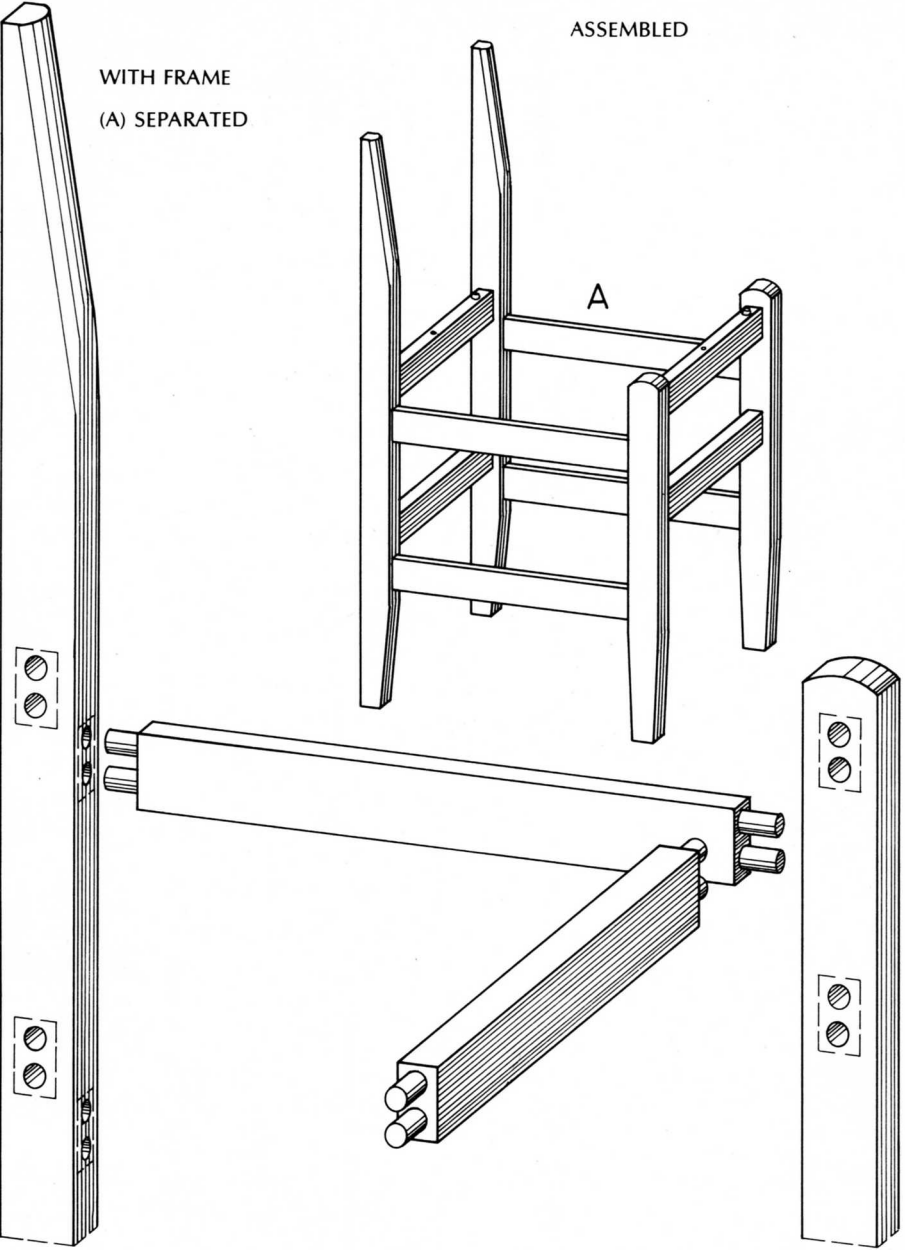
CHAIR BACK, FLAT VIEW



CHAIR SEEN FROM ABOVE WITHOUT BACK



FRAME SEEN IN OBLIQUE



be veneered with the same type of wood used in the frame. The seat rests on four rubber pads screwed to the top crossbar of the chair frame. A brass screw is used at the front and back center of the chair seat to force the seat down in the center, giving it a comfortable shape. The chair back is made of two identical parts glued together and bent into shape in the form press (see p. 24).

In order for the chair back to incline slightly backward, the front surface of each upright support is tapered and slightly rounded at the top to position the chair back.

This chair corresponds in height to the tables that follow. It can be made lower by shortening the length of the legs at the bottom. The seat and back give good support and promote a natural and correct working position.

A thin foam-rubber seat cushion can be made to be held in place by a fabric cover with elastic run through the hem which can be pulled down over the free edge of the seat.

Materials

Frame	Legs	2 pcs. $1\frac{1}{8}" \times 1\frac{1}{2}" \times 18"$ (28 × 40 × 480 mm) 2 pcs. $1\frac{1}{8}" \times 1\frac{1}{2}" \times 30"$ (28 × 40 × 760 mm)
	Crossbars	4 pcs. $\frac{7}{8}" \times 1\frac{1}{2}" \times 12\frac{3}{4}"$ (22 × 40 × 320 mm) 4 pcs. $\frac{7}{8}" \times 1\frac{1}{2}" \times 14"$ (22 × 40 × 360 mm)
	(Measurements for crossbars are for dowel assembly. If the chair is to be assembled using a mortise and tenon joint, an extra length of $1\frac{1}{2}"$ (40 mm) should be added.)	
Seat	1 pc. $\frac{1}{4}"$ (6 mm) plywood $16\frac{1}{2}" \times 17\frac{1}{4}"$ (420 × 440 mm) including excess. (Grain must be lengthwise.)	
Back	2 pcs. $\frac{3}{16}"$ (4 mm) plywood $7\frac{1}{4}" \times 21"$ (180 × 550 mm) including excess. (Grain must be crosswise.)	
Misc.	Veneer	1 pc. $\frac{1}{50}"$ (0.5 mm) veneer $11\frac{3}{4}" \times 60"$ (300 × 1500 mm) (divided and joined).
	Dowels	$\frac{3}{8}" \times 2"$ (8 × 50 mm).
	Screws	1" No. 8, flat-headed, brass (for seat and chair back). $\frac{3}{4}"$ No. 6, flat-headed (for rubber pads).
	Rubber	
	Bumpers	4 pcs. about $\frac{3}{4}"$ (20 mm) diameter and $\frac{3}{8}"$ (10 mm) high.

Procedure Cut the legs and crossbars to the specified measurements. (It is important to cut the crossbars at true right angles.) Taper chair legs and round all the edges as shown.

Pencil in location for dowel assembly. Bore holes in the ends of the crossbars and at the corresponding points on the inside of the legs. Glue the dowels into the crossbars and cut to proper length. Make a trial assembly of frame.

Sand and finish the surfaces of individual parts.

Assemble frame. Assemble each side of chair, gluing side crossbars in place. Fasten piece in the workbench vise, keeping the parts at right angles. When the glue has hardened, the front and back crossbars can then be glued into the side frames. Place the frame on its legs. Use two or four clamps to force the frame together. Check the angle of the legs and straighten, if necessary, by twisting slightly or shifting the clamps. Finish the frame.

Veneer the plywood pieces for the back and seat with the top grain running in the direction of the intended curve. Sand the finished sections.

Glue the two chair back pieces together and place securely in the form press. In order to prevent them from slipping out of line with each other, they can be kept together by nailing scrap wood placed in the center at the outer edge of the board. After 24 hours the chair back can be removed from the press. Bore holes for screws and cut the chair back shape following a full-size paper pattern. Finish the exterior surfaces, and screw the chair back to the frame.

The seat is also made by following a full-size pattern. Screw the four rubber pads to the top crossbar, lay the seat in place, and force it down in the center with a few C-clamps. Then screw it into place:

Kenya Chair

Description This chair is inspired by the light armchair carried on African safaris. Unlike the original safari chair, this one is not made to be taken apart and packed in a trunk. But like the safari chair it is made of a strong material slung on a movable frame to comfortably support its occupant at different positions.

The chair consists of two frames, which can be varied in detail. These are held together by four crossbars, the two strongest supporting the

laced seat. All pieces are straight and assembled at right angles with dowels or tenons. In Model A, where none of the pieces are flush, all the pieces can be made and the surface sanded before the chair is assembled. While these frames are well suited for assembly with dowels, it would be better to assemble models B and C with tenons.

The back is fastened to the armrests with carriage bolts so that its position can be changed.

The seat and back can be made out of two layers of material glued together and "hemmed" with glue. Hide, with hessian or canvas glued to the back of it, can also be used.

Materials

Frame Model A

Finished measurements for dowel assembly

Armrest	2 pcs. $\frac{7}{8}$ " $\times$ 3" $\times$ 26" (22 $\times$ 75 $\times$ 660 mm)
Legs	4 pcs. $1\frac{1}{8}$ " $\times$ 2" $\times$ $19\frac{3}{4}$ " (28 $\times$ 50 $\times$ 500 mm)
Frame	2 pcs. $\frac{7}{8}$ " $\times$ 2" $\times$ $19\frac{3}{4}$ " (22 $\times$ 50 $\times$ 500 mm)

Model B

Finished measurements for tenon assembly

Armrest	2 pcs. $1\frac{1}{8}$ " $\times$ 2" $\times$ 26" (28 $\times$ 50 $\times$ 660 mm), including extra length
Legs	4 pcs. $1\frac{1}{8}$ " $\times$ 2" $\times$ $20\frac{3}{4}$ " (28 $\times$ 50 $\times$ 525 mm)
Frame	2 pcs. $1\frac{1}{8}$ " $\times$ 2" $\times$ $21\frac{1}{8}$ " (28 $\times$ 50 $\times$ 550 mm)

Model C

Finished measurements for tenon assembly

Legs	4 pcs. $1\frac{1}{8}$ " $\times$ 2" $\times$ 26" (28 $\times$ 50 $\times$ 660 mm), including extra length
Arm and bottom rails	4 pcs. $1\frac{1}{8}$ " $\times$ 2" $\times$ $19\frac{3}{4}$ " (28 $\times$ 50 $\times$ 500 mm)

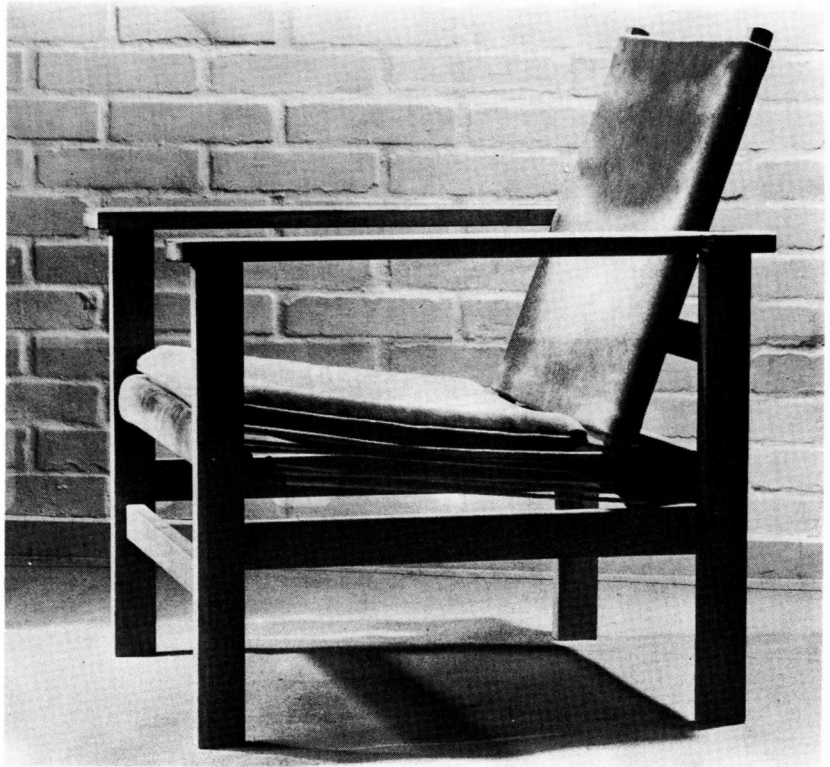
Common to All Models:

Measurements are intended for dowel assembly

(Measurements for tenon assembly are in parentheses)

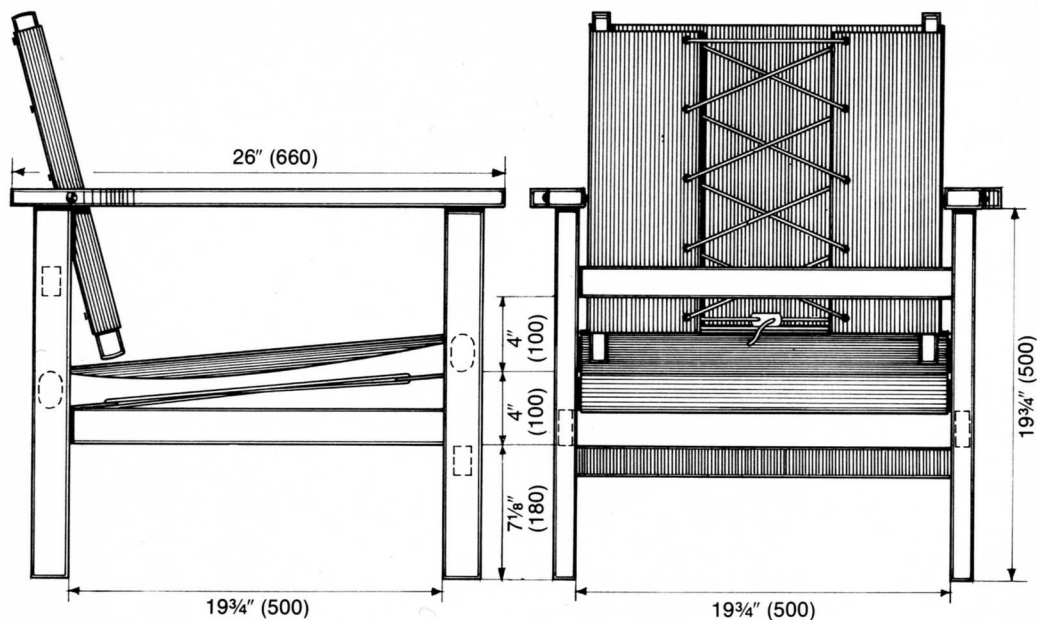
Crossbars	2 pcs. $1\frac{1}{8}$ " $\times$ 2" $\times$ 20" (22") (28 $\times$ 50 $\times$ 500 [550] mm) 2 pcs. $\frac{7}{8}$ " $\times$ $1\frac{1}{2}$ " $\times$ 20" (22") (22 $\times$ 40 $\times$ 500 [550] mm)
Back	2 pcs. $\frac{7}{8}$ " $\times$ $1\frac{1}{4}$ " $\times$ 19" (22 $\times$ 28 $\times$ 480 mm)

*The Kenya chair,
with seat, back and
flat cushion
made of hide.
The back will swing
and will give support
in all sitting postures.*

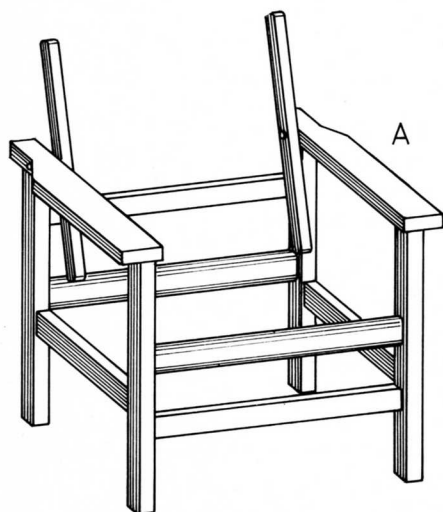


Misc.	Dowels	$\frac{3}{8}$ " $\times$ 2" (10 $\times$ 50 mm)
	Carriage Bolts A	2 ea. $\frac{5}{16}$ " $\times$ 4" (8 $\times$ 100 mm)
	Carriage Bolts B & C	2 ea. $\frac{5}{16}$ " $\times$ 3" (8 $\times$ 80 mm)
	Nuts	4 (2 for each bolt)
	Washers	4 thick brass washers to install between back and armrest 2 ordinary iron washers + 2 spring washers
Seat and Back	Fabric	40" $\times$ 40" (1 m $\times$ 1 m) leather or heavy fabric 40" $\times$ 40" (1 m $\times$ 1 m) canvas, hessian or other lining
	Eyelets	to fit lacing used, leather hole punch set
	Lacing	strong cord or heavy gauge plastic rope lacing

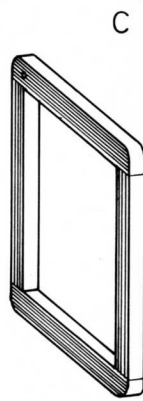
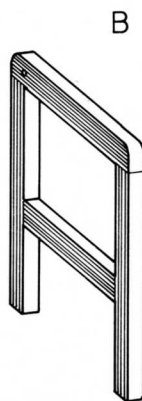
KENYA CHAIR



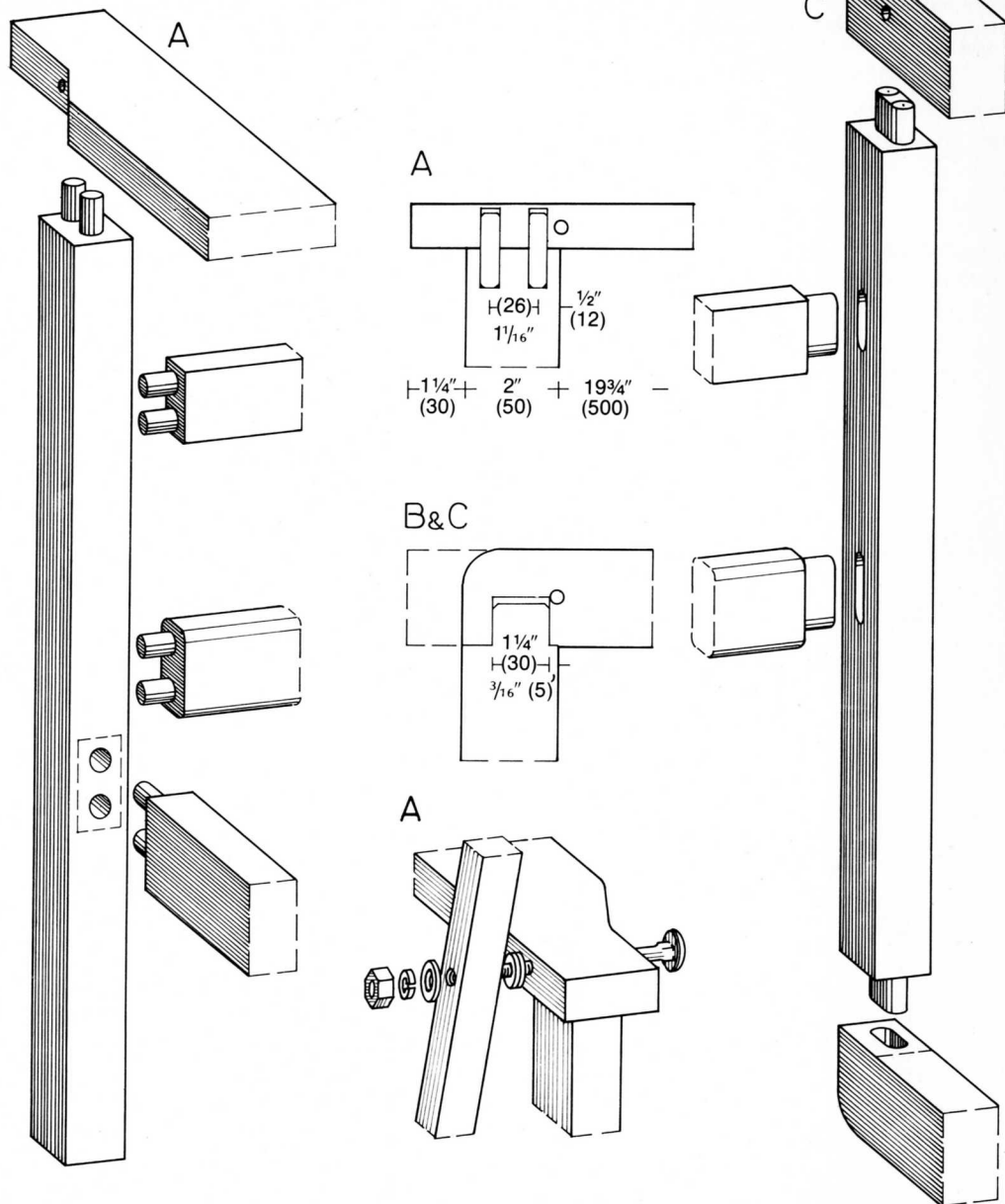
SIDE AND BACK SHOWN IN PROJECTION
IN OBLIQUE WITHOUT CUSHIONS



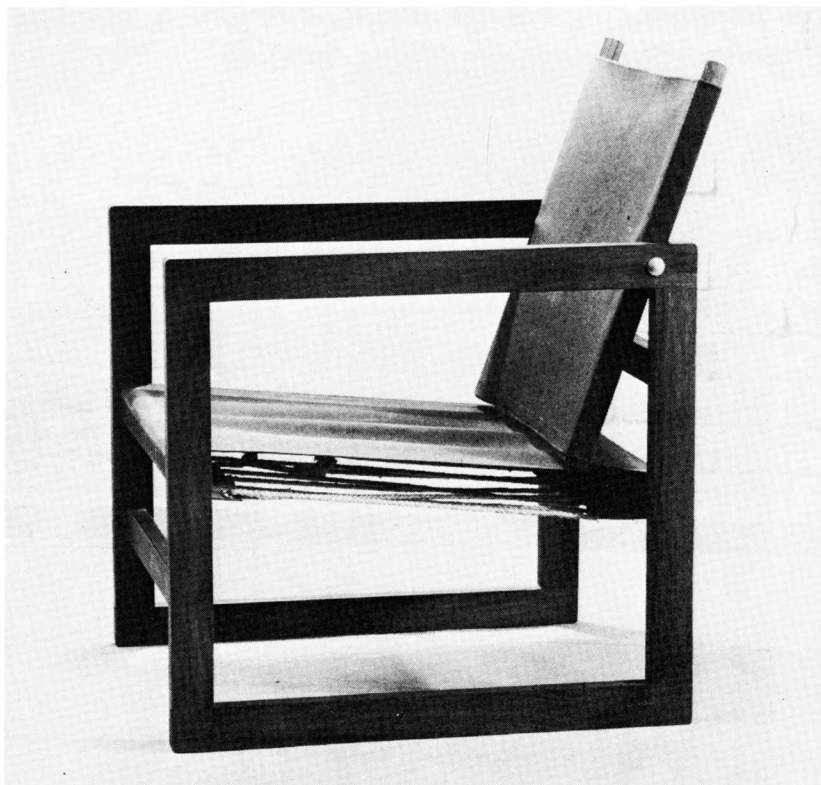
TWO VARIATIONS
OF SIDE FRAMES



OBLIQUE DRAWING OF CHAIR ASSEMBLY
SHOWN WITH DOWELS AND WITH MORTISE AND TENON



*This variation of the
Kenya chair
is dominated by the
square frame, which
gives it its
special character.*



Procedure

Frame Make individual pieces. Draw position and measurements for dowel assembly or mortise and tenon joint, and position of holes for carriage bolts in arm and chair back.

Drill holes. Place dowels into crossbars – or cut mortise and tenon. Drill holes for bolts and make trial assembly of chair.

Eliminate sharp edges of the two crossbars supporting the seat. Shape the ends of chair back pieces.

Model A: Shape end surfaces of armrest, sand and finish wood.

Model B and C: Sand crossbars and back pieces. Finish wood and all inside surfaces of frame pieces. Note: sanding exterior surfaces of frame and applying finish must be done after assembly.

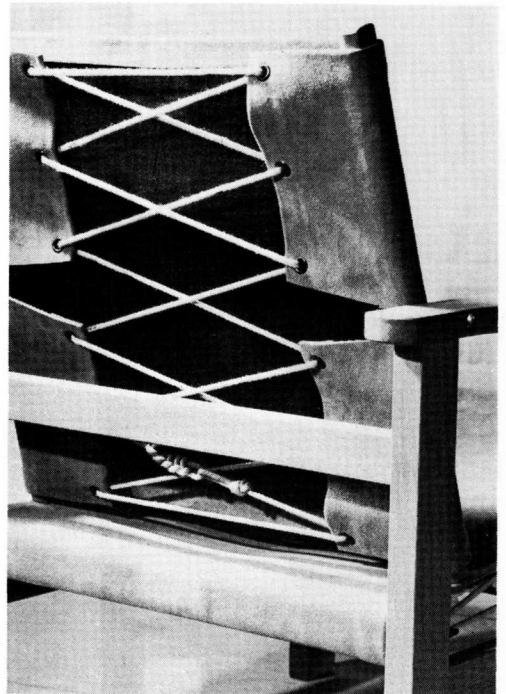
Assemble side frames. Glue frames at right angles, fasten with clamps and place on a flat surface.

Complete the sanding of B and C.

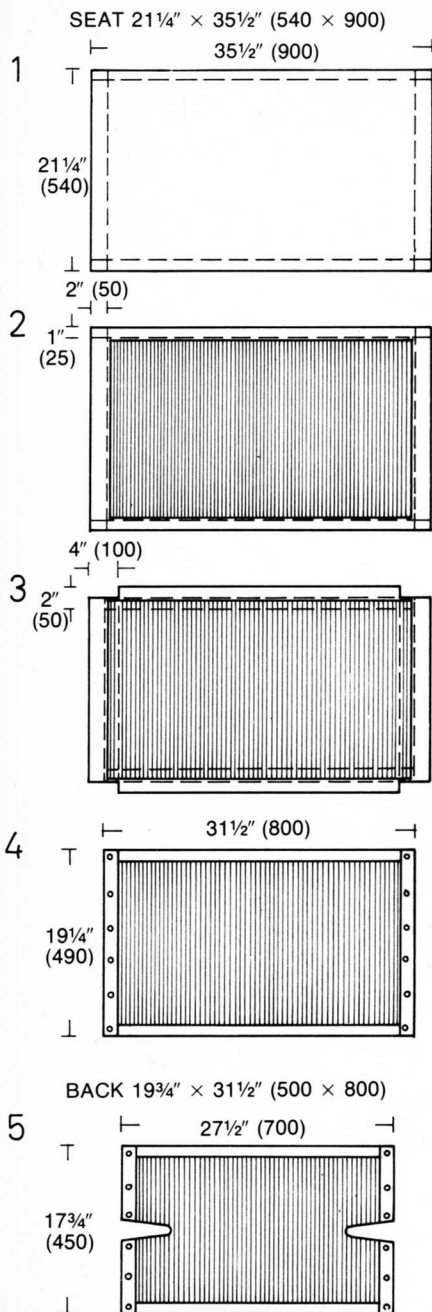
Working on a flat surface assemble the entire frame using four strong C-clamps. Check framework and verticality of legs and correct any errors by shifting clamps.

The chair can now be finished.

Seat and Back The seat and back of the chair can be made of strong canvas or leather. If you cannot get them sewn, you can simply glue them according to the following method:



This photograph shows the lacing at the back, with the cut-outs for the bolts that hold the back.



1. Cut the material to the required size and draw lines on the underside 2" (50 mm) in from the short ends and 1" (25 mm) from the long sides.
2. Using PVA glue, stick on a piece of canvas that fits exactly inside the lines and press it down firmly. Apply the glue with a brush or spatula.
3. Draw new lines 4" (100 mm) and 2" (50 mm) from the edges, cut away the four corners (see drawing) and spread contact cement from the new lines right out to the edges with a brush or spatula.
4. When the glue is hand-dry (i.e. no longer sticky to the touch), fold the edges in to the innermost lines and press or hammer them down. Begin with the short ends. Next mark off the holes for the lacing, cut them out and put in the eyelets. Make six holes in each end, on the back and on the seat.
5. The back piece must have cut-outs or holes for the bolts used to secure the back. Make the necessary measurements on the chair.

Mounting

Insert the bolts through the armrests from the outside, put on two thick washers (to make enough room for the material), put the back frame uprights on the bolts and finish up with a washer, a spring washer (so that the nut cannot work loose) and a nut (see diagram on p. 39).

Put the material on the frame and lace up with blind cord or something similar. Begin with a loop, skip every other hole, and finish by pulling the loose ends through the loop and pulling tight.

The glued fabric can get very stiff, so it is nice to have a flat cushion on the seat. It can be made with glued hems and filled with $1\frac{1}{2}"$ (40 mm) polyether.

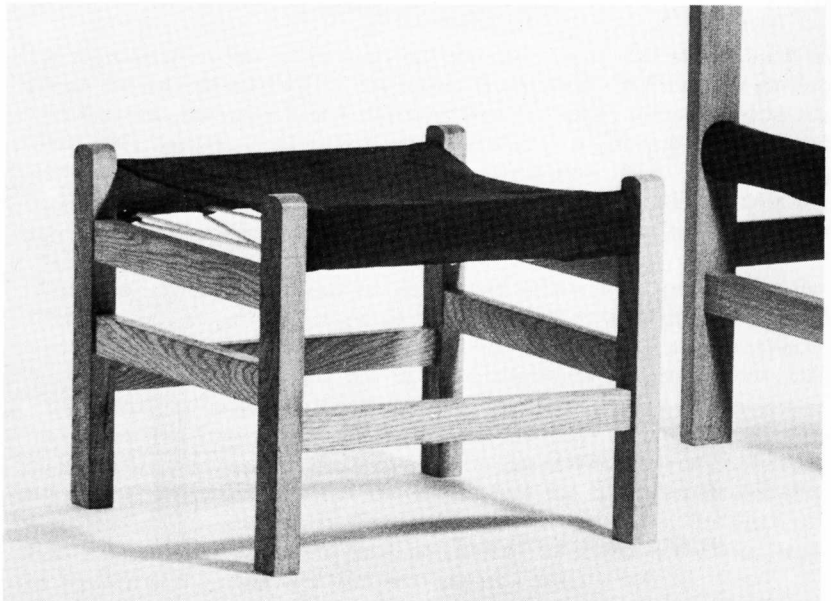
Footstool

Description The footstool is intended to go with the Kenya chair, and like the chair it can be made in several different forms. It can also be produced as an independent stool for sitting on.

Materials The measurements are finished measurements intended for dowel assembly. For assembly with mortise and tenon, increase the measurements by 2" (50 mm).

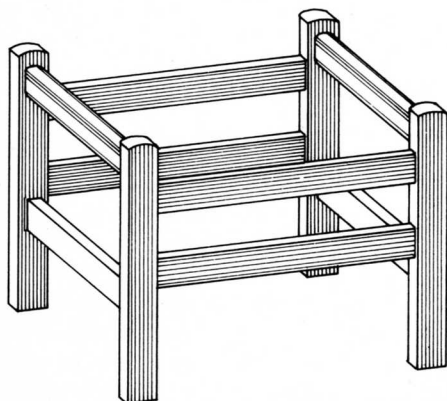
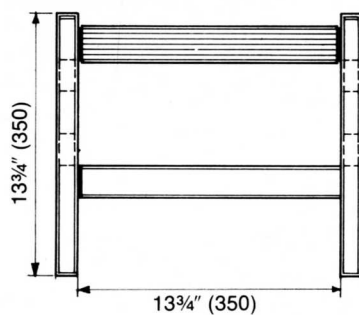
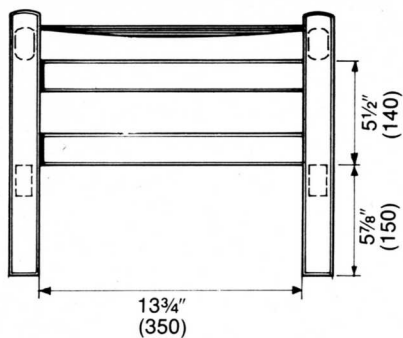
Model A

Legs	4 pcs. $1\frac{1}{8}" \times 1\frac{1}{2}" \times 13\frac{3}{4}"$ (28 × 40 × 350 mm)
Crossbars	2 pcs. $1\frac{1}{8}" \times 1\frac{1}{2}" \times 13\frac{3}{4}"$ (28 × 40 × 350 mm) (to carry the seat)
	6 pcs. $\frac{7}{8}" \times 1\frac{1}{2}" \times 13\frac{3}{4}"$ (22 × 40 × 350 mm)

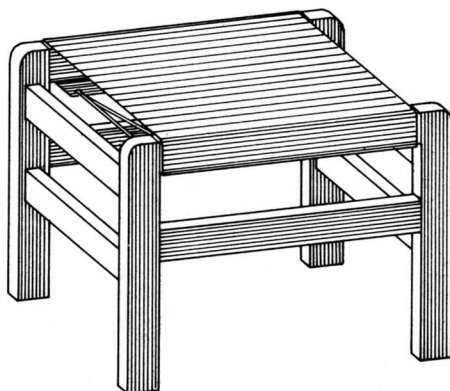


The footstool can also be used as a separate stool for sitting on.

FOOTSTOOL SEEN IN PROJECTION



MODEL A SEEN IN OBLIQUE,
WITHOUT SEAT



MODEL B SEEN WITH SEAT

Model B

Legs	4 pcs. $\frac{7}{8}$ " $\times$ $1\frac{1}{2}$ " $\times$ 14" (22 $\times$ 40 $\times$ 360 mm) (including extra length)
Crossbars	8 pcs. $1\frac{1}{8}$ " $\times$ $1\frac{1}{2}$ " $\times$ $13\frac{3}{4}$ " (28 $\times$ 40 $\times$ 350 mm)
Misc. Dowels	$\frac{3}{8}$ " $\times$ 2" (10 $\times$ 50 mm)
Fabric	about $17\frac{1}{2}$ " $\times$ $31\frac{1}{2}$ " (450 $\times$ 800 mm) (heavy fabric or leather) about $15\frac{1}{2}$ " $\times$ $27\frac{1}{2}$ " (400 $\times$ 700 mm) (canvas or hessian)

Eyelets and cord as for the Kenya chair

To assemble the stool, follow the procedure described for assembling the Kenya chair.

Chair – Original Danish design

Description This comfortable, low chair with an unusual frame that slants back to rest on the floor is suitable for any room. The standard Adirondack garden chair was its prototype but it has now been adapted for use inside the home. This design principle has intrigued many furniture designers, and one of the most comfortable results is presented here. The seat has a comfortable height in front and slopes steeply backwards towards the high back, with which it makes an angle of 115 degrees. The back has a neck cushion at the top which can be adjusted as desired.

The chair consists of a pair of lap jointed side frames joined with five crossbars, which can be joined to the sides either with dowels or with mortise and tenon. All the parts of the chair are made of straight pieces of wood, and all the joints are at right angles except the connection of the arm rests to the back members.

It can be fitted with loose cushions, which should be about 3" (80 mm) thick and of good quality. The seat cushion can rest on a piece of plywood laid on the two crosspieces of the seat, while the back can be stiffened by a sheet of plywood inserted into the back of the cushion. The neck-rest should be about 8" (200 mm) thick and can be attached to the top, broad cross piece of the chair with straps or strong cord.

The chair has a fixed sitting angle and loose cushions. The neck can be moved up and down as required. Original Danish design.



The chair can be made without the neck rest by cutting off the back members $1\frac{1}{4}$ " (30 mm) above the highest crossbar at the back, and in the same way the model can be made without armrests by shortening the legs above the joints. The chair can be made, say, 2"-4" (50-100 mm) wider by lengthening the crossbars, but in that case it will gain in stability if an extra crossbar is fitted between the front legs right under the joints. This must be tried out first to find the best position.

Materials

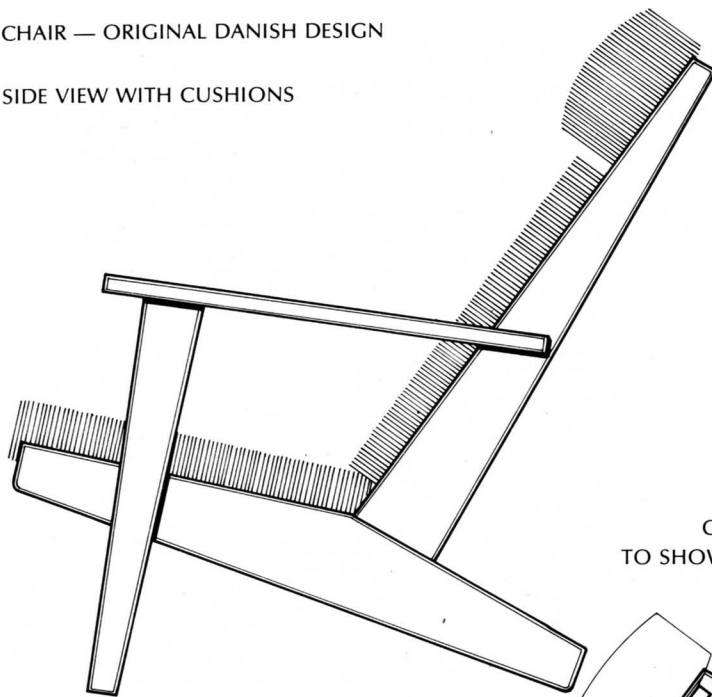
Frame

Side frames

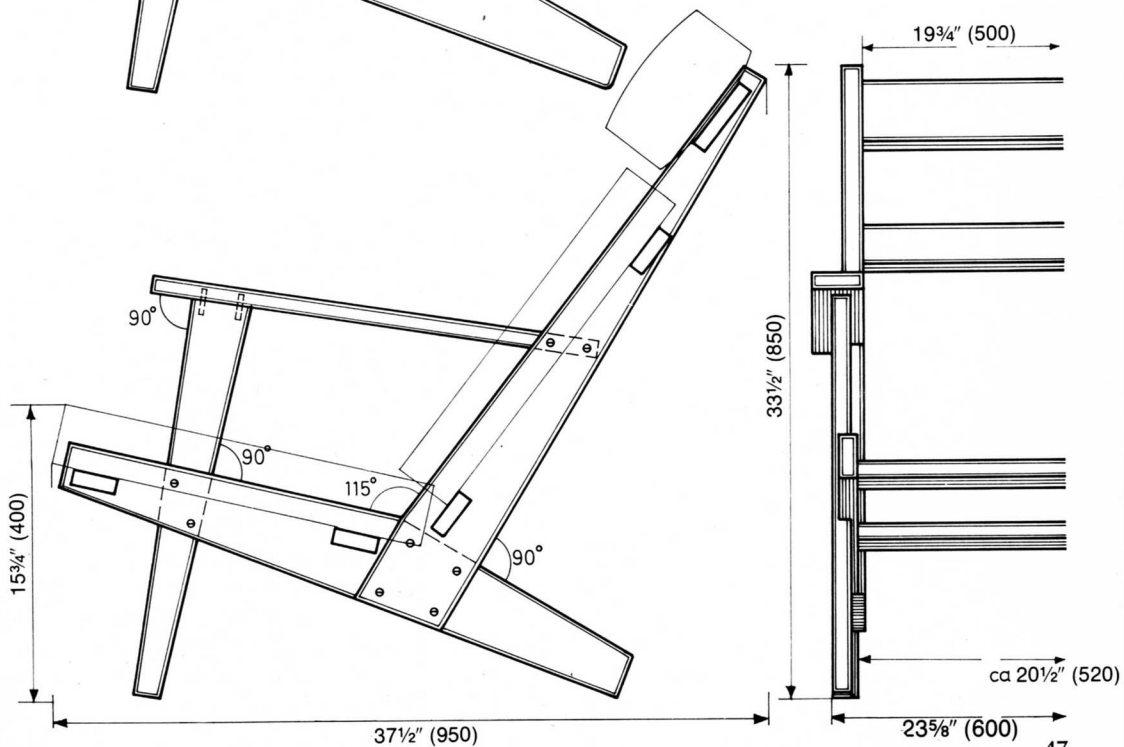
Side members	2 pcs. $1\frac{1}{8}$ " $\times$ 4" $\times$ 30" (28 $\times$ 120 $\times$ 800 mm)
Back	2 pcs. $1\frac{1}{8}$ " $\times$ 4" $\times$ $34\frac{1}{2}$ " (28 $\times$ 120 $\times$ 880 mm)
Legs	1 piece $1\frac{1}{8}$ " $\times$ 4" $\times$ $20\frac{3}{4}$ " (28 $\times$ 120 $\times$ 530 mm) (divided on a slant)
Armrests	1 piece $\frac{7}{8}$ " $\times$ $5\frac{7}{8}$ " $\times$ $23\frac{1}{2}$ " (22 $\times$ 150 $\times$ 60 mm)

CHAIR — ORIGINAL DANISH DESIGN

SIDE VIEW WITH CUSHIONS



CROSS SECTION OF SIDE VIEW TO SHOW ASSEMBLY AND CROSSBARS



Crossbars:

Seat	2 pcs. $\frac{7}{8}$ " $\times$ $2\frac{3}{8}$ " $\times$ about $20\frac{1}{2}$ " (22 $\times$ 60 $\times$ about 520 mm) (1 piece twice as broad divided lengthwise)
	2 pcs. $\frac{7}{8}$ " $\times$ $2\frac{3}{8}$ " $\times$ $19\frac{1}{2}$ " (22 $\times$ 60 $\times$ 500 mm) (1 piece twice as broad divided lengthwise)
	1 piece $\frac{7}{8}$ " $\times$ $3\frac{3}{4}$ " $\times$ $19\frac{1}{2}$ " (22 $\times$ 95 $\times$ 500 mm)

Misc. Cushions:

Seat	1 piece $3\frac{1}{8}$ " $\times$ $19\frac{1}{2}$ " $\times$ $19\frac{1}{2}$ " (80 $\times$ 500 $\times$ 500 mm)
Back	1 piece $3\frac{1}{8}$ " $\times$ $19\frac{1}{2}$ " $\times$ $21\frac{1}{2}$ " (80 $\times$ 500 $\times$ 550 mm)
Neck-rest	1 piece 7" $\times$ $19\frac{1}{2}$ " (180 $\times$ 500 mm)

Plywood $\frac{1}{4}$ " (6 mm):

Seat	1 piece $19\frac{1}{2}$ " $\times$ $19\frac{1}{2}$ " (500 $\times$ 500 mm)
Back	1 piece $19\frac{1}{2}$ " $\times$ $23\frac{1}{2}$ " (500 $\times$ 600 mm)
Screws	$1\frac{1}{4}$ " No. 10 for the lap joints $1\frac{1}{2}$ " No. 10 for the armrests
Dowels	$\frac{3}{8}$ " $\times$ $2\frac{3}{8}$ " (10 $\times$ 60 mm)

Procedure Square and cut the parts for the side frames and then make the lap joints, which must be an exact, tight fit. (For this purpose the narrow surfaces should be sanded before construction begins.)

The lap joints can be made as follows.

1. Set up and mark off the individual parts.
2. Draw in the dead straight guidelines on side members, legs and back.
3. Lay the parts in position on one another and draw the approximate breadth and depth of the lap joints.
4. Draw the depth of the lap joint on the narrow surfaces to measure about $\frac{3}{8}$ " (9 mm).
5. Now fix a prepared guide block to the side member along the guideline for the lap joint, lay the leg along the side of the block and fix another block on the other side of the leg, so that the leg is held between them. Then take the leg away, saw along the side of the blocks to the depth of the lap joint, and remove the wood between the two saw cuts with chisel and plane (rabbet plane and base plane).

WITH AN EXAMPLE OF DIMENSIONS

Technical drawing showing the side view of a chair seat and a separate part, with dimensions in inches and millimeters.

Dimensions (inches / millimeters):

- Top horizontal dimension: $23\frac{3}{4}"$ (600)
- Top vertical dimension: $23\frac{3}{4}"$ (70)
- Top right vertical dimension: $7\frac{1}{8}"$ (22)
- Top right horizontal dimension: $2"$ (50)
- Top right vertical dimension: $1\frac{1}{8}"$ (28)
- Top right horizontal dimension: $19\frac{3}{4}"$ (500)
- Top right vertical dimension: $1\frac{1}{8}"$ (28)
- Top right horizontal dimension: $29\frac{1}{2}"$ (750)
- Top right vertical dimension: $34\frac{3}{4}"$ (880)
- Top right horizontal dimension: $1\frac{1}{8}"$ (28)
- Top right vertical dimension: $1\frac{1}{8}"$ (28)
- Top right horizontal dimension: $17\frac{3}{4}"$ (450)
- Top right vertical dimension: $7\frac{1}{8}"$ (200)
- Top right horizontal dimension: $15\frac{1}{8}"$ (40)
- Top right vertical dimension: 90°
- Top right horizontal dimension: $31\frac{1}{2}"$ (800)
- Top right vertical dimension: $4\frac{3}{4}"$ (120)
- Top right horizontal dimension: $3\frac{1}{8}"$ (80)
- Top right vertical dimension: 90°
- Top right horizontal dimension: $20\frac{7}{8}"$ (530)
- Top right vertical dimension: $11\frac{7}{8}"$ (300)
- Top right horizontal dimension: $3\frac{1}{8}"$ (9)
- Top right vertical dimension: 90°
- Top right horizontal dimension: $1\frac{1}{8}"$ (40)
- Top right vertical dimension: $1\frac{1}{8}"$ (28)

SIDE OF THE CHAIR SEAT
AND THE SEPARATE PA
SHOWN IN PROJECT

49

6. If a lap joint is too tight, plane the narrow surfaces; if it is too loose, a hacksaw blade should be laid alongside the second of the guide blocks so that the saw-cut is moved about $\frac{1}{25}$ " (1 mm) in. Some experiments will give guidance.

When the lap joints are finished, bore holes for the dowels on the crossbars and for two screws in the front and four in the back joints. The flat surfaces can then be sanded and the frames assembled with glue and screws, and finished. The armrests are dowelled to the legs and screwed on to the back pieces. The cutting out for this must be adjusted by a trial assembly.

The crossbars – of which the seat crossbars must be adjusted for length – are made and fitted with dowels at the end surfaces, after which the whole chair can be clamped together with five 24" (600 mm) long C-clamps. The plywood sheet for the seat is fitted with a distance piece to hold it in place on the crossbars.

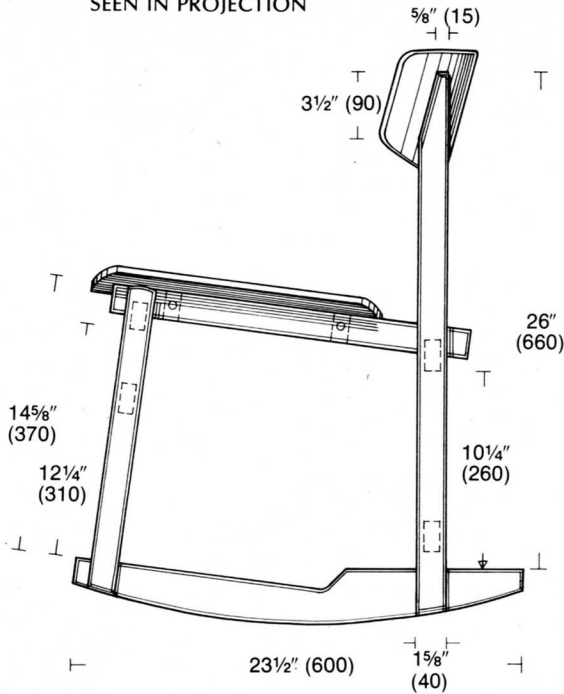
Rocking Chair

Description The traditional rocking chair, with turned legs, curved armrests, high back with slender, bent rods and a shaped top, is not a thing for amateurs to undertake; but you can certainly make a chair which will rock, and which is in fact a very comfortable working chair for anyone who has to work a lot at a desk or drawing table. It enables you, without shifting the chair, to take a close look at your work or to get a general view from a distance whenever you want to. It is also very convenient for people who have to do a lot of work sitting down to be able to change their position.

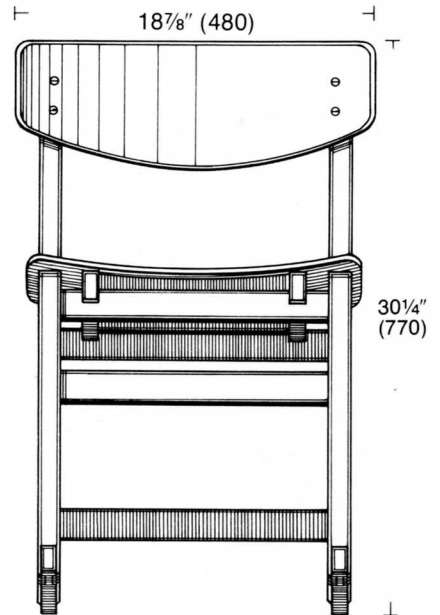
The rocking chair here is essentially made like the chair on p. 27, except that at the bottom the legs are slotted into a pair of rockers designed so that the joints are at right angles even if the front and back legs are not in line.

The curve of the seat is made by pressing it down into a pair of hollowed-out shaping blocks by means of screws; it rests on a pair of side members which are sunk into the top crossbars of the chair.

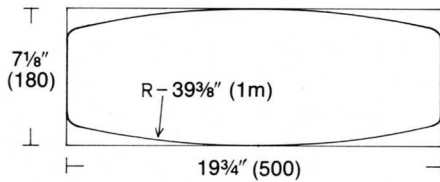
ROCKING CHAIR
SEEN IN PROJECTION



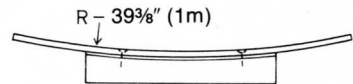
CHAIR BACK, FLAT VIEW



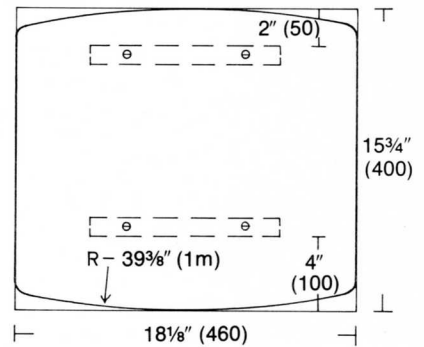
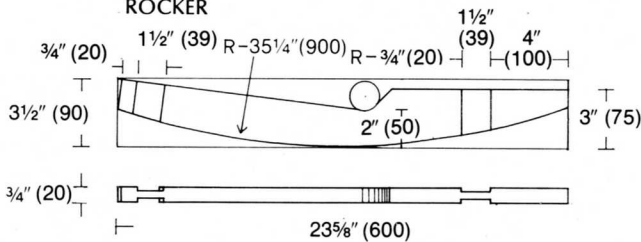
THE BACK FOLDED OUT



SEAT WITH SHAPING BLOCK



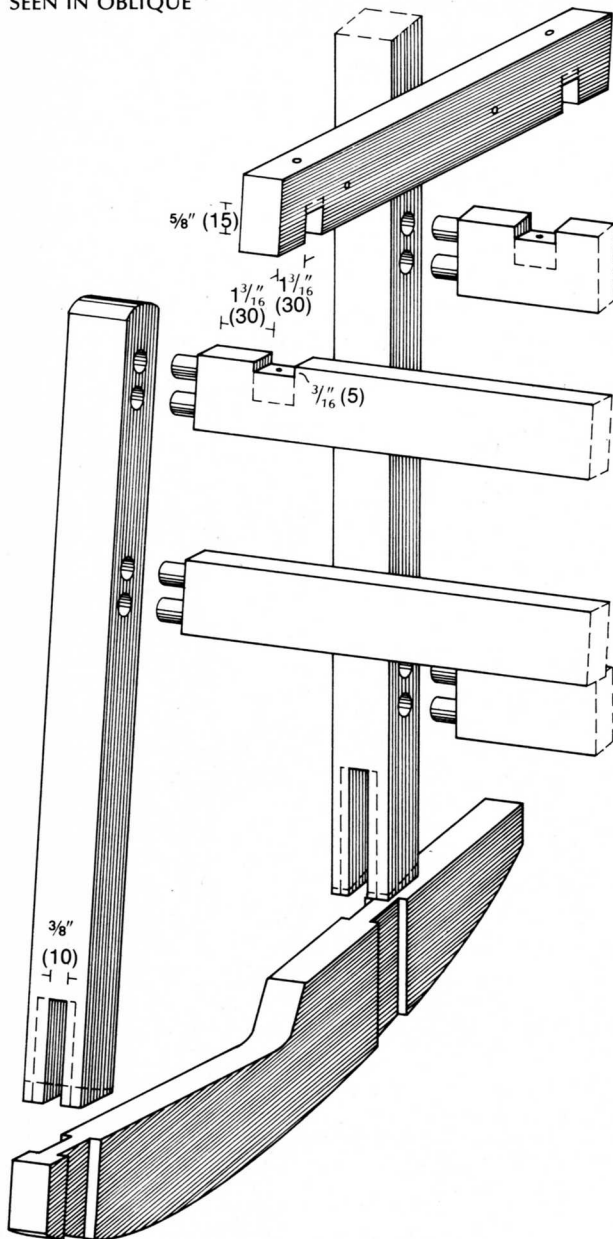
ROCKER



ROCKING CHAIR ASSEMBLY

SEEN IN OBLIQUE

Materials



Frame

Rockers 2 pcs.

$\frac{3}{4}" \times 3\frac{1}{2}" \times 23\frac{1}{2}"$
(20 × 90 × 600 mm)

Legs 2 pcs.

$1" \times 1\frac{1}{2}" \times 17\frac{3}{4}"$
(28 × 40 × 450 mm)
(including extra length)
2 pcs. $1" \times 1\frac{1}{2}" \times 29\frac{3}{4}"$
(28 × 40 × 750 mm)
(including extra length)

Crossbars 4 pcs.

$\frac{7}{8}" \times 1\frac{1}{2}" \times 14"$
(22 × 40 × 360 mm)

Side pieces 2 pcs.

$\frac{7}{8}" \times 1\frac{1}{2}" \times 19"$
(22 × 40 × 480 mm)

Seat

Plywood 1 piece $\frac{1}{4}"$ (6 mm) veneer, 19" (480 mm) wide and 16½" (420 mm) long (including extra length) (The grain of the outer veneer must lie lengthwise)

Shaping block 2 pcs.

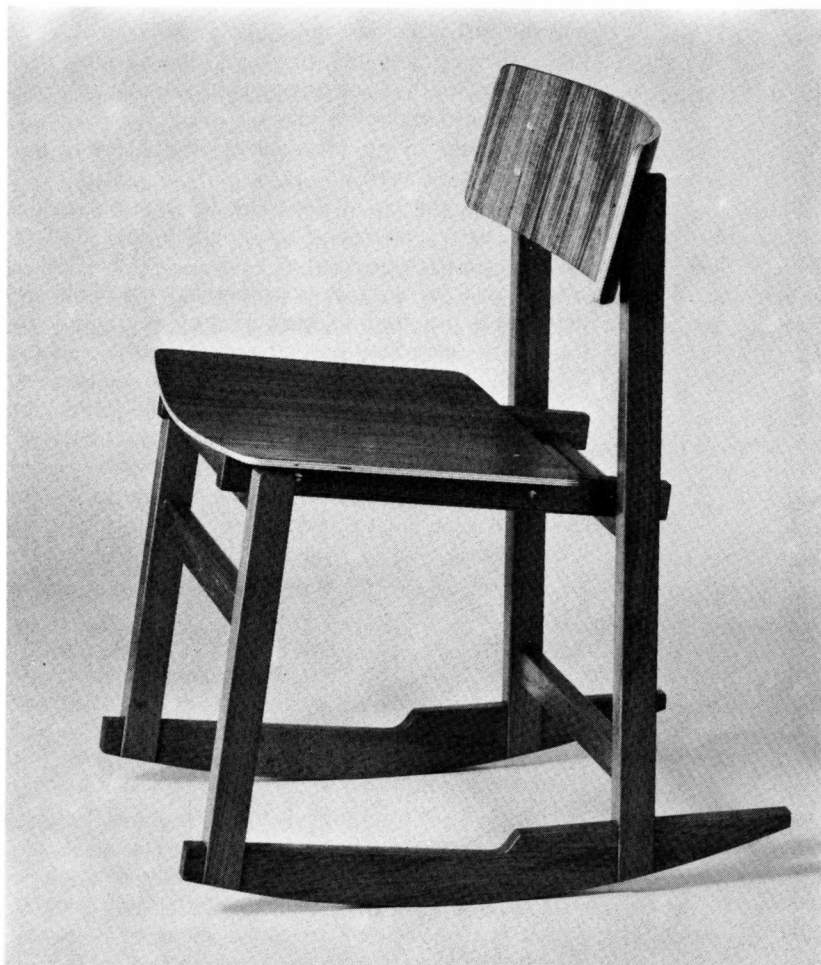
$\frac{7}{8}" \times 1\frac{1}{2}" \times$ about 11"
(22 × 40 × 280 mm)
(to fit)

Back

Plywood 2 pcs. $\frac{1}{8}"$ (4 mm) veneer 20½" (520 mm) wide and 7¾" (200 mm) long (including extra length) (The grain of the outer veneer must be upwards)

Misc.	Veneer	1 piece $\frac{1}{25}$ " $\times$ about $11\frac{3}{4}$ " $\times$ $78\frac{3}{4}$ " (0.5 $\times$ about 300 $\times$ 2000 mm)
	Dowels	16 pcs. $\frac{1}{3}$ " $\times$ 2" (8 $\times$ 50 mm)
	Screws	8 pcs. 1" No. 8, flat-headed brass
		4 pcs. $1\frac{1}{4}$ " No. 8, flat-headed brass

A working chair that you can rock in and which cannot tip over.



Procedure Make the rockers, legs, crossbars and side members to the required measurements.

Shape the rockers. The curve can be drawn with a compass, but, like the other curved parts of the chair, it can also be made by following a pattern on cardboard or plywood.

Draw the lines for the slotted construction on the legs and rockers, and construct as described in the introduction. Next draw the assembly lines with dowels on the legs and crossbars, bore the holes, and glue the dowels in the crossbars.

The front pair of legs is rounded on the front side, and the back pair is tapered and rounded off so that the backboard can be fitted to it. (See the drawing of the chair on p. 33.) Next sand the side members and the top crossbars and make a trial assembly. The joints between the side members and the crossbars can now be drawn in (those in front are square but the back ones must be drawn in in position); then dismantle the chair and make the joints.

All sections of the chair except the curve of the rockers can now be sanded and finished.

Assemble the chair. Glue the legs to the rockers. Lay the frames on a table, adjust them and fasten them with C-clamps. The curve of the rockers can then be sanded.

Assemble frames and crossbars. Lay the chair on a table with the back down and the rockers sticking out over the edge of the table, then clamp the assembled parts together with two or four long screw clamps. Check the angles between the parts of the chair.

Fit the side members and reinforce the joints with screws if necessary.

Make the seat and the backboard as described for the chair. Then make the shaping blocks to fit between the side pieces and screw the seat on to the shaping blocks. Lay the seat on to the frame. Use four screws from the side pieces and screw them into the shaping blocks to hold it in position.

TABLES AND DESKS – GENERAL POINTS

The height and size of a table will depend on its intended function and the style of other furniture in the home.

Height The most popular table height today is 28¼" (720 mm). This is a comfortable height, particularly for dining or drawing, where the arms must be able to move easily above the surface. If the table is used for reading or writing, a height of 29"-30" (740-760 mm) is better as it supports the arms.

Table-Top A top surface area of 23" × 47" (600 × 1200 mm) is the minimum for a comfortable desk, particularly if there is to be room to spread things out. If the table is for dining on, a size of 30" × 48" (750 × 1200 mm) will provide ample space for six people, assuming the table legs are as far apart at the corners as possible, allowing two chairs to fit easily on either side of the table.

Base The base of the table must be so constructed that it does not get in the way when the table is in use. Neither the rail nor the crossbars should contact the knees or the legs. The chairs must also fit the table well without bumping against its legs or crossbars.

A drawer can either be arranged at one end of the table or, if it must be in the middle, it must be so shallow that it does not get in the way of your knees.

Coffee Table

The coffee table is usually the center of activity in the living room and the designs vary enormously in every aspect, more so than the table or desk. If it is used for party snacks, or after-dinner coffee, a height of 19½"-23½" (500-600 mm) is comfortable. If it is used for displaying books, magazines, ashtrays, flowers, etc., it may be quite low, 16" (400 mm). This is, however, a matter of personal preference.

A shelf for the higher coffee table is very useful and, incidentally, helps to strengthen the table. It must be narrower than the top surface and high enough so that it does not get in the way of your legs.

Nowadays you often find people sitting on coffee tables, which calls for a suitably low height and strong construction.

Here is one idea for a coffee table.

Description A higher coffee table with an extra shelf as seen in the following model is very popular. This table is a comfortable height and when used for serving coffee the lower shelf, usually used for magazines, books, and small items, can hold a cake dish, extra plates, etc.

The table is made with a veneered, laminated plywood top supported by a trestle at each end and using a mortise and tenon dovetailed joint. The trestles are connected by a long center rail which is fastened to them with bolts.

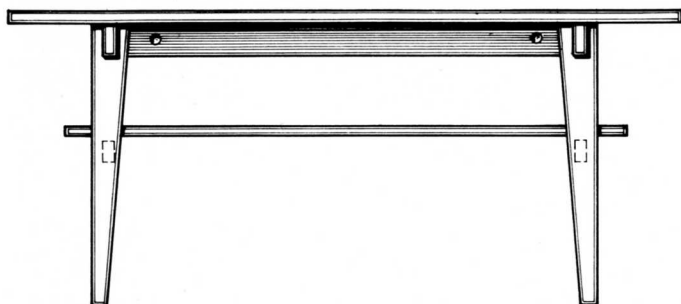
A lower crossbar is fastened (using dowels or mortise and tenon) to the legs of the trestle. The under shelf is screwed to this crossbar and it is wise to raise the shelf slightly off the crossbar by inserting screws through small rubber bumpers set between the wood surfaces. The shelf is made of veneered chipboard like the top.

The table construction is the same as that used in several of the following designs. Further instructions for making them are explained in the introduction.

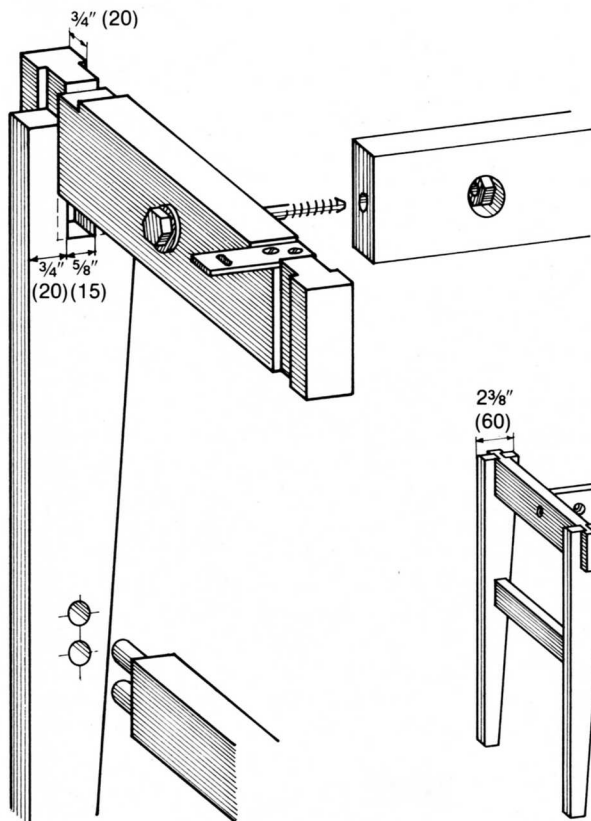
<i>Materials</i>	Legs	2 pcs. $\frac{7}{8}$ " $\times$ 4" $\times$ 19 $\frac{3}{4}$ " (22 $\times$ 100 $\times$ 500 mm) (divided diagonally)
	Rails	1 piece $\frac{7}{8}$ " $\times$ 2 $\frac{1}{2}$ " $\times$ 32 $\frac{1}{4}$ " (22 $\times$ 60 $\times$ 820 mm) 2 pcs. $\frac{7}{8}$ " $\times$ 2 $\frac{1}{2}$ " $\times$ 18 $\frac{1}{8}$ " (22 $\times$ 60 $\times$ 460 mm)
	Crossbars	2 pcs. $\frac{7}{8}$ " $\times$ 1 $\frac{1}{2}$ " $\times$ approx. 15" (22 $\times$ 40 $\times$ about 380 mm) (to fit) Length is for assembly with dowels. To make assembly with mortise and tenon, add 1 $\frac{1}{4}$ " (30 mm)

COFFEE TABLE

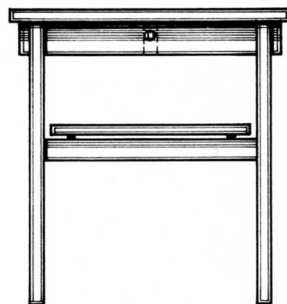
SHOWN IN PROJECTION



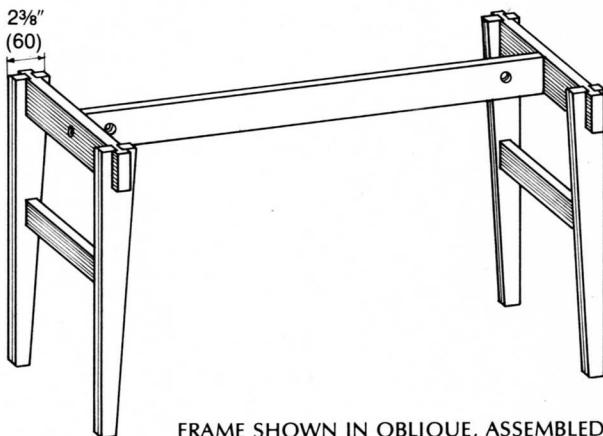
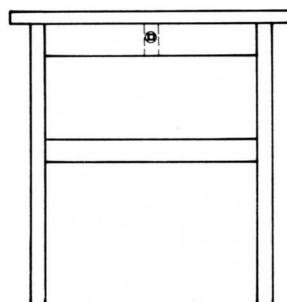
A CORNER ASSEMBLY



(A)



(B)



FRAME SHOWN IN OBLIQUE, ASSEMBLED

<i>Top & Shelf</i>	Top	1 piece chipboard $\frac{3}{4}" \times 18\frac{7}{8}" \times 46\frac{1}{2}"$ ($19 \times 480 \times 1180$ mm)
	Shelf	1 piece chipboard $\frac{5}{8}" \times 12\frac{5}{8}" \times 38\frac{5}{8}"$ ($16 \times 320 \times 980$ mm)
	Veneer	1 piece $\frac{1}{25}" \times 11\frac{3}{8}" \times 98\frac{1}{2}"$ ($0.5 \times 300 \times 2500$ mm) (to be cut and joined)
	Wood Strip Edging	1 piece $\frac{1}{25}" \times 15\frac{1}{4}" \times 43\frac{1}{4}"$ ($0.5 \times 400 \times 1100$ mm)
		3 pcs. $\frac{3}{8}" \times \frac{7}{8}" \times 48"$ ($10 \times 22 \times 1220$ mm) (to fit) 3 pcs. $\frac{3}{8}" \times \frac{3}{4}" \times 40"$ ($10 \times 20 \times 1020$ mm) (to fit)
<i>Misc.</i>	Junction Pieces	4 pieces $\frac{5}{16}"$ (8 mm) plywood or cast iron $1\frac{1}{4}" \times 3\frac{1}{8}"$ (30×80 mm)
	Bolts	2 ea. $\frac{5}{16}" \times 4"$ (8×100 mm) with $1"$ (25 mm) or $1\frac{1}{4}"$ (30 mm) washers, and square nuts
	Screws	1" No. 8, flat-headed for junction pieces
		1" No. 8 ($\frac{3}{4}"$ No. 8), round-headed for junction pieces
		2" No. 8, flat-headed for shelf
	Rubber Bumpers	4 ea. $\frac{3}{8}"$ (10 mm)
	Dowels	8 ea. 2" (50 mm)

Procedure

Base Cut pieces for trestle and rails. Divide wood for legs on diagonal, lengthwise.

Saw and form dovetail mortise and tenon joints on legs and crossbars. Drill holes in lower crossbars for screws to hold shelf and for dowels in both crossbars and legs.

Bore holes for bolts in the center of the top crossbars of the trestle.

Near each end of the long rail bore a hole measured to accommodate the nut for the bolt, and from here to the end of the rail drill a hole to insert the bolt (position must correspond to hole on the trestle crossbar).

Now the frame is ready for a trial assembly, then sanding and finishing. (Do not use oil or lacquer on glued surfaces.)

Assemble the trestles. Insert and glue crossbar dowels into legs. Then pound the top crossbars of trestles down into the mortise opening in the legs. Remove excess glue and check to see that legs are straight. If they are twisted slightly, they can be adjusted by clamping them on a level surface and twisting them a little, in the opposite direction, with wedges. Let them stand to dry for 24 hours.

Make junction pieces and screw them into the prepared depressions in the upper crossbars of trestles.

Top & Shelf Square and smooth surfaces to the given measurements. Glue on wood strip edging. Then smooth the right side of plywood and veneer it. Polish and finish wood.

Table Assembly Fasten the long center rail to the trestles. (Hold the nut firmly with a pair of pincers in the pre-bored holes until the bolt is tight.) Lay table-top right side down, place frame on it in its proper position and attach it into place through junction pieces.

Attach shelf to crossbars using two C-clamps and screw it into place from below (straighten legs if necessary). Here small rubber bumpers, or blocks, are used between crossbars and shelf.

*Coffee table with
top and lower shelf
covered with
laminated plywood
is both classic in
design and very useful.*



Kenya Table

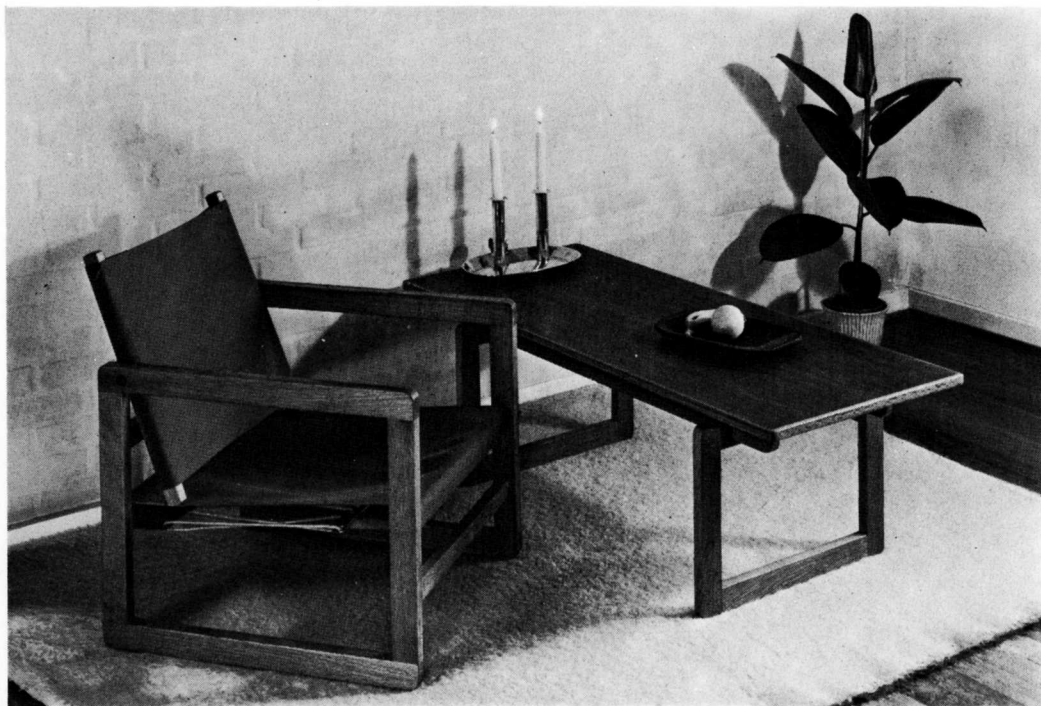
Description The Kenya table is a low coffee table which matches the Kenya chair in proportion and design.

The base consists of a pair of frames which are mortised or doweled together and are joined with a cross lap joint to the long rail pieces which support the raised table top. The table-top is screwed to the rail pieces using four junction pieces fashioned of plywood or ready bored metal.

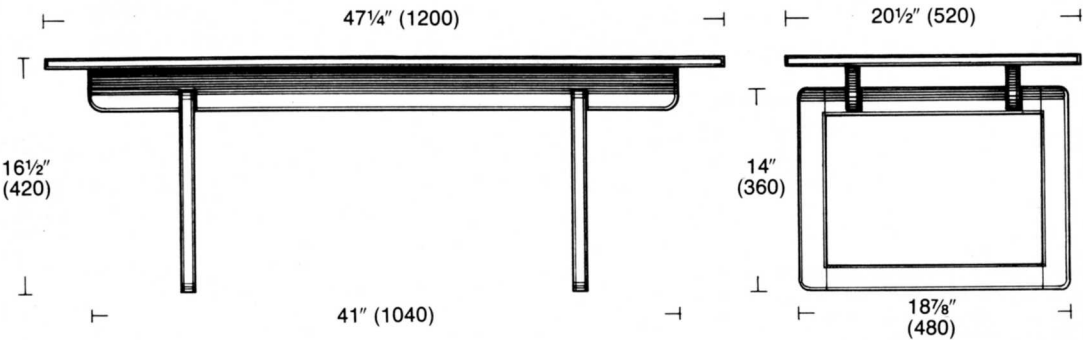
The rail pieces are placed well under the table so that normally they are invisible. This helps to give the table a light appearance.

The table surface here is a piece of chipboard which has been veneered and then edged with wood strip. This construction is not suitable, however, for tables that are higher than the one given here.

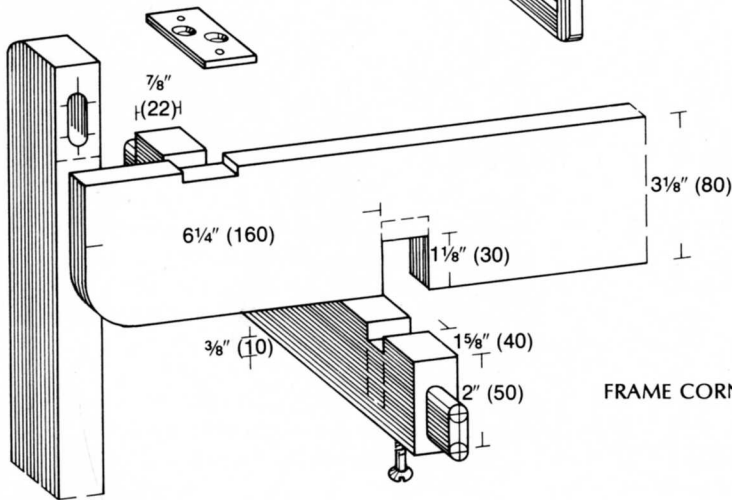
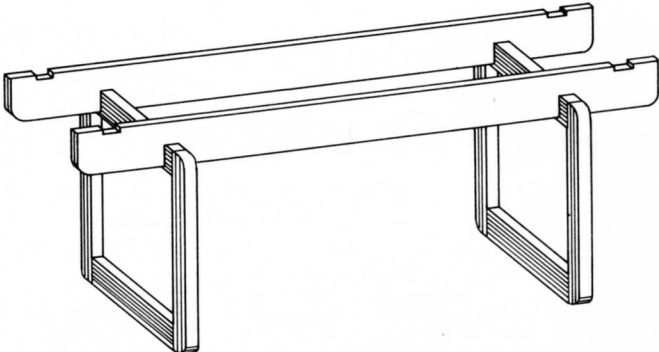
*The firm square elements
are repeated in the frames
of both table and chair.
The chair is described on p. 35.*



KENYA TABLE



SHOWN IN PROJECTION



FRAME CORNER SHOWING RAIL ASSEMBLY
SHOWN IN OBLIQUE

Materials

Base	Frame	4 pcs. $\frac{7}{8}$ " $\times$ 2" $\times$ 15 $\frac{3}{4}$ " (22 $\times$ 50 $\times$ 400 mm), including extra length
		4 pcs. $\frac{7}{8}$ " $\times$ 2" $\times$ 17 $\frac{1}{4}$ " (22 $\times$ 50 $\times$ 440 mm), including tenon
	Rails	2 pcs. $\frac{7}{8}$ " $\times$ 3 $\frac{1}{8}$ " $\times$ 41" (22 $\times$ 80 $\times$ 1040 mm)
Top	Chipboard	1 piece $\frac{3}{4}$ " $\times$ 19 $\frac{3}{4}$ " $\times$ 46 $\frac{1}{2}$ " (19 $\times$ 500 $\times$ 1180 mm)
	Wood Strip	
	Edging	3 pcs. $\frac{3}{8}$ " $\times$ 1" $\times$ 50" (10 $\times$ 24 $\times$ 1250 mm) (cut to fit)
	Veneer	1 piece $\frac{1}{50}$ " (0.5 mm) $\times$ about 11 $\frac{3}{4}$ " $\times$ 102" (about 300 $\times$ 2600 mm) (to be cut and joined)
Misc.	Junction	
	Pieces	4 pcs. $\frac{5}{16}$ " $\times$ 1 $\frac{1}{4}$ " $\times$ 3 $\frac{1}{8}$ " (8 $\times$ 30 $\times$ 80 mm) plywood
	Screws	1" No. 8, flat-headed for junction pieces $\frac{3}{4}$ " No. 8 (1" No. 8), round-headed for junction pieces 2 $\frac{1}{2}$ " No. 12, flat-headed for reinforcement of joints.

Procedure

Base Cut frame pieces and indicate position and measurements of mortise and tenon assembly. Saw tenon pieces. Bore holes and form the space between them to fit tenon.

Make trial assembly of frame, then sand inner surfaces. Next, assemble frame and clamp together on a flat surface, straightening pieces to stand at right angles. When glue has hardened, shape the corners. Now the rest of the sanding and finishing of the wood may be done. (Do not oil or lacquer glued surfaces.)

Make rail pieces and draw position and measurements for cross lap joints on rails and frames.

Saw lines for cross lap joint and clean out with chisel. After a trial assembly, sand and finish rail pieces. The junction pieces can be made and countersunk in the upper side of the rail.

Assemble base with the help of C-clamps. Check to see that rails fit flush and are perpendicular to table-top. Correct any crookedness by adjusting frame before glue hardens and reinforce the joints with four screws, screwed from below through the top piece of the frame into the rail. The holes must be drilled before assembly.

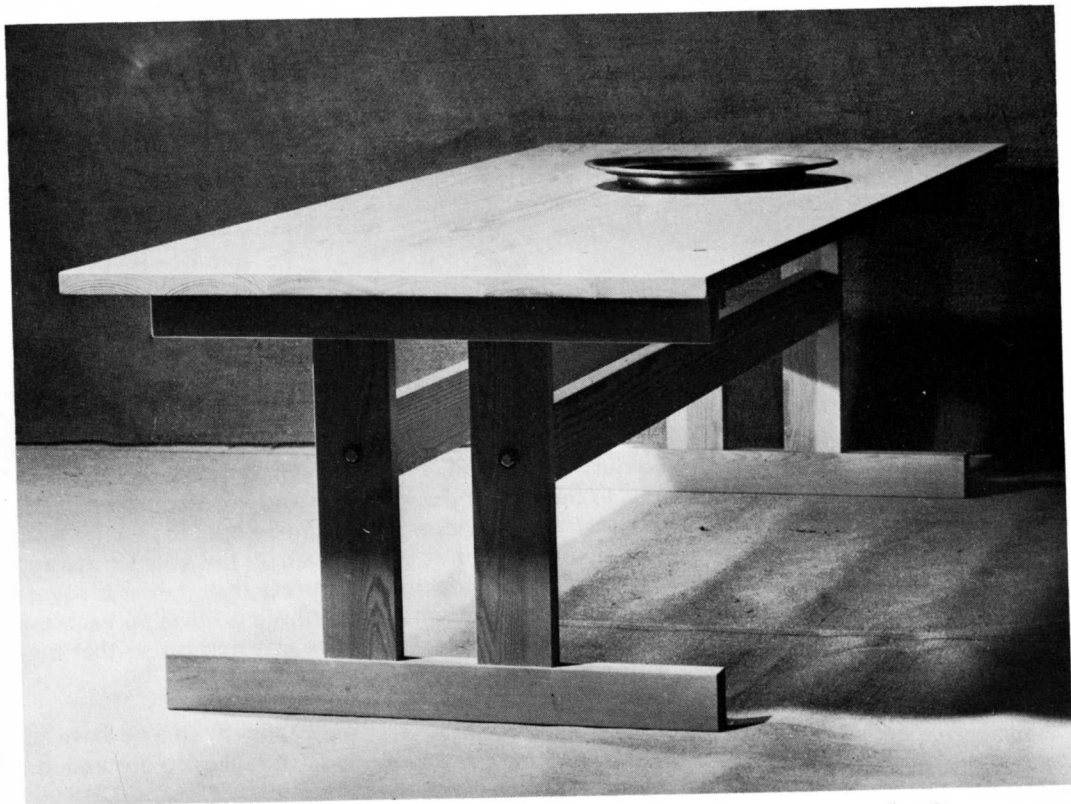
Top Square and smooth table-top edges. Fit cut wood strips to edges and glue in place. Smooth upper side of the table-top and veneer it.

Lay table-top on flat surface with underside up. Place the base in position and screw it into place.

Bench Table

Description The table is in the modern low style and can be used as a bench as well as a table. The top, which is intended to be made of joined planks, rests on a base consisting of a pair of trestles held together by long crossbars. The trestles, made in the shape of a Roman figure II, are very strong, and will not be damaged if they are knocked over on to the floor. If a shelf is called for it will be easy to find room for one somewhere on the crossbars.

The solid proportions of the bench table suit the modern home, where the furniture has to put up with being used for a bit of everything.



Materials	Planned pine planks $\frac{7}{8}$ " (22 mm) and $1\frac{1}{8}$ " (28 mm) thick are used for the table shown in the illustration, but if you need a larger one the dimensions can be stepped up to $1\frac{1}{8}$ " (28 mm) and $1\frac{1}{4}$ " (32 mm).	
Base	Trestles	4 pcs. $\frac{7}{8}$ " $\times$ $2\frac{3}{4}$ " $\times$ $11\frac{7}{8}$ " (22 $\times$ 70 $\times$ 300 mm) 4 pcs. $1\frac{1}{8}$ " $\times$ 2" $\times$ $19\frac{1}{2}$ " (28 $\times$ 50 $\times$ 500 mm)
	Crossbars	2 pcs. $\frac{7}{8}$ " $\times$ $2\frac{3}{4}$ " $\times$ $45\frac{1}{2}$ " (22 $\times$ 70 $\times$ 1160 mm)
	Top	for example 6 pcs. $\frac{7}{8}$ " $\times$ $3\frac{3}{4}$ " $\times$ 59" (22 $\times$ 95 $\times$ 1500 mm) or 1 piece chipboard $\frac{3}{4}$ " $\times$ $21\frac{1}{2}$ " $\times$ 59" (19 $\times$ 550 $\times$ 1500 mm) + a little extra + wood strip edging and veneer
Misc.	Joining pieces	6 ea. iron braces, with groove across.
	Bolts	4 ea. machine bolts $\frac{5}{16}$ " $\times$ 4" (8 $\times$ 100 mm) with washers and preferably four-sided nuts
	Screws	1" No. 8, flat and round-headed for the iron
	Dowels	$\frac{3}{8}$ " $\times$ 2" (10 $\times$ 50 mm)

Procedure

Base Cut out the wood for the trestles and crossbars and drill holes for the dowels. Next bore holes in the side of the crossbars for the nuts on the assembly bolts, and for the bolts themselves in the upright members of the trestles and in the end surfaces of the crossbars, right down through the holes for the nuts.

Glue the dowels in the end of the crossbars and make a trial assembly of the base, after which the individual pieces can be sanded and finished, possibly with matt lacquer. (Do not use lacquer on the glued surfaces.)

Glue and clamp the trestles together, ensuring that they are square and checking for crookedness. Then cut out three grooves in each top member for the iron brackets, which must be screwed on so that they turn out towards the ends of the table.

Top The table-top is now joined up, squared and sanded. (If you have no means of fixing such a large piece together you should ask a professional for help; he may also machine-plane the joined board.)

BENCH TABLE
SEEN IN PROJECTION

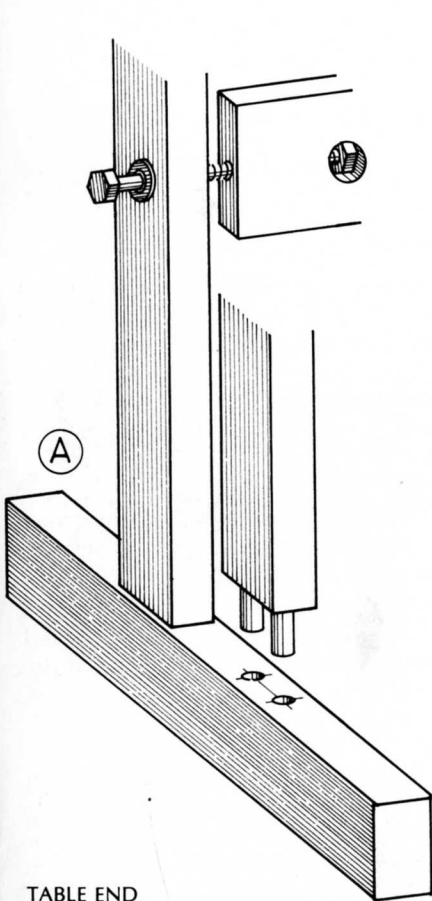
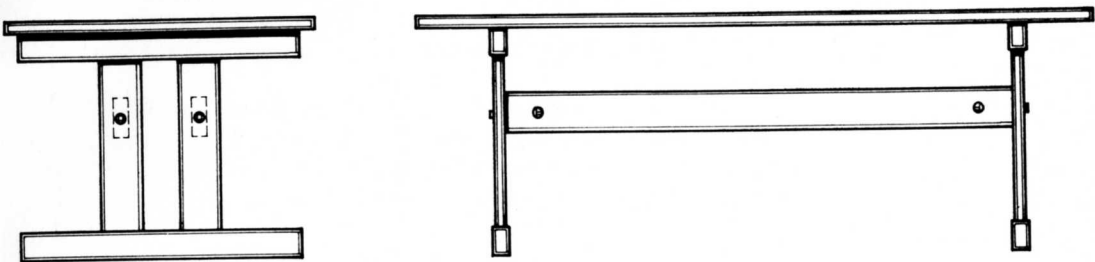
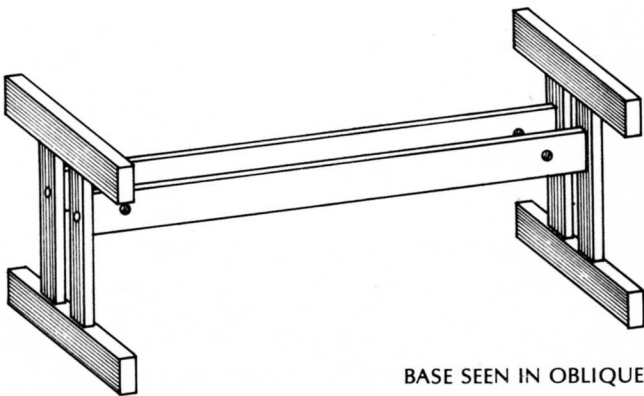
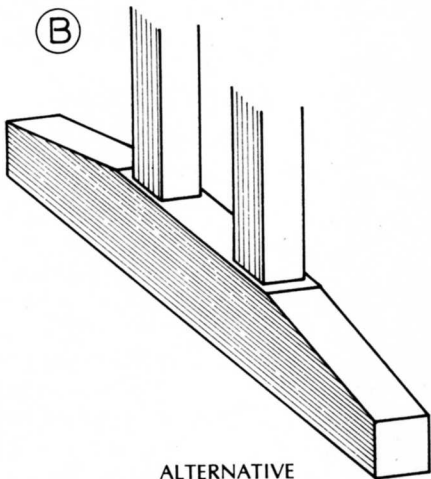


TABLE END



BASE SEEN IN OBLIQUE



ALTERNATIVE

Assembly The base is fixed together with the bolts; the nuts must be held with pliers until they are screwed on in their holes. It will make the mounting easier if the bolts are tapered slightly, so that they pick up the nuts more easily. If the frame is crooked it can be adjusted in position, one bolt in each crossbar being loosened.

Lay the table-top upside down, fit the frame in place, check right angles and measurements, and screw on the top with round-headed screws through the grooves of the iron brackets. The screws must be fitted so that the top can easily work out and in without splitting.

Desk

Description The amateur carpenter has always hesitated to undertake the making of a traditional chair, dining table, or desk. The supposedly complicated drawer construction and corner joints threaten enough difficulties to discourage beginners.

Instructions are given here for a table type that can be made relatively simply and yet is light and solid.

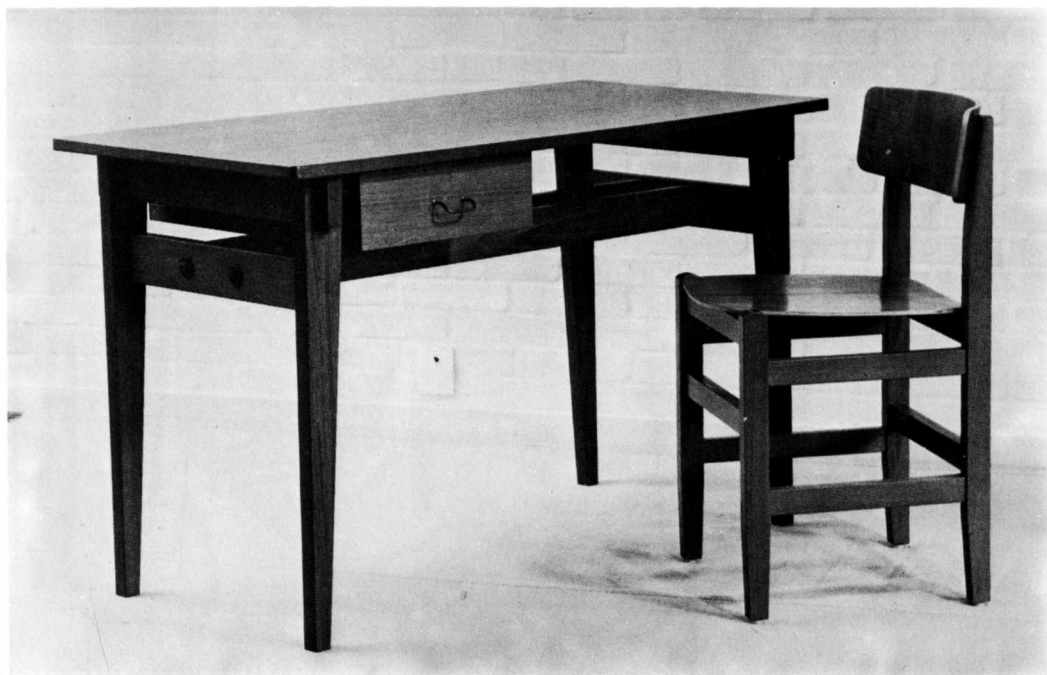
The frame is built of two trestles which are assembled using the strong mortise and tenon joint and are joined by two center rails and crossbars. The drawer is directly under the desk top. On the outside of the drawer an invisible runner glides in a supporting track screwed beneath the desk top. The long crossbars of the table which hold the trestles firm are placed just under the drawer, and are as close as possible to the center of the table to avoid contact with the knees. They are joined to the trestles with bolts so the frame can be dismantled.

The drawer is assembled around a plywood bottom which fits into grooves on all four sides. The four sides are glued together in lap joints at front and back, and the assembly is strengthened by a row of dowels. The desk is chipboard edged with wood strips, and veneered. The top is then screwed to the top crossbars of the trestles using four iron brackets.

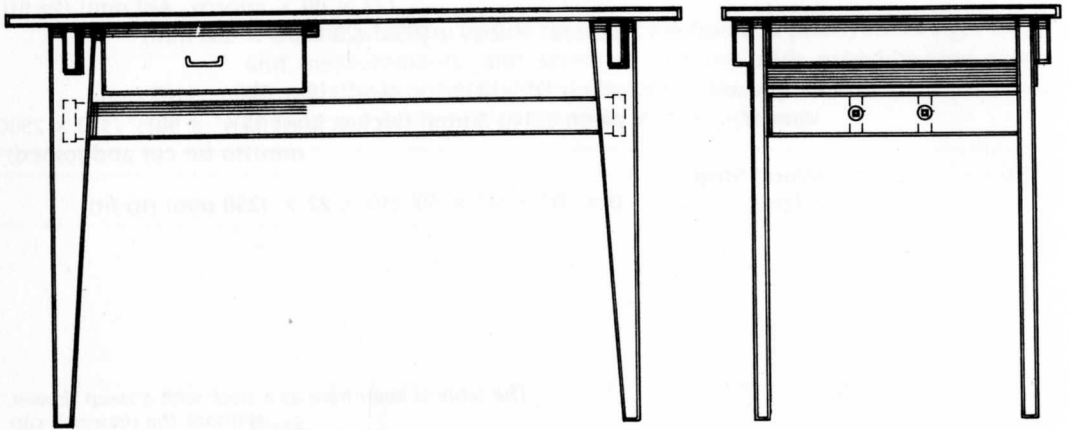
Materials

Base	Legs	2 pcs. $1\frac{1}{4}" \times 5" \times 28\frac{3}{8}"$ (28 × 125 × 720 mm) (divide diagonally)
	Rails	2 pcs. $1\frac{1}{4}" \times 3\frac{1}{8}" \times 22"$ (28 × 80 × 560 mm)
	Crossbars	2 pcs. $\frac{7}{8}" \times 3\frac{1}{8}" \times \text{approx. } 17\frac{1}{4}"$ (22 × 80 × approx. 440 mm) (to fit)
		2 pcs. $\frac{7}{8}" \times 2\frac{3}{4}" \times 37\frac{3}{4}"$ (22 × 70 × 960 mm)
Top	Chipboard	1 piece $\frac{3}{4}" \times 22\frac{3}{4}" \times 46\frac{1}{2}"$ (19 × 580 × 1180 mm)
	Veneer	1 piece $\frac{1}{50}"$ (0.5 mm) thick at least $13\frac{3}{4}" \times 98\frac{1}{2}"$ (350 × 2500 mm) (to be cut and joined)
	Wood Strip Edging	3 pcs. $\frac{3}{8}" \times \frac{7}{8}" \times 50"$ (10 × 22 × 1250 mm) (to fit)

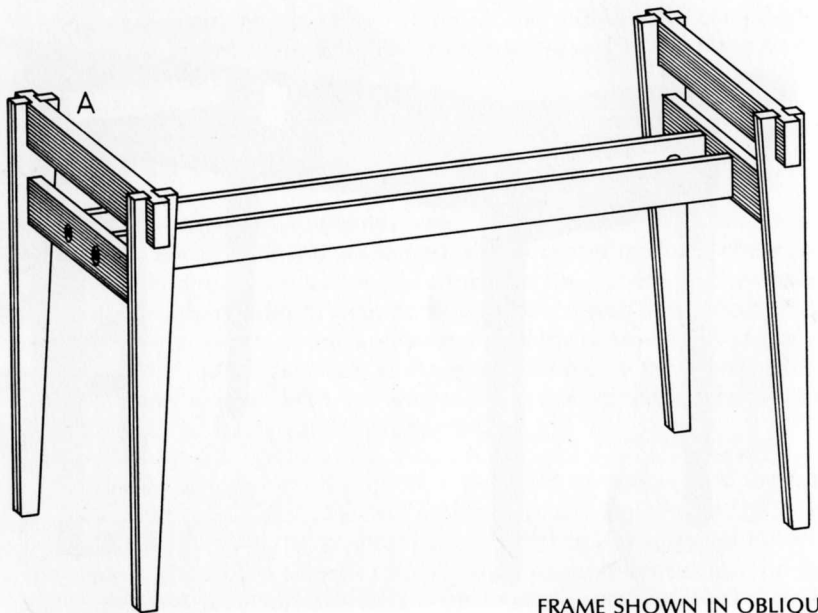
*The table is seen here as a desk with a deep drawer.
Without the drawer it can
be used as a dining table for four.*



DESK

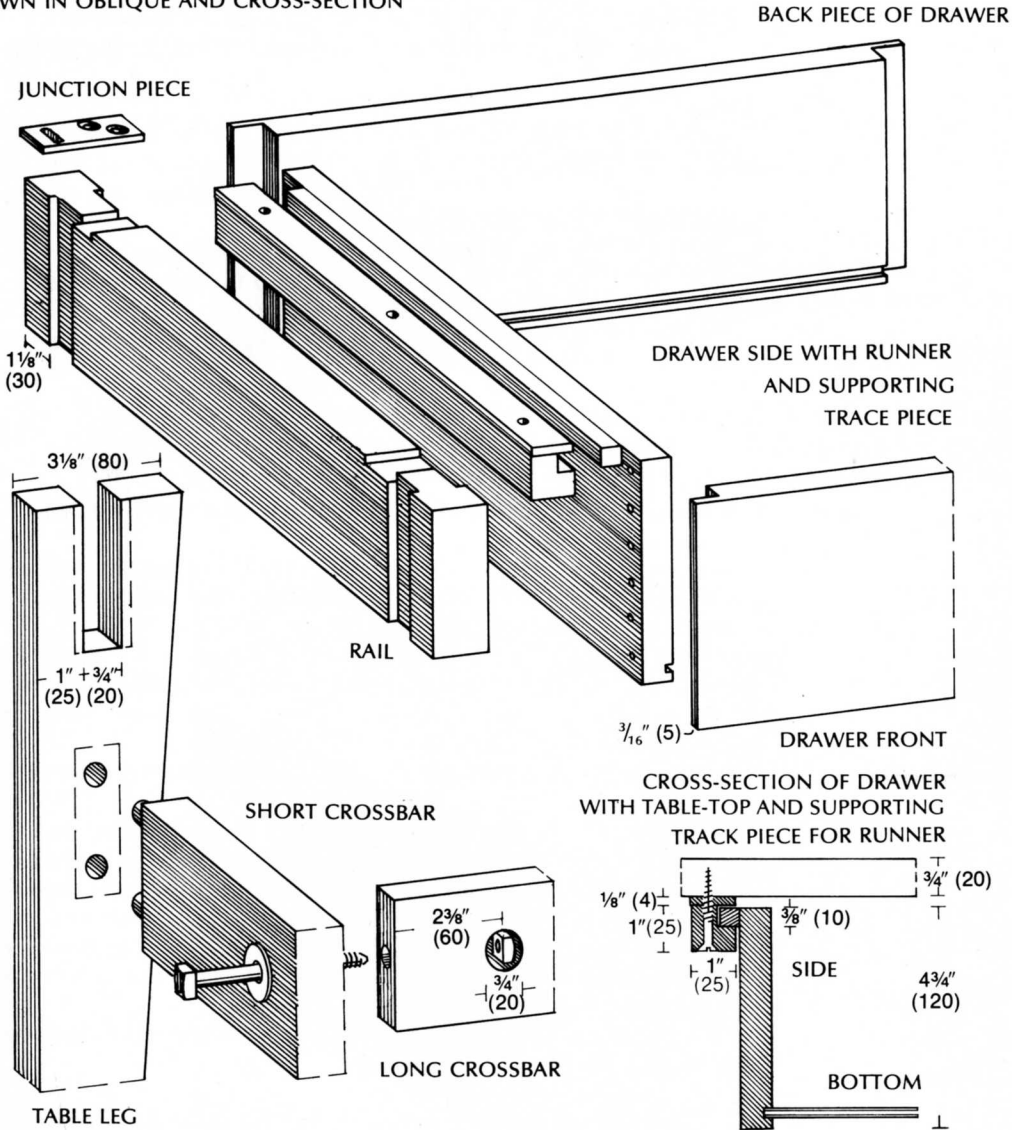


SHOWN IN PROJECTION



FRAME SHOWN IN OBLIQUE

TABLE CORNER A WITH DRAWER – SEPARATED
SHOWN IN OBLIQUE AND CROSS-SECTION



<i>Drawer</i>	Sides	2 pcs. $\frac{5}{8}$ " $\times$ $4\frac{3}{4}$ " $\times$ 20" (16 $\times$ 120 $\times$ 510 mm)
	Front & back	2 pcs. $\frac{7}{8}$ " $\times$ $4\frac{3}{4}$ " $\times$ 14" (22 $\times$ 120 $\times$ 360 mm)
	Bottom	1 piece $\frac{3}{16}$ " (4 mm) plywood 14" $\times$ 19 $\frac{3}{4}$ " (360 $\times$ 500 mm)
	Runner	2 pcs. $\frac{1}{2}$ " $\times$ $\frac{1}{2}$ " $\times$ 17 $\frac{3}{4}$ " (12 $\times$ 12 $\times$ 450 mm)
	Supporting-track	2 pcs. $\frac{7}{8}$ " $\times$ $\frac{7}{8}$ " $\times$ 17 $\frac{3}{4}$ " (22 $\times$ 22 $\times$ 450 mm) 2 pcs. $\frac{3}{16}$ " (4 mm) plywood, 1" $\times$ 17 $\frac{3}{4}$ " (24 $\times$ 450 mm)
<i>Misc.</i>	Junction Pieces	4 pcs. $\frac{3}{16}$ " (8 mm) plywood, 1 $\frac{1}{4}$ " $\times$ 3 $\frac{1}{8}$ " (30 $\times$ 80 mm)
	Bolts	4 ea. $\frac{3}{16}$ " $\times$ 4" (8 $\times$ 100 mm) with 1" (25 mm) or 1 $\frac{1}{4}$ " (30 mm) metal washers and square nuts
	Drawer-pull	1 ea. 2 $\frac{3}{8}$ " (60 mm) brass
	Screws	1" No. 8, flat-headed for junction pieces $\frac{3}{4}$ " or 1" No. 8, round-headed for junction pieces
	Dowels	1 $\frac{1}{4}$ " No. 6, flat-headed for tracks $\frac{3}{8}$ " $\times$ 2" (10 $\times$ 50 mm) for base and $\frac{1}{4}$ " (5 mm) for drawer assembly

Procedure

Base

Cut pieces for legs, rails, and long crossbars. Form legs by dividing wood on the diagonal, lengthwise.

Form mortise and tenon joints in legs and rails and make a trial assembly. Cut the short crossbars so that their length corresponds to the distance between the end legs of the desk.

Then bore holes in the long and short crossbars for the bolts and nuts. (In the long crossbars bore holes from the inside to the desired depth.) In addition bore holes for dowels in the short crossbars and legs.

Now make another trial assembly of the whole frame, then sand and finish the pieces.

Assemble trestles: glue the dowels of the short crossbars to the legs and press the cross members down into the prepared leg mortises. (The mortise and tenon joint can be held with a pair of short C-clamps while a long clamp can hold the joint of the leg and lower crossbars together.) Square, and check for perpendiculars. Possible errors can be corrected by clamping trestle on a level surface and twisting the piece in the opposite direction of the error with the help of a wedge.

Make junction pieces and screw them into pre-cut notches in the upper edge of short trestle rail pieces.

Desk-Top

Square and cut desk-top to the proper size. Glue wood strips on smoothed desk edges. Smooth desk-top wood and veneer it. The surface may then be sanded and finished.

Desk Assembly Join the long crossbars to the trestle using bolts (Hold nut in pre-bored hole with a pair of pincers until bolt is joined firmly to it.)

Lay desk-top right side down and position frame on it. Screw one trestle fast, making sure legs are at right angles to desk-top. It may be possible to correct slight errors by shifting the other trestle in or out before it also is very firmly attached to the top.

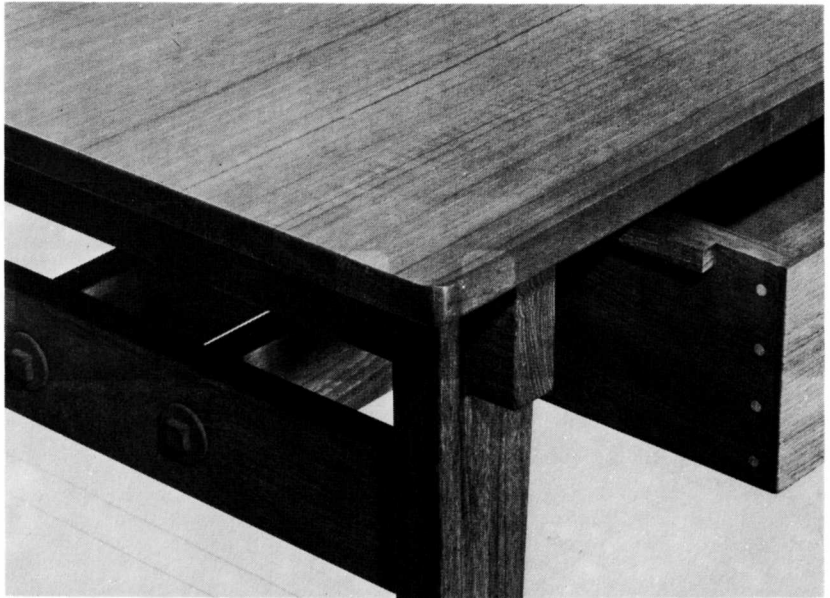
Drawer Cut and square side and end pieces. Make rabbet groove in the end pieces slightly wider than the depth of the sides (use a supporting block of wood). Then make a groove along the bottom of all inner sides to take the plywood bottom.

Make trial drawer assembly. Sand inner surfaces and bottom, and finish wood. Glue drawer together. Strengthen corner joints by boring a row of holes for $\frac{3}{16}$ " (5 mm) dowels which are hammered in with glue.

Sand exterior sides and edges. Make runners and glue in place. The exterior of the drawer is now ready to finish.

Make supporting track pieces so they will fit runners. Bore holes for assembly screws.

Place desk-top with legs up and position the drawer. Drawer track pieces are placed above runners and are screwed on to the under surface of the desk-top so the drawer can be pulled in or out from either direction.



The bolts for the end section of the table and the bearing strip for the drawer.

Rubber bumpers or wood blocks can also be attached at the end of the runners as a backstop for the drawer.

The drawer will pull more easily if a thin piece of plywood is placed between the supporting track pieces and the desk-top for then the drawer front and back will not come in contact with the desk-top.

Table – Original Danish Design

Description This table meets the same need as the desk but is substantially easier to make, since the difficult mortise and tenon joints are replaced by dowels. It is made on the same principle as the bench table (p. 63), with II-shaped trestles held together by two closely positioned crossbars, which are bolted to the trestles so that the table can be dismantled.

The positioning of the crossbars depends on what the table is to be used for and how big it is to be. If it is to have a drawer, as for example the one shown under the desk, the crossbars must again be placed right under the drawer so that they are in the way of the knees as little as possible. If a drawer is not called for the crossbars can be moved right up, as shown in the drawing; but if the table is wide enough for them not to get in the way of the knees, then it will be more stable if they are fitted about a third of the way down the trestles. The length of the crossbars, which is the same as the distance between the trestles, must also be carefully considered in relation to the number of chairs you intend to put round the table.

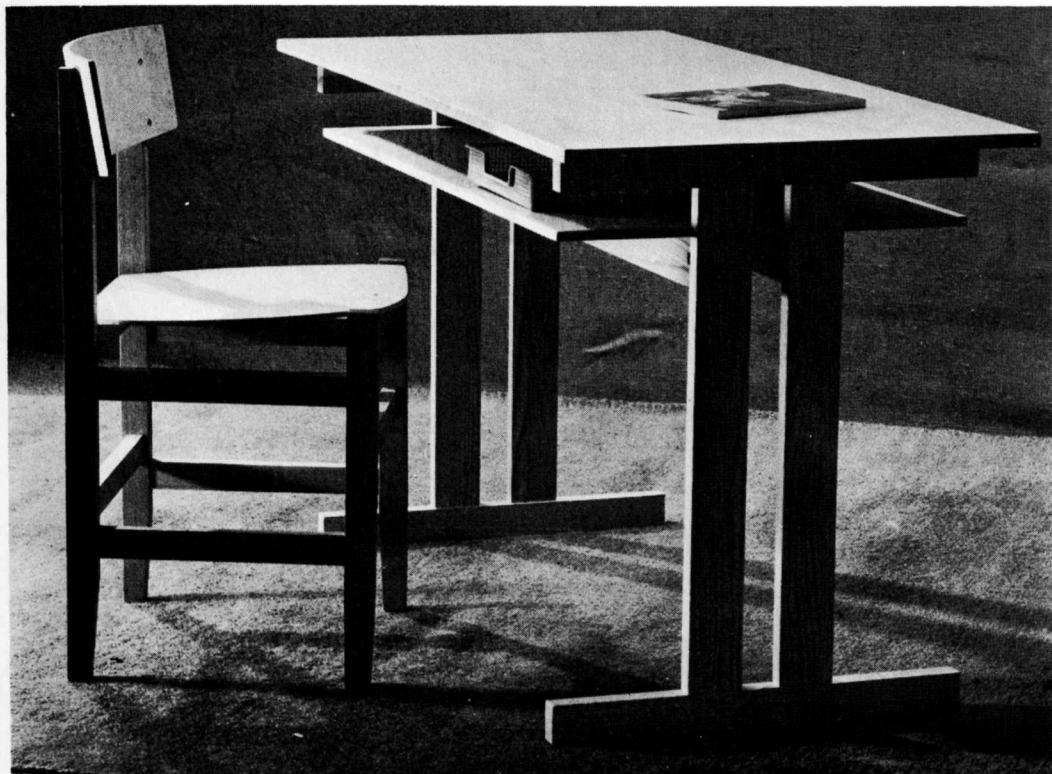
If a lot of room is required for laying things down, or if a drawer is not thought necessary or is too difficult a task, a shelf, larger or smaller, can be fitted on the crossbars. On the drawing (B), the shelf is the same length as the crossbars and the same width as the trestles. The wood strip edging is broken off where it meets the trestles, so that the shelf looks 'natural'. It can have a low check-strip at the back, and if furnished with a number of office trays it can take the place of a whole system of drawers.

The table can be lengthened by a leaf screwed on to a pair of runners, which slide in grooves in the upper members of the trestles. See drawing (C) on p. 75.

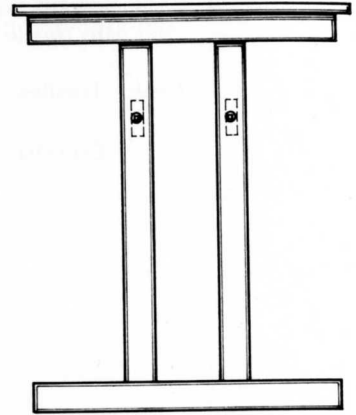
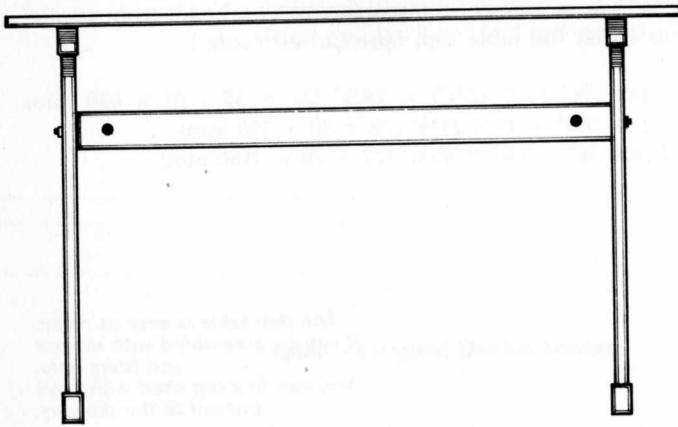
Materials The example given here is the smallest acceptable measurement for a table with room for four people. If the dimensions of the top are altered, the trestles – and possibly also the long crossbars – must be altered in proportion, and of course it may be necessary to fit a beam from trestle to trestle right up under the table top. (See *Coffee Table*.)

Base	Trestles	4 pcs. $\frac{7}{8}$ " $\times$ 2" ($2\frac{3}{4}$ ") $\times$ $24\frac{1}{2}$ " (22×50 [70] $\times$ 620 mm)
		4 pcs. $1\frac{1}{8}$ " $\times$ 2" $\times$ $21\frac{1}{2}$ " ($28 \times 50 \times 550$ mm)
	Crossbars	2 pcs. $\frac{7}{8}$ " $\times$ $2\frac{3}{4}$ " $\times$ $45\frac{1}{2}$ " ($22 \times 70 \times 1160$ mm)

*The den table is easy to make.
It can be assembled with dowels
and bolts only.
You can fit a big shelf with trays
instead of the drawers.*

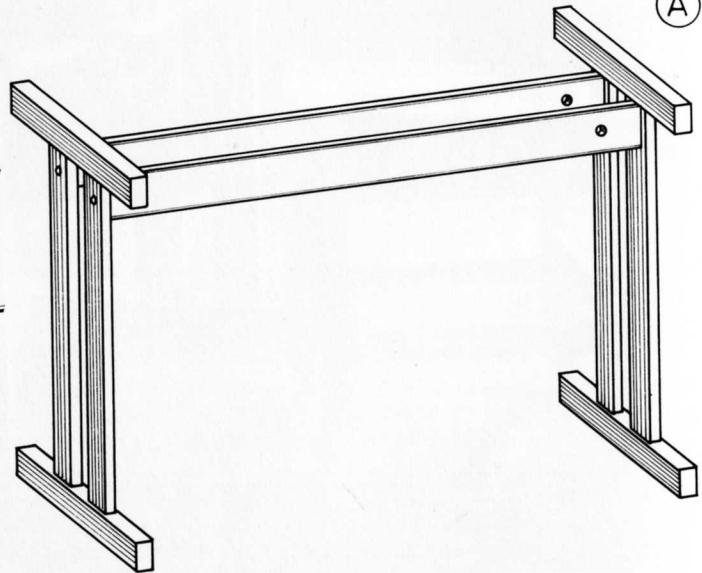
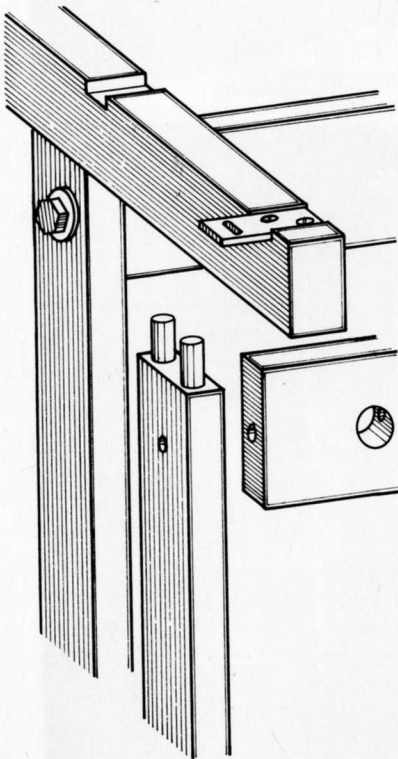


DEN TABLE



SEEN IN PROJECTION

AND IN OBLIQUE WITH DETAILS OF ASSEMBLY
AND WITH CROSSBARS FITTED IN THE HIGHEST
POSITION



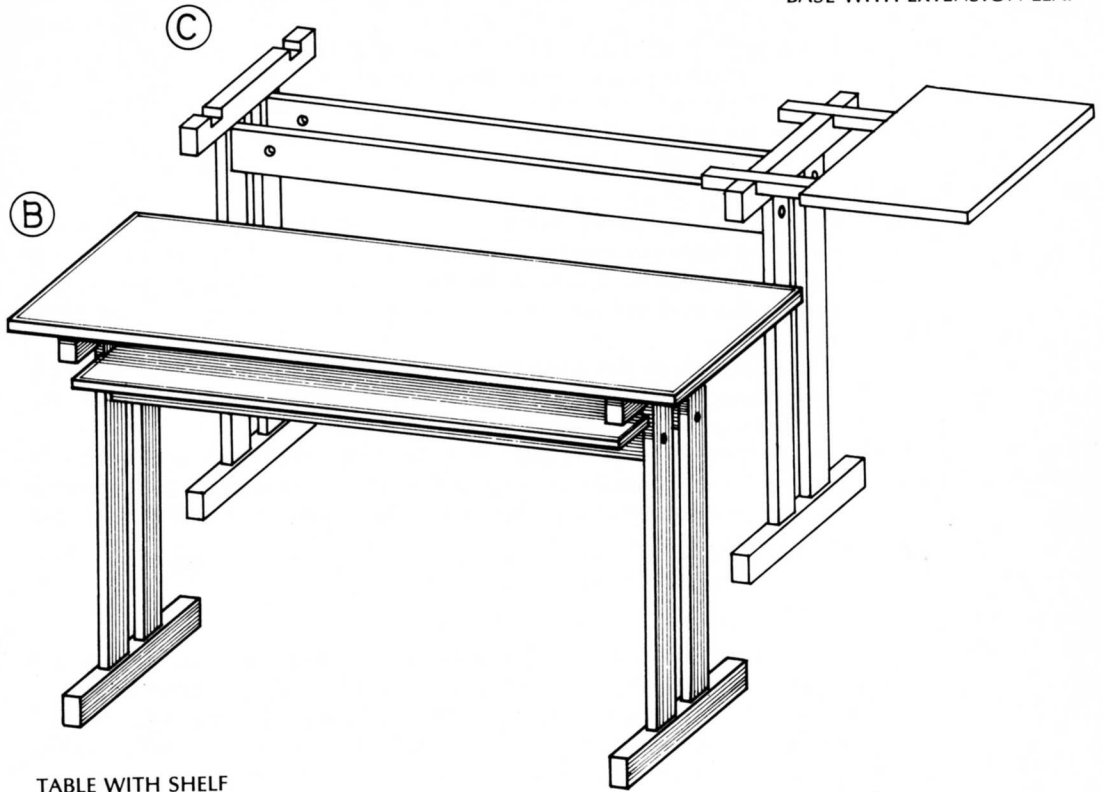


TABLE WITH SHELF

<i>Top</i>	(say)	6-7 pcs. $\frac{7}{8}$ " $\times$ $3\frac{3}{4}$ " $\times$ $47\frac{1}{8}$ " (22 $\times$ 95 $\times$ 1200 mm)
		+ a little extra
	or	1 piece chipboard $\frac{3}{4}$ " $\times$ $22\frac{7}{8}$ " $\times$ $46\frac{1}{2}$ " (19 $\times$ 580 $\times$ 1180 mm) + edging strip and veneer
<i>Misc.</i>	Joining pieces	4-6 iron, with groove across
	Bolts	4 ea. machine bolts $\frac{5}{16}$ " $\times$ 4" (8 $\times$ 100 mm) with washers, and preferably four-sided nuts
	Screws	1" No. 8, flat-headed and $\frac{3}{4}$ " No. 8, round-headed for the joining pieces
	Dowels	$\frac{3}{8}$ " $\times$ 2" (10 $\times$ 50 mm)
<i>Shelf</i>	Same materials as for the top, but thinner	

<i>Extension</i>	Same materials, thickness and width as table top, say 11 $\frac{3}{4}$ " (300 mm) long
<i>Runners</i>	2 pcs. $\frac{7}{8}$ " $\times$ 1 $\frac{3}{4}$ " $\times$ about 19 $\frac{1}{2}$ " (22 $\times$ 44 $\times$ about 500 mm)

Procedure

Base

Make the pieces for the trestles and crossbars and drill holes for dowels. Next drill holes in the sides of the crossbars for the nuts on the assembly bolts, and holes for the bolts themselves in the uprights of the trestles and in the end surfaces of the crossbars, right through to the holes for the nuts.

Glue dowels in the ends of the crossbars and make a trial assembly of the base, after which the individual parts can be sanded and finished. (Do not use varnish or oil on glued surfaces.)

Glue the trestles and clamp them together, check for perpendiculars and for crookedness. Then cut grooves in the top members of the trestles for the junction pieces, which are screwed on so that they turn out towards the ends of the table.

Top

If the table-top is made of planks, glue them together, then square and sand them. (If you cannot take on so large a job, an expert may help both with joining the planks and with planing the table-top.) If the top is chip-board, square the edges, fit the strip edging and veneer. If a shelf is wanted it can be made in the same way, but will have to fit both the trestles and the crossbars.

Assembly

The base is clamped together with bolts; the nuts will have to be held with pliers until they are taken up in their holes. (The bolts can be tapered, so that they pick up the nuts more easily.) If the frame is crooked it can be straightened in position, one bolt in each crossbar being loosened.

Lay the table-top upside down. Fit the base in position, check perpendiculars and measurements, and screw the top on with round-headed screws through the grooves in the brackets. If the top is made of planks the screws must be inserted so that it can work without splitting.

BOOKSHELVES AND BOOKCASES – GENERAL POINTS

As living space gradually becomes smaller and the number of pieces of furniture is consequently reduced, many things are placed on shelves, to be displayed with books. Even the record player, radio and television are found there. In making these shelves four primary factors are to be considered: *thickness and length and the width and space in between.*

Thickness and Length The thickness of the shelf and its unsupported length will depend upon each other. If they are to be used mainly for books, use the following measurements as a guide for pine shelves.

Thickness $\frac{5}{8}$ " (16 mm) – maximum length 24" (600 mm)

Thickness $\frac{7}{8}$ " (22 mm) – maximum length 36" (900 mm)

If they are made of hardwood, or if they are to be used either for particularly light or very heavy things, subtract or add to the length depending on the situation. It is also an advantage in the construction to be able to turn a shelf over in order to straighten a warped board.

Width and Spacing of Shelves There is a certain relationship between the length and width of a shelf just as there is between its width and the distance shelves should be placed apart. An allowance should be made for the shelf to extend beyond the back of the books, and enough free space must be allowed between each shelf so that books may easily be removed. Using standard size lumber the adjustability of the shelves should be placed at 1"-2" (25-50 mm) increments. These standard shelf measurements can be used as a guide. The figures in brackets give the width of timber used.

Average fiction and school textbooks

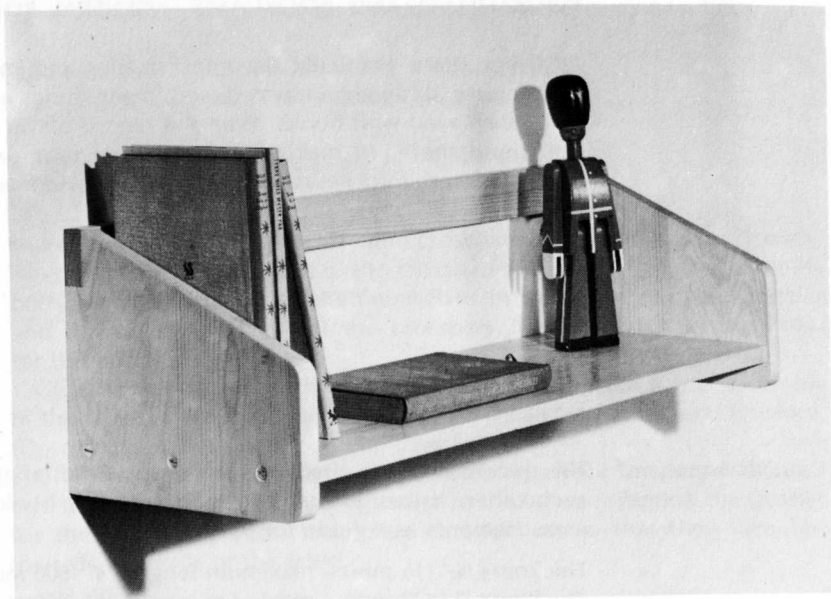
$\frac{1}{50}$ " $\times$ $3\frac{3}{4}$ " (0.5 $\times$ 95 mm) (10") (250 mm)

Non-fiction and reference books

$\frac{1}{50}$ " $\times$ $4\frac{3}{4}$ " (0.5 $\times$ 120 mm) (12") (300 mm)

Magazines and art books $4\frac{3}{4}$ " $\times$ $5\frac{7}{8}$ " (120 $\times$ 150 mm) (14") (350 mm)

Records and radio $\frac{1}{8}$ " $\times$ $4\frac{3}{4}$ " (3 $\times$ 120 mm) (14") (350 mm)



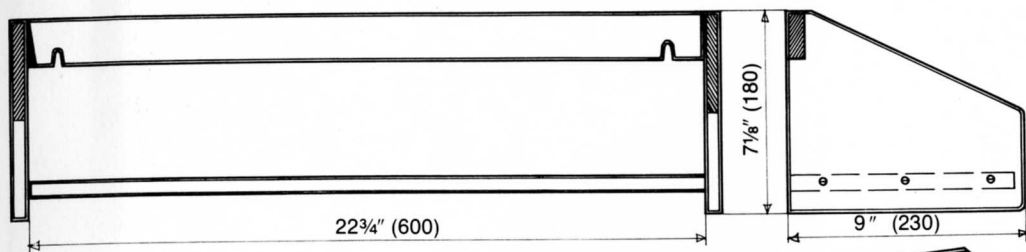
A small pine bookshelf for a child's room, or for bedside books in adults' bedrooms.

Simple Bookshelves

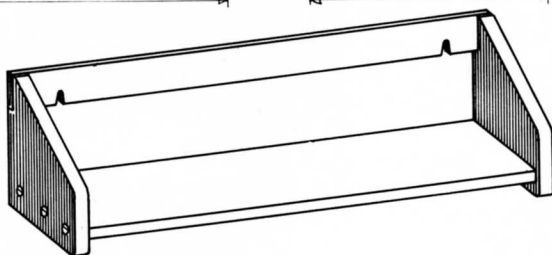
Description Here are directions for a small bookshelf which is easy to make. It is assembled with screws and can be hung on a supporting wooden bar. Several may be made and arranged on wooden strips attached to a strong wall, to form a unit. The bookshelves can be screwed to the wooden strips before being attached to the wall as shown in A on p. 79. They can also, as shown in diagram B, be hung loose on strips which have already been screwed firmly to the wall. In this manner the shelves are very simply and easily moved up or down.

Materials These dimensions are finished measurements with no extra waste. The sizes of the raw material should allow an excess for correcting saw cuts and a little leeway for gluing together.

BOOKSHELF

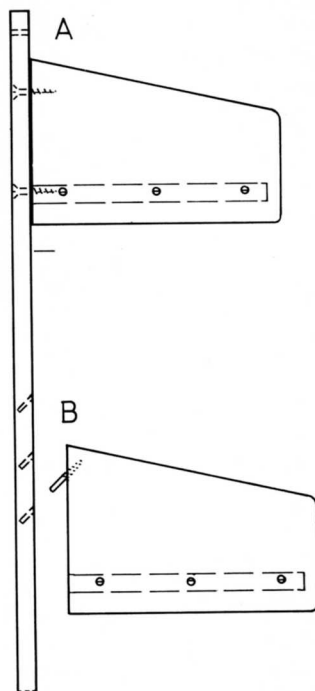
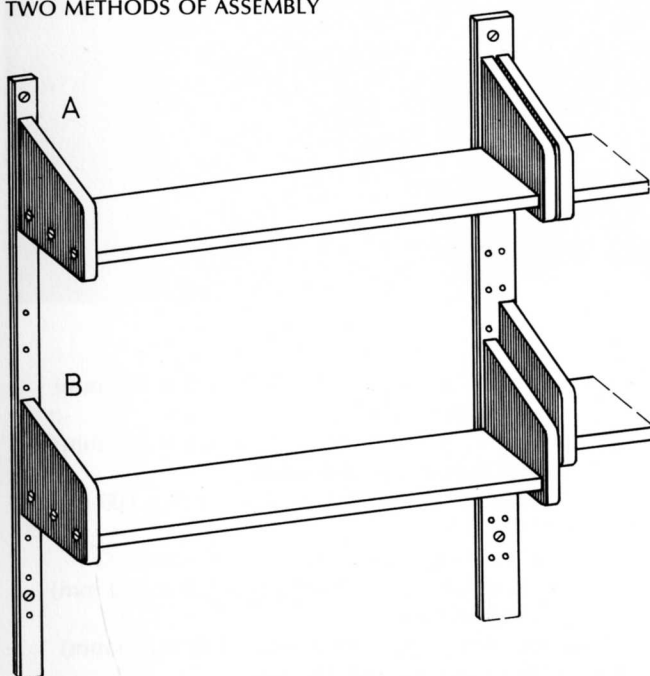


SINGLE FREE-HANGING BOOKSHELF

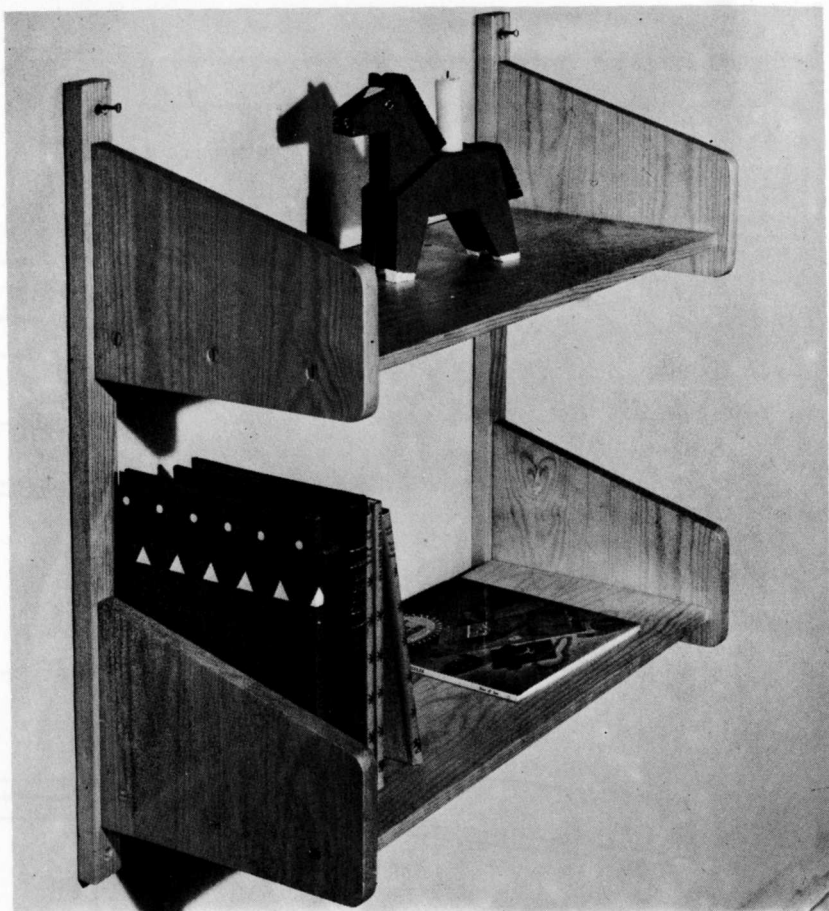


MULTIPLE SHELVES

TWO METHODS OF ASSEMBLY



The bookshelf can be extended to form a unit.



Single Shelf Bookshelf

2 ends

Wall bar support

2 pcs. $\frac{5}{8}$ " $\times$ $4\frac{3}{4}$ " $\times$ $22\frac{3}{4}$ " (16 $\times$ 120 $\times$ 600 mm)
(glued together)
2 pcs. $\frac{5}{8}$ " $\times$ $4\frac{3}{4}$ " $\times$ $11\frac{1}{2}$ " (16 $\times$ 120 $\times$ 300 mm)
(glued together and divided)
1 piece $\frac{5}{8}$ " $\times$ $4\frac{3}{4}$ " $\times$ $22\frac{3}{4}$ " (16 $\times$ 120 $\times$ 600 mm)
(to fit)

Multiple Shelves Bookshelf

2 ends

2 pcs. $\frac{5}{8}$ " $\times$ $4\frac{3}{4}$ " $\times$ $22\frac{3}{4}$ " (16 $\times$ 120 $\times$ 600 mm)
(glued together)
2 pcs. $\frac{5}{8}$ " $\times$ $4\frac{3}{4}$ " $\times$ $11\frac{1}{2}$ " (16 $\times$ 120 $\times$ 300 mm)
(glued together and divided)

Wall strip, single	1 piece $\frac{5}{8}$ " $\times$ $1\frac{1}{4}$ " (16 $\times$ 30 mm) $\times$ required length
Wall strip, double	1 piece $\frac{5}{8}$ " $\times$ $1\frac{3}{8}$ " (16 $\times$ 44 mm) $\times$ required length

Screws for assembly of:

Sides to shelves: $1\frac{1}{2}$ " No. 6, flat-headed brass
 Sides to wall bar: 1" No. 5 flat-headed (smaller)
 Sides to wall strips A: $1\frac{1}{2}$ " No. 6, flat-headed
 Sides to wall strips B: $1\frac{3}{4}$ " No. 10

Procedure
Single Shelf

Glue together the materials for the shelf and ends, cut and shape. Then divide them across, and cut the separate pieces to the given measurements. (The materials for the sides should be used with the grain vertical.) Make the wall support bar, cut out to fit the back side of the ends, and drill holes for the assembly screws.

Make a trial assembly, sand and finish, and screw together.

Multiple Shelves

The support bar is replaced here by wall strips in which holes are drilled at suitable intervals for screwing to the wall. Holes must also be drilled for fitting the end pieces.

If the shelves are to be permanently fixed into place screw them to the wall strips before these are installed on the wall.

Loose shelves, which can be moved up or down, are fitted with screws with the heads sawn off. Screw them into the back of the end pieces at an angle of 45° . Receiving holes are drilled in the wall strips about 2" (50 mm) apart.

Bookcases

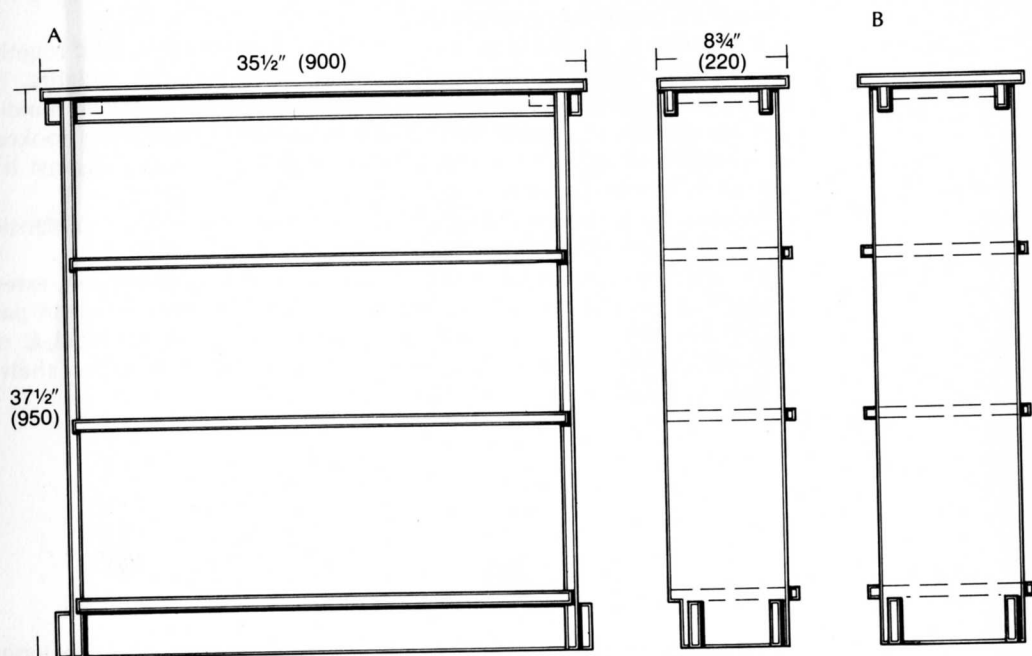
Description

Woodworking teachers hesitate to start a project of making bookcases even with advanced students. This is partly because a bookcase consumes a lot of expensive material and partly because its assembly, since it must be steady and strong, is usually complicated and demands a good deal of class time.



An untraditional bookcase which is cheap to make

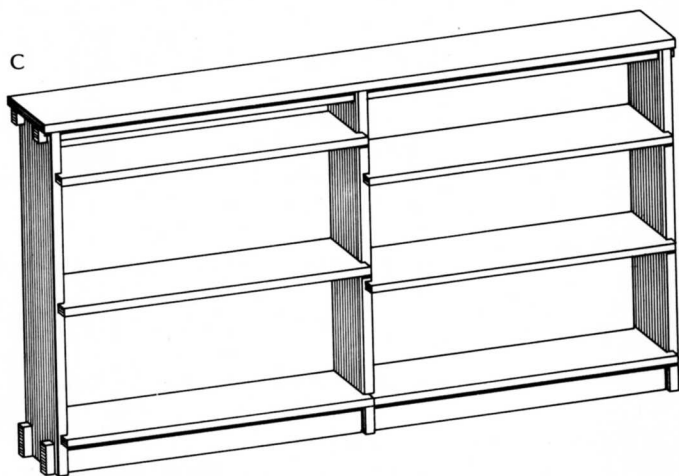
BOOKCASE



A – WALL BOOKCASE

B – FREE-STANDING
BOOKCASE

C – EXTENDED BOOKCASE



Here these problems are avoided by using a completely untraditional construction which is actually sturdier and far less time consuming than customary construction methods.

Bookcases A, B, and C are built with large side uprights, held together by two top rails and two base pieces mortised into the uprights. The base pieces can be indented to accommodate the depth of the molding trim usually found around the wallbase of the room. When the bookcase is then placed against the wall its shelves will fit securely against it as shown in Model A (p. 83).

Model B can be free-standing and used from either side. C is an extension of either A or B. The center piece is identical to the uprights.

The shelves, in order to correspond to the mortise construction, extend across the upright and rest on standard metal shelf braces set in pairs of parallel holes. A small drill bit is used for this. On Model C the outside length of the shelves must not be so great that two shelves cannot be fitted at the same height.

Materials Finished measurements are given for all models with no extra length from cleaning up after glueing together!

<i>Model A (examples)</i>	2 end pieces, each	$\frac{7}{8}'' \times 3\frac{3}{4}'' \times 36''$ (22 × 95 × 930 mm) + $\frac{7}{8}'' \times 4\frac{3}{4}'' \times 36''$ (22 × 120 × 930 mm) (glued together)
	Shelves, each	$\frac{7}{8}'' \times 4\frac{3}{4}'' \times 32''$ (22 × 120 × 820 mm), top shelf 35½'' (900 mm)
	2 top members, each	$\frac{7}{8}'' \times 1\frac{1}{2}'' \times 34\frac{1}{2}''$ (22 × 40 × 880 mm) (glued together)
	2 base members, each	$\frac{7}{8}'' \times 3'' \times 34\frac{1}{2}''$ (22 × 80 × 880 mm)
<i>Model B</i>	2 end pieces, each	2 pcs. $\frac{7}{8}'' \times 4\frac{3}{4}'' \times 36\frac{1}{2}''$ (22 × 120 × 930 mm) (glued together)
	Shelves, each	2 pcs. $\frac{7}{8}'' \times 6'' \times 32''$ (22 × 150 × 820 mm), top shelf 35½'' (900 mm) (glued together)
	Top and base members as for Model A	
<i>For all models</i>	Shelf brackets	
	Screws	1½'' No. 6, flat-headed

A

85/8" (220)

1 5/8" (40)

1 5/8" (40)

77/8" (200)

3 1/8" (80)

— $\frac{3}{4}$ " (20) | $\frac{5}{8}$ " (15) — $\frac{5}{8}$ " (15)

3 1/8" (80)

—| 7/8" |—
(22)

7/8" (22)

7/8"
21
3/4"
(20)

This diagram illustrates the exploded view of a mechanical assembly. It consists of several main components: a large rectangular top plate at the top; a central frame structure featuring a vertical rail with multiple horizontal slots and a horizontal rail; and two side rails positioned on either side of the central frame. The components are shown in an exploded state to demonstrate their relative positions and how they fit together. Dashed lines are used to indicate the alignment and assembly path of the parts.

OBLIQUE

PROJECTION

Procedure Sort out the separate pieces and glue together to the desired widths. (Use the nicest pieces of wood for top shelf and sides.) Form the top rails and base pieces.

Make mortise and tenon joints. (See introduction and remember that rails and bases project beyond the side uprights by a little less than the thickness of the upright.)

Bore holes for shelf braces. Make trial assembly of the bookcase. The short interior shelves should fit snugly between the uprights. Separate all parts and sand the surfaces. Finish wood. Insert the shelf brace hardware into the holes in the uprights and assemble bookcase.

Strengthen top shelf on the underside with blocks which will hold it tightly in place between the uprights.

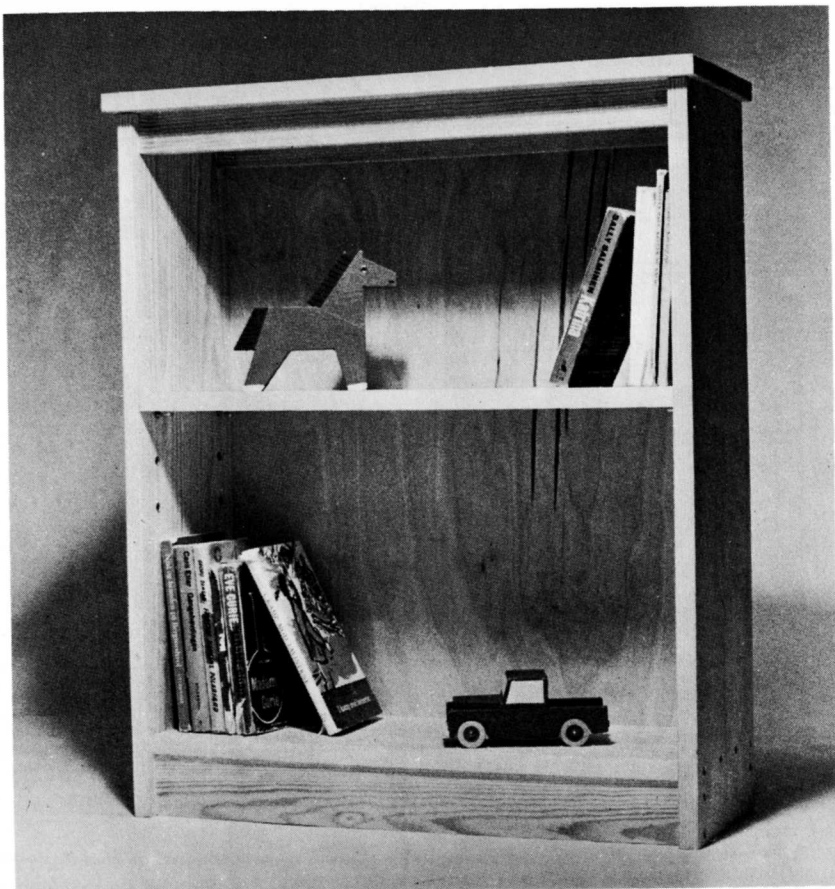
Junior Bookcase

Description This bookcase can be made without joints of any kind, being assembled with strong glue and screws. Even though it is of simple construction, it is solid, practical, and good looking.

It consists of a top fitted with two rails glued underneath along the front and back, and a bottom shelf attached with glue to two boards, so as to form the base. The sides are screwed and glued to the top and bottom. A piece of plywood is used for the back, fastened to the top behind the rail. It is fitted into grooves cut in the sides, and the bottom edge is screwed into the rear edge of the bottom shelf. The interior shelves rest on metal shelf supports.

Measurements are not specified in the drawings but there is basic information about this in the practical advice introducing this section.

*An untraditional bookcase
which is cheap to make.*



Materials

Bottom and shelves Make these all the same length and width.

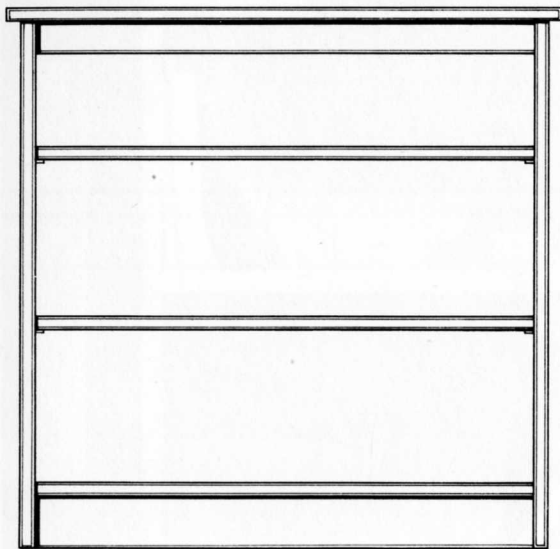
Base and top rails All same length.

Sides Cut a little wider than the base. The front edge must project a little beyond the shelves. Allow space for cutting a groove across bottom shelf and up both sides to hold plywood backing.

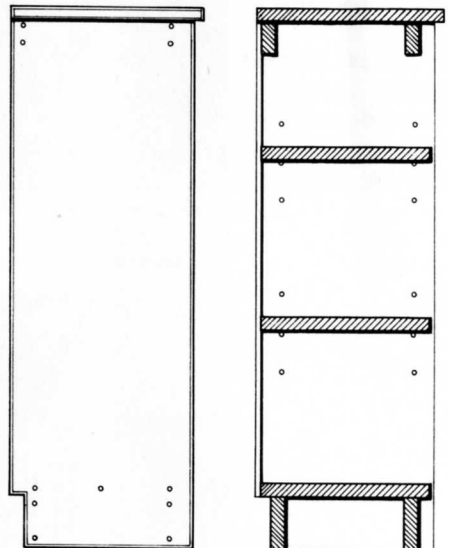
Top Cut wider than the sides and long enough to project over front and both sides when the bookcase is assembled.

Back $\frac{3}{16}$ " (4 mm) plywood.

JUNIOR BOOKCASE
SHOWN IN PROJECTION



ASSEMBLED



AND WITH ONE SIDE REMOVED

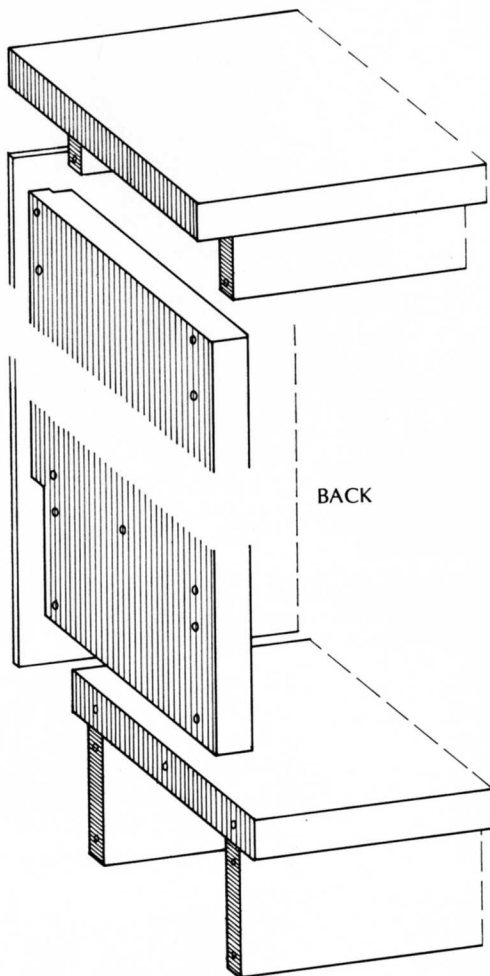
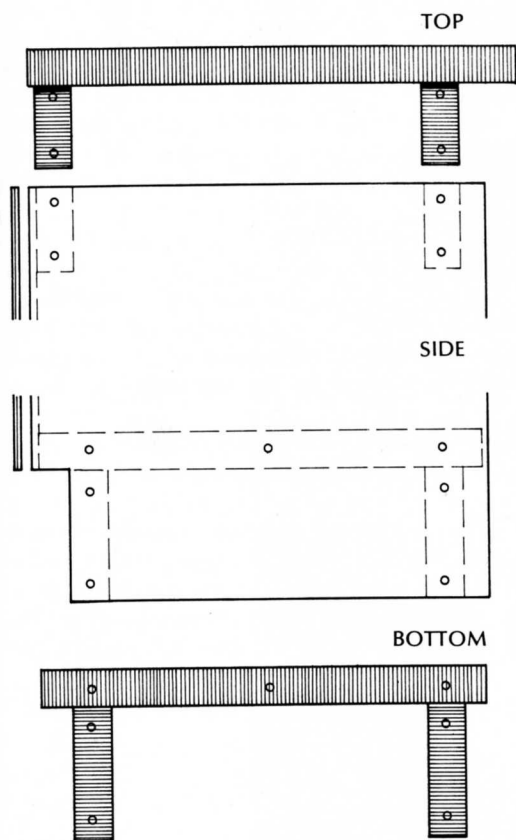
Procedure Cut and prepare the pieces. Make certain they are cut to the proper size and are perfectly square at the corners so that the pieces will meet exactly. Square the base and top rails which have been cut to the same length as the bottom shelf. Make a groove $\frac{1}{4}$ " (6 mm) wide in the bottom shelf and near the back edge of the sides to accept and hold the plywood backing in place.

Glue the base boards to the underside of the base at a suitable distance from the front and back edges, and glue the rails under the top, leaving room for the plywood backing behind the back rail.

Mark position of the holes for the screws and shelf supports on the side pieces. Drill the holes and sand and finish all the surfaces. Insert the shelf supports.

To assemble the bookcase, apply glue to the joints, bottom, top, and sides, then fasten the pieces together. Use four long clamps to hold the pieces firmly. Straighten the parts making sure that the sides are at true right angles to the top and bottom. See that the groove for the backing

SIDE VIEW AND OBLIQUE
WITH SHELF OMITTED



is lined up along the bottom and sides. When the glue is dry remove the clamps. Screw the parts together, insert the backing and secure it into place with glue and screws.

For a more finished appearance in your work the screws can be replaced by $\frac{5}{16}$ " (8 mm) dowels. If you prefer to use dowels, the holes should be drilled after the bookcase has been glued together. You must then wait to do the sanding and finishing until the dowels have been glued into the holes and then trimmed off flush with the wood surface.

Bookcase – Original Danish Design

Description If you need a great deal of shelf space, a wall unit of one or other of the flexible systems is a suitable solution, and if you want to make one yourself, here is a suggestion of a rather unconventional kind. The system consists of a number of wall rails which, instead of being screwed on to the wall separately by a large number of screws, are joined at top and bottom by a pair of bearing pieces, the whole making a coherent frame or section. This can either be hung up on the wall by means of two or three right angle hooks fitting under the top bearing piece, or else it can be screwed firmly into the wall through the bearing pieces with a few screws.

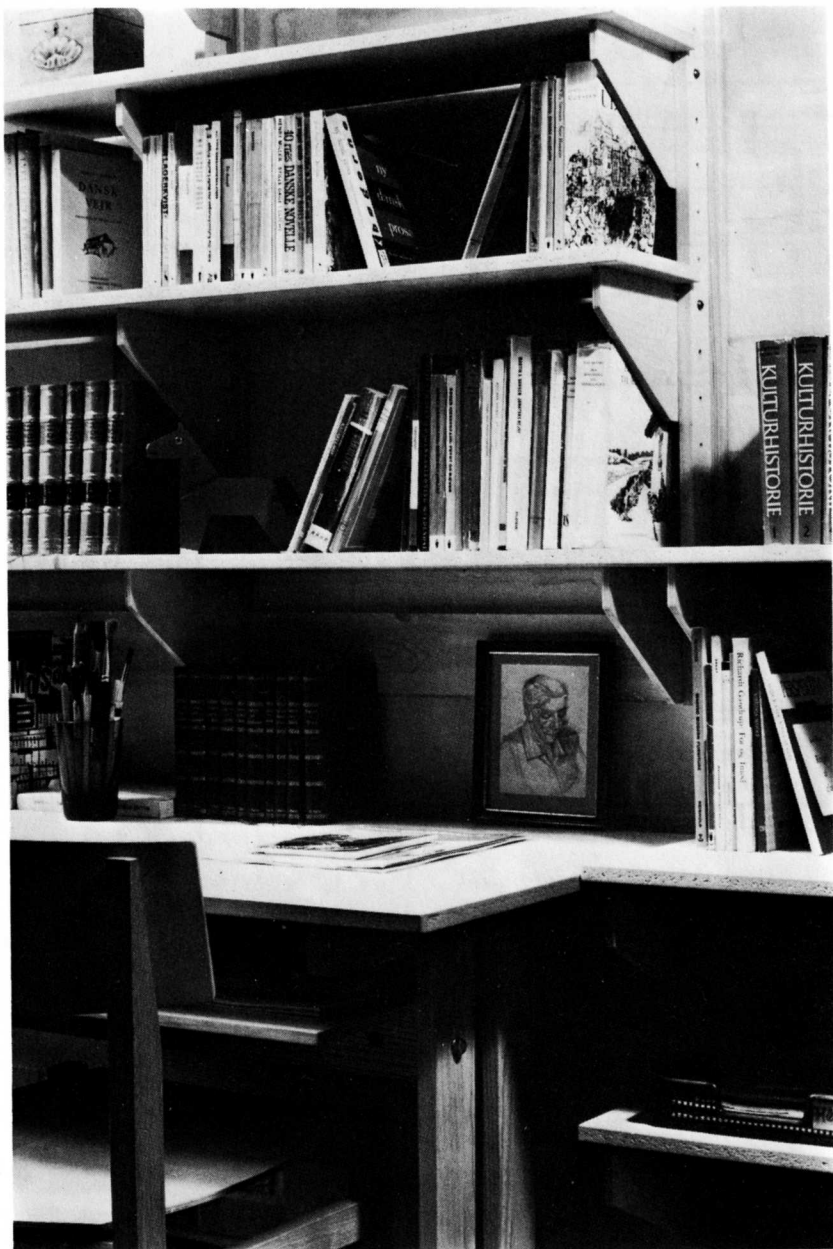
The wall rails consist of two planed rails glued together in a T-shape, the back branch of the T being just so much shorter that there is room for a bearing piece at top and bottom. In the front (long) piece the holes are drilled to take the bolts for the shelf brackets. The brackets might be made of $\frac{1}{4}$ " (6 mm) plywood, and the shelves made of planks glued together or of lengths of chipboard; all except the top shelf must have cut-outs in their back edges for the wall rails.

Several sections can be hung up in conjunction with one another. They can either be separated, so as to make a frame round a window or a piece of furniture, or be arranged in a straight line to form long lines of shelving. With a gap corresponding to the distance between the wall rails a saving can be made in bearing pieces and hanging. Where there is only room for short shelves, the brackets can be turned over to make "gables" which form vertical sides to the shelves. These can either be screwed to the shelves or have a flange on which the shelf rests, as in the picture.

The wall rails and shelves can be lacquered and the braces painted.

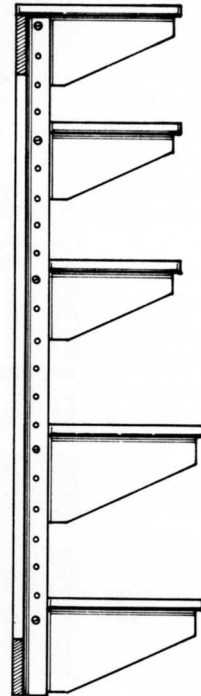
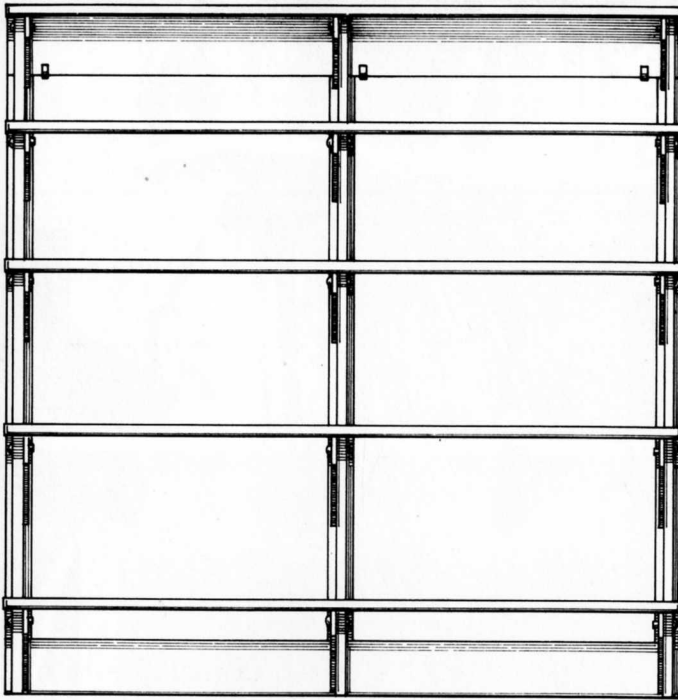
Materials The size and shape of the sections must in all cases be adapted to the proposed surroundings and the use to which they are to be put. In the following list of materials the requirements are given for the bookcase illustrated here, which is $47\frac{1}{4}$ " (1200 mm) in each dimension and can be used for ordinary books or for small ornaments.

*The hanging bookcase
is made on unconventional
lines. The height of the
shelves can be adjusted
as required.*



BOOKCASE – ORIGINAL DANISH DESIGN

SEEN IN PROJECTION



<i>Wall rails</i>	Front pieces	3 pcs. $\frac{5}{8}$ " $\times$ $1\frac{3}{4}$ " $\times$ $47\frac{1}{4}$ " (16 $\times$ 44 $\times$ 1200 mm)
	Back pieces	3 pcs. $\frac{5}{8}$ " $\times$ $1\frac{3}{4}$ " $\times$ approx. 39" (16 $\times$ 44 $\times$ about 1000 mm)

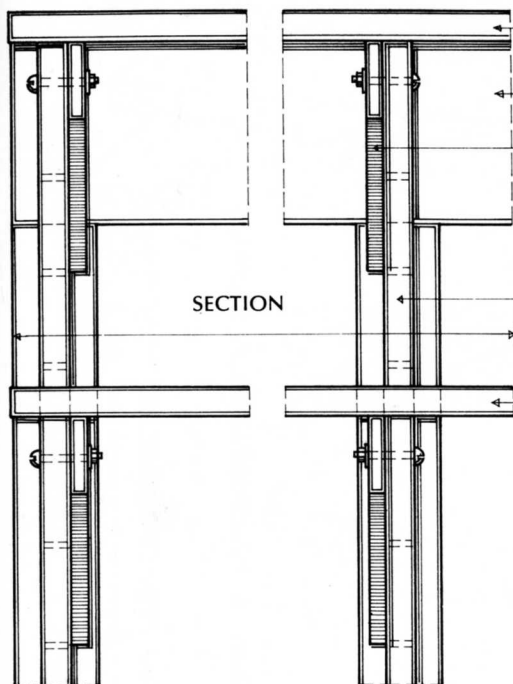
<i>Bearing pieces</i>	2 pcs. $\frac{5}{8}$ " $\times$ $3\frac{3}{4}$ " $\times$ $47\frac{1}{4}$ " (16 $\times$ 95 $\times$ 1200 mm)
-----------------------	---

<i>Braces</i>	$\frac{1}{4}$ " (6 mm) plywood approx.
	30" $\times$ 60" (760 $\times$ 1520 mm)
	9 pcs. $4\frac{3}{4}$ " $\times$ 7" (120 $\times$ 180 mm)
	6 pcs. 6" $\times$ $4\frac{3}{4}$ " (150 $\times$ 120 mm)

<i>Shelves</i>	(if made of chipboard)
Top	1 piece $\frac{5}{8}$ " $\times$ $8\frac{5}{8}$ " $\times$ $47\frac{1}{4}$ " (16 $\times$ 220 $\times$ 1200 mm)
Middle	2 pcs. $\frac{5}{8}$ " $\times$ $7\frac{7}{8}$ " $\times$ $47\frac{1}{4}$ " (16 $\times$ 200 $\times$ 1200 mm)
Bottom	2 pcs. $\frac{5}{8}$ " $\times$ $9\frac{1}{2}$ " $\times$ $47\frac{1}{4}$ " (16 $\times$ 240 $\times$ 1200 mm)

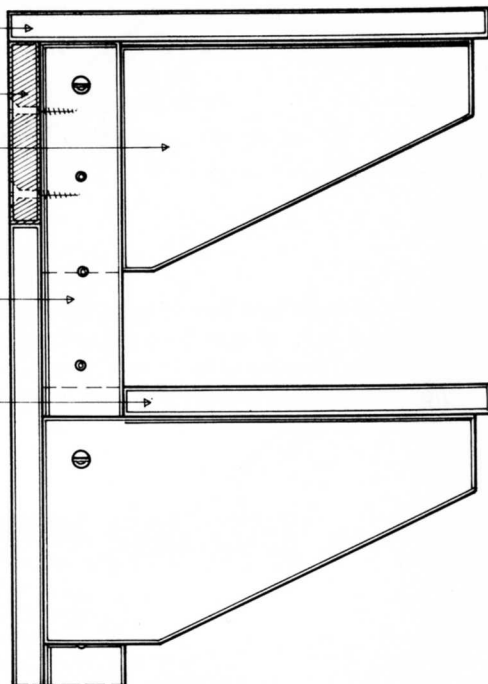
BOOKCASE – ORIGINAL DANISH DESIGN

SEEN IN PROJECTION FROM THE FRONT



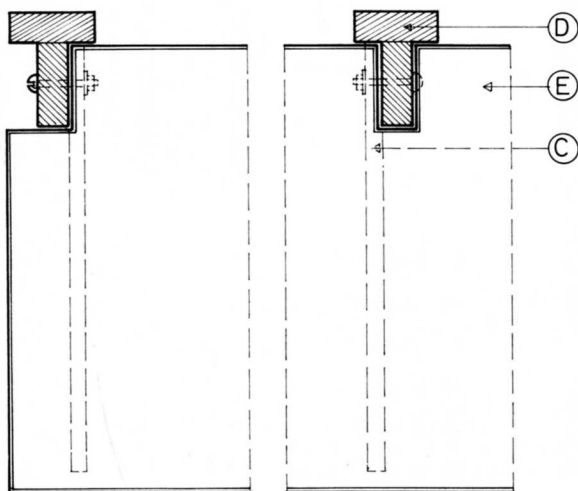
SECTION

FROM THE SIDE



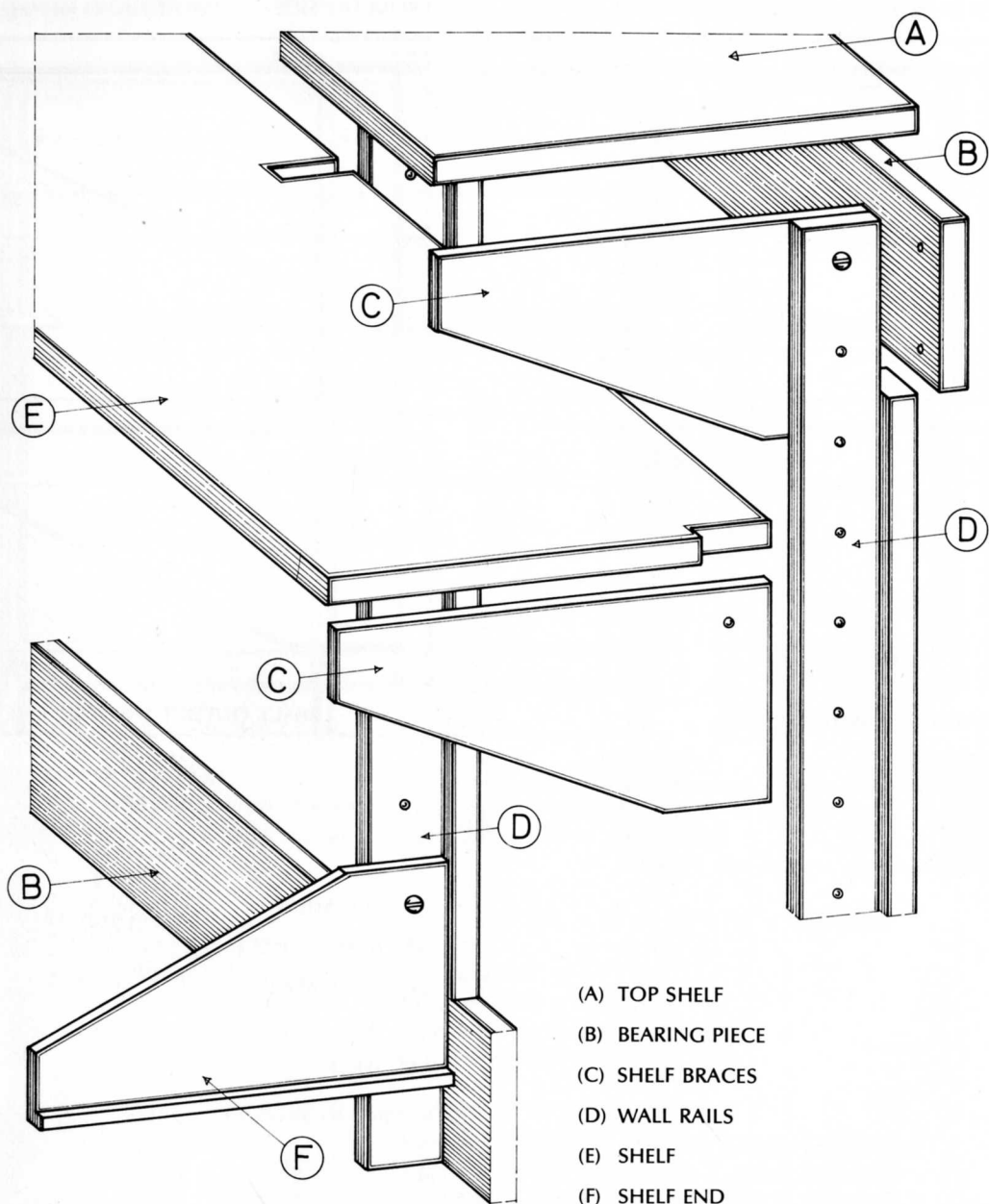
BRACE OUTSIDE THE WALL RAIL

FROM ABOVE, WITH SECTION



- (A) TOP SHELF
- (B) BEARING PIECE
- (C) SHELF BRACE
- (D) WALL RAILS
- (E) SHELF

THE BOOKCASE BEFORE ASSEMBLY — SHOWN IN OBLIQUE



- (A) TOP SHELF
- (B) BEARING PIECE
- (C) SHELF BRACES
- (D) WALL RAILS
- (E) SHELF
- (F) SHELF END

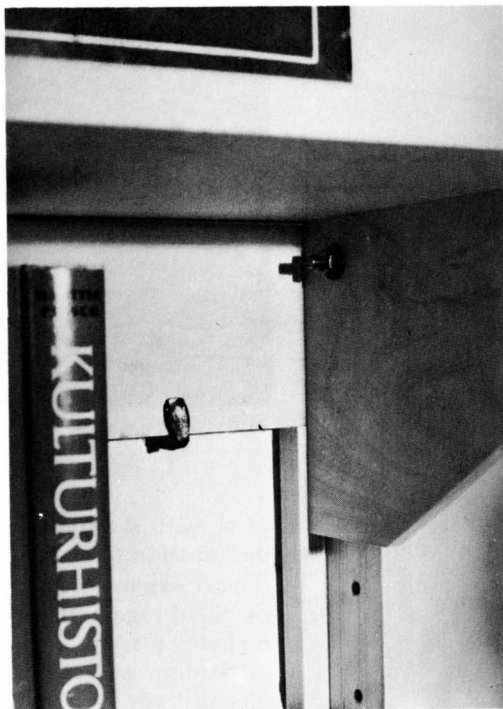
Shelves (if made of board)

Top	1 piece $\frac{5}{8}$ " $\times$ $3\frac{3}{4}$ " $\times$ $47\frac{1}{4}$ " (16 $\times$ 95 $\times$ 1200 mm) + 1 piece $\frac{5}{8}$ " $\times$ $4\frac{3}{4}$ " $\times$ $47\frac{1}{4}$ " (16 $\times$ 120 $\times$ 1200 mm)
2 middle	4 pcs. $\frac{5}{8}$ " $\times$ $3\frac{3}{4}$ " $\times$ $47\frac{1}{4}$ " (16 $\times$ 95 $\times$ 1200 mm)
2 bottom	4 pcs. $\frac{5}{8}$ " $\times$ $4\frac{3}{4}$ " $\times$ $47\frac{1}{4}$ " (16 $\times$ 120 $\times$ 1200 mm)

Screws for the bearing pieces, $1\frac{1}{2}$ " No. 8, flat-headed

Coach bolts or machine screws for the braces, 6 No. 30 or No. 40 with washers and nuts.

Procedure Cut and prepare the sections for the bearing pieces and the front and back parts of the wall rails so that the back part is shorter than the front part by twice the breadth of the bearing piece. Drill holes in the front part for the bolts for the braces. This must be done very accurately, best



The bookcase hung on a wall hook. French screws can be used for a wooden wall.

You can make all kinds of combinations out of this type of bookshelf. The working chair is described on p. 31 and the table on p. 72.



of all with a stationary electric drill or with the help of the drill guide described in this book.

Next assemble the frames. First the two parts of the wall rails must be glued together, then the bearing pieces are glued and screwed back on to the prepared rails. Make careful measurements before placing them in position and use long screws which are not too thick. Put a clamp on the front part so that it does not split when the screw is inserted.

Shelves If the shelves are made of planks, glue them together, square off the ends and sand. If you are using chipboard, cut in the proper widths and sand the edges. The top shelf can lie on top of the wall rail and so needs no fitting. The others will need cut-outs at the back for the wall rail.

Braces If the sheets of plywood are cut up into suitably sized squares they can be shaped as required. The angle between the back of the braces and the wall rails must be a little over 90 degrees to avoid hanging shelves. Finally bore the holes for the bolts. The distance from hole to back edge must be exactly the same as the corresponding distance on the wall rails.

Hanging On a wall with fixed joints the bookcase can be hung up by hooking the bearing piece over three hooks knocked into a joint close to the wall rails. If the joint is loose, pegs must be driven into the bricks and the bookcase can then be hung up by means of French screws screwed through the holes in the bearing piece into the pegs. French screws will also work well for hanging on wooden walls.

BEDS AND COUCHES – GENERAL POINTS

Usually the largest piece of furniture in the home is the bed or sofa, or a combination of the two. A studio bed serves double duty as a place for sitting and sleeping on. In planning to make one of these you should always start with the standard mattress sizes available.

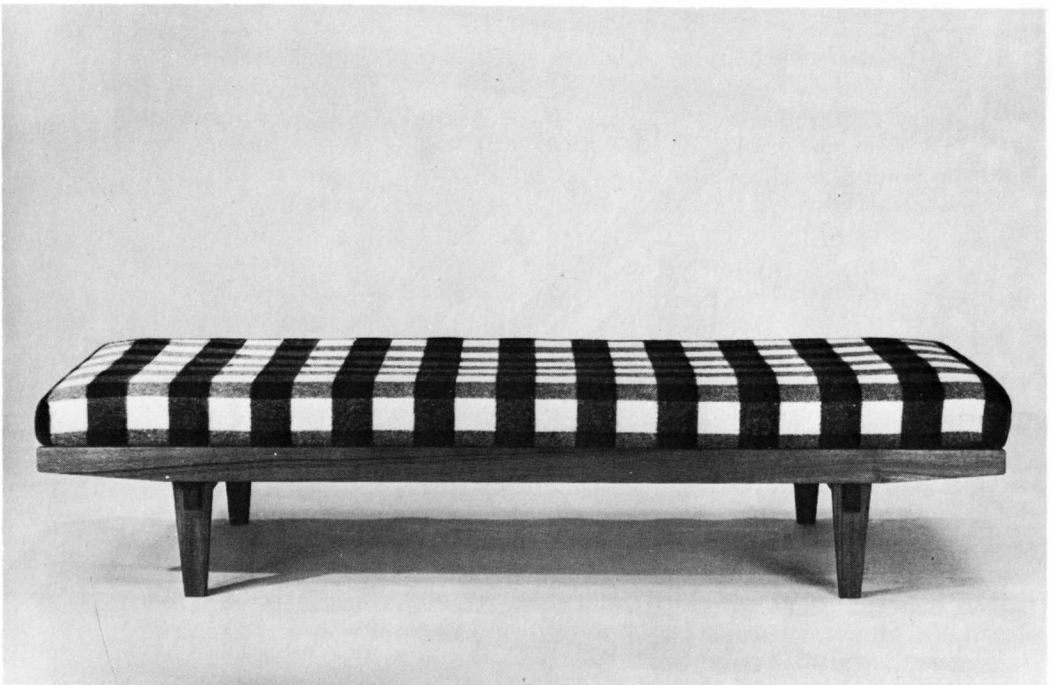
- Height* Used as a seat the top of the studio bed should not be more than $17\frac{3}{4}$ " (400 mm) high. At the same time at least 10" (250 mm) of space is needed under the studio bed for easy cleaning.
- Length and Width* The mattress size determines the length and width of the construction. While the standard length of about 76" (1900 mm) is equally comfortable for sleeping or sitting, the corresponding width of $33\frac{1}{2}$ " (850 mm) is not good for sitting. A deep back cushion can help, but people with long legs are more comfortable with their legs up, and if the couch is definitely going to be used as a seat it is better to use a mattress about 28" (700 mm) wide.
- Base* There are many possible ways of making the base, but in any case it must be both strong and flexible.
A slatted bottom, where the slats are loose so they can be turned or moved, is preferable. This can be made of 1" (25 mm) thick slats which are placed lengthwise, or $\frac{3}{4}$ " (16 mm) thick slats placed crosswise. These slats must be placed securely on a solid cross board. They should not be positioned in a rabbet or groove which may be broken by stress. A lamella base, which consists of strips held together by rubber bands, can be bought for a reasonable price and will fit all sizes.
- Bed Rails* If two studio beds are to be placed together to form one unit, the adjoining side rails can be made low enough so that the mattresses can extend over them and fit snugly against each other with no intervening space.
- Mattress* The good old spring mattress still gives the best support for sleeping or sitting on, but the polyether mattress is increasingly gaining ground because it is both cheap and light. It is always best to choose the finest quality, 4" to 5" (100–120 mm) thick.

Studio Bed

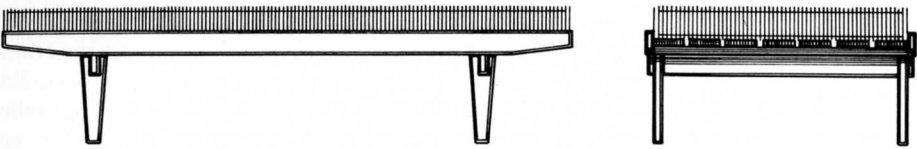
Description As the original personal character of the bedroom has been changed in small apartments by the combination bed-sitting room, the traditional bed with its high uprights and broad bed rails has been replaced by a studio bed to disguise its dual function as both sitting and sleeping place. Usually it is equipped with an inner spring mattress resting on a slatted base frame or lamella. One of the perennial problems in making such a studio bed in a hobby shop or woodworking shop was assembling the large unwieldy frame. Another was in mounting the legs which were often screwed into the frame by means of a wooden thread turned on a lathe.

In order to avoid these problems, the attractive studio bed shown here has neither a solid frame nor loose legs. It consists of a sturdy base of 1" (25 mm) thick wood slats fitted on a pair of crossbars, in turn resting on a pair of strong trestles.

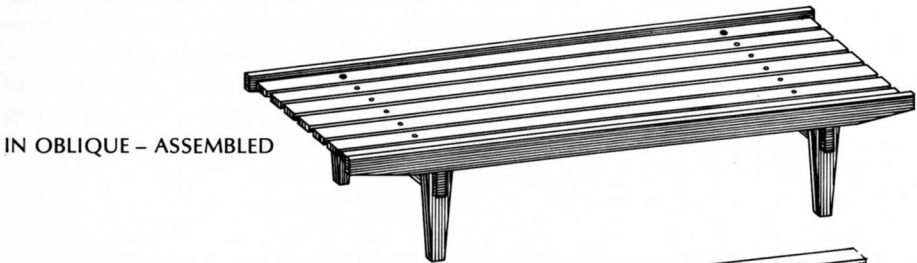
The studio bed made up with the inner spring or foam rubber mattress attractively covered with a plaid wool blanket.



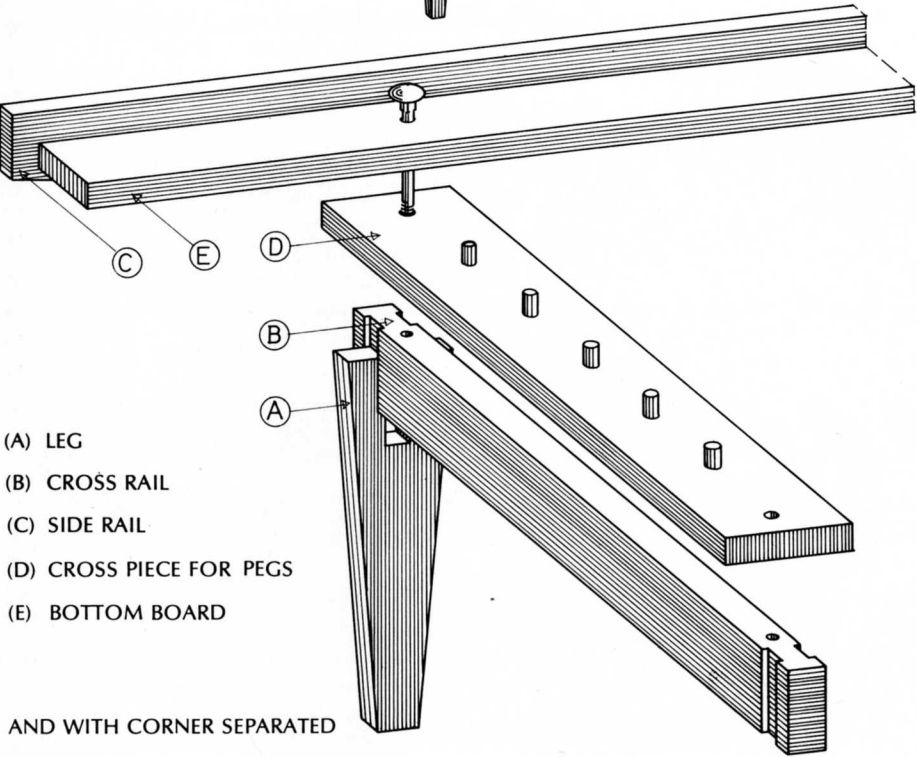
STUDIO BED



SHOWN IN PROJECTION



IN OBLIQUE – ASSEMBLED



- (A) LEG
- (B) CROSS RAIL
- (C) SIDE RAIL
- (D) CROSS PIECE FOR PEGS
- (E) BOTTOM BOARD

AND WITH CORNER SEPARATED

The slats at each edge are glued to the sides and by means of holes in the crossbars are bolted to the trestle. The slats in the middle are loose but are held in place by a row of intervening short dowels or pegs, glued into the crossbars and fitted into holes in the slats.

The trestle pieces are joined by mortise and tenon as was done with the desks. The four carriage bolts which hold the studio bed together give it a very stable assembly. If the wood tends to loosen with age, the bolts can be re-tightened. If sometime later there is no need for the bed, it can be taken apart and stored in very little space.

The strong and flexible slats will not break, and if in time a slat should become bent, it can simply be turned over.

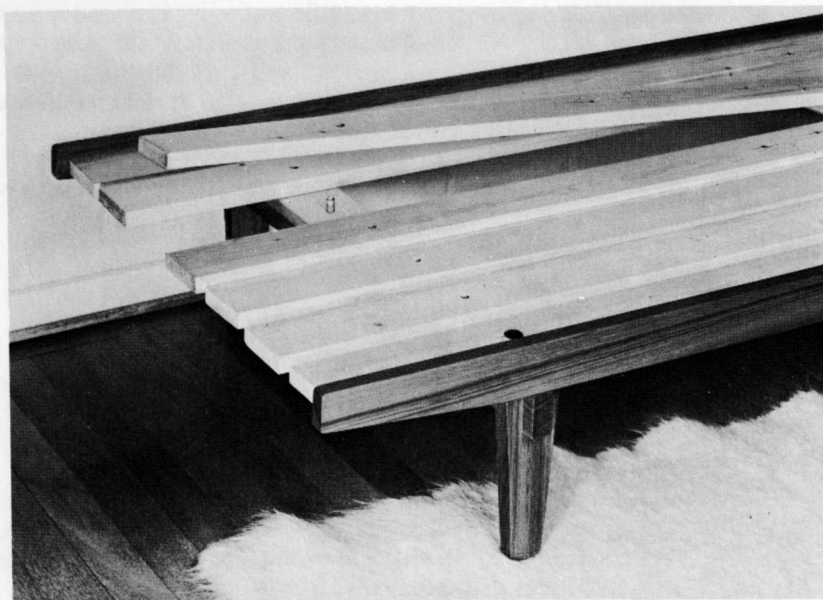
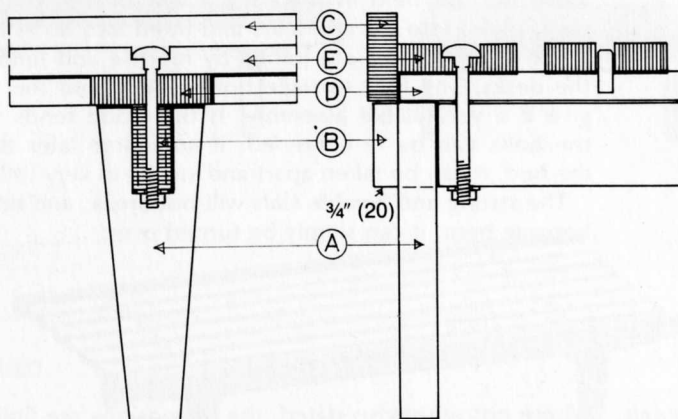
Materials Where not otherwise stated, the dimensions are finished measurements intended for a twin size mattress $6'' \times 33\frac{1}{2}'' \times 76''$ ($150 \times 850 \times 1900$ mm). A seating height of about $17\frac{3}{4}''$ (450 mm) is usual.

<i>Trestle</i>	Legs	2 pcs. $1\frac{1}{4}'' \times 6'' \times 10''$ ($30 \times 150 \times 250$ mm) (divided lengthwise)
	Cross rails	2 pcs. $1\frac{1}{4}'' \times 2\frac{3}{4}'' \times 35''$ ($30 \times 70 \times 890$ mm) (mattress width + $1\frac{1}{2}''$ [40 mm])
<i>Bottom</i>	Side rails	2 pcs. $1'' \times 2\frac{3}{4}'' \times 76''$ ($22 \times 70 \times 1900$ mm)
	Slats	7 pcs. $1'' \times 3\frac{3}{4}'' \times 74\frac{1}{2}''$ ($22 \times 95 \times 1860$ mm)
	Cross piece for pegs	2 pcs. $\frac{7}{8}'' \times 3\frac{3}{4}'' \times 33\frac{7}{8}''$ ($22 \times 95 \times$ approx. 860 mm) (to fit distance between legs under slats)
<i>Misc.</i>	Dowels	10 pcs. $\frac{1}{2}'' \times 2''$ (10×50 mm)
	Carriage bolts	4 ea. $\frac{5}{16}'' \times 4\frac{3}{4}''$ (9×120 mm) with washers.

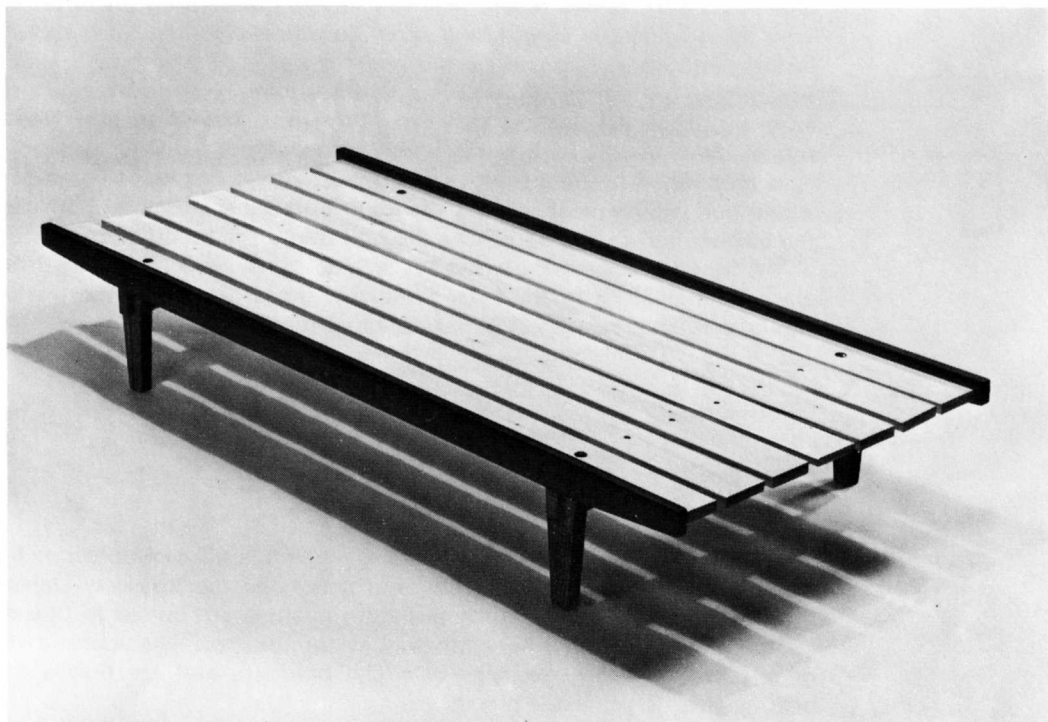
Procedure Before starting the studio bed make sure it will fit an available mattress or one to be purchased.

Trestle Cut and square wood to given measurements. On flat pieces of lumber draw two of the legs (they will fit each other when turned in opposite directions). Draw position and measurements for mortise and tenon joints on legs and cross rails.

CROSS-SECTION OF ASSEMBLY SHOWN IN PROJECTION



*Detail of studio bed
showing how slats are fixed.*



The studio bed is simple to make, yet solid.

Saw the leg pieces apart and shape them as in diagram. Make mortise and tenon joint and trial assembly of trestles. Sand pieces and finish. Glue pieces together.

Bottom Make cross pieces so that they are just long enough to fit the space between the inner sides of the legs. Cut and sand side rails. Sand the two straightest slats and use these to glue to the inner edge of the side rail, leaving just as much wood showing on the side rail under the slat as the cross piece is thick. (Use wood pieces as a guide.)

Bore holes for the four bolts in the slats, cross piece, and trestle cross rail. (The cross piece extends all the way across up to the edge of the side rails.)

Make trial assembly of pieces. Mark places for dowels in cross piece

and slats. Bore dowel holes, glue and insert dowels into cross piece. Trim them to proper length, and sand. Bore holes in slats. They should be large enough so that slats can slip over the dowel pegs without forcing. Separate all parts of studio bed and finish sanding. Finish side rails and other visible wood surfaces very smoothly. Wax dowels so they won't squeak. Now the studio bed can be bolted together.

As mentioned in the introduction on the mortise and tenon joint, the studio bed will be most stable if the joint is placed at the point between the bottom and the trestle where the bolt draws the broad end surfaces of the legs up against the cross piece. The bolts, therefore, are to be placed rather close to the legs. Preferably the cross rail of the trestle should not have to support either the cross piece or the sides.

Frame Bed

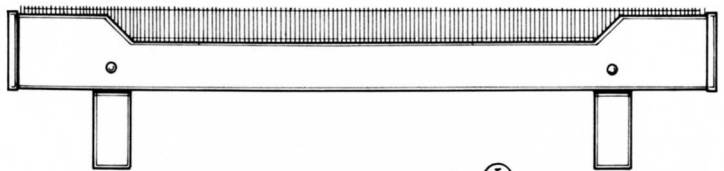
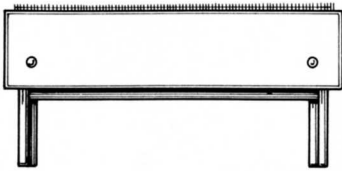
Description The frame bed is quick and easy to make, since all assembly can be done with glue, screws and bolts, but it is none the less very stable. It consists of a frame of which the end members are bolted to blocks on the side pieces, in the same way as for the bed. The frame rests on a pair of trestles, the legs of which hold up, and are bolted to, bearing strips on the side pieces.

The trestles consist of a pair of legs which must be wide enough at the top to give good support to the bearing strips without wobbling. A supporting leg is glued to the back of the leg and extends up the inside edge of the bearing strip, where it has a hole for a bolt. Two crossbars joining the legs are also attached to it.

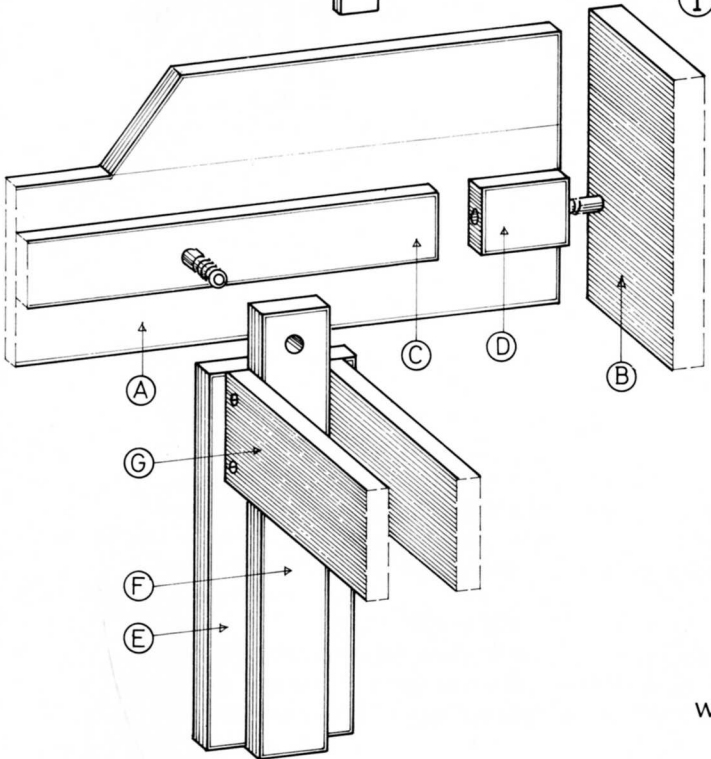
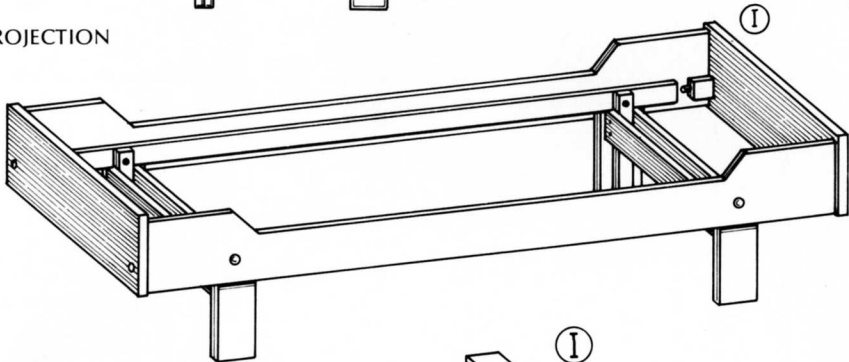
Materials For a bed intended for a mattress measuring, say, $5'' \times 33\frac{1}{2}'' \times 75''$ ($120 \times 850 \times 1900$ mm), the following will be required:

<i>Frame</i>	Sides	2 pcs. $\frac{7}{8}'' \times 4\frac{3}{4}'' \times 75''$ ($22 \times 120 \times 1900$ mm)
		(length of mattress)
		4 pcs. $\frac{7}{8}'' \times 2\frac{3}{8}'' \times 11\frac{3}{4}''$ ($22 \times 60 \times 300$ mm)
		(at the high ends)
	Bearing strips	2 pcs. $\frac{7}{8}'' \times 1\frac{3}{4}'' \times 74''$ ($22 \times 44 \times 1850$ mm)
	and assembly blocks	2 pcs. $\frac{7}{8}'' \times 4\frac{3}{4}'' \times 35''$ ($22 \times 120 \times 910$ mm)
		(width of mattress + $2\frac{3}{8}''$ [60 mm])
	End members	2 pcs. $\frac{7}{8}'' \times 2\frac{3}{8}'' \times 35''$ ($22 \times 60 \times 910$ mm)
		(glued on the broad pieces)

FRAME BED

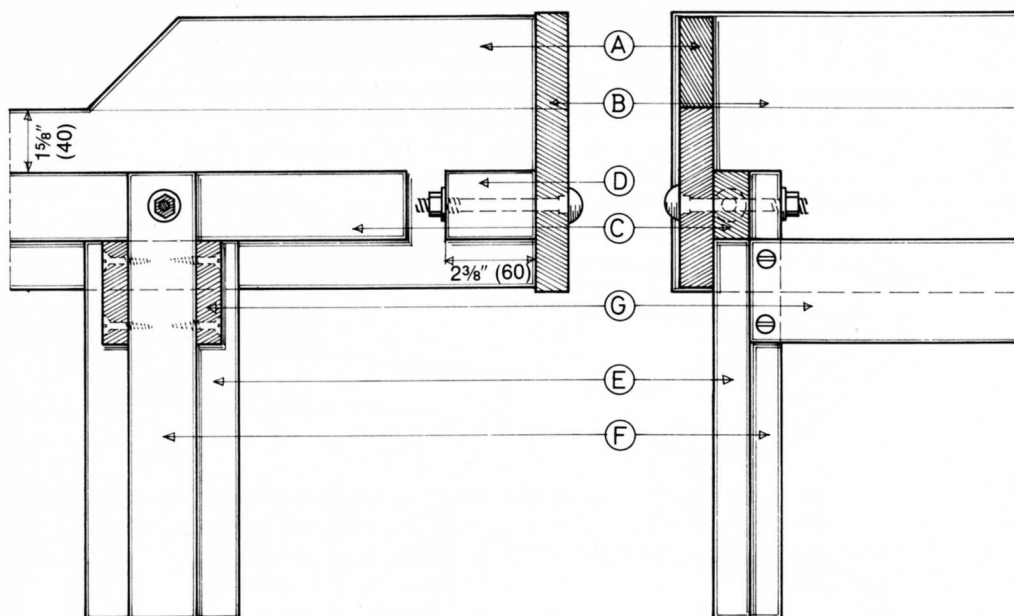


SEEN IN PROJECTION

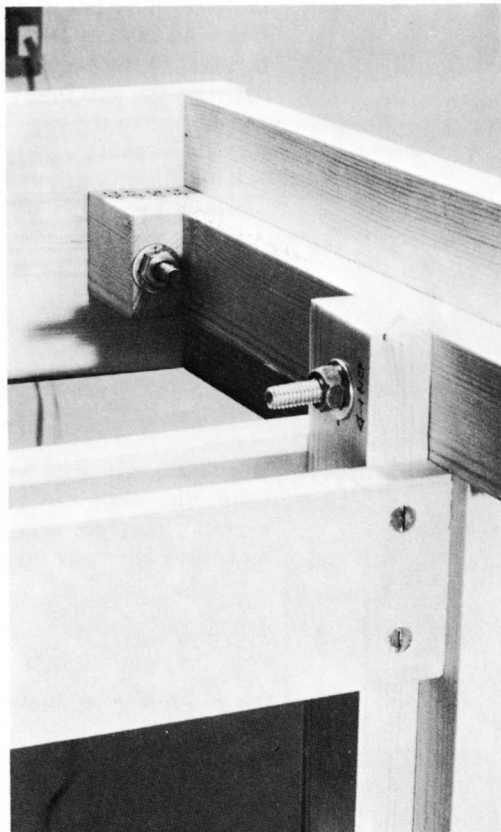


SHOWN IN OBLIQUE AND
WITH CORNER (I) BEFORE ASSEMBLY

CORNER (I) OF THE FRAME BED SHOWN IN SECTION



<i>Trestles</i>	Legs	4 pcs. $\frac{7}{8}'' \times 3\frac{3}{4}'' \times 10''$ (22 × 95 × 250 mm)
	Supporting legs	4 pcs. $\frac{7}{8}'' \times 1\frac{3}{4}'' \times 11\frac{3}{4}''$ (22 × 44 × 294 mm) (leg + bearing strip)
	Crossbars	4 pcs. $\frac{5}{8}'' \times 2\frac{3}{4}'' \times 31\frac{3}{4}''$ (16 × 70 × 806 mm) (mattress - $1\frac{3}{4}''$ [44 mm])
<i>Misc.</i>	Lamella base	$33\frac{1}{2}'' \times 76''$ (850 × 1900 mm)
	Carriage bolts	4 ea. $\frac{3}{8}'' \times 3\frac{1}{16}''$ (10 × 80 mm) (for trestles) 4 ea. $\frac{5}{16}'' \times 4''$ (8 × 100 mm) (for end members)
	Screws	$1\frac{3}{4}'' \times \frac{3}{8}''$ (44 × 10 mm) (for the crossbars)



The frame bed is assembled with nuts and bolts.

Procedure

Frame

Prepare and glue pieces for sides and end members. Glue bearing strips and assembly blocks, with the bolt-hole drilled, on to the inside of the side pieces. Now bore the holes for the bolts for the trestles and sand the frame.

Trestles

Prepare the pieces for the legs, supporting legs and crossbars, glue the supporting legs to the inside of the legs, and glue and screw the crossbars on to the supporting legs (tighten well and use a T-square).

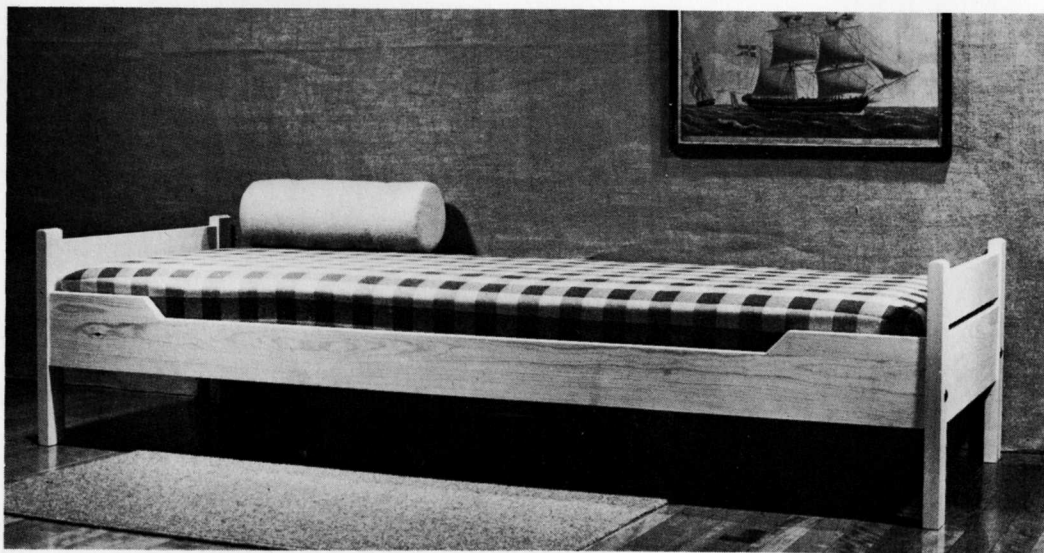
Assembly Clamp the side pieces in place on the trestles with C-clamps. Drill bolt-holes from the outside of the side pieces through the supporting legs on the trestles. Fit the bolts and do up the nuts. Only now can the exact distance between the bolt-holes in the end members be measured; bore the holes and complete the assembly of the couch.

Note: – If one leg is not fully in contact with the bearing strip, causing the trestle to rock, a bit of veneer or cardboard can be glued to the top of the leg.

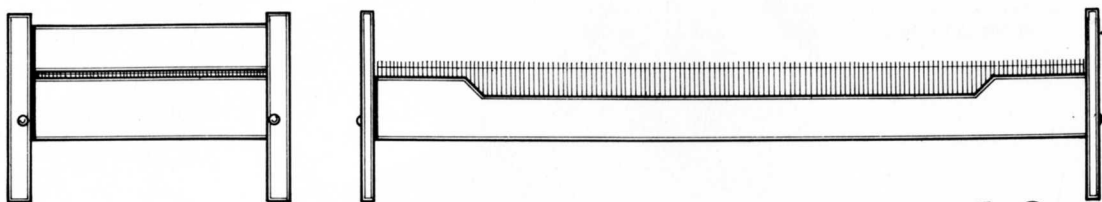
Bed – Original Danish Design

Description The bed consists of two ends, between which a pair of side pieces are fixed. The ends can be made to whatever height is preferred; in this example they are very low, but still give support to the pillow and the feet. They are made up of a pair of legs with two boards doweled between

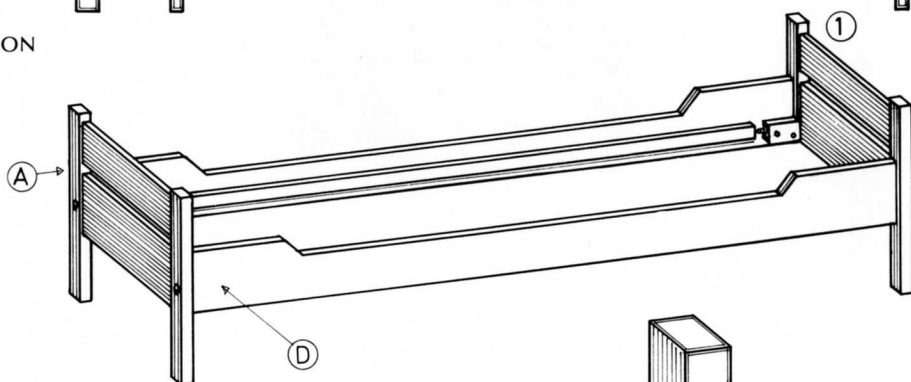
This couch with its alcove-shaped sides looks more like a bed than the earlier couches.



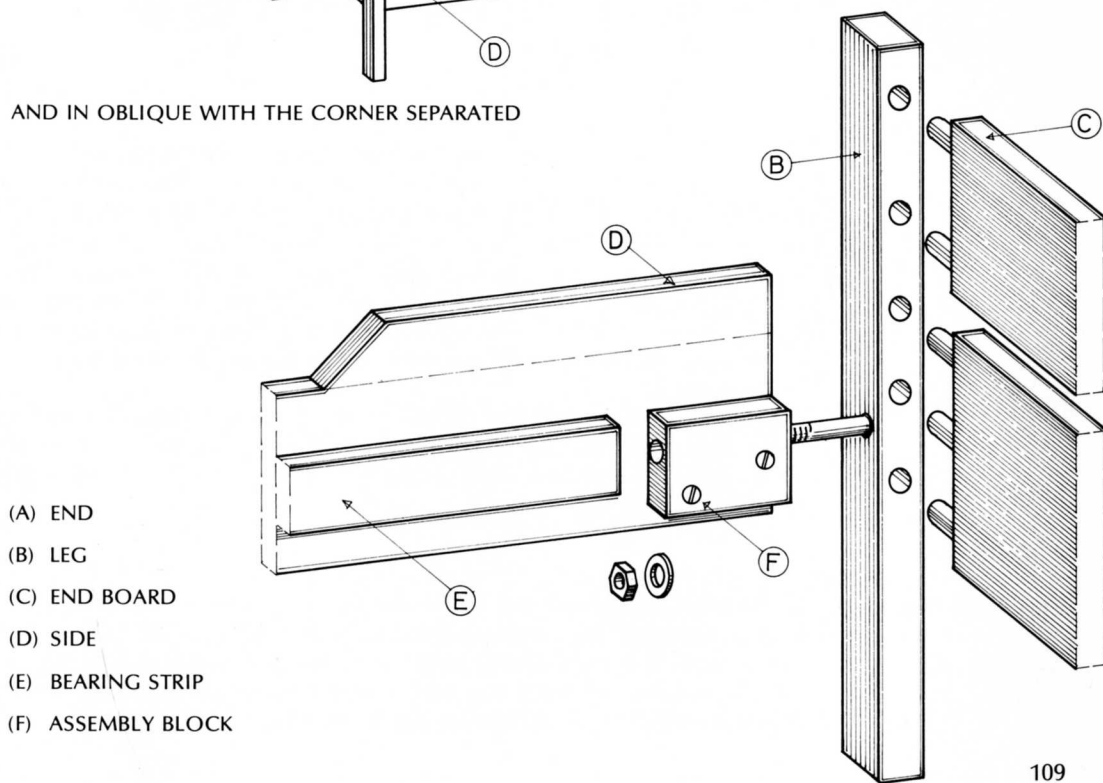
BED – ORIGINAL DANISH DESIGN



SEEN IN PROJECTION

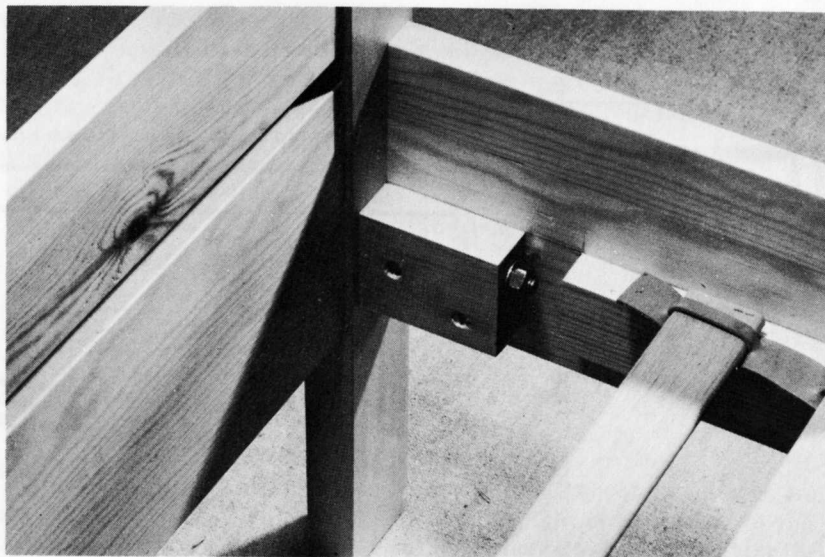


AND IN OBLIQUE WITH THE CORNER SEPARATED



- (A) END
- (B) LEG
- (C) END BOARD
- (D) SIDE
- (E) BEARING STRIP
- (F) ASSEMBLY BLOCK

The bed is assembled with carriage bolts. A lamella base, bought ready-made, is used for the model in the photograph.



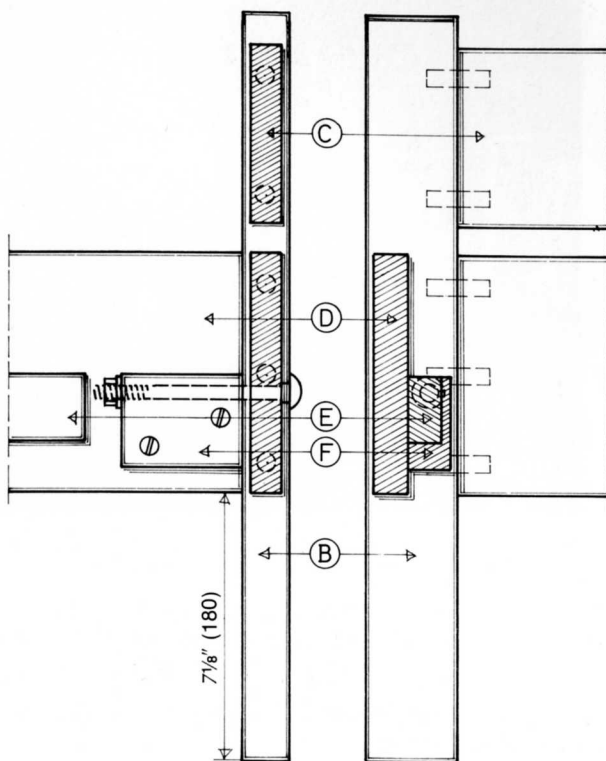
them, the lower of these having the same breadth as the raised end of the side pieces. The sides, which are a little higher at the ends than in the middle (see illustrations), have a bearing strip on the inside for the base of the bed. At each end this strip is replaced by a wood block.

The bed is held together by four long carriage bolts, which go from the outside of the ends of the bed through a hole in the assembly blocks on the sides, where they are fixed with washers and nuts. There must be about an inch between the bearing strip and the block so that a spanner can be got in to tighten the nuts.

The side pieces have no real vertical "control", so they must be properly positioned before the nuts are fully tightened; but a control can be made in the shape of a dowel fitted at the top of the side piece and fitting into a hole in the leg.

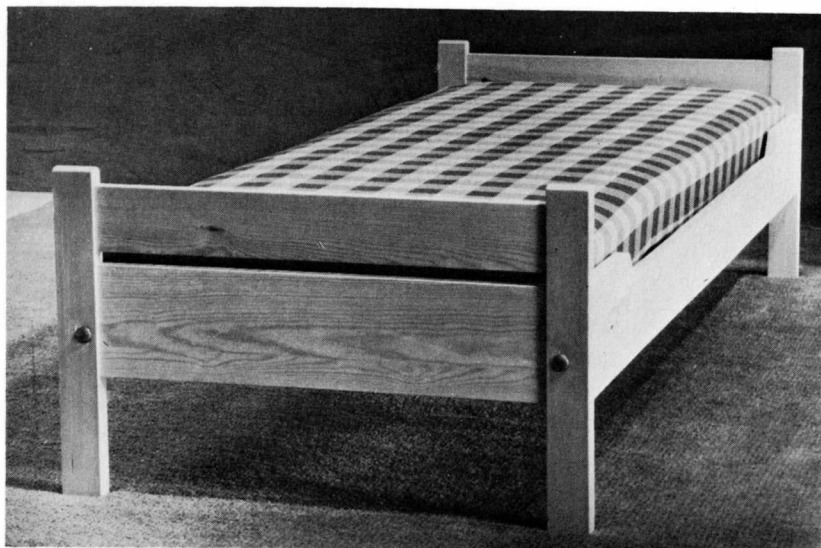
Materials The materials listed here will be for the bed illustrated in the drawings, which is intended for a polyether mattress $5'' \times 27\frac{1}{2}'' \times 75''$ ($120 \times 700 \times 1900$ mm). If a fixed spring mattress is used, it needs a little space round it and the width of the ends and the length of the sides must be increased by half an inch or so (10–20 mm).

CORNER OF THE BED IN SECTION TO SHOW HOW IT IS ASSEMBLED



<i>Ends</i>	Legs	4 pcs. $1\frac{1}{8}'' \times 2\frac{3}{8}'' \times 20''$ (28 × 60 × 500 mm)
	Boards	4 pcs. $\frac{7}{8}'' \times 4\frac{3}{4}'' \times 24\frac{3}{4}''$ (22 × 120 × 630 mm) (mattress – $2\frac{3}{4}''$ [70 mm])
		2 pcs. $\frac{7}{8}'' \times 1\frac{3}{4}'' \times 24\frac{3}{4}''$ (22 × 44 × 630 mm) (glued to two of the other pieces for the lower end board)
<i>Sides</i>		2 pcs. $\frac{7}{8}'' \times 4\frac{3}{4}'' \times 75''$ (22 × 120 × 1900 mm) (mattress length)
		4 pcs. $\frac{7}{8}'' \times 1\frac{3}{4}'' \times 11\frac{3}{4}''$ (22 × 44 × 300 mm) (at the raised ends)
	Bearing strips	2 pcs. $\frac{7}{8}'' \times 1\frac{3}{4}'' \times 66\frac{1}{4}''$ (22 × 44 × 1680 mm) (mattress – $8\frac{3}{4}''$ [220 mm])
	Assembly blocks	4 pcs. $1\frac{1}{8}'' \times 2\frac{3}{8}'' \times 3\frac{3}{16}''$ (28 × 60 × 80 mm) (same dimensions as the legs)
<i>Misc.</i>	Base	Lamella base $27\frac{1}{2}'' \times 75''$ (700 × 1900 mm)

*Den bed
seen from one end –
original Danish design.*



Dowels	4 pcs. $\frac{3}{8}$ " $\times$ $4\frac{3}{4}$ " (10 $\times$ 120 mm)
Carriage bolts	For assembly blocks, $1\frac{1}{2}$ " $\times$ $\frac{3}{8}$ " (40 $\times$ 10 mm)
Screws	$\frac{3}{8}$ " $\times$ $2\frac{3}{8}$ " (10 $\times$ 60 mm)

*Assembly
Procedure*

Make legs and end boards to the agreed measurements. Drill holes for dowels, which are glued in the end surfaces of the boards. Make a trial assembly of the ends, and sand. Do not finally assemble yet.

Prepare the sides and bearing strips. Glue into place the strips and the small blocks of wood at the ends of the sides. Make the assembly blocks and drill holes for the bolts above and for a pair of screws underneath; then glue and screw them on to the sides so that they are in line with the bearing strips. (The assembly blocks must be fitted very securely and must be of good, sound wood: the stability of the bed depends on them.)

When the assembly blocks are fitted to the sides, make the measurements for their corresponding holes on the legs (and for the guiding dowels if required). Bore the holes and make a trial assembly of the bed. The ends can then be glued together and put in clamps, and the sides sanded.