

THE
BOY JOINER
AND
MODEL MAKER.

The Boy Joiner and Model Maker
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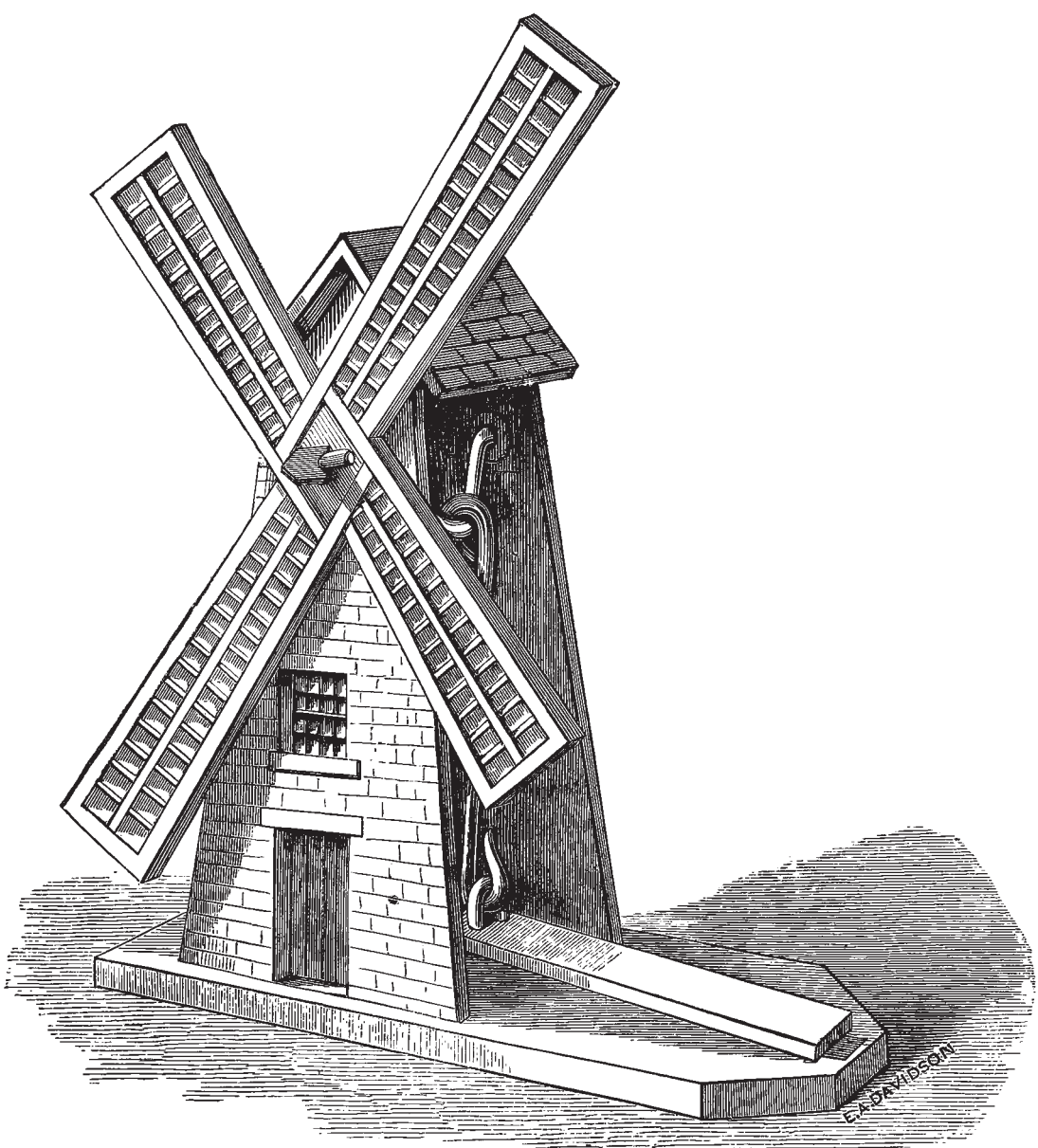
PRINTED IN THE UNITED STATES OF AMERICA

ISBN: 978-0-9828632-1-3

Published by: BT&C Books
32 33rd Street 5th Floor
Brooklyn, NY 11232

Please direct all enquiries to: support@brooklyntoolandcraft.com

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TO MAKE A MODEL MILL, WORKED BY A TREADLE.

(See page 167.)

THE
BOY JOINER
AND
MODEL MAKER.

CONTAINING

PRACTICAL DIRECTIONS FOR MAKING NUMEROUS ARTICLES
FOR USE AND ORNAMENT, MECHANICAL TOYS, MODELS,
&c. ; WITH DESCRIPTIONS OF VARIOUS TOOLS, AND THE
METHOD OF USING THEM.

BY

ELLIS A. DAVIDSON,

*Author of "Our Houses, and what they are made of," "Linear Drawing," "Building
Construction," "Drawing for Carpenters and Joiners," &c. &c.*

With nearly 200 Illustrations.

CASELL, PETTER & GALPIN :

LONDON, PARIS & NEW YORK.

[1874]

INTRODUCTION.

IN placing the *BOY JOINER* in the hands of my young readers, I entertain the hope of adding to their sources of enjoyment.

There is a charm in occupation which can scarcely be understood by idle persons, nor does the enjoyment end when the time has been whiled away; for the permanent results remain in the comfort or gratification we are enabled to give to those around us.

Whether in the play-hours at boarding-school, or during evenings at home; whether at the sea-side or in the garden; the boy who is handy with tools, who, as the boys say, "can make all sorts of things," becomes a most important individual, and is able to contribute to the pleasure of his companions in numerous ways.

It is rarely that we meet with a boy who has not some constructive powers, or who would not evince them if he were permitted the use of tools. I assure all intending "Boy Joiners" that the fear of tools is groundless; it is only at the very outset that they seem clumsy or feel heavy—that the hammer seems specially designed to hit your finger, and the chisel to cut you.

If you just keep your left hand behind your tools whilst working, you will soon become accustomed to their use, and you will be surprised at the dread with which you formerly regarded them.

I must remind you that whatever is worth doing at all is worth

doing well. I have not merely said "Do this," or "do that," as if this were a mere toy book for infants. I wish to cultivate that manly tone which is natural to all English boys, and I have therefore, when necessary, explained the principles of construction required for the proper carrying out of the work in hand. I have even ventured to add a few lessons in the delineation of geometrical figures, without a knowledge of which the Boy Joiner would, as it were, grope in darkness, whilst by their aid he will be able to construct the required forms with ease and rapidity.

I will in conclusion only say that the instructions here given are practical; that I have when a boy constructed all the objects described, and that I have seen these and similar ones made by others.

Should any of my readers wish to pursue the subject further, they will find complete courses of study worked out in my Technical Manuals.

ELLIS A. DAVIDSON.

CONTENTS.

Tools, and How to Use them.

	PAGE
General advice as to purchasing Tools, and the methods of using them—The Hammer—Mallet—Axe—Adze—Brad-awl—Gimlet—Auger—Brace and Bits—Screwdriver—Shaping-knife—Spokeshave—Pincers—The various kinds of Chisels—Gouges—The Mortising Chisel—The Hand-saw—The Sash or Tenon-saw—The Keyhole Saw—The Gauge—The Square—The Jack-plane—The Trying-plane—The Long Plane—The “Jointer”—The Smoothing-plane—The Rebate Plane—The “Plough-and-tongue” Plane—How to manage the “Plane-iron”—The “Two-foot-rule”—The Compass—The Glue-pot, and how to melt Glue—The Carpenter’s Bench	13 to 24

The Grindstone and Oilstone.

The Stone—The various ways of Mounting—The simplest Mounting—The Sides—Ends—The method of Uniting—To secure against Leakage—How to fix the Bottom—The Iron Spindle, its Shape and Length—The Brasses in which the Spindle is to work—How to make and fix—The Handle—How to adapt—The necessity of obtaining the various parts before commencing to work—How to keep the Grinding Surface Flat—Grindstones to work by a Treadle—The Oilstone and its uses—How to make the Case, and fix the Stone—Slips for Sharpening Gouges	25 to 31
--	----------

To Make a Drawing-Board.

The difficulties to contend with in making a Drawing-board—Splitting, Warping, and Twisting—The necessity of using well-seasoned Wood—Various methods of joining Wood so as to form flat surfaces—Rebated—Ploughed and Tongued—Clamped—The Shrinkage of Wood—How to keep the Drawing-board “true”—Mitre-clamping—The “Dovetail Notch”—Cassell’s New Drawing-board—Framing and Panelling—Dowelling	32 to 36
---	----------

To Make a Set of Bookshelves.

Sizes to be decided upon, and Drawing made before commencing work—The Drawing should be made to a proportionate scale—The marks used to designate inches and feet—The Boy Joiner advised to buy large boards ready-planed—The wood required in making the object—How to Saw Boards—Hints in relation to second-hand Tools—“Flush”—“Set Back”—The different stages of the work—“Counter-sinking”—How to fix the Shelves—Details of finishing—Staining, Sizing, and Varnishing—Border and Moulding for the Shelves .	37 to 46
--	----------

To Make a Small Gate for a Landing or Nursery-door.

How accidents may often be prevented—"Pitch-pine"—The proportions must depend on position—The fixed uprights—How to carve—The Gate Posts—Mortising the Horizontal Bars into the Gate Posts—The Tenons—The Wedges—The Cross-piece—Should have a self-acting Spring to keep it closed 47 to 51

To Make a Box.

The size of the boards required—Simplest method of putting the Sides together—Nails and Sprigs—How to be driven in—Angle Mitre—Dovetail—The different kinds of—Mitre, or Secret Dovetail—Its application—Method of joining two boards at right angles to each other 52 to 55

To Make a Dog-kennel.

The various kinds of Dog-kennels—How to make a Kennel for a small Dog out of a Box—Care must be taken to secure proper warmth and ventilation—For a large Dog, the Kennel should be built on a proper framing—The various parts, and how to put them together—"Halving" wood—The floor, how to make and put down—The ventilation—The Walls and Roof—How to prevent water penetrating the joints—Painting and Lime-washing 56 to 62

To Make a Tool-chest.

The necessary conditions—The wood required—The Moulding—The Sliding Tray—How to put on the Lock—The Escutcheon—The Handles—Larger Tool-chests—A Rack in which to place the Tools around the Box—The advantage of such arrangement—Tools should be kept in their places—The danger of leaving them about 63 to 65

To Make a Pigeon-house.

The upper part—Must be water-tight—The bottom of it to project—The separate compartments—The Pole—How to protect it from rotting—The foundation for it—How the house is fixed on to the Pole—How the struts should be cut to prevent their splitting—The lower struts—How to carve or turn the spike 66 to 68

A Dwarf Bookcase.

General form illustrated—How to build the body—The top to be made to support a microscope, &c.—To make the Shelves movable—The Racks and Ledges—The Feet—The Section—The Back framed and panelled—Oil-rubbing 69 to 70

A Cabinet for Microscope Slides.

The Slides should not stand on edge, but should lie horizontally — General description of the Cabinet to be made—The Trays, how to make them—How to join the sides—The floors of the Trays should be made of cartridge-paper—The wood to be used for the Cabinet—Very nice Cabinets can be made of cigar-boxes—One operation to be followed up throughout—How to make the Cabinet —The measurements and method of working 71 to 78

To Make a Writing-desk.

General description of Desk—The wood to be used—May be veneered or inlaid—The principle of folding explained—How to cut the ends—To join the angles —The Lids—How fixed and supported—Desk hinges—Recesses for Ink-glasses, Stamps, Sealing wax, &c.—The Secret Drawers—The Locks, Bolts, and Handles 79 to 85

Parquet or Inlaid Work.

The various woods used in Parquet Work—Method of attaching the pieces to each other, and to the floor—Veneering—How to plan out a pattern composed of Octagons and Squares—To multiply the pieces—To make and use a “Templet” —Another design of similar elements, the proportions being varied—Various designs introducing the Square, the Hexagon, Star, Circle, &c.—Wax-rubbing 86 to 90

To Make and Carve a Book-cradle.

General construction in its simplest form—To darken the wood—To transfer a design to the wood for Carving—To fix the wood for Carving—Carving Tools —Their forms, and how to use them—The processes of Carving in Wood—To Work a pattern over the ground—To make tools for this purpose—Wood-carving should not be sand-papered 91 to 98

To Make and Carve a Reading-stand.

The wood to be used—Piercing the Tracery—The Key-hole Saw—The Turning or Frame Saw—Its construction and method of using—To cut out the general form—The making up—The Shelf and Back-stays—The Brass Catches—To make the Reading-stand to fold, for convenience in travelling—Geometrical methods of drawing various designs for Gothic Tracery in Circles or Squares, for Windows or Carved Panels—“Chamfering” 99 to 107

To Make a Flower-box for a Window.

The wood to be used—The size and general design—The Corner Piers—How to adapt to the slanting or “weathered” surface of the Window-sill—To fix the front and sides to the Piers—Special necessity for strength and durability—To join the back and sides—How to fix the bottom—Provision for drainage—To “rusticate” the front, and “embattle” the top—To make the pyramidal tops of the Piers—Tarring to prevent rotting 108 to 111

To Make a Step-ladder.

The uses of a Step-ladder in a household—General view of the Step-ladder to be constructed—Working Drawing of one side—The recesses for the Steps—The shape of the Steps—The Top—How to wedge the Tenons in the Steps—Method of Driving in the nails, or of extracting bent ones—The Back-stay—Its shape—How to fix—The Hinges—The Ropes 112 to 117

To Build a Small Summer-house.

How to plan and lay the foundation—The uprights—How they are to be fixed—The Tie-beam and Roof-trusses—The King-post—The Principals—The Ornamental Spike—Method of regulating the work—The Sides—To be boarded in—The Purlins to support the Roof-boards—The Roof-boards—How they are to be nailed on—How they are to meet at the ridge—The Fillets on the Joints—How to make the Trellis-work for the front—The ornamental “Barge Board”—The Seats and Table—How to paint the Summer-house 118 to 124

To Make a Small Wardrobe.

To be made in separate parts for the convenience of the Boy Joiner—To be made of Dry Pine—Size and general proportions—How to construct the Base and Plinth—The Drawer in the Base—The Upright Cases—The Doors—To be framed and panelled—The Cornice and Moulding—The Pegs—The Trays, or Drawers 125 to 129

To Make a Drawing-room Cabinet.

To make this handsome piece of furniture out of an old Box, or out of new wood—To take out the old nails, and “make good” the surface—The Pedestal—The Shelves—The Doors framed—How to fix the Glass Panels in them—How to paint the Cabinet white, or to Ebonise it—The top to be made of a thin slab of Marble 130 to 133

To Make a Desk Writing-table.

General form—Arrangement of Drawers—Real and sham—The Framing—The Legs PAGE
 —The fixed Top—The beading round the Drawers—The Desk Top—Arrange-
 ments for raising—The Frame to support it when raised—To cover with
 American Cloth or Leather 134 to 137

To Make a Pedestal Writing-table.

How this may be made of old Boxes—Nothing need be wasted—The most con-
 venient sizes of Boxes—The Ground Plan and Perspective View, to show how
 the Boxes are to be placed—How they are to be fastened together—To make
 the upper compartment to contain a Drawer—The Doors for the Cupboards—
 How to make “Sham Panels”—The Drawer—How to make, and divide into
 nests—How to cover or veneer the Top—The Handles—How to put on the
 Locks 138 to 144

Model Making.

To make a Model Lodge or Toll-house—The wood and implements required in
 making Models—How to mark out the different parts of the body of the Model,
 and how to put them together—The Windows and Door—“French” nails—
 The Chimney Stack and Chimney-pots—The Roof—To imitate Slates or Tiles—
 The Palings—The Garden—How to paint the Model 145 to 150

To Make a Model Cottage.

Proportions of the sides—General instructions in making—To give additional
 strength—The Attic Window—The Chimney—To thatch the Roof—How to
 paint the Cottage—To imitate a Winter Scene 151 to 155

To Make a Model Bridge.

General description—Same method applies to a Model Railway—To cut out the
 Sides—To indicate the Stones—Material of which to make the covering of the
 Arch—How to put the parts of the Bridge together—The Roadway—The stand
 to imitate Canal or Stream—How to colour the Model 156 to 160

To Make a Model Railway.

The model to stand on a Mantelpiece—The two ends of the road must project—
 How to lay down the Rails—The Stations—Hip Roofs—Trains may be pur-
 chased—Desirable to have Mineral Wagons, so that the children may load
 them—The weight adds to steadiness of the Train—How to make the Wagons
 illustrated by working drawings—The Axle-box—The Wheels—Method of pro-
 ducing motion—The Weights and Pulleys—How to increase or diminish the
 speed 161 to 166

To Make a Working Model Mill.

How to build the body of the Structure—Children like to see the working of Machinery—One side of the Mill should therefore be made of Glass—The Roof—How to make the Crank—Its Plates and Pins—The Crank-hook—The Treadle and Loop—How to work the Iron Wire—Drills, and how to use them—The Sails of the Mill—How to make—To give additional strength if large-sized—How to attach to the Spindle—The Stand—How to work the Mill—This mechanical action may be used for other purposes—Suggestions for Star, Figures, Punch, &c. 167 to 172

To Make a Nursery Table and Chair.

To cut and mortise the Legs—To shape and tenon the Frame-pieces—To put the Frame together, and to affix the Top. General Instructions for making a Chair to correspond 173 to 178

To Make a Model Doorway.

General description—The sides of the block of Steps—The “Tread” and “Riser”—The Jambs or Uprights—The Architrave or Horizontal—How to fix—The Cornice—The Door itself—The Panels—The Knocker—Door-plate and Bell—How to paint 179 to 182

A Few Words about Mouldings, and How to Form them.

The Torus—Astragal—Bead—Fillet—Apophyge, “scape” or “spring”—Ovolo—Cavetto—Scotia—Cyma Recta—Cyma Reversa—Gothic Mouldings 183 to 187

Various Methods of Lengthening Timber.

Scarfing—Square and Oblique—The *Trait de Jupiter*—The “Sally” in Scarfing—The Dovetail halving—Joining timbers at right angles—Mortise and Tenon—Fox-tail Mortise—Halving and its variations—To join timber obliquely 188 to 193

Geometrical Constructions, Specially Useful to the Boy Joiner.

The importance of a knowledge of Practical Geometry to the Joiner—To erect a perpendicular at the end of a line, and at a given point—The terms “perpendicular” and “vertical”—Radius and Diameter explained—To construct a Square—Oblong—Equilateral Triangle—The various kinds of Angles and Triangles described—To construct a Triangle of given dimensions—To construct an Equilateral Triangle of a given altitude—To draw a Rectangle equal in area to a given Triangle—To find the centre of a Circle—To draw a Circle through three given points—To construct a Square, about and in a Circle, and in a given Diagonal—A Pentagon on a given line—A Hexagon, Octagon, and other Polygons—To draw an Elliptical figure by different methods—To draw a true Ellipse and an Oval 194 to 207

THE BOY JOINER.



TOOLS, AND HOW TO USE THEM.

To boys of an industrial or mechanical turn of mind, the very name of "tools" possesses a charm which others can scarcely understand; and I purpose, therefore, giving some information about them, before starting on the actual work in which they are to be employed—to describe, as it were, the characters who are to perform on our stage. The few hints given will serve as a guide in the selection of the tools.

A well-fitted tool-chest is not by any means to be undervalued, but you need not wait until you possess one. You can buy tools singly, just as your work requires them, and I shall, in the course of this book, give some instructions for the construction of a chest to contain them.

If, however, you are disposed to purchase a tool-box, do not buy one in which the tools are mere toys—this is absolutely a waste of money—and you will be annoyed by the failure of your work, and your inability to accomplish your wishes, owing to the inefficiency of your tools.

There is an old adage that a "good workman can work with bad tools." Very likely he can, but if so, it is just because he is a good workman. His skill enables him to overcome every difficulty, and to make each tool do its best; but he would be able to work better, and certainly with greater ease, with good tools.

This book is not however addressed to good workmen, but to boys,

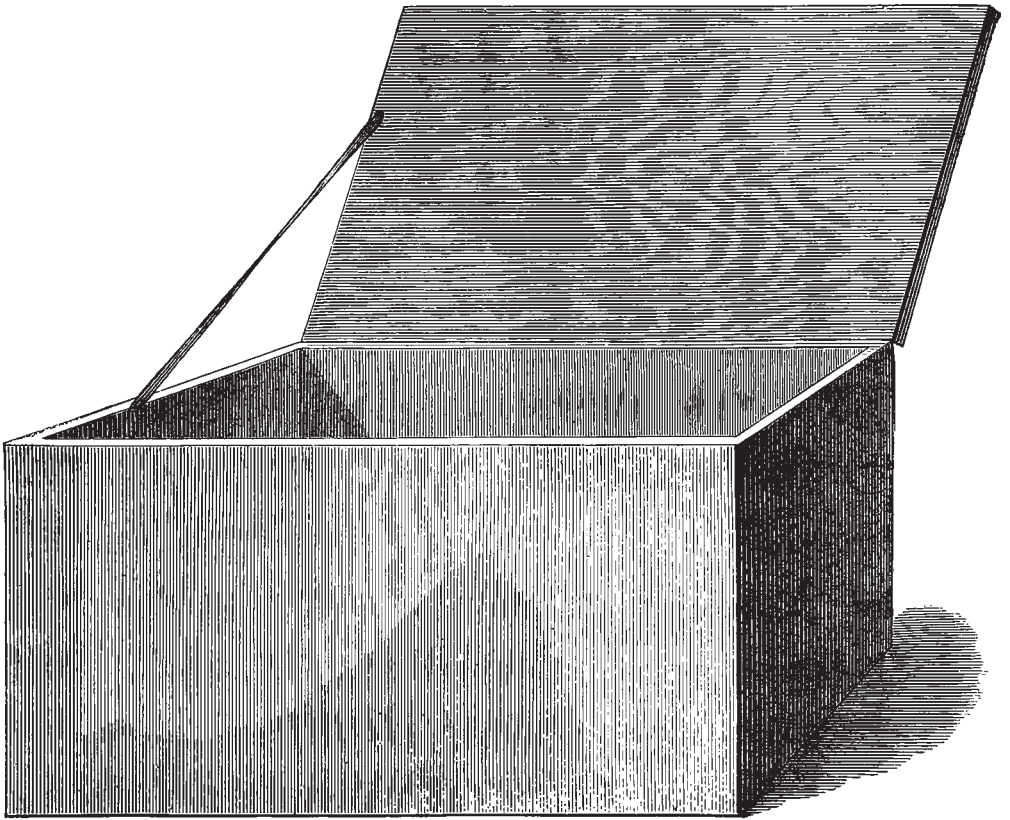


Fig. 45.

How to Make a Box.

Boxes are always useful, and they can be made in various ways. I will give the very simplest, and then show you how the method of construction can be improved upon.

We will suppose that you wish to make a box (Fig. 45) two feet long

and one foot high; but of course the same method would be followed whatever might be the measurements desired.

You will require wood as follows:—Two pieces for back and front, 2' long and 11" wide, 4' 0"; two pieces for sides, 11" long and 11" wide, 1' 10"; total 5' 10", of 11-inch wide deal, $\frac{1}{2}$ inch thick.

You will observe that the whole width of the end is to be one foot, therefore the end pieces must be eleven inches wide, and to these are added the back and front, each half an inch thick, making together the required size of twelve inches wide.

As far as we have proceeded, the height is only eleven inches, but if we add the thickness of the bottom and the lid of the box—which are to be half an inch each—we shall make up the height to twelve inches. The bottom and lid will require each two feet of deal, half an inch thick, and twelve inches wide.

If you find any difficulty in getting boards twelve inches wide, you can glue them up of narrower ones, say of two widths of six-inch boards.

The sides are to be attached to each other and to the bottom by nails, or rather sprigs, the heads of which should be hammered below the surface by means of a punch.

As already said, this is the simplest method of construction. The next best is by the uniting the sides by the joint called the "mitre." For this purpose the sides and ends must be cut of the full length, and their edges must be planed off, so that they may meet at a right angle; then, having been glued together, a cutting is made with the saw through the angle, as shown in Fig. 46, into which a strip of very hard wood dipped in glue is inserted. When the glue is quite hardened, the strip of wood is shaved down so as to be quite flush with the side.

The best way, however, of joining the sides of a box or drawer, is by the plan known as **Dovetailing**, which is of three kinds, common, lap, and mitre. **Common dovetailing** shows the form of the pins or projecting parts

as well as the cavities cut to receive them in both of the sides, the parts being cut as shown in Fig. 47. Fig. 48 represents a variation of this form, used in

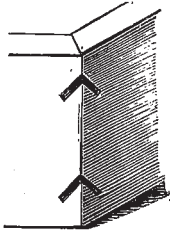


Fig. 46.

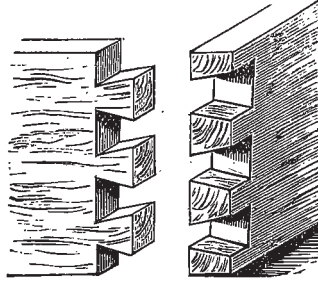


Fig. 47.

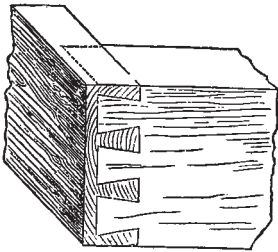


Fig. 48.

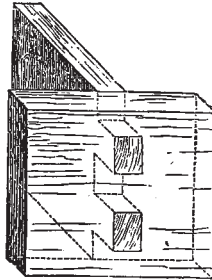


Fig. 50.

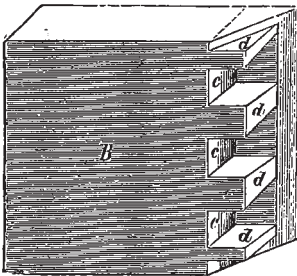
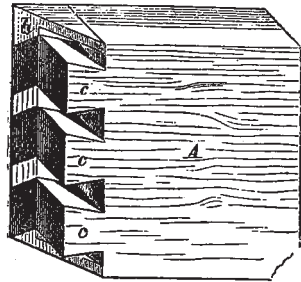


Fig. 49.



attaching the fronts of drawers to their sides, and for similar purposes. Here the dovetail is seen on the one side only, a ledge being left so that the ends of the dovetails do not penetrate quite to the front.

Lap Dovetailing is similar to this, but in that system the ends of the dovetails of the side are shortened, and the recesses which are to receive them are not cut through. When joined together, therefore, only the ledge is visible on the return side.

Mitre Dovetailing, sometimes also called secret dovetailing, conceals the dovetails, and shows only the mitre at the corners. The manner in which this joint is effected will be understood from Fig. 49, in which the two parts A and B are given, each part being lettered to correspond with the position it is to occupy when the sides are joined.

Mitre dovetailing is particularly useful where the faces of the boards are intended to form a salient angle, that is, one which is on the outside of any piece of work, but where the faces form what is called a "re-entrant" angle, that is, a joint to be seen from the *inside*, common dovetailing is most generally used, because, first, it is stronger, since the dovetails pass entirely instead of only partially through; secondly, it takes less time to execute; and thirdly, by the very nature of the work the dovetails are concealed inside.

Fig. 50 shows a good method of joining two boards at right angles to each other by mortices and tenons. This plan is useful where a strong partition is required in a large box.

A Writing-Desk.

This is an exceedingly useful article, which I recommend every Boy Joiner to attempt, and I am certain that with but a little care and perseverance the attempt will not fail.

The desk as a whole is nothing more than a deep box, the lid of which, instead of being fixed horizontally, so that its edges should be parallel to the top and bottom of the ends of the box, is cut obliquely, so that when the desk is opened a slanting surface is presented (Fig. 66).

The wood used may be mahogany, baywood, or even pine. Rosewood is not adapted for the purpose, it is too heavy, and by far too hard to work; but of course you can make your desk of cedar or baywood, and veneer it with rosewood, walnut, or any other of the ornamental woods, and this is the plan usually adopted. In veneering, as will be shown in the article on inlaid work, page 86, you can produce very pretty effects, and these are particularly applicable to the top of a desk, on which you might form a border, or your own initials, or those of any one to whom you intend presenting the results of your work.

A very nice size to adopt is ten inches wide at the end, and eight inches high, and this desk might be fifteen or eighteen inches wide in the front.

You must obtain, then, in the first instance, some wood half an inch thick, well planed and smoothed. If you do not intend to veneer the desk you should use pieces of wood which are prettily veined, but if the surface is to be covered this need not be studied.

I will assume that you intend to veneer the desk, and that, therefore, its appearance before veneering is of no consequence.

Cut two pieces to your size, 10" by 8" (Fig. 67). Find the middle of the one side, A, and draw the line A B. This line is to be drawn at the exact slant you

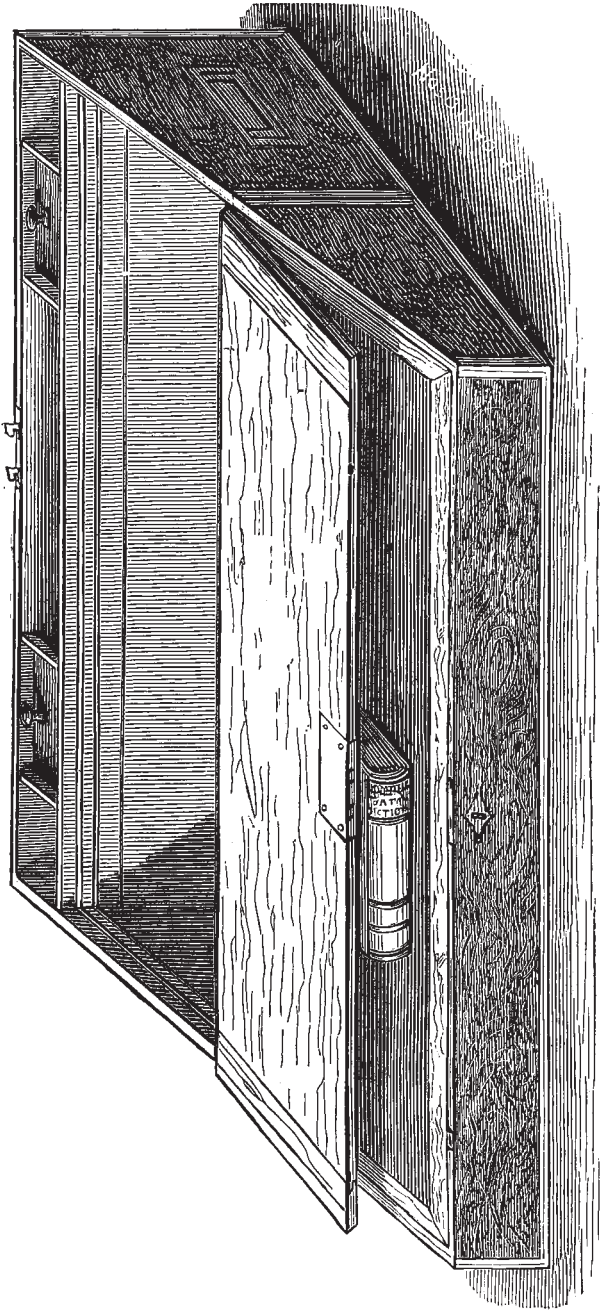


Fig. 66.

intend the surface of the desk to be when open, and from the diagram you will see that if the piece $A B C D$ were rotated in the point A , then D would come to d , c to c , B to b . And this is precisely that which takes place when the desk is opened. Having drawn this line, then, on both end pieces, cut down it carefully with your tenon-saw, which must be held quite perpendicularly during the operation. Unless you are quite sure of your power in wielding your plane you had better not attempt to plane these edges, as, if you take off more at one part

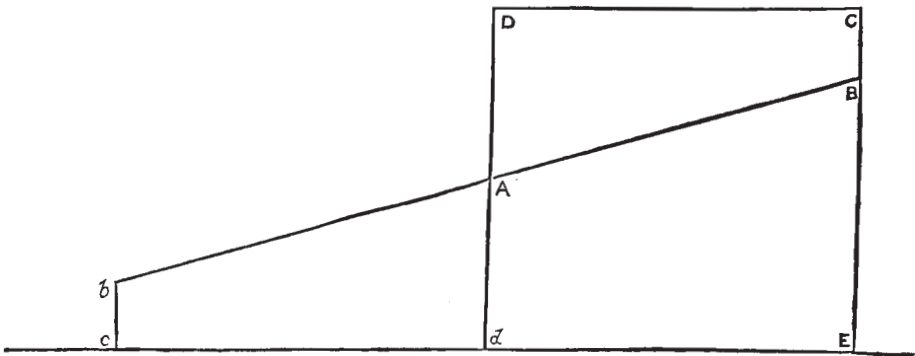


Fig. 67.

than another, the exactitude with which the two parts should fit would be destroyed.

In order to smoothen them, therefore, you had better place a sheet of fine glass-paper on a flat surface, and, holding the pieces perfectly upright, rub the edges on the paper until any projections are removed, but the edges need not be quite smooth if you intend covering them with veneer.

The back and front of each part having been cut to their proper length and width, the sides are next to be put together by means of a simple dovetail joint, as shown on page 54. The two pieces which are to form the bottom and top are to be let in from the inside. They must fit exactly, and are to be secured by means of sprigs driven through from the outside. A strip of wood should be

glued around the edges of the bottom on the inside, to give further security, and to close up any crevice that may have been left.

If the desk is not to be veneered the angles must be joined by the mitre or secret dovetail, as described on page 54.

In that case, too, the top and bottom must be differently fixed. The edges of both must be planed slantingly towards the inside, and the same must be done with the corresponding edges of the sides, so that the top and bottom may sink in without any joint being visible; and a ledge having been nailed all round the inside, the top and bottom are to be glued to it, and then screws are to pass from the ledge into the top and bottom, but must not reach entirely through the thickness of them.

The two parts of the desk are now to be attached to each other by means of narrow hinges, called desk hinges, which are to be sunk into the edges of the shorter sides. Great care is necessary in fixing these, so that when the desk is closed the two parts may exactly correspond, and that the part *b c* may form a portion of the upright surface *B E*.

The general body of the desk having been thus constructed, the writing surface next claims attention. The partition shown towards the distant side of the desk must be made. In the first place, a strip of wood about two and a half inches wide is to be fixed vertically at about three inches from the back, and under this a similar piece is to be glued horizontally, thus forming, as it were, a long and narrow box. This box is to be divided into compartments, as shown in the drawing, viz., one at each corner for ink-bottles, next to these spaces for stamps, steel-pen nibs, &c., and between these a long space for pens in holders. Around the walls of the two compartments intended for stamps, &c., narrow strips are to be glued to support lids made to lift off by means of small knobs. The lids must be so placed that these knobs do not rise above the edges of the divisions, in which case they would prevent the closing of the desk.

In the middle compartment, two thin pieces of wood are to be glued against the back and front. These are to be about one and a half inch wide, and must be slanted off towards their ends. On these a piece of wood curved towards the middle is the rest, to form a tray, the space underneath being used for sealing-wax, seal, &c. In order to raise the tray, it is only necessary to press on one end of it (over the slanting part of the supports), when the other end will, of course, rise.

Now, there is always a certain charm in mystery, and so I will show you how to make the "secret drawers" of the desk.

You will remember that we have just constructed a long box against the back of the desk, and when this has been done, there will, of course, be a space underneath it; in this the secret drawers are to be placed. They will not be very broad, but we must not mind that.

In the first place, cut a piece of board a quarter of an inch thick, to fit with the utmost exactitude into the space below the long box already fixed. It must fit so closely, that when in its place it must be continuous with the front of the box, and that the recess may be entirely unnoticed.

Having placed this in its precise situation, bore holes, with a long and fine gimlet, through the bottom of the cavities intended for the ink-bottles, down into the top edge of the additional piece. Obtain at the ironmonger's a couple of long French nails; these are very thin and smooth, with neat flat heads, and they will just drop through the holes in the cavity into those of the sham wall, thus keeping it in its place. Make a false bottom to the cavity, so that even if the ink-bottles are taken out the heads of the nails may not be seen, and so no one will be "any the wiser" as to the existence of the sham wall, or the drawers behind it.

To remove the sham wall, withdraw the nails, and by just pressing against one end of it the other will protrude, and you will be able to take hold of it.

A piece of wood about an inch square is to be glued to the back, and to this a piece one inch wide and about seven inches long is to be fastened by a hinge. This will serve as a support for the book-rest, which may be made to stand more or less upright by its means.

This useful article may, however, be rendered more portable in the following manner :—Attach the two sides to each other by means of small hinges, so that they may fold together like the covers of a book. Fix two wooden pins of about one-eighth of an inch thick in the edge of the shelf, and bore two corresponding holes in the carved sides, so that the shelf may be fixed or withdrawn at pleasure. Make the piece of wood, to which the support is to be attached at the back, of two pieces, glued on the two parts of the bookstand in such a way, that when it is opened they may meet closely together, and having fastened a similar piece by means of a hinge to the support, this is to be fixed to the two blocks by means of wooden pins and holes, as used in the shelf.

As already stated, the window in the design given is one of the simplest form ; and as the Gothic tracery with which many of the windows, doors, and panels of churches are filled is extremely beautiful, I give here the method of drawing a few examples, in order to afford guides for carrying your work beyond the common objects usually sold.

Whatever is worth doing at all is worth doing well ; and the principles here laid down will enable you to draw the figures with geometrical correctness, and to strike curves with your compasses in a manner infinitely better and quicker than you could do them by “free-hand.” I advise you to study the geometrical figures in the little text-book of “Linear Drawing,”* which will enable you not merely to copy, but to design for yourself.

Fig. 83 is the elementary study on which the following figure is based.

* “Linear Drawing and Practical Geometry applied to Trade and Manufactures,” by E. A. DAVIDSON, published by Cassell, Petter & Galpin.

Having drawn the circle, describe on the diameter two equal semicircles meeting at the centre *a*. Divide one of these semicircles into six equal parts, and set off

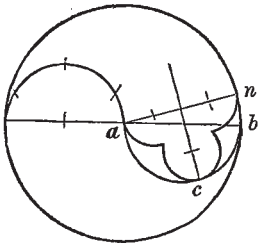


Fig. 83.

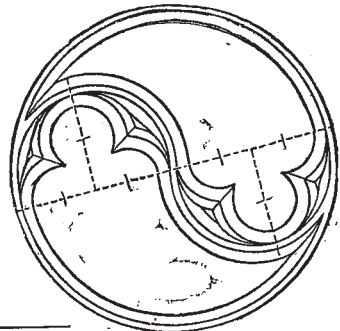


Fig. 84.

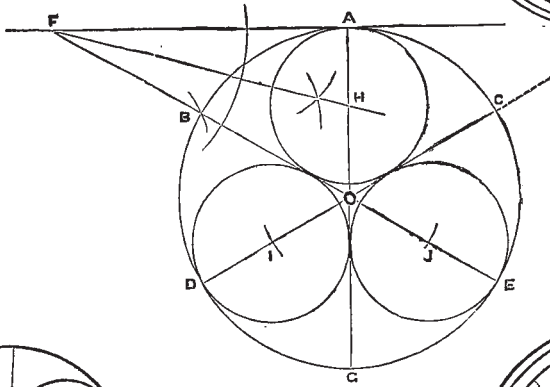


Fig. 85.

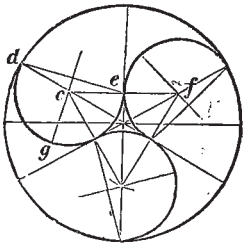


Fig. 86.

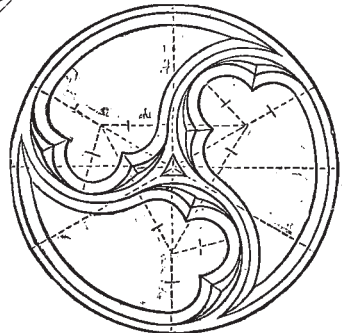


Fig. 87.

one of these sixths from *b* to *n*. Draw a line from *a* to *n*, and divide it into four equal parts. From the middle point of *a n* draw a line passing through the

centre of the semicircle, and cutting it in c . From c set off on this line the length of one of the fourths of $a n$. This point, and the two in $a n$, will be the centres of the interior curves.

Fig. 84 is the further working out of this elementary figure. Draw the outer circle of the required size; carry the work as far as described in the last figure, and all the rest of the curves will be drawn from the same centres.

Figs. 85 and 86 are the elementary stages of the beautiful piece of tracery shown in Fig. 87. We will commence with Fig. 85, which shows how to inscribe three equal circles in a circle.

At any point in the circles, as A , draw the radius $A O$, and another line, $A F$, at right angles to it. From A , with the length $O A$, cut the circle in B and C . From B and C draw lines cutting the circle in D and E , and carry the line on until it cuts the horizontal line in F .

Bisect the angle F , that is, divide it into two equal parts, and draw the line which divides it, until it passes through $A O$ in H . From O , with the length $O H$, mark the lines $D C$ and $E B$ in I and J . From H , I , and J , with radius $H A$, draw the three required circles, each of which should touch the other two, and also the outer circle.

We now proceed to the next stage of the figure, which is shown in Fig. 86. Having inscribed three equal circles in the circle, join their centres, thus forming an equal-sided triangle. From the centre of the outer circle draw radii passing through the angles of the triangle, and cutting the circle in points, as d , and two others. Draw $e d$, and bisect it by $c g$. Then the centres for the curves, which are in the semicircles in the completed drawing (Fig. 87) are on the three lines $d c$, $c g$, and $c e$.

These curves are called "foliations," or "feathering," and the points at which they meet are called cusps.

Fig. 88 shows how to begin to draw Fig. 89. Draw two diameters at right

angles to each other, and join the ends of these, thus forming a square in the circle. Divide each of the quadrants into two equal parts by lines cutting the sides of the square in points, as *g* and *n*. Join these points, and a second square

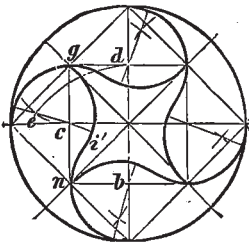


Fig. 88.

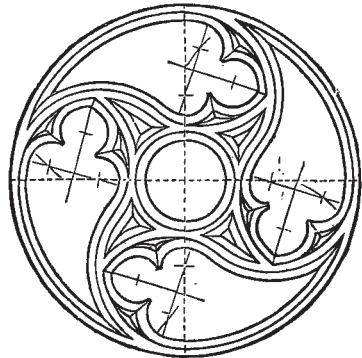


Fig. 89.

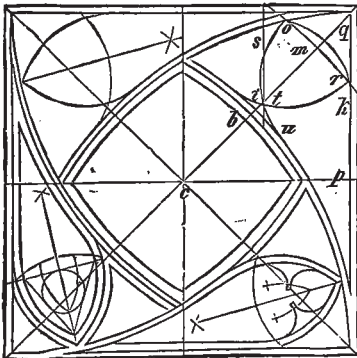


Fig. 90.

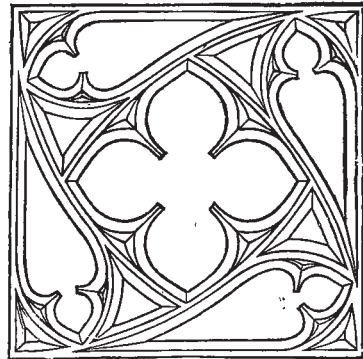


Fig. 91.

will be formed within the first. The middle points of the sides of this inner square, as *b*, *c*, *d*, are the centres of the arcs which start from the extremities of the diameter.

From *b*, with the length *b d*, draw part of a circle, and from *g*, with radius