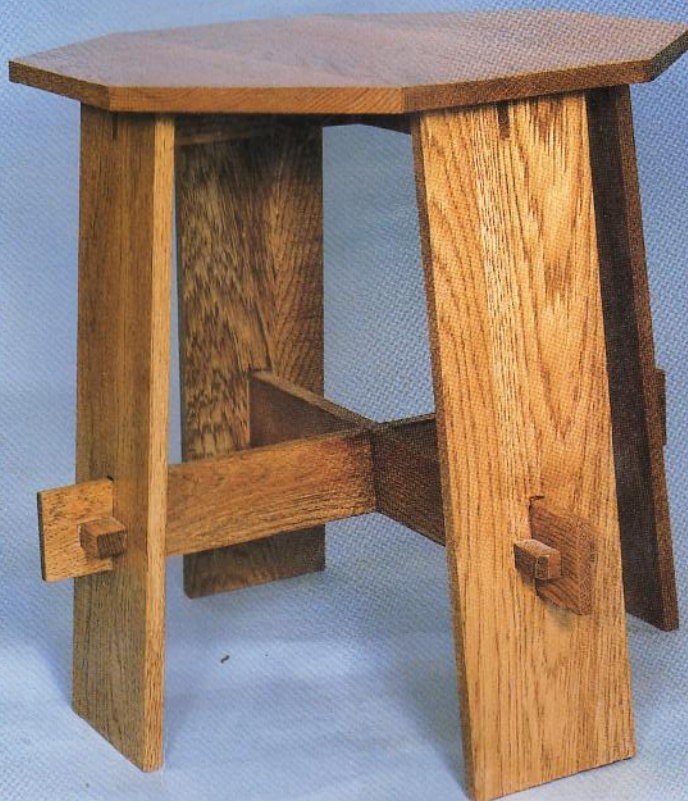
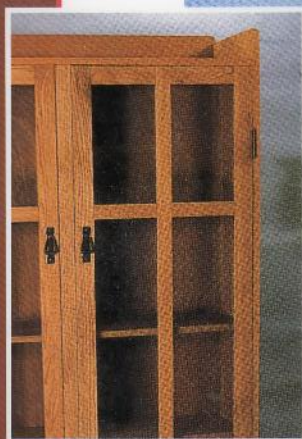




ARTS & CRAFTS



FURNITURE



Projects by
STICKLEY : LIMBERT : ONKEN : WRIGHT

Projects You Can Build
for the Home

BLAIR HOWARD



Arts and Crafts Furniture

Blair Howard

UNION PUBLISHING
FRESNO CALIFORNIA

**Arts & Crafts Furniture:
Projects You Can Build for the Home**

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TABLE OF CONTENTS

Introduction	6
Chapter One	8
<i>The Arts and Crafts Movement</i>	
Chapter Two	16
<i>The Projects</i>	

Chapter Three	19
<i>Materials</i>	
Chapter Four	21
<i>Construction Techniques</i>	
Chapter Five	30
<i>Finishing</i>	

THE PROJECTS



Chapter Six	34
<i>Stickley Bench</i>	



Chapter Seven	42
<i>Limbert Bookcase</i>	



Chapter Eight	50
<i>Stickley Hall Mirror</i>	



Chapter Nine	54
<i>Arts and Crafts Table</i>	



Chapter Ten	60
<i>Stickley Octagonal Tabouret</i>	



Chapter Eleven	68
<i>Limbert Pedestal</i>	



Chapter Twelve	74
<i>Limbert Plant Stand</i>	



Chapter Thirteen	78
<i>Arts and Crafts Tea Tray</i>	



Chapter Fourteen	82
<i>Stickley Writing Table</i>	



Chapter Fifteen	90
<i>Small Bookshelf</i>	



Chapter Sixteen	94
<i>Limbert Magazine Stand</i>	



Chapter Seventeen	100
<i>Frank Lloyd Wright Print Stand</i>	



Chapter Eighteen	106
<i>Limbert Coffee Table</i>	



Chapter Nineteen	114
<i>Stickley Hanging Bookshelf</i>	



Chapter Twenty	120
<i>Onken Book Stand</i>	



INTRODUCTION

It seems a long time ago since I was asked to write this book. At the time I had only the vaguest idea of what the Arts and Crafts movement was all about. What little I did know I'd learned from watching the Antiques Road show on television. The few pieces I'd seen there weren't, to me at least, at all inspiring. The copper, wooden and iron lamps at first seemed primitive, and the furniture, almost all of which seemed to be made of depressingly dark-colored oak, was heavy, unattractive, even crude. Today, however, my home is filled with the stuff. So what happened?

Well, I'd already written several woodworking books and was looking for another subject when this was suggested. A journey to the local library produced several coffee table books, but a tour of the local antique shops produced nothing more than the enthusiastic endorsement of the Arts and Crafts Movement by the shop keepers. It seems very few original pieces can be found outside of museums and private collections.

Anyway, after spending some time with the books, my interest was piqued. One of those books included reproductions of original articles written for *The Crafts-*

man magazine by one Gustav Stickley who, although long-since passed away, was to figure largely in my life for many months to come, and he still does. *The Craftsman* was a magazine published by Stickley during the early years of the 20th century for woodworkers of all levels of skill, but especially for novices. The articles therein were short—I believe they must have been heavily edited for content. The illustrations and drawings were hand-done, primitive and lacked the detail we are used to today, and I don't think they would have been much use to someone who didn't possess a fairly advanced level of skill. Gustav, I'm afraid, must have taken a lot for granted: he certainly knew what he was about, and therefore assumed we would too. But the articles did contain enough information for me to be able to broadly interpret the master's way of thinking, I hope, and I set about building several of the pieces contained in those articles.

The result was that I came to love the simplicity and elegance of Arts and Crafts furniture, I built a house full of oak furniture, and I wrote this book.

The projects you'll find in the pages that follow range from the

very simple to the quite complex. Some are original designs by Gustav Stickley himself, in which case I have interpreted and expanded upon his short descriptions and somewhat rudimentary drawings to a point where I think most woodworkers, even novices, will, with time and patience, be able to produce them. Other projects are my interpretations of pieces designed and built by other masters of the Movement: Charles Limbert, Oscar Onken and Frank Lloyd Wright. Surviving examples of their work are even rarer than those of Gustav Stickley. Those projects, then, are the result of long hours of research that produced hundreds of long-lost designs, none of which were more than small, hand-drawn illustrations or black and white photographs of small images in room settings. From these, I selected the ones I personally found attractive, transposed them as faithfully as possible onto paper, and then set about building them. As best I could I have used the same materials as were used to build the originals, mostly white oak. The dark, fumed finishes, however, I have not reproduced to any degree; I just don't like dark oak furniture.



That's not to say that you can't reproduce it for your projects. In fact, in the interests of authenticity, you should. And so, you'll find a full description of fuming techniques within the text.

Today, Arts and Crafts-style furniture is, if anything, even more popular than it was in its heyday, and what few designs are available, namely variations of the good old Morris reclining chair, are extremely expensive. So I think this book will provide many interesting and enjoyable hours in the shop where you'll produce some equally interesting and enjoyable additions to your

home. Also, I have given you a short history of The Movement itself, along with a somewhat brief look at some of its leading craftsmen.

By the time I had begun work on this book I was a devotee of the art form. Gustav Stickley had become a household name, at least as far as my wife and I were concerned. The first piece I built was the Stickley hanging bookshelf you'll find described beginning on page 114. The Master's original illustration of the piece did little to sell the piece, but I chose it because I thought it would be simple enough to

make, and that I could easily sell it when it wasn't needed after the book was finished. It took a couple of days, working on and off, to make the piece, and when it was finished I found there was something about it, an attraction that was quite indefinable. I fell in love with it and, today, it occupies pride of place on the wall of our master bedroom. And that's the way it seems to be with all Arts and Crafts furniture. Certainly I have found it so—I still own all fifteen pieces described in this book. I hope you too will come to love Arts and Crafts Furniture as much as I do.

Safety

To prevent accidents, use the safety guards installed on your power equipment; they are for your protection. Where photographs in this book show the guards removed, it was done simply for photographic purposes. Always wear eye protection, keep fingers away from saw blades, wear hearing protection, and consider installing dust protection equipment to remove sawdust from the air. Never wear loose clothing—ties, unbuttoned shirt sleeves, loose coats or neckties. Never wear rings, bracelets, watches or other jewelry that might get caught in machinery. Tie back long hair. The author of this book has tried to make the contents as accurate as possible, but neither the author nor Linden Publishing Company, Inc., accept any responsibility for any accidents, injuries, damages or other losses incurred resulting from the material presented in this book.



chapter one

THE ARTS AND CRAFTS MOVEMENT

Don't worry. I'm not going to do an in-depth analysis of the Arts and Crafts Movement. I would not presume to expand upon, or even repeat, what so many better-qualified authors who have gone before me have said. My intention is to give you just a basic overview of the Movement in general, Gustav Stickley in particular, and some little insight into the thinking of the men who led it.

William Morris

The Arts and Crafts movement was, I think, something of a revolution. It began in England sometime around 1870 as a protest against the shoddy reproduction techniques and furniture that was being mass produced in sweat shops all over the country. Its leader, William Morris, was a well-known architect, artist and philosopher of the time, and the designer of the signature piece of the Movement, the Morris Chair. The revolution itself brought about radical changes in furniture design, and in the way it was made, and lasted for the next forty years or so. But it wasn't only furniture that Morris set about changing. Soon textiles, wallpaper, decorative glass, lamps, and works of art began to show the influence of Morris' ideas and philosophy.

It was Morris' contention that everything in the home should be functional as well as aesthetically pleasing. At that time, Victorian homes were filled with ornate pieces of furniture that were decorative, but of little practical use. There were tables, chairs, and stools that could barely stand under their own weight, much less that of their human owners. It was an age of frivolity, of keeping up with the Joneses, when items were purchased more for prestige than functionality, which galled William Morris no end. And so he set about changing things, at least as far as his own world was concerned. Little did he know where it would lead.

Morris was an intellectual, influenced greatly by the past and the works of men like John Ruskin, a writer, art critic and champion of socialism.

Ruskin was a strange man, an extremist who put his whole being into his beliefs, and most of his fortune too. Born in London, England, in 1819, he was the son of a wealthy wine merchant who devoted a lot of time and money to Ruskin's education.

Early in his career Ruskin wrote mostly about painting and architecture. The first volume of his *Modern Painters* series was published when he was only 24 years old; it had a profound effect on public taste and appreciation of

the arts. The series gave the people of Queen Victoria's reign, and William Morris in particular, a new interest in art and a new point of view. Ruskin was a prolific writer of beautiful, clear English which, at times, might be simple and straightforward and then again ornate and colored. During a career that spanned more than 60 years he wrote over 50 volumes. Ruskin died at his home in Coniston, Lancashire, in 1900.

Ruskin's ideals and philosophies had a profound effect on William Morris. He became, in almost every way, an exponent of Ruskin's fundamental principles and of the burgeoning Arts and Crafts Movement in England. He formed deep and lasting friendships with the leading artists of the day—Edward Burne-Jones, William Holman Hunt, Ford Maddox Brown and Dante Gabriel Rossetti—and they too exerted enormous influence on his way of thinking. It was inevitable, then, that these collective influences would eventually result in something tangible, and they did. The first true Arts and Crafts home was Red House, William Morris' London home. Together with his friends, Burne-Jones and Rossetti, he designed it from the ground up with one thought in mind: functionality. Every element was designed to meet the everyday needs of the modern family. It was built by

hand from handmade materials and furnished throughout with pieces Morris himself designed; the decorations he left to Burne-Jones and Rosetti.

Morris must have been well pleased with his efforts for, not long after completing Red House, he opened a shop in London that was filled with the fruits of his ideas. It must have been quite an exceptional store, because everything for sale therein was designed either by Morris himself or by Burne-Jones and Rosetti. There were furniture, paintings and sculpture, pottery, wall hangings, rugs and carpets, textiles, metalware, and pottery, all handmade, and all designed to further a movement whose founders probably had little idea was happening. And so it continued to grow. Soon workshops were springing up all over England. By the time Morris died in 1896 its influence had already reached the United States, and was entering a new phase.

William Morris and his contemporaries in England spurned the mass production methods of the great factories, insisting instead that everything should be made by hand using traditional methods and tools. Machine tools were rarely used, and then only when they could enhance the overall quality of any given piece. At first, his American peers embraced this philosophy wholeheartedly. But it soon became apparent that no matter how wonderfully idealistic this might be, the economics of hand-production just didn't add up. To make a profit the American workshops had to price their goods so high that only the very rich could afford to buy them. And then they realized that quality furni-

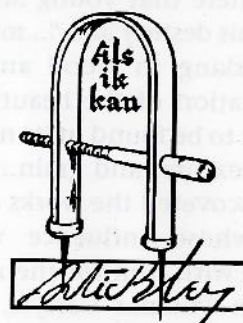
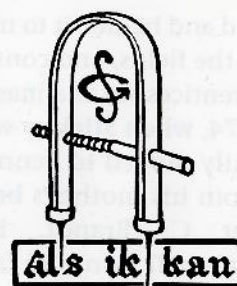
ture can be produced using machinery, without sacrificing either the quality or aesthetic appeal of the handmade product. Thus production increased, prices dropped and, even though Arts and Crafts furniture was still very expensive, the marketplace grew to include families with more modest incomes.

Gustav Stickley

At the forefront of the movement in America was the now famous Gustav Stickley. He embraced the ideas of William Morris and his contemporaries, improved upon them, and made them his own. Essentially, he took the basic principles of the English Arts and Crafts Movement and created the Craftsman school of design: simple, functional, democratic pieces of exceptional quality and natural finish, made from native woods, principally oak. In November, 1901, Stickley published the first issue of *The Craftsman*, a magazine devoted to his personal philosophies and what he already termed the "Craftsman Movement."

Stickley was born in Osceola, Wisconsin, in 1857 and was the first of eleven children. His father, Leopold, was a farmer and stonemason who worked hard to support his large family. By the time he was twelve, Gustav had been apprenticed as a stonemason and was already making a much-needed contribution to the family income. He mixed mortar, cut stone, and carried it to the masons. It was hard work and he hated it.

By the time Stickley had turned 15 his father had abandoned the family and young Gustav had to take full responsibility for his mother, brother and sisters. He



Variations of Gustav Stickley's signature, found on pieces dating from 1902-1912

cut wood and hauled it to market, worked the fields, and continued his apprenticeship as a mason.

In 1874, when Stickley was 16, the family moved to Pennsylvania to join his mother's brother, Schuyler C. Brandt. Brandt owned a small furniture factory, and it was during his employment there that young Stickley found his destiny and "...my love for working in wood and my appreciation of the beauty and interest to be found in its natural color, texture, and grain...." He also discovered the works of the men whose influence would remain with him for the rest of his life: Thomas Carlyle, John Ruskin and William Morris.

By the time he'd turned twenty-one, Stickley had become manager and foreman of his uncle's factory, and things began to move quickly. In 1883 he married Edna Simmons. The following year, with two of his brothers, Charles and Albert, he moved to Binghamton, New York, and opened a wholesale and retail furniture business selling prod-

ucts from his uncle's factory in Pennsylvania, and period reproductions made in Grand Rapids. Unfortunately, the new business didn't immediately prosper. In fact, it went downhill almost from day one.

Rescue for the fledgling business arrived in the form of an offer of financial support, but only if Stickley Brothers would manufacture their products in Binghamton. Now this was a new concept for Stickley, and something of a Catch-22 situation. To get the money he needed he had to have enough money to begin manufacturing, and he didn't. It was a situation that might have deterred a lesser man, but not Stickley. "Before any capital would be put into the concern, it was necessary to show that we were actually manufacturing, and we had no money to buy machinery."

Stickley solved the problem by making use of a lathe that belonged to a friend who made brooms. With this he blocked out the "plainer parts" of simple Shaker chairs. The rest of the parts he made by hand. It's also interesting to know that he dried his wood by laying it in the sun on the tin roof of the building.

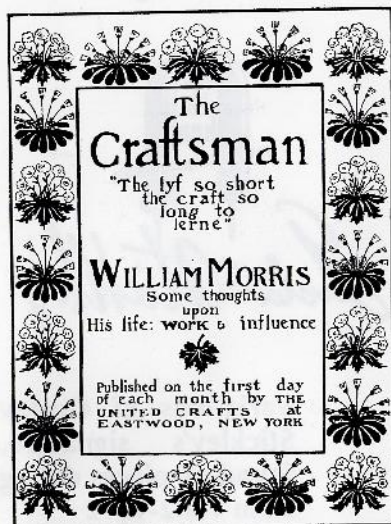
He wrote, "The very primitiveness of this equipment, made necessary by the lack of means, furnished what really was a golden opportunity to break away from the monotony of commercial forms, and I turned my attention to reproducing by hand some of the simplest and best models of old Colonial, Windsor and other plain chairs, and to a study of this period as a foundation for original work along the same lines."

From those tough beginnings Stickley's empire grew and pros-

pered. Imitators, much to his disgust, were quick to jump on the bandwagon, although the quality of their products failed to meet the exacting standards set by Stickley.

In 1888 Stickley left his brothers and the furniture industry. During the next couple of years he had several jobs, one in the railroad industry, another at Auburn Prison, but he wasn't happy. In 1894 he moved his family from Binghamton to Syracuse and, with a partner, opened a new furniture manufacturing business, the Stickley-Simonds Company. He was shortly joined there by two of his brothers, Leopold and J. George Stickley. These two were soon to leave Gustav and venture out on their own. Their company, L & J.G. Stickley, is still in business.

At first, Stickley-Simonds manufactured the same simple chairs that Stickley had made years earlier in Binghamton, but it wasn't to last. Stickley still wasn't satisfied and, in 1898, he set out on an extended trip to Europe. In France he met Lalique, Samuel Bing and other notable producers of Art Nouveau. In England, he met with the leaders of the English Arts and Crafts Movement and bought samples of their work which were, on his return to the United States, to become the foundations of yet another new direction in Stickley's checkered career. First, he changed the name of his business to the Gustav Stickley Company, then he set about designing a new range of furniture based on what he had seen and learned in Europe. He tried his hand at Art Nouveau, but never was able to quite find what he was looking for. Then he turned to the samples of Arts and Crafts furniture he had pur-



The first issue of Gustav Stickley's *The Craftsman* magazine.

chased in England. There was something about the simplicity of design that appealed to Stickley. From the basic Arts and Crafts forms he had found in England, he developed a new line of furniture that he felt would be more in keeping with the American middle class way of life.

The new designs were basic, simple, almost primitive. Ornamentation was restricted to simple curves, and the basic joints were turned into prominent features of the new line, which Stickley called "structural" furniture. It was different from anything that had been put on the market in America before, and Stickley must have had many an anxious moment at its introduction.

In 1900, Stickley's structural furniture was exhibited at the Grand Rapids Furniture Market. It received only a lukewarm reception: *The House Beautiful* called it "sensible furniture," not quite the rave review he was hoping for. But Stickley persevered. Turning to the old masters, William Morris, John Ruskin, and others for inspiration, he changed the name of his company to United Crafts, and refined his new designs. In 1901 he founded *The Craftsman* magazine. A single copy sold for 20 cents. Over the years, it closely followed the evolution of Stickley's new concepts, and became a pulpit from which Stickley preached the gospel of the new movement.

But, it was several years before he was able to call his new ventures a success, and during those years the company and the furniture it produced continued to evolve. The first Stickley furniture was massive, almost medieval in design, with hardware designed and artificially aged to complement it. From these early designs

grew the furniture that was to make Stickley's name.

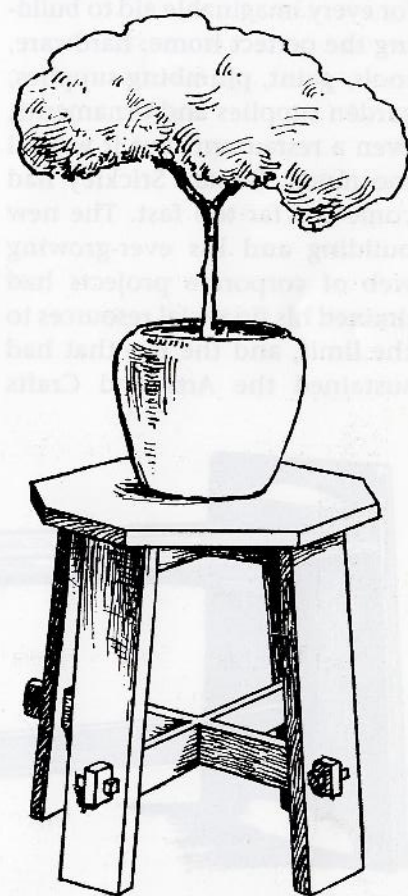
In 1902 Stickley was doing so well he had to move to a larger building. In 1903, the Arts and Crafts Exhibition opened in United Crafts Hall, and included the work of more than 100 craftsmen from America and Europe.

By 1904 it was obvious that Stickley's endeavors had been successful. His Craftsman furniture was selling, and the magazine had emerged in a new format as the voice of the fledgling American Arts and Crafts Movement. The same year, Stickley broadened his influence even further. He added textiles, pottery and lamps to his ever-growing inventory of designs. And then he began to look at the entire home environment, and the first Craftsman-designed houses were built. They were simple designs containing large, open rooms. Structural beams were left exposed, and fireplaces were the focal points of large, comfortable living rooms. Stickley had become not only the leader of a new movement, but also the founder of a whole new way of life.

But what of his competitors? If, as they say, imitation is the sincerest form of flattery, Stickley must have felt flattered indeed. First among his flatterers were his brothers, all of them. Trained by Stickley himself, they each went into business for themselves. And they were successful. Their designs were almost identical to those of their now famous brother. And there were many others, all with names that linked them closely to the new movement. But Stickley wasn't flattered. He was concerned that many of his competitors were turning out furniture of a quality

that was inferior to his Craftsman line and that, because of the similarities of the names, his own reputation would be damaged because of it. But he needn't have worried. By 1908 his furniture was selling all across America and, so it seems, Craftsman-designed homes were being built in every American community.

In 1908 Stickley bought 600 acres in Morris Plains, New Jersey. It was here that he built what he considered to be the ultimate American home. It was to become the center of yet another Stickley enterprise, Craftsman Farms. In 1910 he bought a sawmill in the Adirondacks to



Tabouret from Gustav Stickley's *The Craftsman* magazine.

supply the raw lumber for his Craftsman furniture. Stickley now was the complete manufacturer, controlling the production of his line of furniture from tree to home, but it wasn't until 1913 that he was able to consolidate his company under one roof. In that year he moved The Craftsman Inc. into a 12-story building at 6 East 39th Street in New York, and opened it to the public. The first four floors were showrooms, the upper floors housed *The Craftsman* magazine, business offices, a lecture hall, and a library. The building also housed another of Stickley's innovations, the Permanent Home Builder's Exposition. It was a showplace for every imaginable aid to building the perfect home: hardware, tools, paint, plumbing supplies, garden supplies and ornaments, even a restaurant. But it was all too much. Gustav Stickley had come too far too fast. The new building and his ever-growing web of corporate projects had drained his financial resources to the limit, and the fire that had sustained the Arts and Crafts

Movement for more than ten years was already dying. The fickle public had turned away from Craftsman-designed furniture. In 1915 Stickley was declared bankrupt.

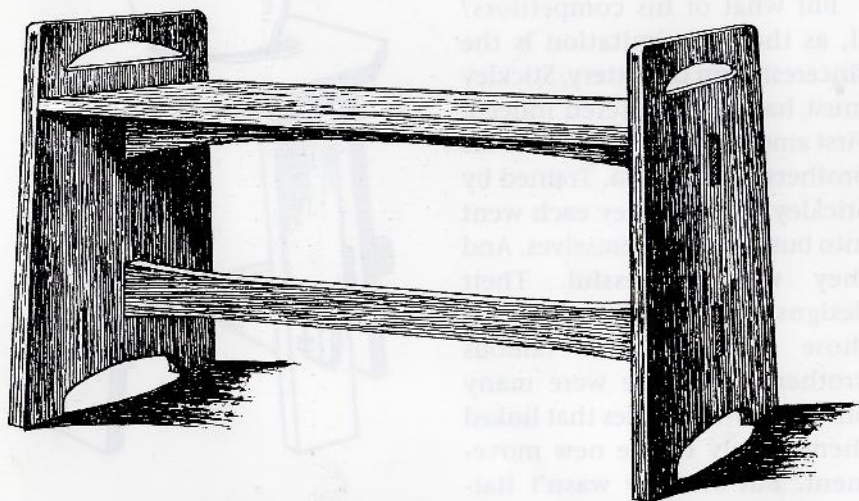
But Stickley wasn't done yet. He accepted the change in public taste, though with little grace, and turned his hand to new ideas. In 1916 he introduced a new finish to the woodworking industry; it didn't catch on. He then tried making Chinese Chippendale furniture, but that didn't work either. The last issue of *The Craftsman* was published in December, 1916, and that really heralded the beginning of the end of an American era. Craftsman Farms was sold in 1918 and, the same year, Gustav's brother, Leopold of L. & J.G. Stickley, bought the Eastwood factory. In 1918 Leopold formed a new company with Gustav as vice-president, an arrangement that was to last for less than a year. The Eastwood factory continued to make Craftsman designed furniture until 1927, and then even Leopold had no option but to

turn his hand to other more popular styles.

Although Gustav soldiered doggedly on, he never again achieved even a measure of the success he'd enjoyed during the glory years between 1900 and 1915. He died in 1942 aged 82.

Although the Arts and Crafts span of popularity lasted for less than twenty years, there wasn't a corner of the nation it didn't reach. By 1910, literally hundreds of small shops were turning out furniture in the Craftsman style. Much of it was less than memorable but, as it always seems to do, quality floats to the surface, and a handful of designers managed to cling to Gustav Stickley's shirttails and enjoy a limited amount of success, if only for a while.

Of these, aside from Gustav's brothers, Charles Limbert was, arguably, the most prominent, and there's no doubt that he would have liked to have taken credit for the inception of the new movement; you only have to read the preambles to his catalogs to see that this is true. Limbert made an enormous contribution to Arts and Crafts. His designs, though similar to Stickley's, were a little more subtle. There were more curves. Exposed tenons were often longer, cunningly shaped, and more finely finished. He made extensive use of decorative supports, which appeared in all sorts of strange places on his furniture, even on bookcases and china cabinets where they obviously made no structural contribution. And he used cutouts—holes of various shapes and sizes. And, like Stickley, Limbert was obsessed with quality. The following is taken from a Limbert catalog dated 1906:



This piano bench is from Gustav Stickley's *The Craftsman* magazine.



"Do not confuse Limbert's Holland Dutch Arts and Crafts furniture with the poorly constructed, ill-proportioned and uncraftsman-like specimens of straight line furniture with which the market is flooded at the present time, and called all manner of names, such as "Crafts Style", "Mission", "Quaint," etc., etc., simply because it is devoid of ornamentation. This is not Arts and Crafts Furniture.... Every piece we offer is the result of careful thought and study by artists and craftsmen of recognized ability and experience, who have the true Arts and Crafts spirit, and are able to impart an individuality and feeling to their work. Each piece is actually held together by mortise and tenon, pin and dowel, or other structural device, and is as strong in material and workmanship as we can make it."

Holland Dutch? Limbert claimed that Arts and Crafts furniture had its roots in the Netherlands of the 16th and 17th centuries. "... all furniture styles, with the exception of those that are purely French, from the beginnings of the 16th century down through the Flemish Renaissance (1507), the Elizabethan Renaissance (1558-1603), the Jacobean influence (1603-1649), the times of William and Mary and Queen Anne, and the Georgian transition (1689-1820), on even into the best of modern schools, can be traced and their origins found in or connected with the Netherlands or the work of the Holland Dutch."

And it was to the descendants of the Holland Dutch in America that Limbert turned to find the craftsmen that built his line of furniture. He built his factory in Holland, Michigan, which was

then the largest settlement of Holland Dutch in America.

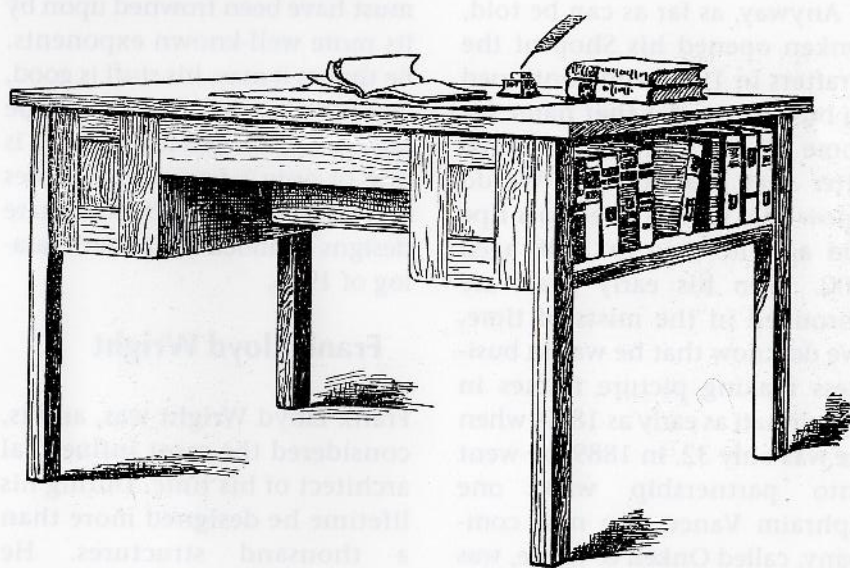
Limbert was prolific. His catalogs listed hundreds of designs. Many were simply variations on a theme. Some were radical in design. All were quality pieces, many of which have survived looking little different from the day they left the factory in Holland, Michigan, almost a century ago.

Elbert Hubbard

Elbert Hubbard had his shop in East Aurora, New York. He was the founder of, and at the center of, the Roycroft community. Hubbard was a flamboyant character, a self-made entrepreneur with a flair for salesmanship. He made a fortune selling soap and, along the way, discovered socialism. In 1893 he went to England and visited William Morris' Kelmscott Press. What he learned there must have had a profound effect, for on his return to the United States he formed the Roycrofters, a guild of bookmakers that evolved into a cooperative steeped in the Arts and Crafts

Movement. Within two years of its inception, the guild was turning out a line of Arts and Crafts products that included books, lamps, metalwork and, of course, a full line of Roycroft furniture. Unfortunately, Hubbard and his wife died with the sinking of the *Lusitania* in 1915. The Roycrofters, however, continued successfully in business for several more years.

Roycroft Arts and Crafts furniture was both functional and sturdy, and a number of pieces have survived, although many of them are to be found today only in museums and private collections. For the most part Roycroft furniture was plain, with little character. Still, original pieces are sought after and highly prized. I haven't included any in this book simply because I couldn't find anything I liked. I did find a side chair, but it was just that, a simple chair with little to recommend it other than the Roycroft mark.



Writing Table by Gustav Stickley, from *The Craftsman* magazine.

Oscar Onken

Oscar Onken and his Shop of the Crafters in Cincinnati are something of an enigma. Except for some odds and ends of sales literature scattered around the Metropolitan Museum of Art, and the Public Library of Cincinnati and Hamilton County, very little information about him or his work is available. One has to wonder why. Especially so, when, from the depth of his catalog, and the obvious fine quality of the few pieces of Onken furniture that are known, there's no doubt that he must have been a prominent member of the Arts and Crafts Movement. And this is significant because Cincinnati never has been closely associated with the Movement. True, it has always been well known as a center for furniture manufacturing, and has long been recognized for its fine art pottery, particularly Rookwood, so Onken's shop can't have been the only one turning out this type of product. One has to wonder, then, what happened to the others.

Anyway, as far as can be told, Onken opened his Shop of the Crafters in 1904, and continued in business under that name for some 15 years. What happened after that is a mystery. We do know that Onken lived to a ripe old age; he died in 1948 aged 100. Even his early years are shrouded in the mists of time. We do know that he was in business making picture frames in Cincinnati as early as 1880, when he was only 32. In 1889, he went into partnership with one Ephraim Vance; the new company, called Onken & Vance, was listed as "Manufacturers of Moldings, Frames, and Dealers in Etch-

ings, Engravings and Art Goods." In 1893 he opened a retail store in Cincinnati's downtown shopping district, and was operating a small factory on West Second Street; what had happened to Mr. Vance is another mystery. No matter, Onken must have been doing well for the Oscar Onken Company was formed in 1903, with Oscar as president and his brother, Robert, as vice president, and was to remain in business until 1931. And that brings us to the Shop of the Crafters, which opened for business in, it is thought, 1904 at Fourth and Park Streets. The new business advertised that it was "Manufacturers of Arts and Crafts Furniture, Hall Clocks, Shaving Stands, Cellarettes, Smokers' Cabinets and Mission Chairs." And there's no doubt that that was exactly where Onken's interests lay. His catalog is stuffed full of just that type of furniture.

His Mission and Arts and Crafts furniture, although the basic designs are similar to those of other members of the Movement, was ornate to the point where it must have been frowned upon by its more well-known exponents. Be that as it may, his stuff is good, and well put together. The single piece I've included in this book is one of only a few simple pieces among the vast number of ornate designs included in Onken's catalog of 1906.

Frank Lloyd Wright

Frank Lloyd Wright was, and is, considered the most influential architect of his time. During his lifetime he designed more than a thousand structures. He described his "organic architecture" as that which "proceeds,

persists, creates, according to the nature of man and his circumstances as they both change." Quite a mouthful, and one that's difficult for the layman to understand. He was a pioneer whose ideas were far ahead of his time, and he had to fight for acceptance of every new design.

Wright was born on June 8, 1867, in Richland Center, Wisconsin. His early influences were his clergyman father, who taught him classical music and introduced him to the works of Bach and Beethoven, and his mother, who educated him during his early years using the kindergarten method of Friedrich Froebel. At the age of 15, he entered the University of Wisconsin, where he studied engineering because the school had no course in architecture.

In 1887, he left Madison to work as a draftsman in Chicago. A year later he went to work for Adler and Sullivan, soon becoming Louis Sullivan's chief assistant. Wright was assigned to design almost all the firm's housing projects and, to pay off his many debts, he moonlighted, designing houses for private clients in his spare time. It wasn't long before his boss, Sullivan, found out about his extra-curricular activities, and the association between the two came to an end: Wright terminated his employment and set up in business on his own. This gave him the opportunity to expand ideas that had been fermenting deep inside him for a number of years. He became involved in, and eventually the leader of, a new style of architecture known as the Prairie School. The houses he designed under this new flag had low-pitched roofs and extended



lines that blended into the landscape. In 1904 he designed the strong, functional Larkin Building in Buffalo, New York, and in 1906 the Unity Temple in Oak Park, Illinois. Then he embarked upon an extended tour of the Orient and Europe, visiting Japan, France and Great Britain. He returned to America in 1911 and built a house on his grandfather's farm in Wisconsin. He called it Taliesin, which is Welsh for "shining brow". In 1916 he returned to Japan, where he designed the Imperial Hotel in Tokyo. It was a radical design that he floated on an underlying sea of mud. Was this the first of the so-called earthquake-proof designs? It might have been, for the structure sustained little damage during the catastrophic earthquake of 1923.

The Depression era of the 1930s severely limited the construction of new houses. But Wright managed to struggle through the hard times. He wrote and lectured widely and, in 1932, established the Taliesin Fellowship. The fellowship was a school where students learned, hands-on, by working with building materials and

with the problems of design and construction. In 1938, Wright moved the school from Wisconsin to Taliesin West, a desert camp near Phoenix, Arizona.

The mid-1930s were productive years during which Wright entered a new era of creative activity. Some of his most famous works date from this period. These include Fallingwater, a luxurious weekend house in Pennsylvania; the S.C. Johnson and Son Administration Building in Racine, Wisconsin; and the Jacobs house in Madison, Wisconsin, the first in a series of ingenious do-it-yourself houses Wright called Usonian. Other notable, post World War II works included the Unitarian Church in Shorewood Hills, Wisconsin; the Price Tower in Bartlesville, Oklahoma; the Beth Shalom Synagogue in Elkins Park, Pennsylvania; the Annunciation Greek Catholic Church in Milwaukee; the Guggenheim Museum in New York City; and the Marin County Civic Center in San Raphael, California.

Although Wright's work was always controversial, and he didn't always receive the recognition

he deserved in the United States. He was acknowledged in Europe as early as 1910 with the publication in Germany of his drawings. In 1925 the Dutch architectural magazine, *Wendingen*, produced a book of his life's work. In 1938, and again in 1949, *Architectural Forum* devoted entire issues to his work. In 1941, he was awarded the Royal Institute of British Architects' gold medal. All this happened in Europe, so one has to wonder why his work didn't have a similar impact in the United States, because it wasn't until 1949 that he received a similar medal from the American Institute of Architects.

Wright certainly lived a full and flamboyant professional life, but it was filled with personal tragedy and he was constantly in financial difficulties. His personal life wasn't much better. He married three times and had seven children. Frank Lloyd Wright died on April 9, 1959, in Phoenix, Arizona. He was one-of-a-kind and, as is often the case with artists of his class, his true worth wasn't recognized until years after his death. Today, he's an American legend.



chapter two

THE PROJECTS

All of the projects in this book are copies of originals. I browsed through books and old catalogs in search of pieces I thought the reader would enjoy building. I felt a bit like a kid in a candy store. I was told there wasn't room in the book for more than fifteen projects. Okay, but which fifteen? There were thousands of pieces and dozens of makers to choose from. Some of the makers were household names, some were virtually unknown. I decided to go with three whose names are synonymous with the Arts and Crafts movement: Gustav Stickley, Charles Limbert and Frank Lloyd Wright. Of the unknowns, I chose one: Oscar Onken of The Shop of the Crafters that produced Arts and Crafts furniture in Cincinnati. The other unknowns, I decided, would be excellent subjects for another book. As well known as the three masters are, the projects themselves provided some special problems. These I managed to work out, so that you won't have to cope with them. That's an advantage, I know, but I'm afraid you'll miss some of the adventures, and trepidations, I was fortunate enough to enjoy. In some cases, the projects required that I become something of a detective: even more fun. I had to try to get into the minds of men that are long dead, and it wasn't easy. The result, however, is fifteen projects, some simple, some a little more complicated, that will test your tal-

ents, provide you with many interesting hours in the shop, and some extremely nice additions to your home.

The Stickley Projects

Some time ago I found a source of Gustav Stickley projects that had been taken straight from the pages of *The Craftsman* magazine, published by Stickley himself during the opening years of the 20th century. All of the Stickley projects included in this book were originally to be found within the pages of that magazine. At first glance I thought I would have little to do other than redo the drawings, build each piece according to Stickley's instructions, then write my own step-by-step instructions. Unfortunately, that wasn't the case. Stickley's instructions were, in every case, no more than a single paragraph describing in general terms the overall procedure, sometimes no more than three or four lines. The working drawings were incomplete, at least in modern terms. Only the major measurements were included. In most cases a very small graduated scale converted inches to the scale of the drawing, and from this the budding craftsman was supposed to estimate the working dimensions. The bills of materials were always several pieces short; these, I suppose, one was supposed to estimate using the dreaded scale. But worst of all, the drawings and bills of materi-

als just didn't work. I soon began to wonder if the old boy was testing us. Take the writing table, for instance. If I'd used the master's dimensions as given in his original drawing, the knee-hole would have been less than 13 inches wide, too small even for a child, the bookshelves would have been caverns, and the whole thing would have been so badly out of proportion it would have looked ridiculous. Only the overall dimensions were accurate and workable.

So, when I set about building the first couple of pieces, I soon found myself scratching my head. In the end, I had no choice but to take the master's overall dimensions for each piece, then build it working everything out along the way. The result is that I now can present you with working drawings, far more detailed, and certainly more accurate, than the originals as they were found in *The Craftsman*. You will have no trouble building these pieces. Each is unique, although some have been reproduced before. My original intention was to include a Morris chair, but I decided that that had been done to death—what book on Arts and Crafts furniture would be complete without one? Mine, I hope.

I built each piece from scratch in my own shop, using almost exclusively the same methods of construction used by Stickley himself. My only real deviation was to substitute biscuits for dowels. This I did primarily in

the interests of speed and convenience, but mostly because I hate doweling—the modern plate jointer is the answer to a long-standing prayer. The purists, I'm sure, will want to use dowels. Stickley preferred to work with white oak, quarter-sawn to provide the best figure. I found quarter-sawn material very difficult to obtain, and very expensive. Plain-sawn white oak, however, is easy to find, and that, for the most part, is what I used.

As to finishing, Stickley preferred to fume almost all of his work, and I did some of that, too. You'll find details of how this can be done in Chapter Five, Finishing. With regard to the finish itself, I've been able to find out very little about the exact methods Stickley used. I suppose he must have used some sort of varnish or shellac, and beeswax. Oscar Onken gives us a clue, though, in his catalog of 1906. He said this: "The Crafters recommend their pieces in the dull waxed finishes, such as Weathered, Fumed, Flemish, Austrian or Early English shades." You'll find further instructions in Chapter Five on finishing. For some of the pieces, I chose for a more contemporary look, and certainly a more durable finish, of a color that suited my own needs. Therefore, in some cases, I used one of the stain/finish combinations; the shade is golden oak.

The Limbert Projects

The pieces designed by Charles Limbert I had to transcribe from photographs of originals and pictures in sales catalogs. This, fortunately, wasn't too difficult, at least as far as the catalogs were concerned, mainly because the

illustrations gave the overall dimensions. From them I was able to work out the bills of materials. Most of the work was done by trial and error. Angles had to be estimated, but even this wasn't too difficult. I simply started each process by cutting the piece of wood in question an inch or two longer than I felt it needed to be and, little by little, arrived at the point where the result looked right. Many of the drawings were actually completed after the pieces had been built. When I was working from a photograph, I looked at the room as whole and, knowing roughly the size of chairs, cabinets, etc., was able to come up with a fairly close estimate of a given piece's dimensions. From there it again became a case of trial and error.

Limbert, too, worked almost exclusively with quarter-sawn oak, and fumed almost all of his work. But, as with Gustav Stickley, I could find nothing that described his finishing methods. So, once again I assume he must have used some sort of varnish, shellac, or both, and beeswax.

The Oscar Onken Project

As with most of the projects in this book I found this one in an old catalog. It's one of the few Shop of the Crafters pieces that wasn't covered in ornate carvings. Even so, the design goes a little beyond what Onken's peers would have deemed appropriate.

As always, I began with an overall size and a small, hand-drawn illustration. From there I was able to lay out the design and build the piece. At first, I wasn't quite sure if I'd like the results, but I needn't have worried. The bookstand now occupies pride of

place alongside the fireplace in my living room. I'm sure you'll like it too.

The Frank Lloyd Wright Project

When I made the Frank Lloyd Wright piece, I had no more than a photograph to work from, not even a single dimension. That wouldn't normally have presented too much of a problem. But this was a unique piece set upon another weird-shaped/size piece of furniture, so I had no real idea of where to begin. Eventually, I arrived at a starting point by estimating its height, using the background furniture as reference points. Once I had the height, I used proportioning to arrive at basic overall dimensions. From there it was simply a matter of building the piece and working out the bill of materials as I proceeded. The drawing was the last part of the process to be completed. The original I found in a coffee table book on the Arts & Crafts. As far as I could tell, it too was made from white oak, but finished to a very light color. I have a feeling, however, that it could possibly have been made from maple. It was presented among very sophisticated surroundings, and it wasn't at all out of place. No matter, oak works fine, but one day I might just make one from maple, if only to satisfy my own curiosity.

As Gustav Stickley said many times throughout the pages of his *The Craftsman* magazine, these projects are simple to construct. Yes, I said that with tongue in cheek. I have yet to figure out exactly what he meant. I can only assume he meant that the construction methods them-

selves are simple, because they are. Some of the projects, however, involve a series of complex angles and a specific order in which they must be assembled. Stickley mentions nothing of these in his texts, at least that I could find. This is also true of the Limbert projects. But I've tried to simplify these potential problems for you. I've tried to present the drawings and instructions in such a way as to make the construction of each piece as simple as possible and, where needed, I've given you the correct order of assembly. Stickley was right.

The methods of construction are simple. If you can make a good mortise and tenon joint you're half way home. Best of all, you can build these pieces using only a minimum of stationary power tools: just a table saw, jointer, and drill press. If you do happen to own a dedicated mortising machine, so much the better. If not, well, they say the old methods are the best. And that's true, if you have the talent and patience. Modern tools, however, have made it possible for woodworkers of more modest talents to build nice, serviceable furni-

ture. Arts and Crafts furniture was popular for its simplicity, and its clean, sophisticated lines. The few pieces that do turn up at auction fetch high prices. You can furnish your house with this stuff and it won't look at all out of place: I have.

My best advice to you, then, is to first sit down, read each project chapter through before you begin, choose your lumber carefully, mark and cut your materials accurately, follow my step-by-step instructions to the letter, and then proceed slowly.



chapter three

MATERIALS

Although other woods were used from time to time, quarter-sawn white oak was the material of choice throughout the Arts and Crafts Movement. Occasionally you'll see Gustav Stickley pieces made from mahogany or cherry, and Charles Limbert seems to have used both, as well as white oak, quite extensively.

The projects in this book were all made with plain-sawn white oak, not quarter-sawn. So, why white oak? Well, it's harder than its cousin, red oak, and the grain is finer and therefore presents a more aesthetically pleasing finish. White oak also contains, to greater or lesser degree, naturally-occurring tannic acid, which means it's susceptible to fuming, a process that naturally colors the wood, and one we'll discuss in depth in Chapter Five.

To understand the difference between quarter-sawn and plain-sawn material, you'll need to know a little about the way the lumber industry works. When a log arrives at the sawmill it's cut up in one of two ways: quarter-sawn or plain-sawn.

Plain-sawn is the easiest and most economical way to cut up a log. The log is simply fed into the saw and sliced into boards. The boards are then trimmed and carted off to the kilns for drying.

Quarter-sawing is a much more involved process. The log is first fed into the saw and split into four equal quarters, hence the term quarter-sawn. Each quarter is then fed into the saw with the growth rings exactly at right

angles to the blade. This technique produces a more stable board that's less prone to shrinkage or swelling, and is also less likely to warp or split. It also reveals the translucent rays that look a lot like extended teardrops. Unfortunately, this method of sawing logs also takes longer, it produces more waste, the lumber takes longer to dry, and the boards are narrower. Thus quarter-sawn white oak is not easy to find, and it's expensive.

Plain-sawn white oak, however, seems to be readily available at hardwood suppliers, lumberyards and sawmills throughout the United States, and at reasonable prices. On occasion, I've been able to buy 4/4 white oak surfaced on four sides for as little as \$1.30 per board foot. Most often, though, I buy it unsurfaced for between \$1.20 and \$1.45 per board foot; 5/4 and 8/4 cost a little more.

I buy it unsurfaced because it often comes thick enough (4/4 up to 1 1/4"), with careful planing, to give me a board a full 7/8" or even 1" thick, and this can mean considerable savings over buying 5/4 stock. The only real problem with buying unsurfaced wood is that you never can tell quite what it is you're getting until you've planed it: the color, grain, etc.

If you can, try to avoid buying unsurfaced stock from the specialty hardwood suppliers. It's often quite a bit more expensive—as much as double—than you'll pay at the lumberyard, and your choices will be strictly lim-

ited. Assuming that you will be working with plain-sawn wood, the best plan is to go direct to the source, the sawmill, where prices and choice will be the best.

Most areas will have several sawmills within easy driving distance; I have a half-dozen within a 25-mile radius of my home. The secret to finding good wood, then, is to try them all. And not just the quality of the material they stock is important. Try to find a sawmill where the staff is friendly, interested, and will let you sort through the stock. They may not let you pick and choose your boards with impunity, but you should be able to insist on straight ones.

When you're considering a particular board, pick it up at one end, turn it on edge and sight down its length. If the board is bent, twisted or wavy you'll see it right away; discard it. Also, it's a good idea to vary the width of the boards you buy. Wide boards look great, and are tempting, but they can mean unforeseen wastage. When I have to glue up a large board, for a table top or cabinet side, I like to be able to choose from a range of widths so that I can arrive at a combination that, overall, measures as close to the finished item as possible. This means I don't have to spoil a wide board. Be sure to include some that are 5" to 6" wide; if you have to produce trim, it's nice to be able to do so from one piece of stock. That way the grain and color will match.

If you really want to use quarter-sawn white oak, your lumber-

yard will be pleased to order it especially for you. You will pay a premium for it, and will probably be expected to pay for it up front, which means you'll be stuck with whatever arrives, good or bad.

A good alternative to white oak is red oak. This is the material most contemporary oak furniture is made from. Take a small piece of white oak along with you and compare the two.

There are, of course, advantages and disadvantages. Red oak is more readily available than white; it's easier to find quarter-sawn red oak than it is white; and the translucent rays on the quarter-sawn red oak are more numerous and striking than those in white oak, which means you can really add character to a piece of furniture. Red oak, however, has a much lower tannic acid content than the white variety, which means it doesn't fume well. As far as price is concerned, there's little difference between the two—plain-sawn, at least. On a good day, I can buy number one common 4/4 kiln-dried red oak at my local sawmill for \$1.20 a board foot.

Lumber Grades

Oak, red or white, comes in the following grades: select; FS or first and seconds; numbers 1, 2 and 3 common, and there are more, but that does not concern us here. I do not use either select or FS. I find that number one common is ideal for the jobs I do, and that, with judicious cutting, leaves very little waste. Select and FS grade plain-sawn white and red oak can cost upward of \$3 per board foot; number one common I can buy all day long, everyday,

for less than \$1.40, and there's no discernable difference in quality between it and the two higher grades. The only difference is the supposed amount of usable stock that can be extracted per average board foot. Number one common is economical to buy and, with a little planning, economical to use.

Glue

Craftsmen at the turn of the 20th Century all used animal glue (hide glue) to assemble their furniture. I used the nasty, smelly stuff myself when I was in high school, more years ago than I care to remember. You can still use it today, if you wish, but it's difficult to work with and requires some special, temperature-controlled equipment.

Basically, you heat the raw lumps of glue, along with water, in a special pot with a water jacket to the required temperature of 150°F. Care must be taken not to boil the glue, because it will destroy the fibers. The result should be a thick, creamy, and foul-smelling concoction that somehow seems to find its way onto clothes, hands, and into all sorts of awkward places. This type of glue also requires that you use it in a warm room. Unfortunately, those are not the only disadvantages of animal glue. The glue cannot be used on outdoor furniture, has a short pot life and, once it's cooled, takes a long time reach a useable state again.

Today's aliphatic glues are far superior to the animal glues of yesteryear, and the new polyurethane glues are even better. For the most part, I use ordinary yellow carpenter's glue. It

dries quickly, especially during warm weather, and it forms a joint that's stronger than the wood itself. It's my glue of choice in all but a few situations. On the rare occasions I use polyurethane glue—mostly for large mortise and tenon joints—I do so when I think the piece in question will be subjected to high stress—joining dining table legs to the apron might be one such situation.

I also keep a hot glue gun on hand. It's handy for tacking and temporarily holding bits and pieces in place. I wouldn't be without it.

Hardware

Gustav Stickley and his contemporaries believed that the design of the hardware used on their products was as important as that of the furniture itself. Each member of the Movement had different ideas, and it's funny how similar those ideas were. There's little to choose between them. Wooden, pyramid-shaped pulls of various sizes were used by almost all Arts and Crafts designers. Today, however, it's the beaten copper hardware that we most associate with this type of furniture. I have used reproduction copper hardware on the Limbert bookcase in Chapter Seven. There are several sources for this type of hardware, but it's always expensive. You can expect to pay as much as \$35 for a single reproduction drawer pull. The pulls and hinges on my bookcase were purchased from Rockler Woodworking and Hardware, but you'll find several more suppliers in your local Yellow Pages.



chapter four

CONSTRUCTION TECHNIQUES

One of the goals of the innovators and designers of the Arts and Crafts Movement was to integrate furniture construction techniques as a feature of the overall design, hence the extraordinary use of the mortise and tenon joint. Another goal was return to the quality of construction lost with the advent of the Industrial Revolution. Late 19th century mass production techniques had rendered the small craftsman-operated shops ineffective, and the hand-built goods they produced expensive beyond the means of the average shopper.

Still, it was the contention of men like Gustav Stickley, Charles Limbert, Oscar Onken and other notables, that quality, "functional" furniture should be available to everyone, regardless of social station. Therefore, lines were smoothed and simplified, ornate carvings were done away with, and the old methods of construction were revived. Finish, though still considered of paramount importance, was also simplified, as much to save time as to retain the integrity and beauty of the underlying material. Mechanical fasteners were used only sparingly—the odd screw here and there, and table irons being the most notable retentions. The mighty mortise and tenon joint was refined, revealed, and turned into a decorative feature of the overall design of the furniture. Dowels, splines, and simple butt

joints again became the preferred methods of joining one board to another. Basic machine tools were used extensively to produce Arts and Crafts furniture—the table saw, bandsaw, lathe, drill press, and so on—but each piece was essentially hand-made, joint-by-joint, piece-by-piece, by people rather than machines, although more than one person might be involved in the production of a single piece of furniture. And these methods were still expensive. The average large piece of Arts and Crafts furniture produced by Stickley, Limbert and their peers could easily cost the equivalent of half a year's pay for a person of average means. Still, the stuff sold, and in large quantities.

Today, Arts and Crafts furniture is enjoying something of a revival. Large manufacturers have recognized the possibilities of this unique range. Small shops around the country are again producing quality pieces that the old masters would have been proud of; L & J.G. Stickley, one of the original companies, is still manufacturing the old lines with as much success today as it enjoyed almost a century ago.

As many of the pieces in this book were taken from old catalogs and photographs, it was difficult to see how they were constructed. The answer, I felt, lay in what was generally known about construction methods in the Arts and Crafts Movement. Therefore, I looked at each piece, considered

all that I knew about the original maker, then made an educated guess. My one concession to modern methods was to substitute biscuits for dowels. And I justify that, at least to myself, by thinking that had biscuits been available to Stickley, Limbert, Onken and the others, they would not have hesitated to do the same. I have used very few mechanical fasteners, just a few screws on one or two of the pieces, relying instead on the integral strength of the mortise and tenon joint, reinforced as I felt necessary with through dowels, which in themselves make a nice decorative feature.

I don't believe, and never have, that the old masters were adverse to trying new methods, tools, and machines. And that goes not only for the members of the Arts and Crafts Movement, but for the grand masters too: Sheraton, Hepplewhite, Chippendale, and the like. I am convinced that if Mr. Chippendale had had access to a modern electric router, he would have used it with much joy and enthusiasm. And I, a much lesser craftsman than any that have gone before me, could do no less.

The advent of modern, affordable machine tools and technology is not a bad thing. In fact, during the last decade, they have been responsible for bringing more enthusiasts into woodworking than at any other time in history. Just as the automatic camera

has made it possible for anyone to produce a good quality photograph, so modern machines and power tools have made it easy for anyone with just a modicum of woodworking skills to produce a fine piece of furniture. This is what Charles Limbert had to say on the subject:

"Limbert's Holland Dutch Arts and Crafts furniture is essentially the result of hand labor, machinery being used where it can be employed to the advantage of the finished article. Each piece is actually held together by mortise and tenon, pin and dowel, or other structural device, and is as strong in material and workmanship as we can make it."

And Gustav Stickley: "The modern trouble lies not with the use of machinery, but with the abuse of it. Given the real need for production and the fundamental desire for honest self-expression, the machine can be put to all its legitimate uses as an aid to, and a preparation for, the work of the hand, and the result be quite as vital and satisfying as the best work of the hand alone."

So, I think it's fairly obvious that these old masters and their contemporaries were well equipped with the most modern machine tools of the day. Within their definition, hand-crafted meant that machines were no more than tools, extensions of the hands, under the infinite control of the individual using them. Each piece of furniture was the product of a hands-on team of craftsmen working together for the good of the art.

Tools & Machines

My shop is quite small, just 22 feet by 14 feet. Therefore, I had to be careful as to how much and what machinery I could install.

Even so, a large piece of furniture seems to completely fill what little space I have left. The following is a list of the machines I use, and the reasons why:

Table Saw

This is the most important machine in the shop. The one I use is a Delta 10" contractor's saw with a precision reversible rip fence. It's not as powerful as I would like, but its larger, more powerful brother, the Unisaw, would take up more room than I have to spare. Still, the contractor's saw does all I need it to do. The secret is to keep the blades sharp. The style of rip fence you use is also important. A fixed fence will work well enough for straightforward ripping, but one with an moveable guide (it slides back and forth in its carrier) can make life a whole lot easier. If you have room for table extensions, so much the better. There's nothing worse than trying to support a long piece of material while at the same time trying to make a perfectly square or angled cut. As to blades, I use basically three types: a ripping blade exclusively for working along the grain, when I'm preparing materials for a new piece; a combination blade for trimming, making joints, and so on; and a stacked dado head with carbide-tipped teeth for a number of special operations, which you'll see as you proceed through the projects. I try to keep the table itself clean and free from rust, an ongoing struggle that the rust must ultimately win, I think. I have also found that if I apply a small amount of silicone lube to the table surface the work will slide through the blade much more easily. I also check the belt on a

regular basis, and replace it often. It's also a good idea to check the pulleys from time to time. They do have a nasty habit of working loose. Finally, position is also important. If you can, place your table saw in the center of the shop, within easy reach of the other tools placed in order around the shop.

Jointer

This, in my opinion, is second only to the table saw in order of importance. If you don't already own one of these versatile machines you should consider getting one. Remember though, if you decide to go shopping, bigger is better. I have a 6" machine, and often wish it was an 8" model. Whatever you do, don't opt for one of the 4" bench-top models. You'll find it very difficult to manipulate a large board on its short infeed and outfeed tables.

The jointer is indispensable when making butt joints, or simply truing or straightening an edge. But that's not all a jointer is good for: it will rabbet, chamfer, and mill angles to the edge of a board across a wide range of degrees. You can also use it to taper legs, adjust doors that are slightly out of square, and any number of other tricky jobs that can be difficult to manage by hand.

Planer

A planer is not an essential machine tool, but it definitely can make life easier, especially if you want to use rough stock. I have a small Delta unit that has served me well for a number of years. I buy my stock unfinished, usually 4/4, but sometimes 5/4, 6/4, 8/4 and even 12/4; a planer offers a



wide range of surfacing opportunities. I have found that 4/4 unsurfaced stock usually comes at least 1 1/8" thick, sometimes even 1 1/4". This means that, with careful planing, I can get a 1" board, or close to it, from a piece of 4/4 unsurfaced stock. This can be very cost-effective when you consider the difference in price between 4/4 and 5/4 material. Better yet, the planer also makes it possible to use wood of varying thicknesses not available at the lumber yard, at least not without paying a hefty premium for having it custom planed.

Bandsaw

A bandsaw is not an essential machine tool for the small shop—you can use a hand-held jigsaw—but it does do a great job on those long curves and arches that figure so prominently in Arts and Crafts furniture. If you don't have one, and have decided to go shopping, don't settle for anything less than a 14" model. I have a Delta 14" saw with a six-inch height extension and a rip fence. This allows me to resaw thick material, or saw small logs up to 12" thick into boards.

Sanding Center

I have a sander with a 6" x 48" belt and a 12" disk. You can get them a lot smaller, and they will do the job quite well but, as always, bigger is better. My 12" disk model has a neat feature included: there's an attachment, very simple, for sanding perfect circles up to 24" in diameter; very handy for small tabletops and the like. One simply has to cut the circle roughly to size, find the center, push in the spike of the sanding center guide post, set the

size of the circle on the table track and set the guide post in the track on the extension table. Then it's simply a matter of turning the wood against the rotating disk until it sands no more. The result is a perfectly circular piece of wood. Aside from that, the sanding center is enormously useful for small finishing jobs that would be difficult to manage by hand.

Spindle Sander

This small, bench-top machine might seem to be something of a luxury. Let me assure you, it's not. For many years, I struggled along without one. It wasn't until I finally bit the bullet and indulged myself that I realized how much I'd been missing. True, its most obvious use is for sanding the inside and outside of curves, but I have found it useful for other jobs as well, not the least of which is finishing the ends of those exposed tenons you find on almost every piece of Arts and Crafts furniture. At a push, you could buy a spindle sanding attachment for your drill press, but I wonder about its usefulness. I think you might find the working height, especially on a floor press, to be awkward, rendering the attachment suitable only for small jobs.

Mortising Machine

A mortiser is definitely a luxury item, but one that I wouldn't be without. The mortise and tenon joint is the fundamental element of Arts and Crafts furniture. Any given piece may incorporate as many as a dozen such joints. Some pieces, a Morris chair for instance, might have as many as 40, even 50. Now oak is

a really tough material, and the mere thought of spending several days, mallet and chisel in hand, fills me with dread. Not only that, a dedicated machine, set up correctly, can make the perfect mortise and, especially where through mortises are concerned, turn a complicated operation into a relatively simple one. Now, I can imagine the purists shuddering with horror at the thought of a machine-made mortise, and that's okay. I fully understand how they feel. Even I will admit there's nothing quite so satisfying as a well-cut mortise done with chisel and mallet. Satisfying as it might be, though, I will also be the first to admit that I can't produce such a mortise consistently, quickly, time after time. Today, I find it equally satisfying to be able to cut a perfect 3/8" wide by 3" long mortise through a 2" thick piece of wood in less than a minute, not just once, but as many times as I care, or need, to do so. The result is a quality joint and, eventually, a quality piece of furniture, and that's what the Arts and Crafts Movement was all about. Would Gustav Stickley have used such a machine? I think he would have.

There is, however, another choice. You can purchase a mortising attachment that will fit onto your drill press. These are not quite as good as the dedicated machines, but work well enough. The main problem is the assembling and breaking down: no sooner have you got the darned thing perfectly aligned than you find you need to use a large-size Forstner bit, and off it has to come again. I have found such an attachment can cause more frustration than joy.

Drill Press

The drill press is always a useful tool, especially when a large hole is needed. I own a small Delta 12" bench-top model. It takes up little room in my small shop, and I've always found it to be perfectly adequate for my needs. Complement yours with a nice set of Forstner bits, a set of brad-point bits, and you need nothing more, unless, of course, you're like me: a new tool junkie.

Router Table/Shaper

I have a small router table I made myself. It's not elaborate, but it's versatile, and quick and easy to set up. The power unit is a Porter Cable router, which is a little under-powered when using larger bits. Still, it does the job adequately. I rarely use it for making Arts and Crafts furniture, but it is handy for milling rabbits, slots and grooves.

The Bench

Nobody ever seems to talk about the workbench, which seems strange to me because it's the one piece of equipment no one can do without. Those commercially available benches—you see them in the large chain stores, such as Lowe's and Home Depot—seem to conform to a single set of standards: six or eight feet long by three feet wide, with a top some 30 inches above the ground. Okay, I suppose, but not as versatile as I would like, especially in a small working area. Mine, because I have a small shop, is a little out of the ordinary. It's very heavy and designed exclusively for furniture-making. The working surface is 5 feet long by 4 feet wide, but the top is only 25 inches

above the ground, which is lower than most, but extremely comfortable to work on. The substructure is very sturdy, made from treated 6" x 6" posts. The top, made from 1 1/4" thick MDF, is absolutely flat. I spent a lot of time making it so, to compensate for the shop floor, which is not flat at all. I use the bench top as a reference upon which to make sure that the feet of tables, chairs and other freestanding pieces all touch the ground as they should.

The low height of the bench serves several purposes: first, I don't have to lift anything much more than a couple of feet. Second, it allows more headroom between the top of a large piece and the shop ceiling, which means I can swing long clamps around without smashing the light fixtures. It's also versatile in that it sets back against the wall, thus it takes up little space, and both ends are easily accessible as working areas. It would be even better if I could move it out into the center of the shop. Finally, when I have either the spindle sander or router table set up on the bench, the work heads are only three feet, or so, above the floor, which is ideal for comfortable working.

The point of all this is, a good workbench doesn't have to conform to any set standard. The best bench is the one you custom-build to suit your own particular needs.

Portable Power Tools

There's more to be said about power tools than I could possibly cover here. The job in hand will usually dictate the need. There are one or two, however, that I consider essential to making

good furniture. The list that follows is necessarily a short one, and there's no doubt that most amateur shops will have all of these, and more.

Router

There's only one job that makes the router an indispensable tool for making Arts and Crafts furniture, and that's the stopped dado. Other than that, you'll find little use for it. Edges are not rounded or chamfered, and hinge and lock mortises can be cut by hand. Still, I often wonder how the woodcrafters of old got along without one.

Drill

Always handy to have close to hand, but you'll find its uses, at least for making Arts and Crafts furniture, are limited. I reinforce some of my dado joints with toenail screws and, because oak is so hard, I use a variable speed drill to make countersunk pilot holes. Other than that, I rarely use it.

Belt Sander

This machine I use a lot. In fact, I use mine more than any other machine in the shop, including the table saw. I have two machines, a 24" x 3" Porter Cable model, and small back-up unit made by Skil. I like the Porter Cable because of its weight. It's a heavy piece of equipment, heavy enough that I don't have to add my own weight in order to make it cut faster. I keep a range of belts on hand, ranging from 50-grit to 220-grit, which I find covers all my needs. The coarser grits are good for quickly removing any slight step where one piece of



board is joined to another. The finer grits I use to make short work of smoothing large flat areas. If you don't already have a belt sander, I recommend you buy one. Be sure to get a good one, they take a lot of abuse, the cheaper models don't have enough weight, and their useful life can often be counted only in months.

Finishing Sander

A piece of furniture is only as good as its finish, and a good finish requires a lot of sanding, which means a lot of hard work, especially where oak is concerned. Now sanding is one part of woodworking that I have never enjoyed, a sentiment I'm sure I share with woodworkers everywhere. Over the years, in an effort to make lighter work of my sanding, I've bought just about every brand of finishing sander on the market. Some worked better than others, some made more work than they saved. The answer is to invest in a quality unit. After all these years, I've finally found one I like, the Porter cable Quicksand. It uses hook & loop discs, has a spin break incorporated into the mechanism, and leaves no trace of swirls on the surface of the work. I find that, once I've prepared the surface with my belt sander, the little Quicksand makes short work of the final finish sanding. I still don't enjoy sanding, but it's a little more bearable, now.

Biscuit/Plate Joiner

Purists, I know, cringe at the mere thought of replacing dowels with biscuits. Progress, however, is a fact of life, and I'm sure, that

had they been available in Gustav Stickley's time, he would have used them too. There's no doubt that the biscuit joint has made joining wood a whole lot easier for most amateur woodworkers, and I'm surely not the first to advocate its use. What once was a long, drawn-out process involving jigs, drills, and other assorted bits and pieces, has now been reduced to a few strokes of the machine, and even fewer minutes. Again, I recommend you purchase a good one. The router attachments that are supposed to cut biscuit slots are more trouble than they're worth.

Jigsaw

Arts and Crafts furniture incorporates a lot of cut-outs, arches and curves. Some can be done best on the bandsaw, others must be cut either by hand or with a power jigsaw. I've bought a number of jigsaws over the years. Most of them last only as long as the warranty that comes with them. In the end, I acquired a top-of-line Porter Cable unit with blade guides that resemble a smaller version of those found on the bandsaw. It's a variable-speed machine, which is great for making fine and intricate cuts.

Portable Circular Saw

Always a handy addition to any workshop, the portable circular saw comes into its own when large sheets of plywood need to be reduced to smaller, more easily handled proportions.

Hand Tools

There's no getting away with it, hand tools, though regarded by many as a thing of the past, are

an essential part of woodworking, and always will be. There are some jobs that just can't be done any other way. The following is a list of the items I think are essential to good woodworking:

Measuring Devices

If you don't already own one, invest in a good quality measuring tape at least 16 feet long. A good quality tape can be pulled all the way out, and will roll up again just as easily. It will also have a strongly attached heel at the business end. Take care of your tape and it will serve you well for many years. I occasionally wipe the entire blade with a rag moistened with light oil, just to keep it running smoothly.

You'll also need a high-quality steel yardstick. They are invaluable for a quick check of one dimension or another, and for measuring diagonals on smaller pieces that need to be perfectly square.

Don't bother with those folding measures. I've found them to be more of a nuisance than an aid. It's almost impossible to get an accurate reading from such a device.

A steel 12" or 18" rule can also be an asset; I have several of each.

Squares

There's no substitute for an accurate square. Always buy the best. You only get what you pay for, and this is especially true where measuring and squaring devices are concerned.

A large steel framing square is an indispensable tool. You'll use it for squaring cabinets, checking upright, and for holding various bits and pieces in place while you fasten them.



A good quality combination square will also be an aid to your endeavors. I have a couple: one is a 12" unit, the other is 18" long.

Hammers

Can't do without hammers. It's better to own one very good, well-balanced hammer, than it is to own a whole bunch of cheap ones. I own a top-of-the-line Stanley claw hammer, and it does everything I need it to.

A good quality rubber mallet is also a good idea. Buy one that won't leave black marks all over the surface of the wood.

A wooden mallet is the proper tool to use with a chisel.

Chisels

I own just a basic set of very good Stanley chisels. I've had them for years, and have never found the need for more.

Handsaws

Ah, handsaws. These are food for the tool junkie. I own a bunch, but rarely do I use any of them.

You do need a good backsaw, or tenon saw, if you live in Europe. I have a 12" model and an 18" model.

A dovetail saw is also a useful piece to have on hand, although I never use mine for the purpose it was intended for. I'm afraid I'm an advocate of the jig and router method of cutting these, the most beautiful joints of all.

And those funny little Japanese saws are also useful to have around the shop.

I'm afraid I don't own either a hand rip saw or cross-cut saw. If either my radial arm or table saw

were to explode, I'd rush straight out and buy another, rather than revert to the most soul destroying process of cutting wood ever invented.

Planes

The only hand plane I own today—I used to own a number of them—is a small block plane I use almost exclusively for chamfering and trimming. Other than hand sawing, I can't think of a process I'd rather do less than hand plane. I hated it in high school, I hated it in college, and I hate it now.

Clamps

You just can't have enough clamps, which the English call cramps. I have clamps that range in size from six inches to six feet, at least 50, and I still could use more. The backbone of my clamping system is the Bessy "K" Body clamp, which I have ranging from 24 inches to 60 inches. For the really big jobs I have several heavy bar clamps. For the smaller jobs I have a range of small Bessy bar and lever clamps. I also own several "C" clamps—these are called "G" clamps if you live in England—and a number of heavy-duty crocodiles—heaven only knows what they are called in Europe. One of the most useful clamps I own, although I don't use it very often, is a Bessy strap clamp. It has a strap some 20 feet, or so, long, and is indispensable for pulling many-sided structures together. By now you must be thinking that I'm sold on the Bessy system. Well I am, especially the "K" bodies. There are extremely strong, are easy to tighten and loosen, and they lie

square and flat on the bench which, in itself, is an aid to good furniture construction. Don't skimp on clamps. Good ones will save you money, while cheap ones, in the long run, can be expensive.

Joints & Joining

The fundamental characteristic of Arts and Crafts furniture is the mortise and tenon joint, a joint whose origins has been lost in the mists of time. Furniture made by the ancient Egyptians more than 35 centuries ago incorporated mortise and tenon joints very little different from those we use today. It was Gustav Stickley, however, who refined it, and turned it into a decorative feature of his new line of furniture. He, and his contemporaries used it in one form or another extensively. Many were through joints, with the tenons extending through and beyond the work. The exposed ends of these tenons were often shaped, sanded smooth, and then finished to match the rest of the piece. Some through-joints were keyed instead of glued. Some were blind mortise and tenon joints. These were often reinforced with dowels. Again, the dowel heads were sanded smooth and finished to create another decorative detail, and there were other versions I haven't used here. But Stickley wasn't the only craftsman to make extensive use of these joints. Charles Limbert took the mortise and tenon joint to an even higher level. His tenons were more extended, carefully shaped, and finely finished. It goes without saying, then, if you're going to build Arts and Crafts furniture, you must be able to make a per-

fect mortise and tenon joint. More about that later.

Large boards, table tops, etc., were built from several smaller pieces of stock, joined together either with glued "V" joints, spline joints, dowels, or simple butt joints.

Extensive use was also made of dado and stopped dado joints.

Making the Perfect Mortise and Tenon Joint

The following illustrations demonstrate the basic versions of the mortise and joint as it's used for the projects in this book. There are, of course, many more versions.

There are a number of ways you can make mortise and tenon joints. The purists will want to make them by hand and, if you have the time and patience, there's no doubt that this method will produce a superior joint. Unfortunately, I have neither, and white oak is incredibly hard and punishing, which means I have to use more practical methods.

In order to make the perfect joint, it's necessary to cut the mortise before you mill the tenon. I've yet to meet the craftsman that can do it well the other way around.

The mortise can be cut using a drill press, brad-point drill bit, and chisel and mallet. This method is also slow, and not conducive to making consistently perfect joints. Finally, there's the mortising machine, which must have been invented with me in mind. There are two versions of this versatile machine: the dedicated machine designed specifically for cutting mortises, and the mortising attachment that is assembled onto a drill press. I

have a dedicated machine, but the drill press version would work well enough, if you can handle the chore of constantly assembling it one moment, and then breaking it down again the next.

The dedicated mortising machine, and the drill press attachment, once they are correctly assembled and aligned, are simple to use and, if you're careful, will produce consistently good results. And you can use them in an almost infinite number of ways. As you work your way through this book, you'll find that's true. Of all the projects I've included, only the bookcase and the Limbert pedestal do not incorporate mortise and tenon joints. And throughout the book you'll find step-by-step photographs and descriptions of how each particular mortise is milled. The simple method is to mark the position of the mortise, then set the depth of cut and the position of the back-fence on the machine, and mill the hole. And that's good enough, if you don't have more than a couple of joints to make.

If you have make more than one or two joints, as you will if you decide to make the Limbert coffee table, to ensure consistency and positioning, you'll need to do something different. Again, as you work your way through the projects, you'll see from the photographs how I've approached the many different tasks. Most of my ideas involve little more than a series of simple marks, either on the working surface of the machine or the back-fence. If I had the time, I'd design a system of stops, but I've found the pencil and a little careful measuring and marking to be as effective as I need.

The Tenon

To make a perfect mortise and tenon joint, the tenon, especially when a through joint is involved, must fit the mortise just so: all of the faces of the tenon should touch the inside walls of the mortise. It should be a stiff push fit, but not so tight that you have to use a mallet. A good joint can easily be put together and broken down dry. For a through joint, a good fit is even more important. There should be no broken edges or gaps showing on the exposed edges of the mortise; just a clean line all around the tenon.

So, how do we form the tenon? You can, of course, form it by hand with a tenon saw, a long and tedious job that, for some, doesn't always produce a perfect result. You can use a radial arm saw set up with a stacked dado head, a method I've used on occasion. Then you can use the table saw, also set up with a stacked dado head, and either a jig specifically designed for the job, or the miter gauge; I've done it that way, too. Finally, you can do it the way I do it now, on the table saw with a combination blade and a tenoning jig.

The Tenoning Jig

I've tried several different types of tenoning jigs, most of them inexpensive, none of them very effective. Finally, I acquired one made by Delta. It's a fearsome-looking piece of equipment, and heavy too, but it does the job better than anything I've ever tried. Its best features are these: the distance between the work and the blade is micro-adjustable, which means the thickness of the tenon can be adjusted infinitely, which also means that a fine push fit



between mortise and tenon can easily be achieved. The angle of the face can be adjusted which, along with the tilt of the blade, facilitates the forming of angled tenons. The back-stop can also be adjusted to steady a sloping tenon, as used in the bench project. In short, the Delta jig is an all around, versatile piece of equipment that I would be hard pushed to do without.

To form a perfect tenon you need to work through a set sequence of tasks. First, make the cheek shoulder cuts. Second, make the edge shoulder cuts and nibble away the waste. Third, make the cheek cuts. You do this as follows:

1. Cut your wood to its finished length.
2. If you have a rip fence with backward adjustment, set it to a point where the distance between the fence and the far side of the blade is exactly the same as the length of the tenon. If you don't have such a rip fence, clamp a piece of wood to the face of the fence as a stop against which you'll set the length of the tenon.
3. Set the cutting depth of the blade to cut a fraction deeper than will be the cheek of the tenon. This is not a critical setting.
4. Use your miter gauge to make all of the cheek shoulder cuts.
5. If necessary, reset the cutting depth of the blade, but leave the rip fence/stop where it is. Now make all of the edge shoulder cuts, and nibble away the waste by moving the wood, a little at a time, laterally away from the rip fence/stop.
6. When all the shoulder cuts have been made, and the waste from the edge shoulders has been removed, move the rip fence away from the blade and install your tenoning jig in the miter gauge slot.
7. Set the table saw blade to cut at a depth that will just clear the shoulder cut, but will not touch the shoulder itself. You can do this easily by holding the stock against the blade and raising it to the required height.
8. Clamp the piece of wood into the jig and set it to make a cut that's a little more than half that required for the finished tenon. In other words, the result of the first two cuts will be an oversize tenon.
9. Make the first pass through the blade and then bring the jig back to its starting position. Reverse the wood and make a second pass through the blade.
10. Remove the wood from the jig and try it against the mortise. Estimate the amount of material you'll need to remove, return the wood to the jig, make the adjustment, but be sure to err on the strong side—you still want to finish with an oversize tenon.
11. Test the tenon against the mortise. If it's still oversize, and it should be, return the wood to the jig then:
12. Repeat steps nine and ten, but this time finely adjust the jig to complete the tenon.
13. Test the fit and, if necessary, make a final pair of passes for a perfect fit.

Spline Joints

This type of joint must have been the inspiration for the modern biscuit joint. It consists of a groove along the center of the edge of each board to be joined, and a strip of wood (the spline). The three pieces are glued, joined together, and then clamped until the glue has fully cured. This type of joint is fairly simple to make and structurally very strong. I've used it extensively in the past, before the advent of the biscuit, and found it a perfectly good way of building large boards. Make the joint as follows:

1. Plane all the boards to be joined to the same thickness, then run the edges through the jointer to make them true and square.
2. Lay out the boards on your bench and check the end grains. If you can, alternate the boards so that one end grain is running upward, the next downward, and so on, and then mark the edges to be joined, 1, 2, 3 and so on. This is so that you can put them all back together in the proper order when the time comes to begin the assembly.
3. Set the rip fence on your table saw so that the blade will cut through the center of the edge of the boards, then back it off 1/16".
4. Set the depth of cut 1/2".
5. Take one of the boards and stand it on edge against the rip fence and then pass it through the machine, thus forming a groove offset 1/16" from the center of the board 1/2" deep by 1/8" wide.
6. Now reverse the board and make a second pass through the same

cut. This will produce a groove 3/16" wide down the exact center of the edge of the board.

7. Repeat this process on all of the edges that are to be joined together.
8. Set the rip fence of your table saw to cut at 3/16", then take a piece of 1" thick wood and cut a strip from its edge. The result will be a thin strip of wood 3/16" thick by 1" wide, which should fit the grooves you've just milled exactly. If so, cut the required number of strips to build the board. If not, adjust the rip fence, make another cut, and then test the strip for a perfect fit. If all is okay, cut the rest of the strips.
9. Apply glue to the grooves and the strips, then assemble the boards together, apply clamps, and leave the assembly overnight, or until the glue has fully cured. The result should be a board that's structurally strong and, if you alternated the end grains, one that's not likely to warp or cup.

Biscuit Joints

There's no doubt that the advent of the biscuit joint changed things considerably for the amateur woodworker. Joining two or more boards together couldn't be easier. Simply lay the boards together on the bench, alternate the end grains, and make marks every eight or nine

inches, across the joint. Separate the boards, line up the machine with each mark and mill the slot. Glue the face of each edge, apply a little glue to each slot, slide the biscuits into the slots on one side, then bring the two boards together, clamp and set them aside until the glue has fully cured. If you're joining more than two boards, you'll need to make witness marks to ensure that you can bring the boards back together in the correct order.

Dowel Joints

Today, with the advent of the biscuit/plate joiner, the dowel joint has become something of a dinosaur. This, I think, is mainly because it's a difficult joint to make, at least for those of more moderate woodworking skills. Even so, it's an easier joint to make now than it was even 20 years ago. The big problem, even with the use of modern jigs, is to get the dowel holes, and the boards, to line up properly. Still, if this is a joint you're used to making, or one that you'd like to try, great. You'll find plenty of opportunities here. One piece of advice: invest in a top-quality jig.

Simple Butt Joints

When you are joining boards edge-to-edge, a simple butt joint is as strong as one that has splines, dowels or biscuits. I've test-built them in the past using a variety of glues, breaking them apart when the glue has fully cured, at least 24 hours after

clamping, and, upon breaking the joints apart I've found them always to be stronger than the wood itself. I've also found that ordinary, yellow carpenter's glue to be as good as any. I make the joint this way:

1. Plane all the boards to the same thickness, and then run the edges through the jointer to ensure that they are square and true.
2. Apply glue to both surfaces that are to be joined. It's best to do this with a brush, to make sure that both surfaces are completely covered.
3. Place both pieces in the clamps, offset by about six inches, push the edges together, and then slide them into place. By sliding the pieces together, you'll push all the air out, creating a slight vacuum/suction between the pieces, thus ensuring a tight joint.
4. Tighten the clamps until the glue squeezes out, but not enough to create a shortage, and then set the structure aside until the glue has fully cured, preferably overnight.

Table Irons

Table irons, or buttons, were used extensively by Stickley and his contemporaries. They were little metal devices that held the table top to the understructure. You can buy these in various forms from mail order companies.



chapter five

FINISHING

A piece of furniture is only as good as its appearance. A poorly-made, but well-finished piece can look, and sell, ten times better than a well-made piece with a poor finish. As location is everything in the real estate business, so finish, finish, finish is just as important in the furniture business. Almost always, it takes me longer to finish a piece than it does to build it, and so it should. To many people, finishing is a chore. To me, it's fun, and the final effect provides me with a real sense of achievement. My best advice is take your time, think each step through, and never try a new technique without practicing it several times first.

How you finish the projects in this book is largely up to you. The fuming process is a simple one, and anyone with a little time and patience can do it without a lot of expense, but it's not necessary to the appearance of any particular piece. It is, however, essential in you want to reproduce these pieces faithfully according to the old masters.

Results Of Aging

The older the piece, the smoother it will be, everywhere. If you're going for an authentic antique look, you'll need to remember this all through the building and finishing process. Time and use tend to smooth rough surfaces, especially those that rub together or are handled

often. Drawer tops, bottoms and runners will all have been worn smooth; corners will have rounded, some only ever-so-slightly; finishes will, in some instances, have been worn almost to nothing around door edges, pulls and knobs; paint will have cracked, flaked, worn through; deep depressions will have been worn into work tops, and so on. So, judicious sanding is required.

Sanding

Oak, as we all know, is a hardwood, and white oak is very hard. If you're used to working only with softwoods, you're in for a rude awakening. Time on the sander will at least be doubled; sandpaper grades, to start with, must be very coarse, but they won't load up quite as quickly as they do when working softwoods.

Most often you'll need to start out using 40- or 50-grit sandpaper, then work your way through the grades all the way to 220-grit, or even finer.

Most of your basic sanding should be done as you work through the project. I find sanding to be a tedious process and, therefore, don't like to do it all at once. Also, some sections will need to be sanded before assembly.

Be sure to sand all the end grains that will show; the better you sand them, the better they will take stain and finish. Sand the bottoms and sides of drawers.

Sand the edges and tops of all doors and trim.

Wood Color/Staining

Staining can be done in two stages: shelves and interior surfaces can be done before assembly; exterior surfaces should be done after distressing so that some of the stain will accumulate in the dings and scrapes. Several shades will work, but the ones I prefer are Provincial by Minwax, Golden Oak, Light Oak, and Dark Oak.

Method

Simply wipe the stain on and then wipe it off, immediately, and leave it to dry. Only when it's dry will you be able to see the true color. I am a great believer in multiple coats rather than leaving stain on for an indeterminate length of time. This gives me much more control over the final color. If you need to apply more than one coat, be sure the first coat is dry before applying the next. Do not leave the stain to dry before wiping; if you do you'll be left with a layer of scum that's difficult to remove. Remember, the older the piece, the deeper (darker) the color.

Finally, you'll need to apply a coat of polyurethane to seal and protect the stain, as well as the finished surface of the piece.

Fuming

This is a simple process used by all of the exponents of the Arts and Crafts movement. It can really only be applied to white oak, due to the naturally occurring content of tannic acid in the wood, and then only to varying degrees, depending upon the wood involved. Therefore, it's best if you can get as much wood for a given piece of furniture out of the same batch of wood.

Method

Ammonia is the agent used for coloring white oak. I use a proprietary brand of household ammonia to fume my pieces. It's not what Gustav Stickley or Charles Limbert would have used, but it does the job quite nicely. It does take a little longer, but the ammonia is a lot less dangerous to use than the mixture recommended by Mr. Stickley, and I think that's important, especially in these environmentally sensitive times.

If it's a large piece that I want to fume, I use a tent made from large sheets of transparent plastic film. The frame can be made of scrap stock, or you can make a more permanent version from plastic plumbing pipes and fittings. Simply place the piece, or pieces, inside the tent, with room for the fumes to circulate freely, then set two or three small open containers of ammonia on the floor. Now close the tent and leave it closed until the desired color is reached. It might take as long as four or five days.

If it's a small piece I simply choose an out-of-the-way place, then set one small open container of ammonia on the floor,

the piece beside or above it, then slide a large plastic garbage bag over the top. I then use small pieces of scrap as weights to hold the edges of the bag to the floor, and leave it alone for the prescribed length of time, usually 48 hours, or so.

Even though household ammonia is fairly weak, it's still a good idea to take some precautions when handling it: always use rubber gloves; always wear a breathing apparatus; always wear protective glasses.

Distressing

I haven't used this technique for any of the projects in this book, but almost all old pieces will have suffered the ravages of time and use and, if you're going for an authentic old-world look, you'll have to apply the effects of perhaps a couple of hundred years in less than a couple of hours. This can be done quite easily using a minimum of readily available tools: a nice piece of rock weighing perhaps a couple of pounds, a bunch of old keys, a fairly heavy rasp file, a small hammer, and a pound or two of mixed gravel — the pieces should be from 1/4" to 1/2" in size, and a mixture of rough and smooth pebbles.

Distressing is a subjective technique. What looks good to one, can look terrible to another. The watchword is restraint. This is definitely one part of the finishing process where less is more, especially where finer pieces of furniture are concerned. Pieces in heavy use areas of the home, such as family rooms, kitchens and halls, will show more signs of wear and tear than pieces kept in more formal areas, drawing rooms, dining rooms, etc. Don't

rush in and beat the piece up. When the time comes, stand back, sit down, survey the piece and think it through. Where would you expect it to show signs of wear? Anywhere it will come in contact with human traffic: edges, around door knobs, feet, and front-facing surfaces. You'll find more suggestions listed along with construction notes throughout the book.

Methods

Distressing should be done before staining.

After spending so much time and effort building and sanding your fine piece of furniture, you'll find it more than a little traumatic when the time comes to apply the hammer. And it seems a little incongruous to spend lots of time sanding a piece to perfection, and then take a rock to it. Don't worry. If you do it right you can only enhance the piece. Regard distressing simply as one more part of the construction process.

Most problems with distressing come from over-enthusiasm; don't get carried away. It's always difficult to know when or where to stop. Just remember this: unless they are very old, or have been badly mistreated, most pieces will show only slight signs of wear. People have always tended to look after their possessions, especially expensive furniture.

First, think it through.

Apply the rasp sparingly to exposed edges and sharp corners, which need to be slightly rounded with time. Be extremely careful when doing this. The tool can make deep gouges and we're looking only for time-worn scrapes.

Again, using the rasp, tap the



exposed edges here and there with the sharp edge. Don't overdo it; six dings are a lot.

Apply the edge of the hammer, gently, here and there, not more than a half-dozen times, to work tops and edges. Do the same with the rock.

Use the keys to make a few nicks and dings on work surfaces, trim, and doors. Finally, stand back and throw a few pieces of gravel, rough and smooth, at the piece. Not too hard. What's needed is only a hint of a mark.

Now quit. You've done enough, probably too much, already.

Antiquing

If you're trying to reproduce the ravages of time, this is the technique you'll use to add all those years. It's the penultimate step in the finishing process, applied to the piece just before the final coat of finish. It's nothing more than a dark, translucent glaze that's wiped or brushed on and then quickly wiped off again, leaving only a thin film, barely discernible, to approximate the layers of dirt and grime that accumulate over very long periods of time. Why not simply rub the piece with dirt and dust, you might say? Well you could, but, nine times out of ten, all you'll end up with is a dirty, grimy piece that looks just terrible. Antiquing is a subtle process, the effects of which should be apparent but not noticeable. Done properly, antiquing will add charm and authenticity to your piece. Remember all those dings and scrapes you made during the distressing process? These will be enhanced by the antiquing oil. A residue of the oil will remain in

them after you've wiped the bulk of it off, looking just like the accumulated grime of centuries.

Recipe

There are a couple of options here. First: to one quart of paint thinner (not lacquer thinner) add one ounce each of burnt sienna and burnt umber pigment and mix thoroughly; this makes a wipe on, wipe off oil. Better is the glaze I use: take one pint of water-based polyurethane, thin it one-to-one with water, add enough pigment—two to three teaspoons of powder or two to three tablespoons of poster paint—to make a transparent glaze.

Method

Antiquing is the next to final step in the finishing process. The oil or glaze should always be applied over a prior coat of satin polyurethane. If you're using the oil version, take two rags, one in each hand. Dip one in the antiquing oil and wipe it onto the piece, then immediately wipe it off again using the dry rag in the other hand. The oil dries very quickly, so don't wait before wiping it off. Leave it on too long and you'll have a real mess. When you've done all the exposed areas let the piece stand for a while—an hour should do nicely—then apply a final coat of polyurethane.

If you're using the poly glaze, you can brush it on then, if necessary, use a balled-up cloth to remove the excess. Remember, a thin film is all that's required. When the glaze is dry, cover it with a final coat of satin or semi-gloss polyurethane.

Shellac/French Polish

Shellac is an old-world finish, still used today, but rarely applied as it was by the old masters. It was, I'm sure, in one form or another, used extensively by the members of the Arts and Crafts Movement. It is, perhaps, the best of sealers, and other finishes can be applied over the top of it. French polishing with shellac as it was done by the old masters has almost died away; done properly, however, it is a very exciting finish. To do it right requires dedication and hard work; it's a tedious process, but the results are well-worth all the effort.

You can buy shellac ready mixed as a liquid, usually as a three-pound cut, or you can buy the raw flakes and mix it yourself, which is the method I prefer. For reproduction antiques you'll need one of the less refined shellacs, such as seedlac, buttonlac or garnetlac. These need straining before use, but produce a nice range of tones from brown to amber. Orange and blonde shellac do not need to be strained, and, in some cases, you may need to use one of these, too.

The cut, as you probably already know, refers to the mixture: one pound of flakes to one gallon of denatured alcohol is a one-pound cut. Of course, you'll never mix a gallon at a time; two ounces to a pint (about four tablespoons to a cup-and-a-quarter) works nicely as a one-pound cut; four ounces (eight tablespoons) per pint makes a two-pound cut; six ounces (12 tablespoons) a three-pound cut, and so on.

Method

Mixing: Put the shellac flakes into a glass container—a large jelly jar with a tight-fitting lid will do fine—then add the alcohol. Put the lid on and allow the mixture to stand for several hours, stirring occasionally, until the flakes are completely dissolved. If you've used one of the shellacs that need straining, pour it through a paint filter, then return it to the jar. It's now ready to use.

First you'll need to do any necessary staining and distressing.

For sealing, a one-pound cut will do fine. Simply apply a coat with a natural bristle brush, wait for it to dry, about 45 minutes, then lightly sand.

To use shellac as a finish a three-pound cut is best; it's easier going with two-pound, and it dries faster, but you'll need to apply more coats. Shellac sets up quite quickly so you'll have to work fast. Using a natural bristle brush, apply your first coat, allow it to dry, then sand lightly with 180-grit sandpaper. Apply two or three more coats, leaving each one to dry overnight. There should be no need to sand between coats. The second coat will dissolve and mix with the

first to form a single, thick coat, and so on. However, before you apply each subsequent coat you should inspect the previous one. You may find a run or two. These can be taken off with 180-grit sandpaper. When you've applied the final coat, and it's dried thoroughly, take a piece of 400-grit wet-and-dry—you might go as fine 600-grit, if you like—dampen it with linseed oil, then gently rub the entire surface. Finally, remove the residue of the oil by gently wiping the surface with a soft cloth barely dampened with alcohol. You should now have a finish to be proud of. If you've distressed lightly, and used one of the darker shellacs, you'll be amazed at what you've achieved.

French polishing requires a one-pound cut and some real dedication on your part. First sand the piece smooth, do any necessary distressing, and apply a non-grain-raising stain of an appropriate color. Then take a soft, lint-free cloth, roll it into a ball, and dip it into the shellac. Now rub the shellac onto the wood using fast, straight strokes along the grain. After the first coat has dried, about 45 minutes to an hour, it should be lightly sanded using 600-grit paper. Con-

tinue to add coats, lightly sanding between each one, until the finish begins to glow. Now add eight to ten drops of boiled linseed oil to the shellac, mix well, and apply another coat, this time rubbing in a circular motion. Continue to add more coats, adding a little more oil to the shellac with each one, until a deep glowing finish is achieved. You'll need to apply at least eight coats, perhaps as many as a dozen, or even more. The results, however, are well worth all the effort.

Beeswax

Beeswax is easy to prepare. Take a small cake—I buy mine at Ace Hardware for \$1.29 a cake—break it into small pieces, put the pieces into a glass dish and then add just enough turpentine to barely cover them, and leave the mixture to soak. When the beeswax has absorbed the turpentine it's ready to use. Simply roll it into a ball, wrap the ball in a piece of lint-free cloth, twist the ends of the cloth so the wax is squeezed through the cloth, and run the ball over the finish in a circular motion. Now buff to a shine.



chapter six

STICKLEY BENCH



Gustav Stickley designed this piece around the turn of the century as a piano bench. It would still serve admirably as such today. However, I don't own a piano, but when I spotted it in Stickley's *The Craftsman* magazine I was immediately taken with its beautiful lines. It's those little, unobtrusive extras that turn a mediocre piece into a work of art. In this case it's the slight inward tilt of the two ends, and the tenons that barely break through to the surface. Had he left the ends upright, this would have been nothing more than a somewhat ordinary bench, rather ugly, in fact. As it is, it's an outstanding piece of art history that never fails to raise a comment.

At first, you'd think this is a simple piece to construct: just five pieces of wood and some through mortise and tenon joints. You would be wrong. This is challenging piece to build. As always, Stickley's building instructions were virtually non-existent: just a bill of materials and a single comment as to how far the tenons should protrude through the sides. It wasn't until I studied the original drawing prior to building the piece that I realized its construction would present some unique problems. First, there were the angles to consider; Stickley

gave no indication in his drawing as to the degree of the tilt. I estimated it to be about three degrees. Second, when you tilt a component that incorporates a dado, you have to do something to cancel the resulting tilt you now have in the piece that goes into it. Obviously, it requires an angled tongue/tenon. How to accurately cut such a tenon across a board some 14 inches wide took some working out. The answer, I knew, had to lie with the table saw, but how? The tenoning jig was out of the question; the cut was longer than the jig by some 8 inches. And I knew, even with the blade tilted to the correct angle, I couldn't nibble the waste away; that would destroy the angle. Then I turned to the radial arm saw, but the cut was too long, and the problems were the same anyway. Then it came to me. The answer was, after all, to use the table saw, but set up with a stacked dado head tilted to the correct angle. This allowed me to remove the waste on TWO angles at once: the shoulder and the cheek. But could I tilt the dado head without fouling the insert? Because the tilt was only five degrees, the answer was yes. This technique turned what at first appeared to be an operation that required an inordinate amount of

skill and patience, into a relatively simple one that required only the most basic skills: anyone could do it. If, however, you will be using hand tools, that would be a totally different story.

There are yet more angles to consider: the shoulders on the stretchers, the tops and bottoms of the sides, the ends of the top, the edges of the sides, and so on; even the edges of the top had to be angled, twice, to match the slope and tilt of the sides. Take your time and think them through.

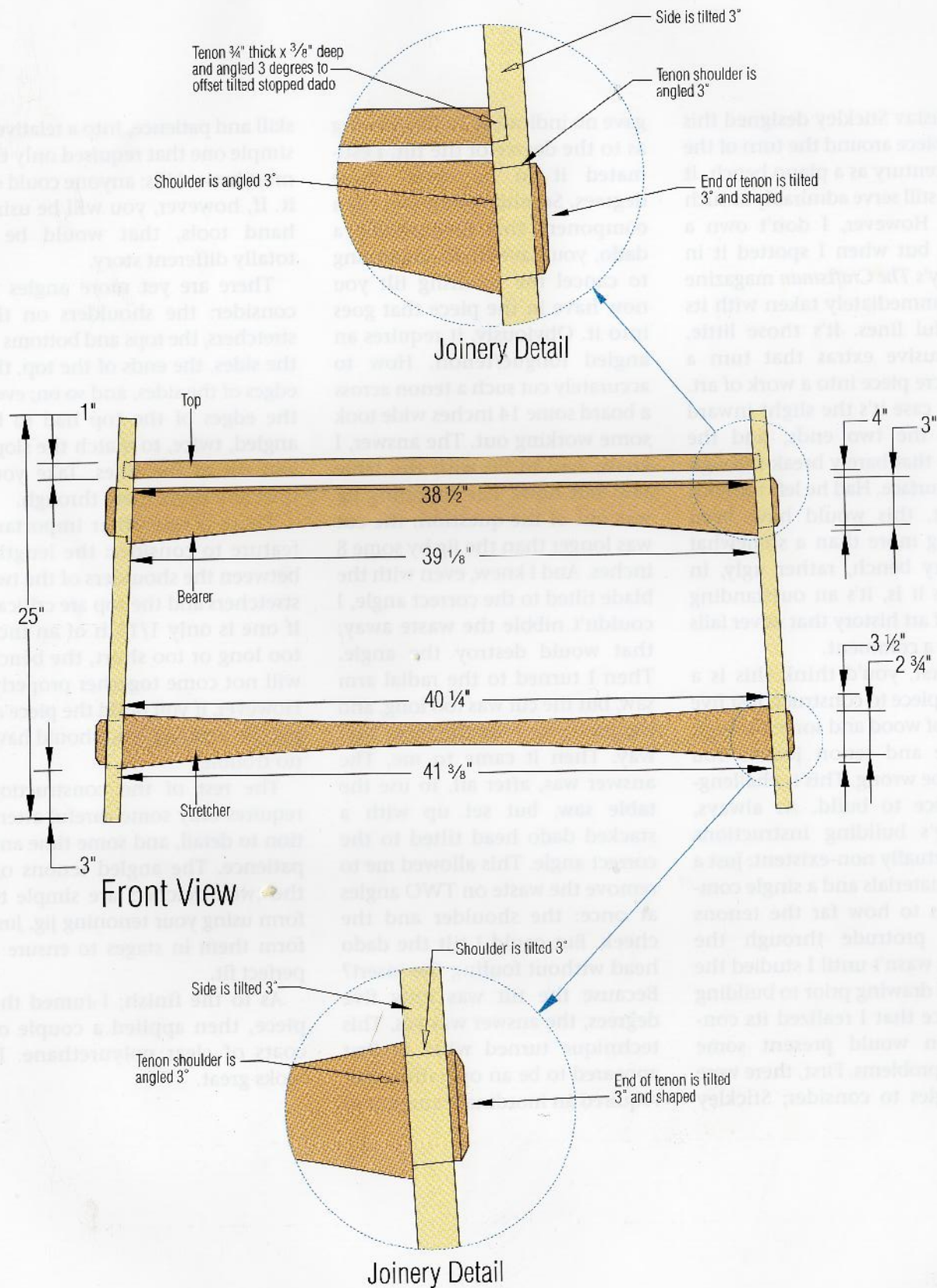
There is one other important feature to consider: the lengths between the shoulders of the two stretchers and the top are critical. If one is only 1/16th of an inch too long or too short, the bench will not come together properly. However, if you build the piece as per the drawing, you should have no trouble.

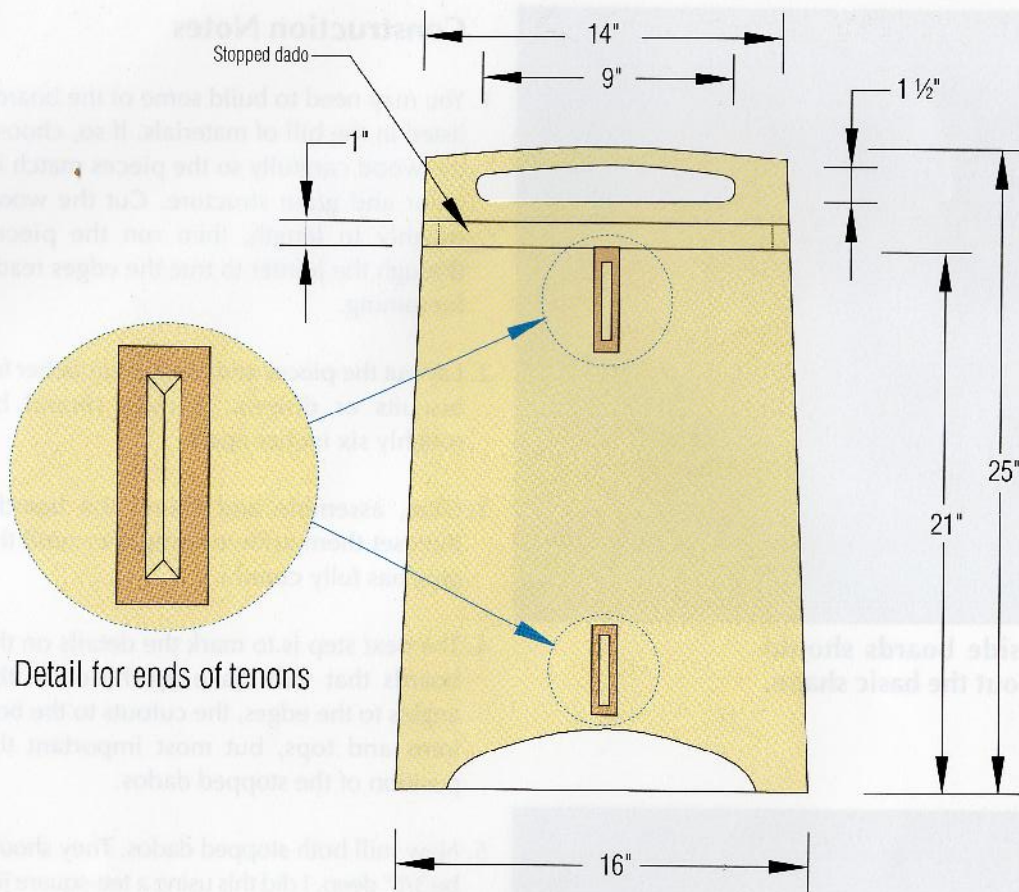
The rest of the construction requires only some careful attention to detail, and some time and patience. The angled tenons on the two stretchers are simple to form using your tenoning jig. Just form them in stages to ensure a perfect fit.

As to the finish; I fumed the piece, then applied a couple of coats of clear polyurethane. It looks great.



Piano Bench by Gustav Stickley

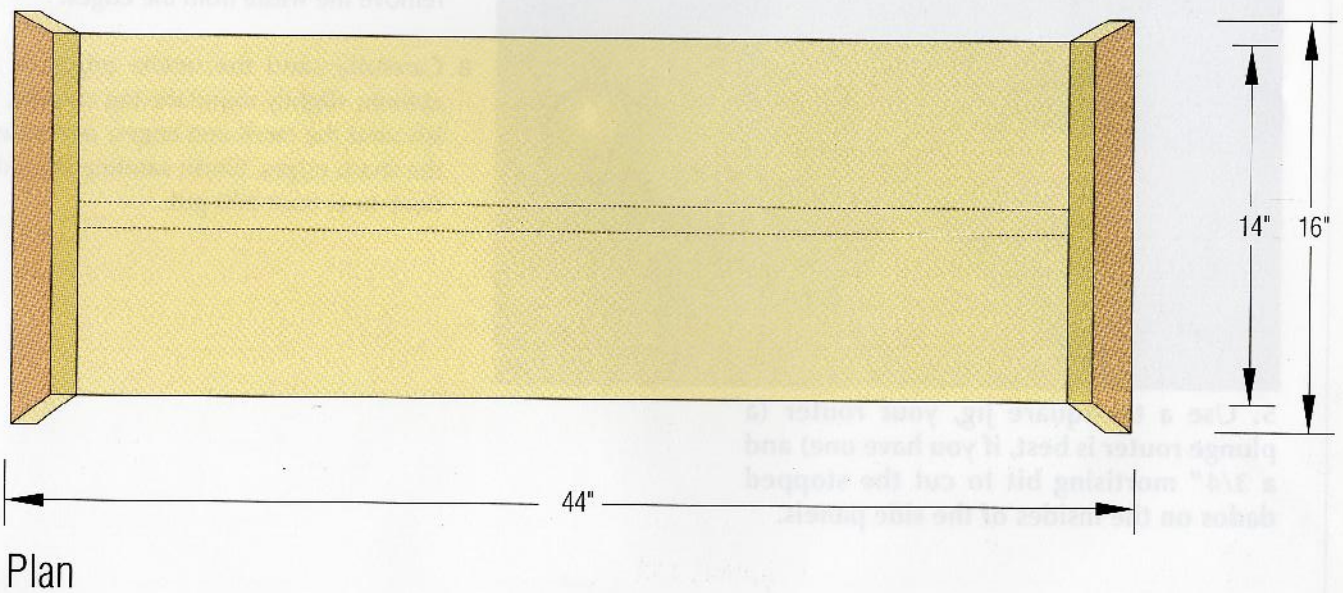




Side View

BILL OF MATERIALS

Sides	2 @ 25" x 16" x 1"
Stretcher	1 @ 44 1/2" x 3 3/4" x 1"
Bearer	1 @ 42 1/2" x 3 3/4" x 1"
Top	1 @ 39 1/4" x 14" x 1"



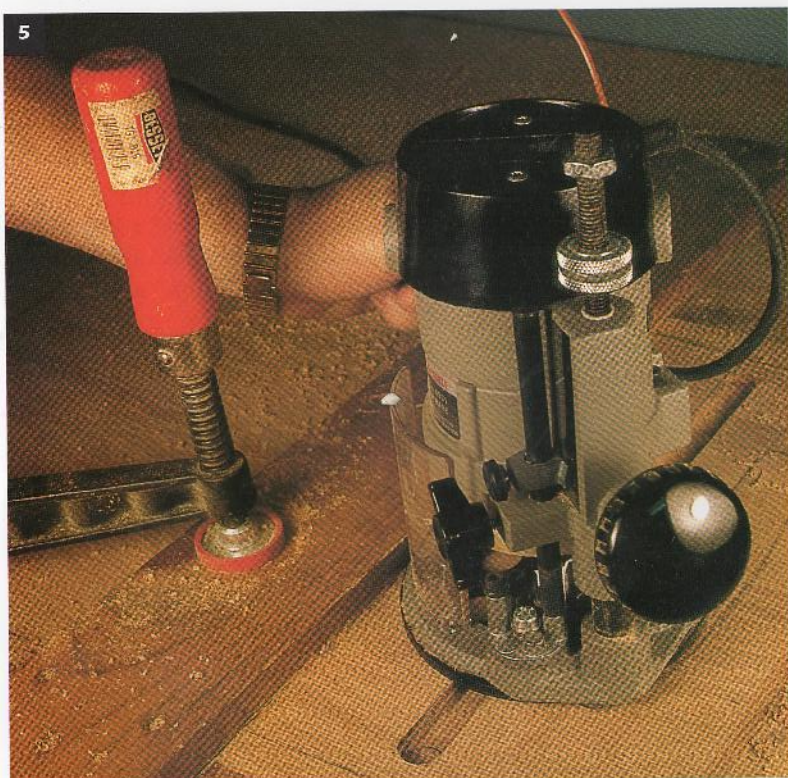
Plan

4



4. This is how your side boards should look after you've laid out the basic shape.

5



5. Use a tee-square jig, your router (a plunge router is best, if you have one) and a 3/4" mortising bit to cut the stopped dados on the insides of the side panels.

Construction Notes

1. You may need to build some of the boards listed in the bill of materials. If so, choose the wood carefully so the pieces match in color and grain structure. Cut the wood roughly to length, then run the pieces through the jointer to true the edges ready for joining.
2. Lay out the pieces and mark them either for biscuits or dowels. Biscuits should be roughly six inches apart.
3. Glue, assemble and clamp the boards, then set them aside overnight or until the glue has fully cured.
4. The next step is to mark the details on the boards that will make up the ends: the angles to the edges, the cutouts to the bottoms and tops, but most important the position of the stopped dados.
5. Now mill both stopped dados. They should be 3/8" deep. I did this using a tee-square jig, held in place with a large clamp, and a plunge router set up with a 3/4" mortising bit.
6. Once you've milled the dados you can make the cutouts. I used a jigsaw. Drill a hole to start the blade in the top cutout.
7. Now use your tapering jig and table saw to remove the waste from the edges.
8. Carefully sand the inside edges of the cutouts, slightly round the top corners, finish sand the faces and edges, and ease all the sharp edges. Finish sanding should be done to at least 220-grit.



9. Tilt your table saw blade to cut at an angle of 3° . Now, take the board that is to be the top and, using your miter gauge, trim one end. Now swing the board round keeping the same face upper-most, and trim it exactly to length. The two angles should both be going the same way. Return the saw blade to the 90° position.

10. Set up your table saw with a stacked dado head, and your rip fence with a sacrificial face. Raise the dado head until it protrudes above the insert $3/8"$. Tilt the cutting head to an angle of 3° , making sure it doesn't foul the insert. Lower the head until it's just below the insert. Move the sacrificial portion of the rip fence over the head, but make sure the metal part is still well clear. Now turn on the saw and slowly raise the head until it cuts into the sacrificial portion of the rip fence. Continue slowly raising the head, making sure you keep it moving so it doesn't burn, until you reach a cutting depth of about $1/2"$. Now lower the blade just a little so that it no longer touches the fence, and turn off the power. Use a combination square set to the outer edge of the head $3/8"$ from the face of the sacrificial fence, and set the depth of cut to remove about a $1/4"$.

11. Use your miter gauge and, keeping the end of the board tight to the sacrificial fence, make your first pass over one end. You should remove just enough material to give you a $1/8"$ step at the edge of the board. Swing the board around and repeat the process at the other end, keeping the same face upper-most.

12. Remove the rip fence and replace it on the other side of the cutting head. If you don't have a reversible fence, you'll have to remove the sacrificial fence and replace it on the other side of the fence.

13. Use a combination square with its protractor head set to 3° to continue the angle across the edge of the board.



7. Use your tapering jig and table saw to cut the tapers to the sides. Be careful the end nearest to you doesn't drop, which would cause the blade to bind and kick back.

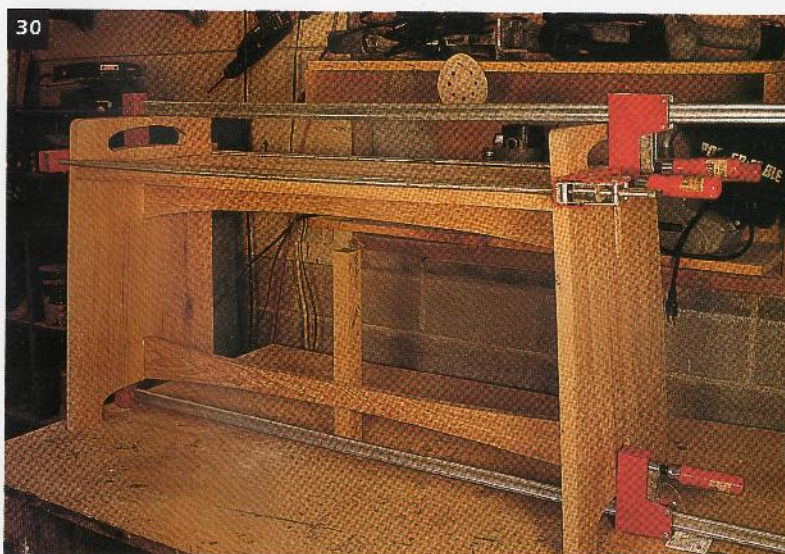


19. Drill pilot holes and then remove the waste from the through mortises with your saber/jigsaw. Take your time and exercise extreme care; if you remove too much material, you can't put it back. It's best to leave the hole a little tight and make adjustments by hand with a chisel.

14. Repeat the set-up process in step 10, but this time set the distance of the fence so that the head will remove material to the line of the angle you scribed in the last step. Now set the depth of cut to leave a tenon 3/4" thick, and back off just a little. This will leave the tenon a little over-size.
15. Complete the tenon by making your first pass over the cutter head.
16. Now dry-fit a corner of the tenon to the dado in one of the ends. It should be over-size. In which case, raise the head slightly and make another pass. Continue to do this, testing after each pass, until your tenon fits the dado perfectly.
17. Swing the board and mill the other tenon. There should be no need to adjust the depth of cut.
18. Reset the cutting head to 90° and replace the dado head with your regular saw blade.
19. Cut the two mortises to the two end sections as laid out in the drawing.
20. Trim the pieces that will form the bearer to length. The bill calls for 42 1/2", and that's a little long, but okay.
21. Set your miter gauge to an angle of 3°, and the table saw blade perfectly upright at 90°. Now trim the ends of both braces to 3°, as you see laid out in the drawing, but taking care not to reduce the over-all lengths.
22. With your miter gauge still set at 3°, make the face shoulder cuts. Make sure that you cut them exactly as required in the drawing. The distance between the shoulders is critical.
23. Tilt the table saw blade to 3°, return your miter gauge to 90° and, taking great care, make the edge shoulder cuts.



24. Using your tenoning jig, make the cheek cuts. Do this in stages, reducing the thickness of the tenon, little by little, testing the fit as you go, until the tenon slides easily, but not sloppily, into its mortise.
25. Repeat the process for the stretcher. It should be 44 1/2" long.
26. Dry fit the ends, the bearer and the stretcher together, and mark the tenons so that, when they are trimmed, they will protrude only 3/8".
27. Disassemble the structure and, with your miter gauge set at 3°, trim away the excess material from the ends of the tenons.
28. Mark the arched shapes on the bearer and stretcher and, using your bandsaw, remove the waste material.
29. Sand the top, the bearer and the stretcher smooth, finishing with a fine-grade sandpaper of at least 220-grit, and prepare the pieces for assembly.
30. Glue and assemble the bearer, the stretcher and top to one of the sides. Now glue and assemble the other side to the exposed ends of the top, the bearer and the stretcher. Clamp the structure, and set it aside until the glue has fully cured, preferably overnight.
31. Complete the building stage by doing any necessary finish sanding.
32. Finish the piece by fuming, for 48 hours or more, and then applying a couple of coats of polyurethane for protection.



30. Glue, clamp and assemble the bench on a flat surface, making sure all the pieces fit properly together, and that the structure stands perfectly square.



chapter seven

LIMBERT BOOKCASE



Arts and Crafts Furniture: Projects You Can Build for the Home



This bookcase was designed by Charles Limbert around the turn of the 20th Century. Gustav Stickley also made similar pieces, but his were a little more austere. I particularly liked the soft lines and gentle curves Limbert added to the base. It's also a little smaller than most two-door bookcases, which makes it the perfect size for the smaller home. I found it in a Limbert sales catalog dated 1906. Other than the overall dimensions, the small, hand-drawn illustration gave no details as to construction or finish. From there, it was a matter of reading the master's mind. I could see from the original illustration that there were no through tenons joining the frame together, and there was no trim to cover the

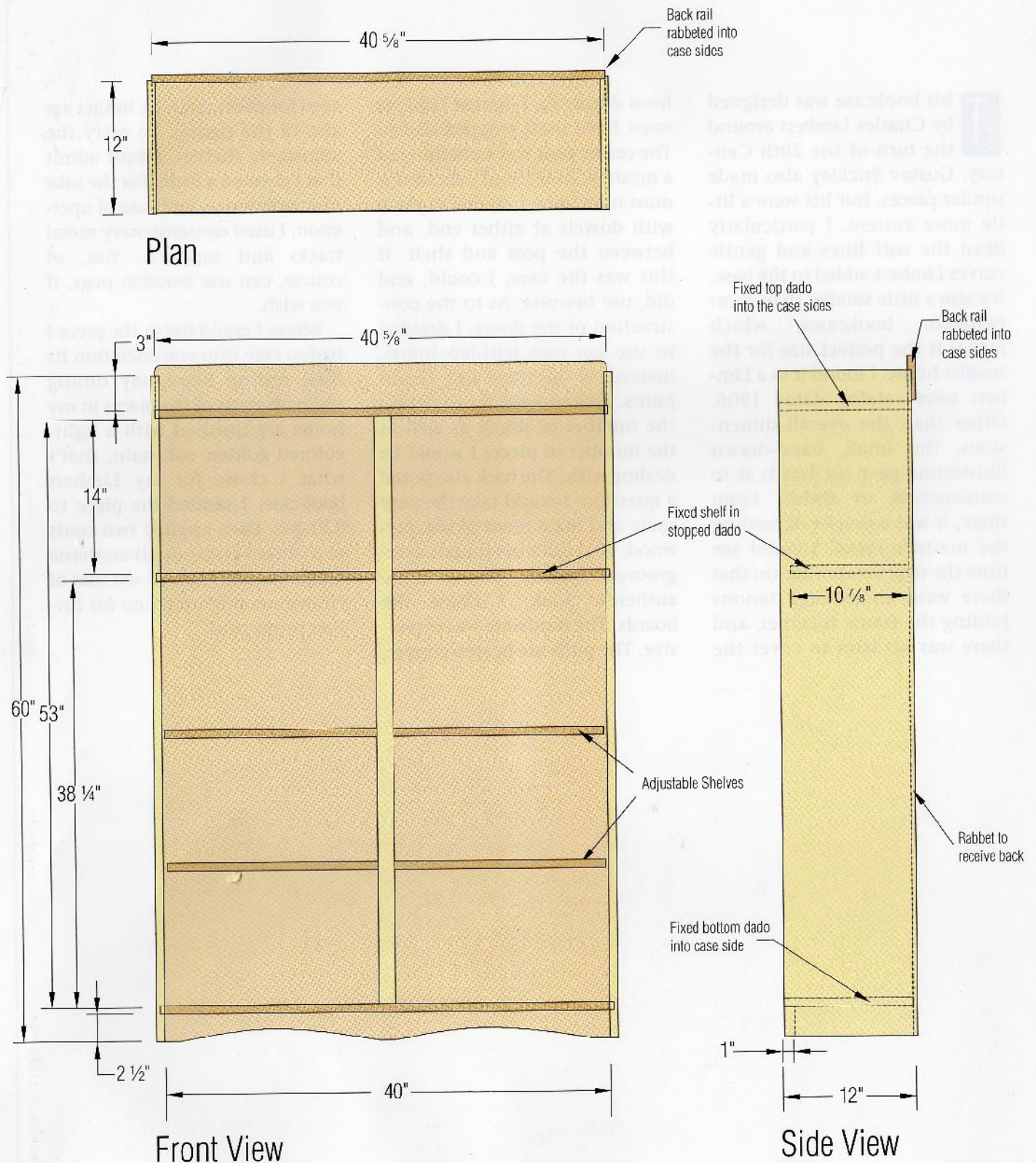
front edges. So, I figured Limbert must have used stopped dados. The center post was something of a mystery. In the end I decided it must have been fastened in place with dowels at either end, and between the post and shelf. If this was the case, I could, and did, use biscuits. As to the construction of the doors, I decided to use lap and half-lap joints, instead of mortise and tenon joints. This allowed me to reduce the number of joints as well as the number of pieces I would be dealing with. The back also posed a question. I could take the easy route and use a piece of oak plywood, or I could use tongue-and-grooved boards for a more authentic look; I chose the boards. The hardware was expensive. The pulls are beaten copper,

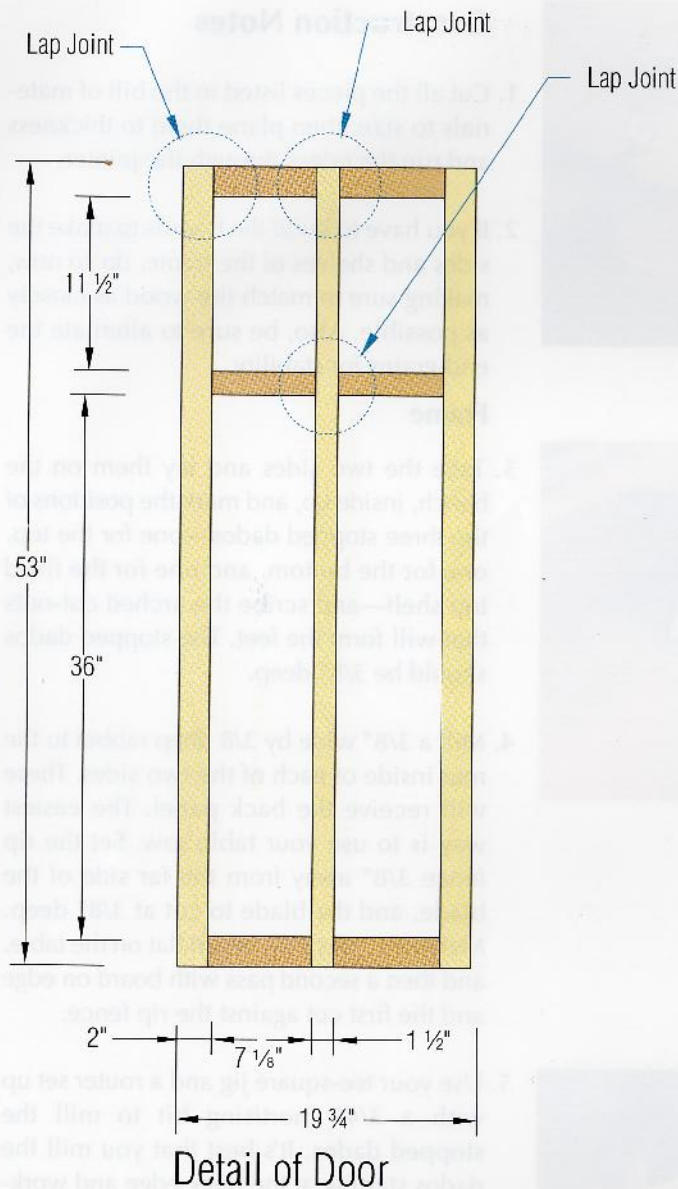
aged for effect, and the hinges are also of the period. To carry the adjustable shelves, I must admit that I cheated a little. For the sake of convenience, and ease of operation, I used contemporary metal tracks and supports. You, of course, can use wooden pegs, if you wish.

Before I could finish the piece I had to take into consideration its final resting place, my dining room. As most of the pieces in my home are finished with a light-colored golden oak stain, that's what I chose for my Limbert bookcase. I sanded the piece to 220-grit, then applied two coats of a one-step stain/polyurethane finish. Finally, I added one coat of clear gloss polyurethane for further protection.



Bookcase by Charles Limbert





Front View with Doors in Place

BILL OF MATERIALS

Frame

Sides:	2 @ 60" x 12" x 3/4"
Top & Bottom:	2 @ 40 3/4" x 11 3/4" x 3/4"
Shelves:	1 @ 40 3/4" x 10 7/8" x 3/4"
	3 @ 39 7/8" x 10 1/2" x 3/4"
Center Post:	1 @ 53 1/4" x 1 3/4" x 1"
Bottom Rail:	1 @ 40" x 3" x 1"
Back Rail:	1 @ 40 5/8" x 3" x 3/4"
Back:	1 @ 40 5/8" x 56" x 1/4" plywood

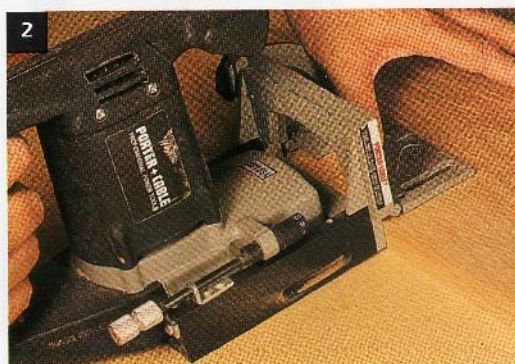
Doors

Stiles:	4 @ 53 1/4" x 2" x 7/8"
Center Posts:	2 @ 53 1/4" x 1 1/2" x 7/8"
Rails:	4 @ 19 3/8" x 2" x 7/8"
Center Rails:	2 @ 19 3/8" x 1 1/2" x 7/8"

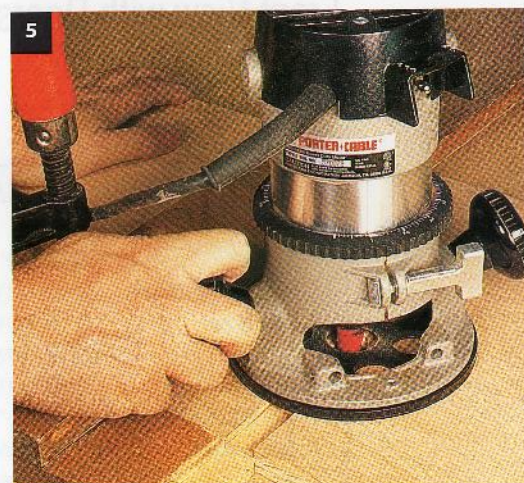
1. Edges of the stock that will be used for this project must be true and square. There's only one way to ensure this, and that's to use your jointer.



2. If you have to build boards, and are using biscuits, they should be no farther than 8" apart.



5. There are many ways to mill dados, but when large pieces of stock are involved the router and tee square makes the job easy.



Construction Notes

1. Cut all the pieces listed in the bill of materials to size, then plane them to thickness and run the edges through the jointer.
2. If you have to build the boards to make the sides and shelves of the frame, do so now, making sure to match the wood as closely as possible. Also, be sure to alternate the end-grains for stability.

Frame

3. Take the two sides and lay them on the bench, inside up, and mark the positions of the three stopped dados—one for the top, one for the bottom, and one for the fixed top shelf—and scribe the arched cut-outs that will form the feet. The stopped dados should be $3/8$ " deep.
4. Mill a $3/8$ " wide by $3/8$ " deep rabbet to the rear inside of each of the two sides. These will receive the back panel. The easiest way is to use your table saw. Set the rip fence $3/8$ " away from the far side of the blade, and the blade to cut at $3/8$ " deep. Make one pass with board flat on the table, and then a second pass with board on edge and the first cut against the rip fence.
5. Use your tee-square jig and a router set up with a $3/4$ " mortising bit to mill the stopped dados. It's best that you mill the dados starting at the back edge and working inward toward the front. That way you won't have to plunge the bit into the wood.



6. Use your jigsaw to make the cut-outs that will form the feet and round the top front corners of the case.

7. Take the top, bottom and fixed shelf and form the shoulders on the front edges, remembering that the ends of the shelves will sink 3/8" deep into the sides. The easiest way to form the shoulders is to use a dovetail saw and cut them carefully by hand.

8. Dry-assemble the frame to ensure that all five pieces fit perfectly together, then disassemble it and sand all the faces and edges smooth using 220-grit sandpaper.

9. At this point, it's a good idea to do your staining, for a couple of reasons. One: it's easier to stain a large piece before it's assembled. Two: it's also easier to clean up any glue that might squeeze out of the dado joints when the surface of the wood has been sealed.

10. Glue, assemble and clamp the frame (the center post is added at a later stage—see Step 12). You can toenail the underside of the dado joints for added strength, if you wish. I drilled pilot holes in the underside of the joints, counter-sank the pilot holes, then toenail-screwed the joints.

11. When the assembly is complete, measure the diagonals to ensure the frame is perfectly square. If necessary, make adjustments by moving the clamps, then leave the assembly overnight until the glue has fully cured.

12. The center post is fastened in place using number "0" biscuits, or dowels. If you choose dowels, you'll need to fasten the post to the frame during the assembly stage described in Step 10. If you use biscuits as I did you can add it after the glue has fully cured. Simply set the post in place, making sure it's in the center of the door opening, and mark for biscuit slots. Mill the slots, then glue and set the biscuits in the slots as follows: Set the bot-



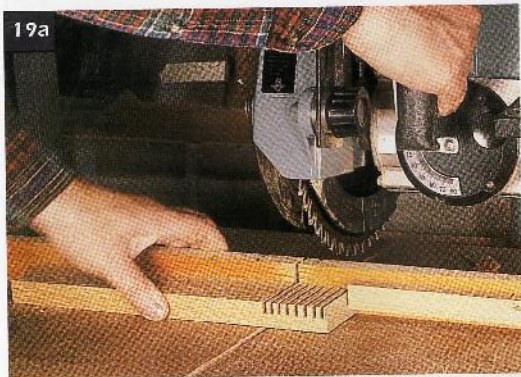
6. The top front corners of the case are rounded. Rough them out first with a jigsaw, then finish them either with a spindle sander or disc sander.

tom biscuit in its slot in the bottom shelf, the top biscuit in the slot at the top of the center post, and the third biscuit in the slot in the front of the fixed shelf. Now, place the bottom end of the post over the bottom biscuit and spring the post into its final position. With the post securely in position, clamp it from top to bottom, then use a second clamp from the front of the post to the back of the fixed shelf. Leave the clamps in place overnight, or until the glue has fully cured.

13. When the glue has fully cured, remove the clamps, then take the bottom front rail and trim it to length—it should fit tightly into position between the two feet of the frame—and scribe the two arches. Now use the bandsaw and carefully cut them out. Sand the piece smooth using 220-grit sandpaper. You can also stain it, if you like.

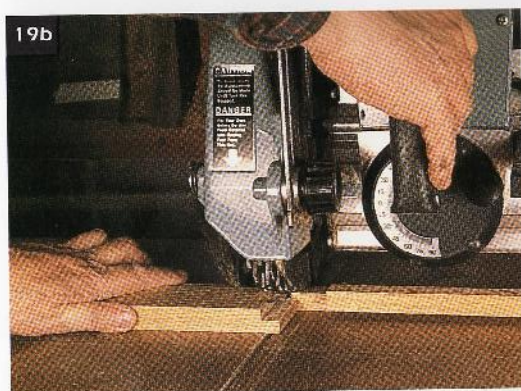
14. Glue, assemble and clamp the rail in place—you can use biscuits to strengthen the joint, if you like, but it's not necessary—and then leave it until the glue has fully cured.

15. Take the rail for the top rear and trim it to length—again, it should fit tightly into position. Round off the top corners at the sanding center, stain it, then glue and clamp the piece into position. Once again, you can strengthen the joint with biscuits, if you wish.



19. Making a lap joint can be something of a trial, but you can do it easily on the radial arm saw, then finish with a chisel.

Another alternative to milling lap joints also uses the radial arm saw, but this time it's set up with a stacked dado cutter.



22. Building the frame involves lots of clamps, but you'll also need to be sure all is square and true.

Back

16. The back can be constructed from a number of boards planed to a finished thickness of $3/8$ ", tongued and grooved together, or from a single piece of $1/4$ " oak plywood. If you use boards—and they can be of varying widths which, in my opinion, makes for a more interesting composition—cut them to length, plane them to thickness, mill the tongues and grooves, then set them in place and fasten them with 1" wire brads. If you decide on plywood, cut the piece to size and fasten it in place using brads. Again, it's a good idea to sand and stain the back before assembling it to the frame.

Doors

17. Cut all of the pieces to size, leaving the four rails and two center mullions $1/8$ " longer than called for by the bill. This will produce doors that are slightly oversize, and allow you to trim them for a perfect fit.
18. Lay out the pieces for one of the doors on the bench, then carefully mark the positions of the lap and half-lap joints. The stiles (verticals) should overlap the rails. Do the same for the second door.
19. The type of equipment you own will dictate how you mill your laps. I used my radial arm saw set up with a stacked dado head, but you could use the table saw and tenoning jig to mill the half laps, and then nibble away the full laps, either with a regular blade, or a stacked dado head. You'll find, however, that the radial arm saw allows a great deal more fine depth control than does the table saw, which is an important aid when making a perfect lap joint.
20. Dry-assemble each door to ensure a perfect fit.
21. When the joints fit, disassemble the doors and mill the rabbets for the glass to the rear inside edges of the stiles and vertical mullions (leave the rails until after assembly is complete – see Step 23). The easiest way to do this is to set the blade of your table saw to cut at a depth of $1/2$ ", and the rip fence $1/2$ " away from the blade. Run each piece through the saw, first on edge to make the initial cut, then flat to complete the rabbet. You could also do this operation making several passes on the router table set up with either a rabbeting bit or a straight-cutting bit, but the table saw leaves square pieces of waste just the right lengths to use as beads to secure the glass.
22. Glue, assemble and clamp the doors. Measure the diagonals to ensure they are perfectly square, then set them aside until the glue has fully cured, overnight if possible.

23. We'll complete the doors by milling the rabbets to the back sides of the horizontal mullions. We'll do this by using a router, hand-held, set up with a rabbeting bit. So, when the glue has fully cured, remove the clamps and set one of the doors on the bench, back side up and mill the rabbets. Finish off by trimming the corners of the rabbets square with a chisel and mallet. Repeat the process for the second door.

24. Fit the doors to the frame. They should be about 1/8" too long. Careful trim away the excess—I used my radial arm saw to do this—and try them again. Repeat the process until you have a perfect fit.

25. Mark the positions of the hinges on both doors and the frame. Mill or cut the rabbets to receive the hinges.

26. If you're using locks—I didn't, just magnetic catches—mark their positions, cut the recesses and key holes, and assemble the locks to the doors. Do the same for the strike plates and center post.

27. Sand the doors smooth using fine sandpaper of at least 220-grit.

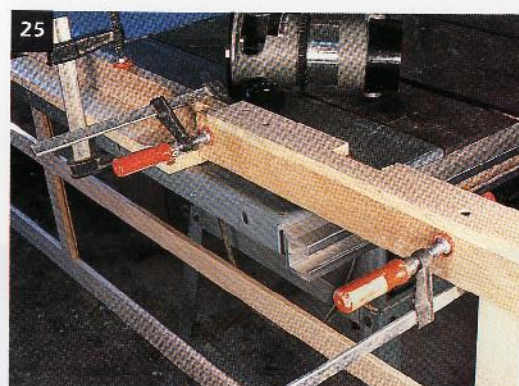
28. Stain the doors.

28. Complete the finishing process by wiping the entire structure over with 320-grit sandpaper, and then apply a second coat of stain/polyurethane finish. Finally, apply a coat of clear gloss polyurethane for protection.

29. Add the door pulls.

30. Take the doors to the glazier to cut and fit the glass. If you're not comfortable handling the glass yourself, you can have the glazier fit it for you, using the beads you'll supply. If you feel you can do it yourself, secure the glass in place using either the square waste sections—suitably sanded and stained—or beads you've made specifically for the job. You can buy bead stock, ready-made, but it's best if you make it yourself. After all, you've come this far, why quit now?

31. Finally, fasten the hinges to the doors, and the doors to the frame.



25. To mill the hinge mortises you can use your router, set up with a straight-cutting bit, and a home-made jig like this one.



31. Hinges should fit snugly into the mortises and, as you're dealing with a very hard material, it's best to drill pilot holes before applying the screws.



chapter eight

STICKLEY HALL MIRROR

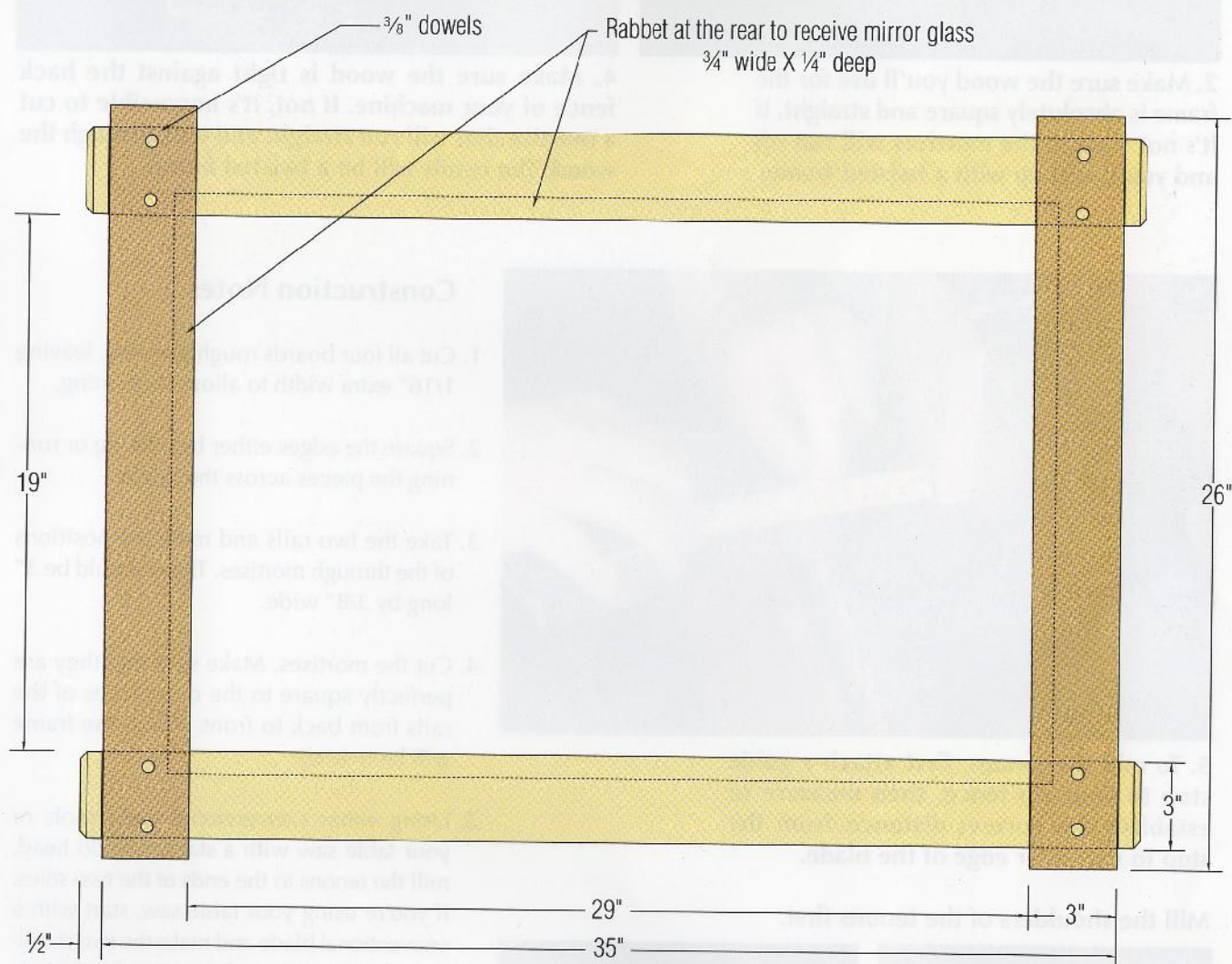
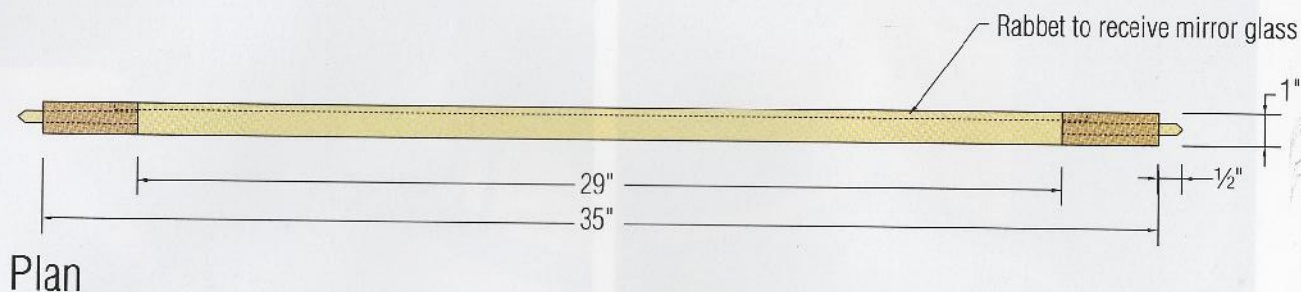


This is another piece taken from the pages of Stickley's *The Craftsman* magazine. I was drawn to it by its simplicity and clean lines. It's also a functional piece, and one we needed for the house.

Construction is pure Stickley: just four large through mortise and tenon joints with a rabbet to the inside rear of the frame to receive the glass and back. It's a relatively simple piece to build. There is, however, one point of concern: the through mortises are deep and you must make sure to cut each perfectly square to the face of its respective board. If not, the frame will be twisted to the point where it's useless. The tenons protrude a full half-inch

beyond the rails and the ends are milled to form elongated pyramids. The rabbets are milled on the router table using a half-inch mortising bit. I milled my mortises using my dedicated mortising machine with a $3/8"$ bit and chisel. You can, if you wish, use the more conventional hand tools, but you'll need to exercise a great deal of skill and patience. As to the tenons, they are too big— $3\ 1/2" \times 2\ 1/2" \times 3/8"$ —to be milled using the table saw and a conventional tenoning jig, so I set the machine up with a stacked dado head and milled them using the miter gauge and the table's rip fence as depth guide. Cut the mortises first, then you can mill your tenons for a snug fit.

For materials I used sassafras for the frame and $1/4"$ plywood for the back. Sassafras is an oak look-alike of a soft gray/green color. The grain structure is almost identical to oak, but it's a much softer material that has a very pleasant, sweet smell when it's worked. The dust, however, is an irritant, so it's a good idea to wear a mask when milling and sanding. It sands beautifully and takes stain well. I used a dark oak stain/finish combination and a couple of coats of semi-gloss polyurethane. Did Gustav Stickley ever use sassafras? Probably not, but I like it. It's easy to work and finish, and aesthetically pleasing when finished.

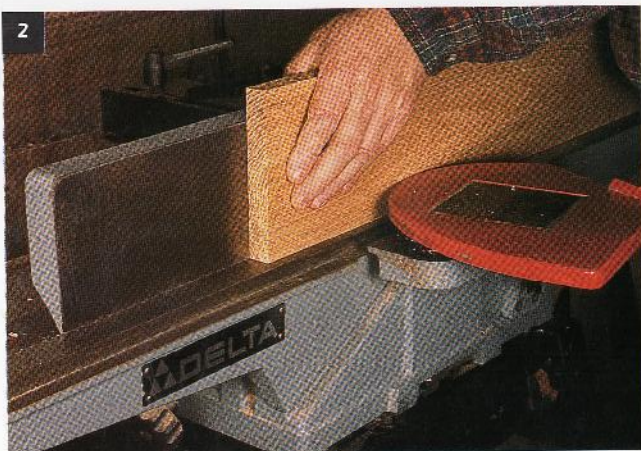


Front View

BILL OF MATERIALS

Rails:	2 @ 36" x 3" x 7/8"
Stiles:	2 @ 26" x 3" x 7/8"

Hall Mirror by Gustav Stickley



2. Make sure the wood you'll use for the frame is absolutely square and straight. If it's not square, the mortises will run off and you'll end up with a twisted frame.



4. Make sure the wood is tight against the back fence of your machine. If not, it's impossible to cut a mortise that will run straight and true through the wood. The result will be a twisted frame.



5. To mill the tenons, first attach a guide stop to your rip fence, then measure to establish the correct distance from the stop to the outer edge of the blade.

Mill the shoulders of the tenons first.



Construction Notes

1. Cut all four boards roughly to size, leaving 1/16" extra width to allow for jointing.
2. Square the edges either by planing or running the pieces across the jointer.
3. Take the two rails and mark the positions of the through mortises. These should be 3" long by 3/8" wide.
4. Cut the mortises. Make sure that they are perfectly square to the outer faces of the rails from back to front. If not, the frame will be twisted.
5. Using either conventional hand tools or your table saw with a stacked dado head, mill the tenons to the ends of the two stiles. If you're using your table saw, start with a conventional blade and make the two shoulder cuts. Then replace the conventional blade with your stacked dado head and begin milling the cheeks of the first tenon. Make the first cut so that the tenon is over-size and measure against one of the mortises. Then continue, raising the head, a small step at a time, until the tenon fits the mortise perfectly. Once you have the head set to the correct depth, you can mill the other three tenons. They, too, should fit perfectly.



6. Assemble the frame to make sure all four pieces fit together perfectly and that the resulting frame is not twisted. If it is twisted, disassemble the frame and use a square to identify the piece that's in error, and fix it or replace it.

7. Before you disassemble the frame, mark the rear to identify which joint goes with which—1 and 1, 2 and 2, etc. This will make final assembly much easier.

8. Using your router table and 1/2" mortising bit, mill the rabbets to the rear inside edges of all four pieces. These should be 1/2" deep by 1/2" wide.

9. Use either a chisel, spindle sander or belt sander to chamfer the ends of all four tenons.

10. Glue, assemble and clamp the frame, measure the diagonals to ensure the structure is square, then set it aside until the glue has fully cured.

11. When the glue has cured, remove the clamps and mark the corners of the frame for dowels. I used eight, aligned vertically with the rails. You could, if you wish, set them diagonally across the corner; whichever you feel is most pleasing.

12. Sand all of the surfaces smooth, beginning with a coarse grit paper, say 80-grit, and finishing with a fine grit paper of at least 220-grit. Be sure to smooth all of the end grains and ease all the edges ready for finishing.

13. If you're trying for an antique look, you'll need to do a little distressing. Don't go overboard. Just a few dings, here and there, applied with a small piece of rock, will do nicely, then you can smooth them over with some 220-grit paper.

14. If you've used white oak to make your mirror, you may want to fume the frame to further the antique look, then add a couple of coats of polyurethane for protection. You'll find a description of how to fume your work on page 31. If you've



11. Mark the positions of the through dowels at each of the four corners, then drill the holes and insert the dowels using a little glue. This makes for a very strong frame.

used some material other than white oak, or have decided against fuming, you'll need to apply some color to the frame. I like to use a one-step stain/finish combination made by Minwax, followed with a couple of coats of polyurethane. For this piece I used a dark oak shade.

15. As to the mirror itself, you have a couple of choices. If you can, find a piece of antique mirror and have it cut to the actual size of the rabbeted opening, minus 1/8" for clearance. If not, any glass company will cut a piece of 3/16" mirror glass at a reasonable price.

16. Set the mirror in place, then the plywood back, and secure them in place with a half-dozen 1" brads.

17. Finally, fasten a couple of hooks to the back, add some picture wire, and you're done.

18. Stickley's design shows a couple of porcelain-tipped clothes hooks added to each of the two stiles, making it a hall mirror. For authenticity, you could add them too. I chose not to do so. If you do decide to add them, place them in the center of the stiles eight inches from the bottom.



chapter nine

ARTS AND CRAFTS WINDOW TABLE

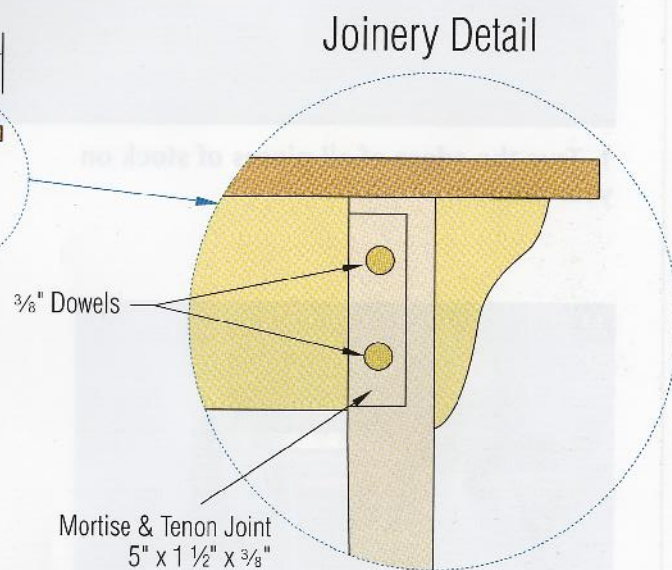
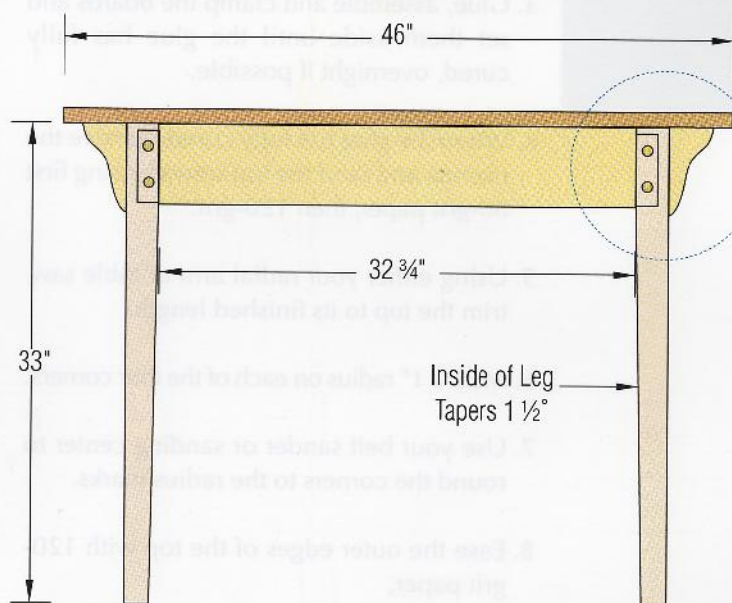
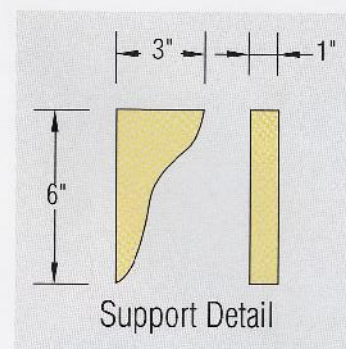
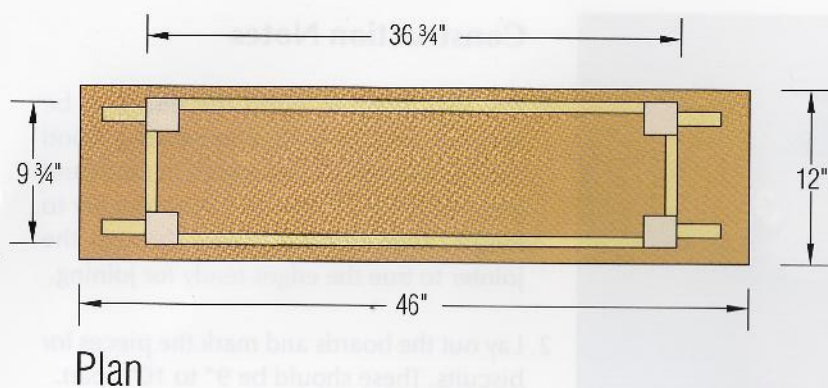


This is a neat little table in the Arts and Crafts style. I found the original in a picture of a room setting in a coffee table book at the local library. There was no mention of its designer, so who that was I've no idea. Nor was there any indication of its size, which I had to estimate by comparing it to rest of the furniture in the room. Anyway, it's a pleasing

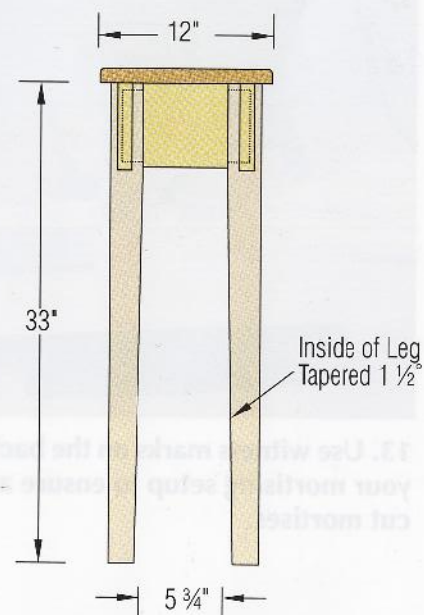
little piece that performs well as plant stand under my dining room window.

One of the main reasons I chose this piece is that, it's fairly quick and simple to make. The rails of the apron are fastened to the slightly tapered legs using blind mortise and tenon joints. The top is fastened to the substructure using buttons made from scrap

stock and biscuits. And the supports, more decorative than functional, can be fastened to the legs using either biscuits or dowels. I finished this one to match the rest of the furniture in my home. You may prefer a darker stain or a fumed finish with a couple of coats of polyurethane for protection.



BILL OF MATERIALS	
Top:	1 @ 46" x 12" x 1"
Apron:	2 @ 35 3/4" x 5 1/2" x 1"
	2 @ 8 3/4" x 5 1/2" (sides)
Legs:	4 @ 33" x 2" x 2"
	(finished dimensions)
Decorative Supports:	4 @ 6" x 3" x 1"
Wooden Table Irons:	10 @ 2 1/2" x 2 1/2" x 3/4"



Arts & Crafts Window Table



1. True the edges of all pieces of stock on your jointer.



13. Use witness marks on the back fence of your mortising setup to ensure accurately cut mortises.

Construction Notes

1. You may need to build the board to be used for the top. If so, choose your wood carefully so the pieces match in color and grain structure. Cut your wood roughly to length, then run the pieces through the jointer to true the edges ready for joining.
2. Lay out the boards and mark the pieces for biscuits. These should be 9" to 10" apart.
3. Glue, assemble and clamp the boards and set them aside until the glue has fully cured, overnight if possible.
4. When the glue has fully cured, remove the clamps and sand the top smooth using first 80-grit paper, then 120-grit.
5. Using either your radial arm or table saw, trim the top to its finished length.
6. Mark a 1" radius on each of the four corners.
7. Use your belt sander or sanding center to round the corners to the radius marks.
8. Ease the outer edges of the top with 120-grit paper.
9. Finish sanding the top surface, edges and end grains to 220-grit.
10. Cut leg stock to make four pieces 33" long by roughly 2 1/8" square.
11. Run all four pieces across the jointer and square them to the finished dimension of 2" square.
12. Mark the mortises as laid out in the drawing.
13. Cut the mortises.

14. After you've cut the mortises, from the top end of each leg, measure six inches and make a mark from which to start the taper.

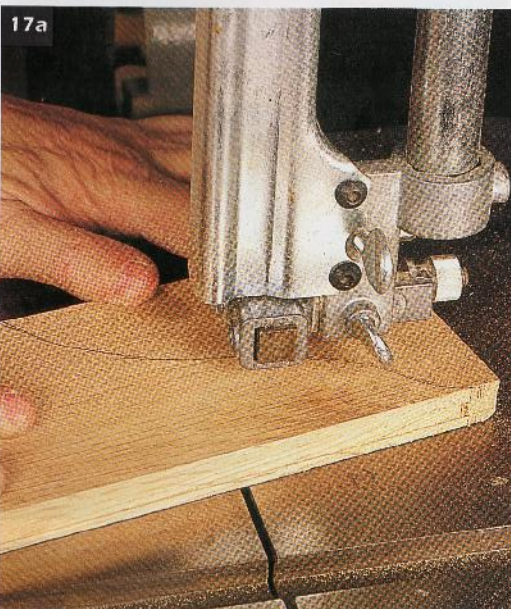
15. Using a table-saw tapering jig set to $1\ 1/2^\circ$, and the table saw, cut the tapers to the two inside surfaces of each leg.

16. Sand the legs smooth, ease the edges, then set them aside until you're ready for assembly.

17. Cut the four decorative supports to the pattern you see in the drawing, then sand them smooth, ease the sharp edges, and set them aside ready for assembly.



15. Use the tapering jig on the table saw to shape the legs. Remember, the taper does not go all the way to the top, and the legs are tapered on the two inside faces only.



17. The bandsaw is the best tool for cutting the top supports, but a jigsaw would do just as well.

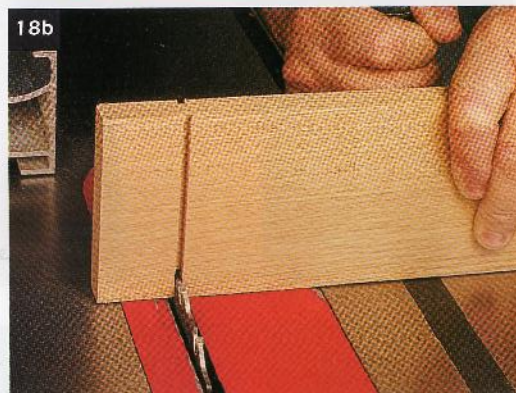


Sand all the edges smooth using either a spindle sander or drum attachment in the drill press.

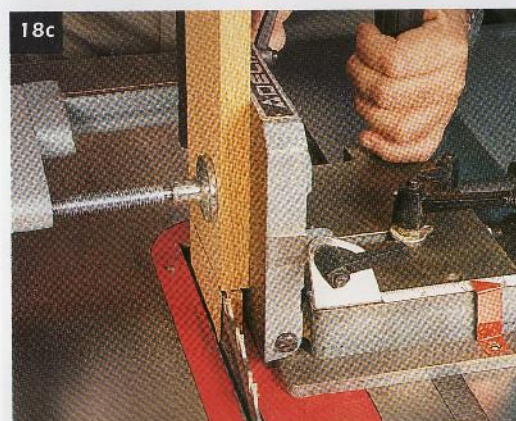
18. Start forming the tenons by milling the cheek shoulder cuts first.



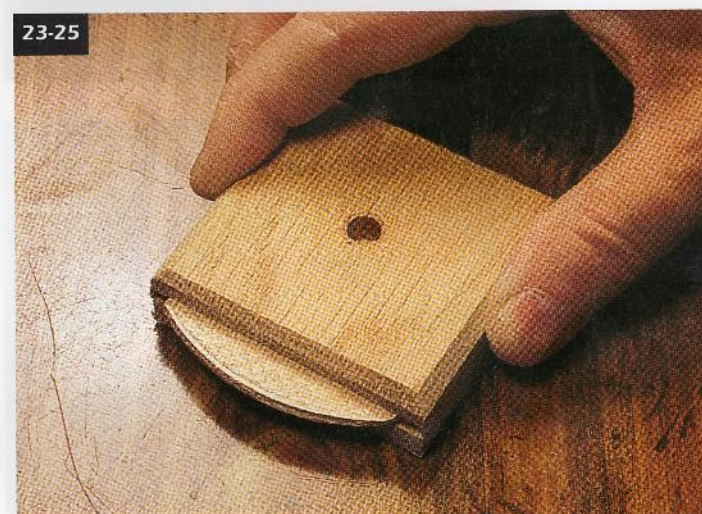
Then continue forming the tenons by milling the edge shoulder cuts.



Use a tenoning jig to saw the cheeks.



23.-25. This is a simple, homemade table button. All you need is a small square of hardwood and a biscuit. The button fits into a matching slot in the table apron. Do not use glue, either in the block or the apron. The top must be free to expand and contract.



18. Take the four pieces that will form the apron and cut the tenons. These should be 5" wide by 3/8" thick by 1 1/2" long.

19. Sand the pieces smooth to 220-grit and ease the lower edges.

20. Dry fit the aprons to the legs and make sure everything fits properly.

21. Disassemble the structure, then glue, reassemble and clamp it. Measure the diagonals to ensure the structure is square, then set it aside until the glue is fully cured.

22. Mill 10 biscuit slots to the upper inside edges of the aprons, four along each side and one at each end, to receive the homemade table buttons that will fasten it to the top.

Wooden Table Buttons

23. From scrap oak stock cut 10 pieces 2 1/2" square by 3/4" thick.

24. In one end grain of each piece mill a #20 biscuit slot.

25. Drill a 1/8" hole through the center of each piece, and set all 10 pieces aside until you're ready to use them.

Assembly

26. Turn the under-structure on its end and set one of the decorative supports in place on one of the legs—it should be placed 1/4" back from the edge so as to leave a step—then mark the piece and the leg for two biscuits, about 3/4" apart. You can use dowels, if you wish. Do the same for each of the other three legs.

27. Mill the biscuit slots.

28. Place the top upside down on the bench; be sure to cover the bench with a soft pad of some sort to protect the finish.

29. Place the under-structure on the underside of the top; measure all around to ensure it's in the center.

30. Now, take the 10 wooden table buttons, dry fit a #20 biscuit to each one, then slide them into the slots in the edges of the under-structure. Do not use glue. The top needs to be able to move in response to humidity.

31. Using 1 1/4" x #8 screws fasten the buttons, and the under-structure, to the top.

32. Glue, assemble and clamp the supports into position, and allow time for the glue to cure.

33. Do your final sanding to 220-grit, making sure all the edges are eased and any excess glue is removed.

34. At this point you'll need to decide on a finish. You have a number of choices. For the light color I chose a golden oak stain/polyurethane combination. As an alternative, you can use a dark oak combination, or you can fume the piece. Either way, you'll need to apply at least one final coat of clear polyurethane for protection; two if you have to lightly sand any raised grain.



32. Glue the decorative supports to the top.





chapter ten

STICKLEY OCTAGONAL TABOURET





At first glance this would seem to be a simple little project. It is, however quite challenging. When I first saw Stickley's hand-drawn illustration in *The Craftsman* magazine (see it on page 11), I wasn't all that impressed. It seemed a chunky little table with little character. As always, I had to rely on Stickley's good taste and eye for design. The result was a unique piece of furniture, to which the original illustration did no justice at all.

If you look through the old Arts and Crafts catalogs, you'll find them filled with these little tabourets, as they called them. Charles Limbert had at least two dozen different designs, Roycroft just as many, and L & G Stickley even more, so they must have been a popular item. Stickley said of this one that its design was "rather heavy and could well be used for a den, living room, library or man's room. The legs slanting outward give it a sturdy appearance. It could be used as a jardiniere stand, to hold a cigar-box and ash tray, or on a hot day a place to rest a tray with cool drinks."

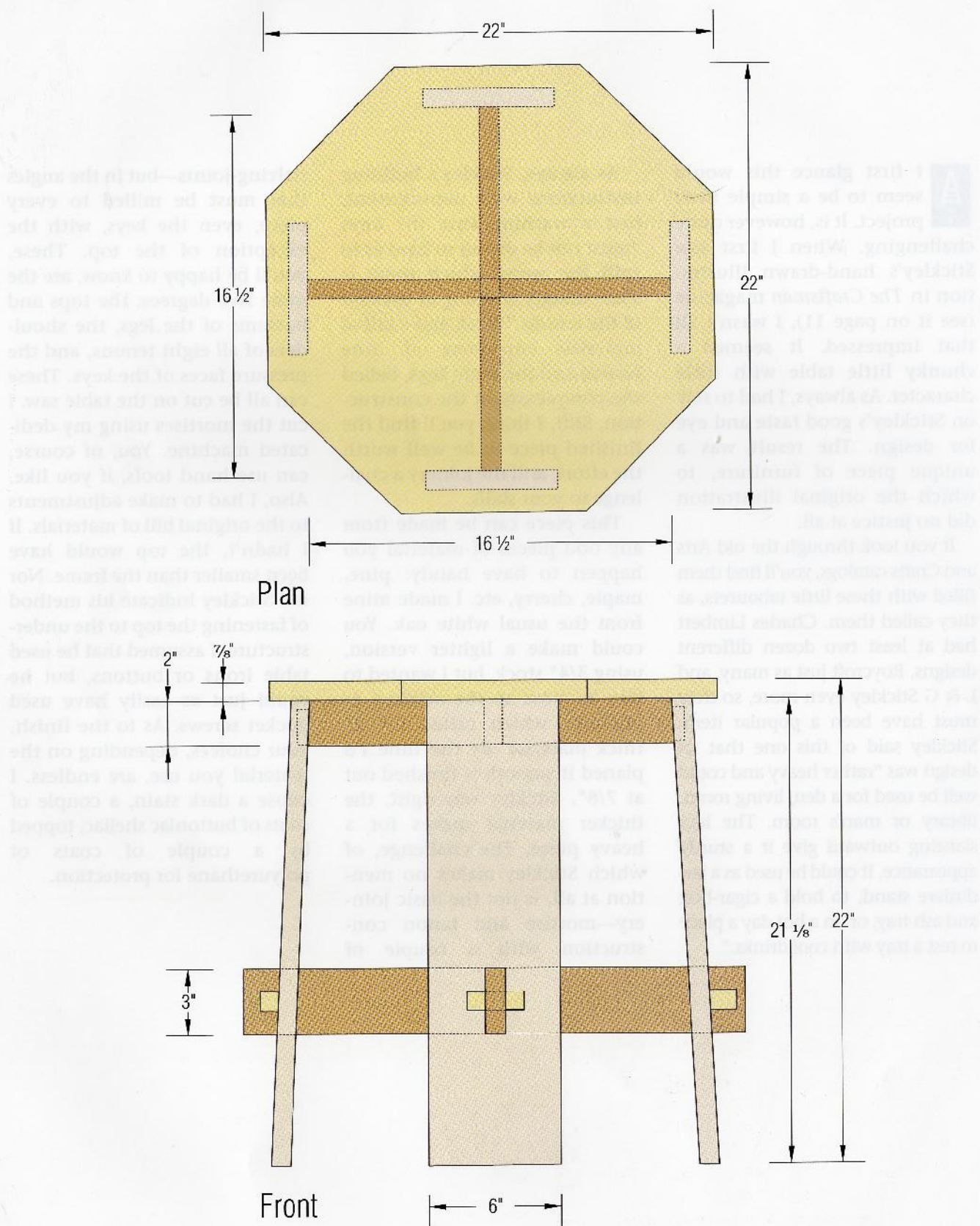
As always, Stickley's building instructions were non-existent, just a warning that the keys "must not be driven so hard as to split the wood which there is some danger of doing at the end of the tenons." That, and a bill of materials consisting of nine boards and the same keys, belied the complexity of the construction. Still, I think you'll find the finished piece to be well worth the effort, and the joinery a challenge to your skills.

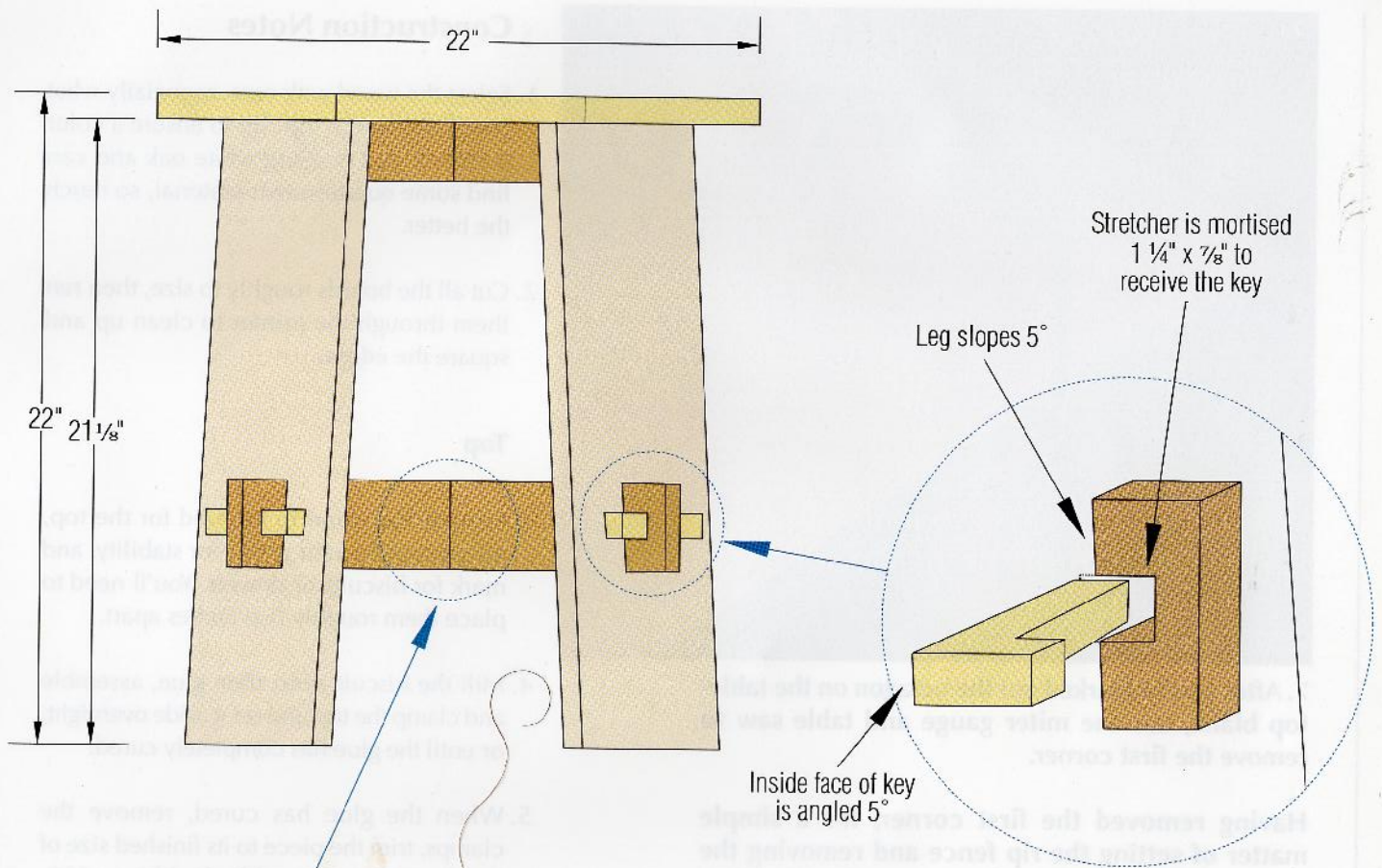
This piece can be made from any odd pieces of material you happen to have handy: pine, maple, cherry, etc. I made mine from the usual white oak. You could make a lighter version, using 3/4" stock, but I wanted to stay as close to the original as possible, which called for 1" thick material. By the time I'd planed it smooth it finished out at 7/8". Stickley was right, the thicker material makes for a heavy piece. The challenge, of which Stickley makes no mention at all, is not the basic joinery—mortise and tenon construction with a couple of

halving-joints—but in the angles that must be milled to every piece, even the keys, with the exception of the top. These, you'll be happy to know, are the same five degrees: the tops and bottoms of the legs, the shoulders of all eight tenons, and the pressure faces of the keys. These can all be cut on the table saw. I cut the mortises using my dedicated machine. You, of course, can use hand tools, if you like. Also, I had to make adjustments to the original bill of materials. If I hadn't, the top would have been smaller than the frame. Nor did Stickley indicate his method of fastening the top to the understructure. I assumed that he used table irons or buttons, but he could just as easily have used pocket screws. As to the finish, your choices, depending on the material you use, are endless. I chose a dark stain, a couple of coats of buttonlac shellac, topped by a couple of coats of polyurethane for protection.

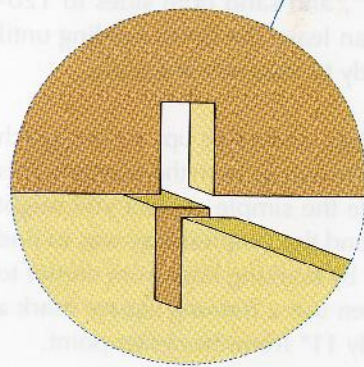


Octagonal Tabouret by Gustav Stickley

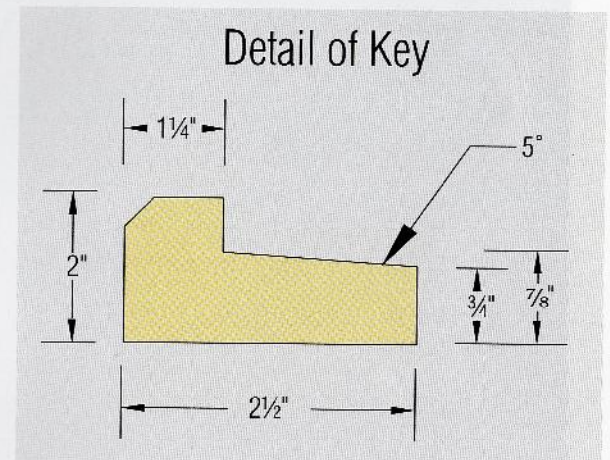




Detail of end of tenon & key



Joinery detail for braces and stretchers

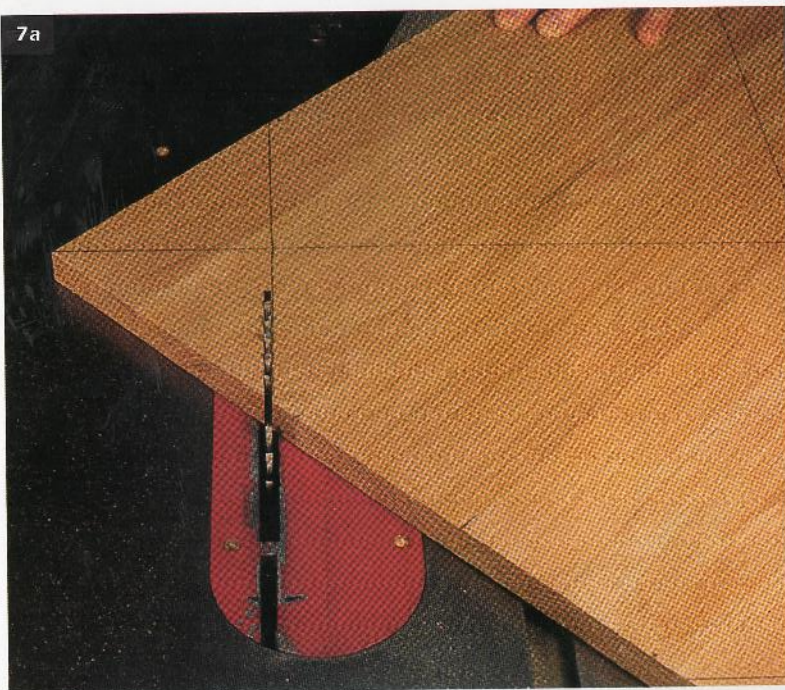


BILL OF MATERIALS

Top:	1 @ 22" x 22" x 7/8"
Legs:	4 @ 22" x 6" x 7/8"
Braces:	2 @ 18 1/2" x 2" x 7/8"
Stretchers:	2 @ 25" x 3" x 7/8"
Keys:	4 @ 2" x 2 1/2" x 7/8"
Table Buttons:	4



7a



7. After you've marked out the octagon on the table-top blank, use the miter gauge and table saw to remove the first corner.

Having removed the first corner, it's a simple matter of setting the rip fence and removing the opposite corner; repeat the process for the other two corners.

7b



Construction Notes

1. Select the wood with care, especially what you'll use for the top. Try to ensure a color match. If you're using white oak and can find some quarter-sawn material, so much the better.
2. Cut all the boards roughly to size, then run them through the jointer to clean up and square the edges.

Top

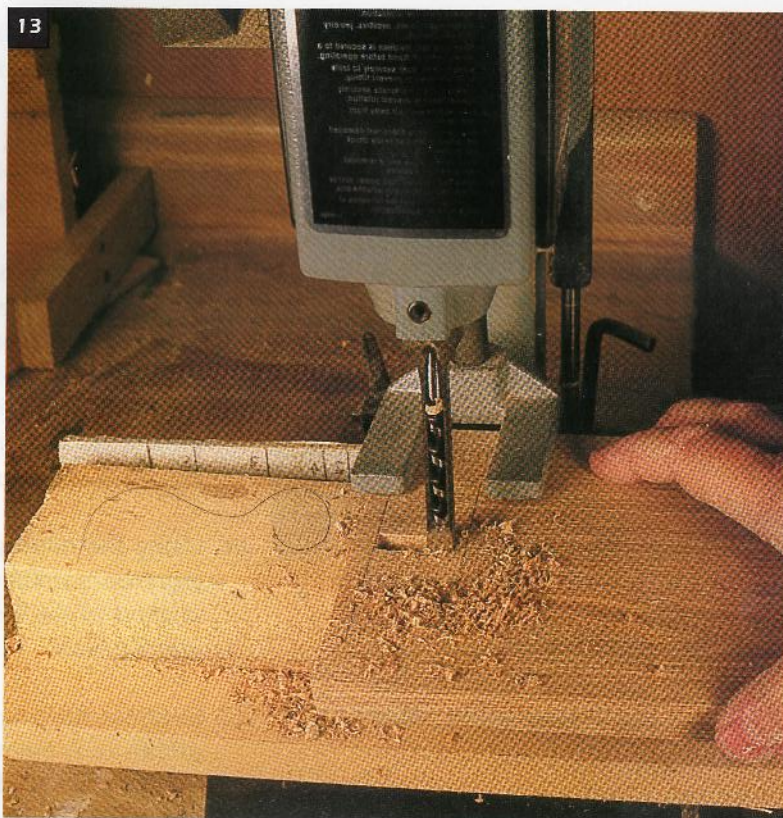
3. Lay out the wood to be used for the top, alternating the end grains for stability, and mark for biscuits or dowels. You'll need to place them roughly five inches apart.
4. Mill the biscuit slots, then glue, assemble and clamp the top and set it aside overnight, or until the glue has completely cured.
5. When the glue has cured, remove the clamps, trim the piece to its finished size of 22" by 22", and sand both sides to 120-grit. You can leave the finish sanding until you're ready to assemble the table.
6. Place the top, underside up, on the bench and mark the cuts to form the octagon. This is not quite the simple project you might think. I found the simplest way was to find the center by marking lines from corner to corner, then use a framing square mark a line exactly 11" from the center point.
7. Now cut out the octagon. I did this on the table saw, making the first two cuts with the miter gauge set at the correct angle. Once the first two cuts had been made, it was simply a matter of setting the rip fence at 22" and removing the opposite corners.

Legs

8. Trim the four legs to length: 22"
9. Set the blade of the table saw to cut at an angle of 5° then, using the miter gauge, trim one end of the first leg, making sure to remove only the waste material. Do not reduce the total length of the leg.
10. Flip the leg end-over-end and remove the waste material from the other end of the leg, again making sure not to reduce its over-all length. You should now have a leg with two 5° angles, each opposing the other, that will fit squarely against the underside of the top and on the floor, thus creating the splayed understructure.
11. Continue by cutting the same angles on the ends of the remaining three legs.
12. Mark the two through mortises on each of the four legs. The ones at the top of the legs that will receive the braces should be 3/8" wide by 1 1/2" long. The mortises that will receive the stretchers should be 1/2" wide by 3" long.
13. Cut all eight mortises. Take extra care with those that are to receive the stretchers—do not cut them oversize.
14. Finish sand all four legs to 220-grit and set them aside.

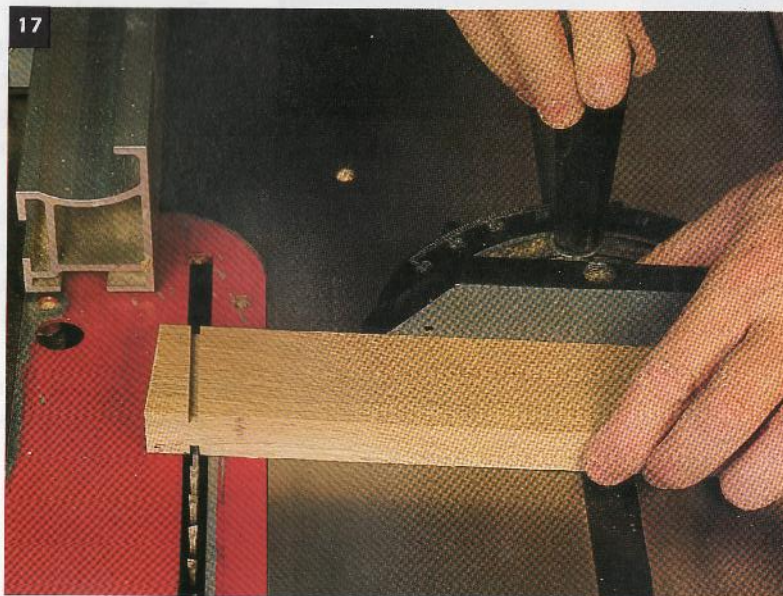
Top Braces

15. Trim the two pieces that will form the top braces to length. The bill calls for 18 1/2", and that's a little long, but okay.
16. Set the miter gauge to an angle of 5°, and the table saw blade perfectly upright at 90°. Now trim away the waste at each end of both braces, taking care not to reduce their over-all length.
17. With your miter gauge still set at 5°, make the face shoulder cuts.

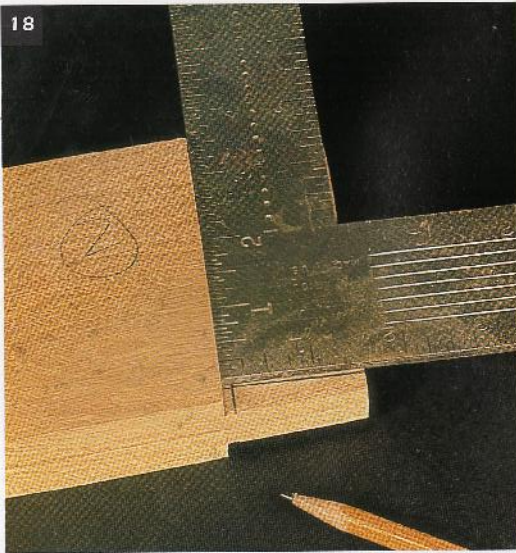


13. There are through mortises at the tops of the four legs as well as those that will receive the lower stretchers.

17. Set the correct angle on your miter gauge, then mill the shoulder cuts for the angled tenons to all four top braces. If you have a sliding rip fence, you can use it as a stop; if not, you'll need to attach a small piece of scrap to your rip fence and use that as a stop.

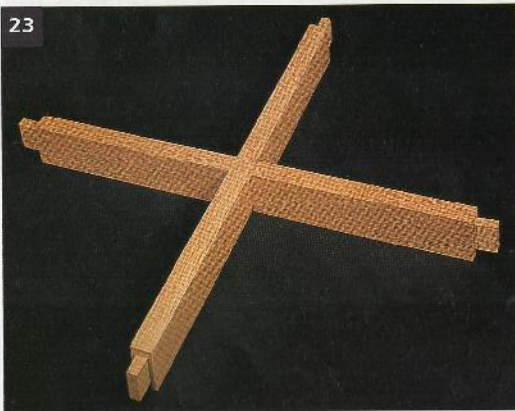


18



18. The edges of the tenons are cut at right angles to the shoulders. Take care to cut them accurately. If you cut them on the slack side you'll have some filling to do.

23



23. This illustrates the top support section of the table after the lap joints have been cut and the two pieces assembled together.

18. Tilt the table saw blade to 5°, return your miter gauge to 90° and, taking great care, make the edge shoulder cuts.
19. Using the tenoning jig, make the cheek cuts. Do this in stages, reducing the thickness of the tenon little by little, testing the fit as you go, until the tenon slides easily, but not sloppily, into its mortise.
20. Set the two top braces side-by-side, one bottom edge up, the other bottom edge down, on the bench and clamp them together. Now mark the center of the upper-facing edge. This will be the center of the halving joint. Make a mark $7/16''$ to either side of the center line. Then mark the outer boundaries of the halving joint. Now set the table saw to cut at exactly 90°—use a set square to make sure—and to a depth of exactly 1".
21. Using the miter gauge, and keeping the two pieces clamped together, carefully make the first cut through the area you've marked for the halving joint. Now measure to make sure it's the correct depth.
22. Continue forming the halving joint by making a series of cuts to nibble away the waste material. Make sure you don't go beyond the lines. If you do, the joint will be sloppy, and you'll have to start over.
23. Remove the clamps and dry-fit the joint. If the fit is too tight, adjust it.
24. Sand both braces to 220-grit, then glue and assemble the joint and set the structure aside until the glue has cured.

Stretchers

The procedure for forming the stretchers is essentially the same as that for forming the top braces, but with a couple of exceptions. There are no edge shoulders to the tenons, the ends of the tenons are not angled—the shoulders are—and you will have to mill the holes to receive the leg-retaining keys.

25. Repeat procedures number 15, 17, and 19. Repeat procedure number 20, but set the table saw blade to cut at exactly $1\frac{1}{2}''$, then continue through the remaining procedures to, and including 23, but not 24.
26. Mark the position of the keyhole on each of the four tenons as shown in the drawing.



27. Using either hand tools or your mortising machine, cut the key-holes. Either way, be sure to support the under side of the tenons to eliminate tear out.
28. Now sand both stretchers to 220-grit, then glue and assemble the halving joint and set the structure aside until the glue has fully cured.

Keys

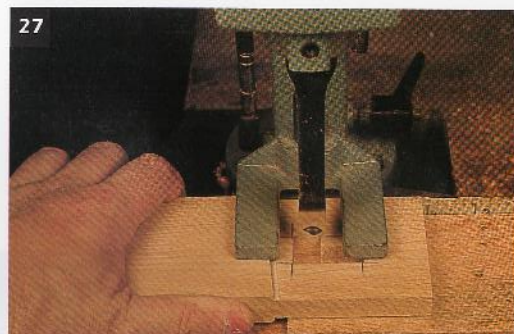
29. Make the four keys as per the pattern you'll find in the drawing, and finish sand them to 220-grit.

Assembly

30. Glue one tenon at one end of one of the braces and assemble it to one of the legs.
31. Slide one tenon of one of the stretchers through the same leg and secure it with a key, to the angled face of which you've applied a little glue.
32. Quickly repeat the procedure until all four legs are securely fastened in position, then clamp the structure, and leave the structure standing on a flat surface until the glue has fully cured.
33. Once the glue has cured, remove the clamps and mill the biscuit slots that will receive your home-made table buttons (see chapter nine). These should be positioned so that they not only hold the top securely on the understructure, but also hold it in the correct position.

Finishing

34. Finish sand the top, including its edges, to at least 220-grit, then either fume the entire piece, assuming you've used white oak, or stain it to the color of your choice.
35. Finally, apply a couple of coats of polyurethane for protection.



27. They don't make square chisels wide enough to make these large through mortises (they are for the keys that will hold the structure together) so you'll need to mill them by making several passes with a smaller chisel. I used a 1/2" chisel.

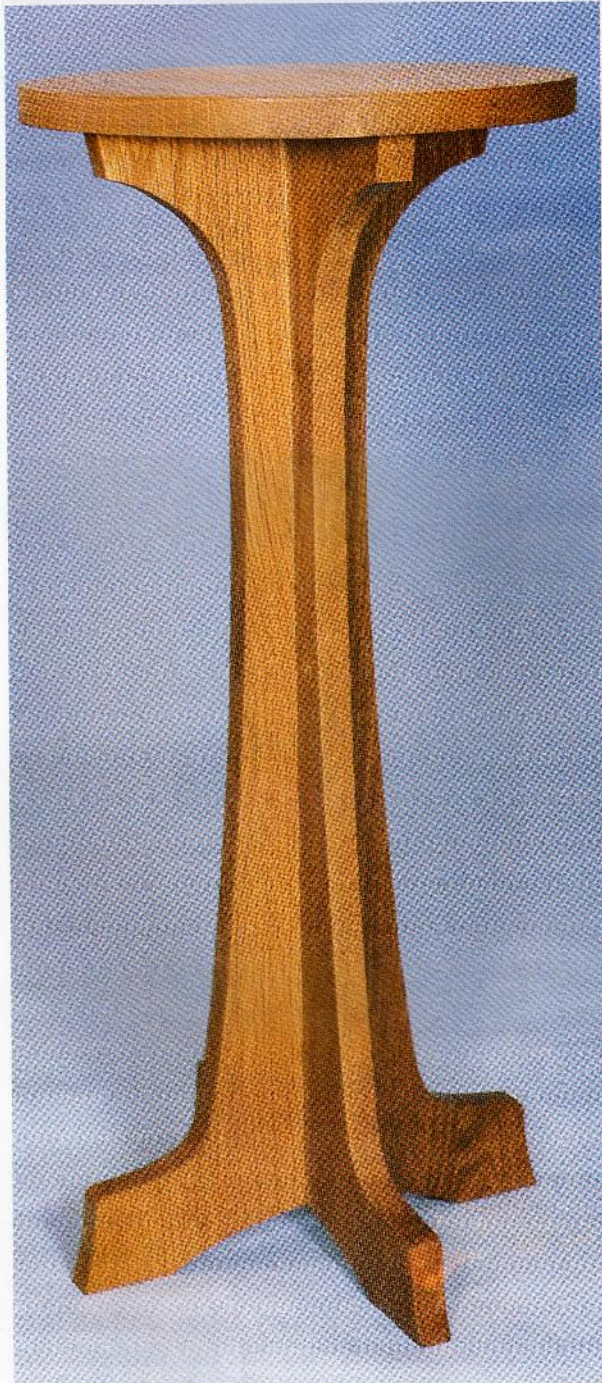


30. As always, the gluing, assembly and clamping is an extremely important part of the project. You must stand the assembly on a flat surface, and you must make sure that all is perfectly square. There's nothing worse than a rickety table, and on this one it would be difficult to correct once the glue had set.



chapter eleven

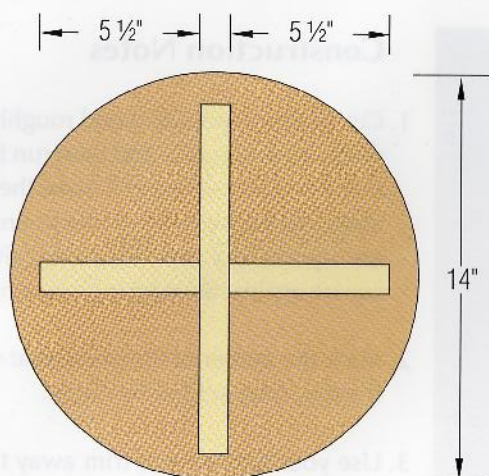
LIMBERT PEDESTAL



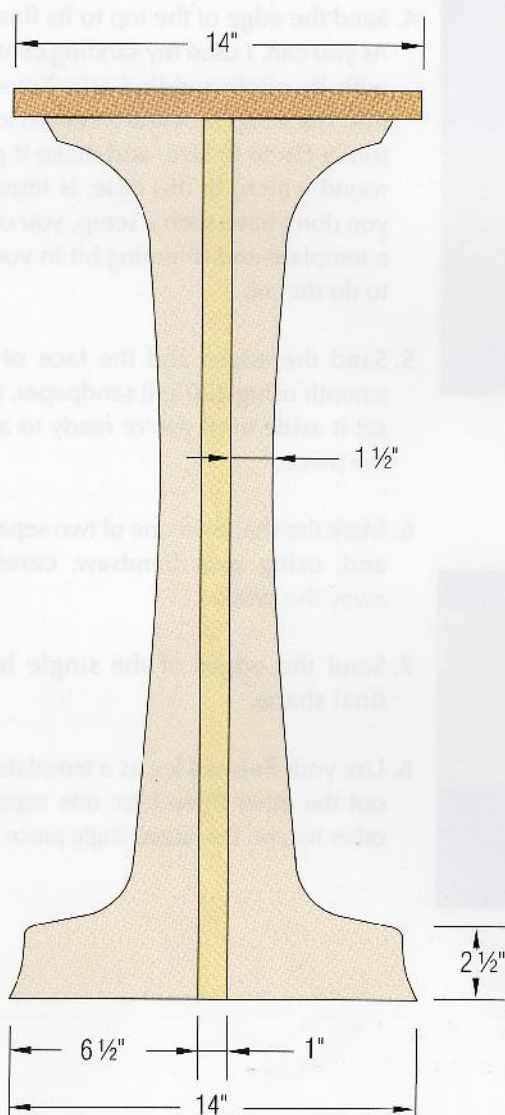
I spotted this piece in an old Charles Limbert catalog dated 1906. The picture was hand-drawn and very small. Still, there was something intriguing about the lines. I had an idea the finished object would be attractive. I was right. The lines are inspired. The design is a work of art. To begin with, all I had to work with was the overall height of the piece, and the radius of the top. The catalog also gave the material: quarter-sawn white oak. Trial and error provided the correct proportions. My first attempt resulted in a piece that was a little stocky in the body. I slimmed it down somewhat and the result is what you see in the photograph.

Construction, as I have designed it, is fairly straight forward. Originally, however, I had no idea of how Limbert put the thing together. I was fairly sure the stand itself was constructed from three pieces, rather than two. A perfect notch joint almost 26 inches long would test the abilities of

even the most skilled craftsman, and I wanted the piece to be within the scope of most woodworkers, even those of moderate skills. I decided to make the stand in three pieces. Two legs are formed from a single piece of wood. The other two were formed separately. The three pieces were then joined together using glue and biscuits. You could, of course, use dowels to do the job. The top is joined to the stand using screws in pocket holes. The material is white oak. As to the finish, I decided to use the traditional method and fume the piece, as did Limbert with the original, with a coat of clear polyurethane for protection. It took me a couple of days to make the piece. You should be able to complete the job over a weekend. One more note: Limbert's catalog price was \$6. Today, if you could find an original, it would be a hundred times that. Even a reproduction would cost a couple of hundred dollars.

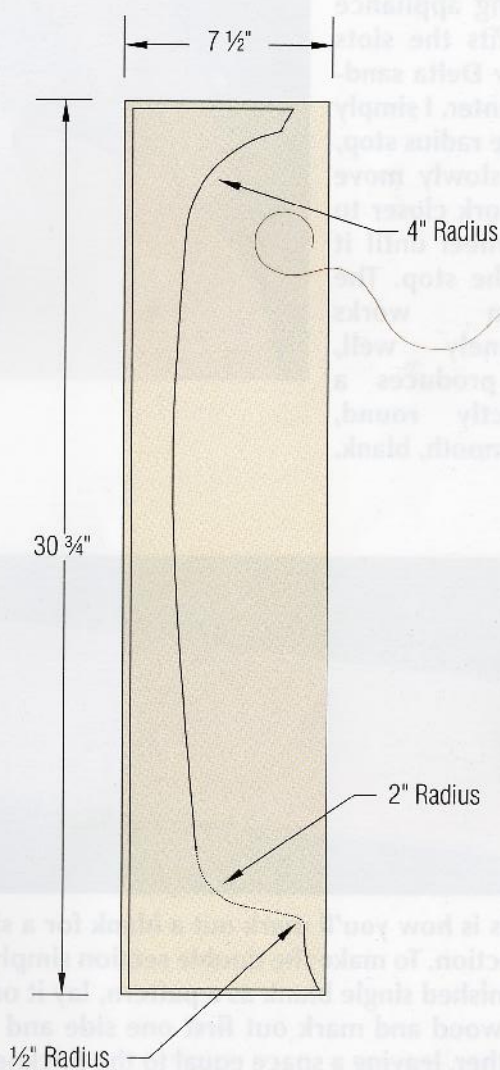


Plan



Front

BILL OF MATERIALS	
Top:	1 @ 14" dia. x 1"
Double Leg:	1 @ 32" x 14" x 1"
Single legs:	2 @ 32" x 6 1/2" x 1"

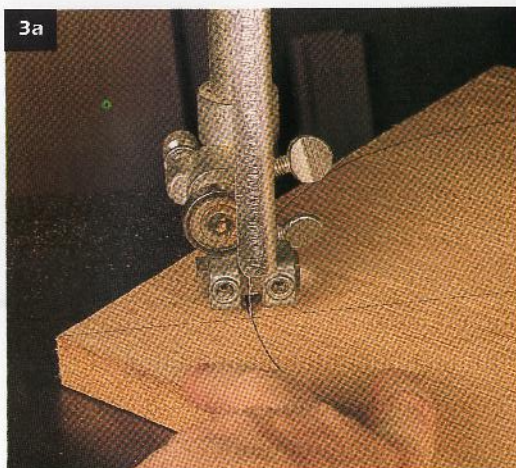


Lay Out of Quarter Section

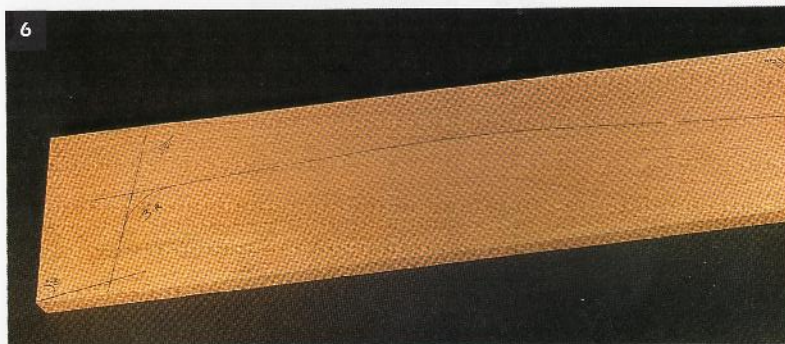
Pedestal by Charles Limbert



3. Use the band-saw to cut the circular top. If you have a circle cutting jig, so much the better; if you don't, it's a good idea to make one.



I have a circle sanding appliance that fits the slots on my Delta sanding center. I simply set the radius stop, then slowly move the work closer to the wheel until it hits the stop. The system works extremely well, and produces a perfectly round, and smooth, blank.



6. This is how you'll mark out a blank for a single leg section. To make the double section simply use the finished single blank as a pattern, lay it on the bare wood and mark out first one side and then the other, leaving a space equal to the thickness of the material.

Construction Notes

1. Cut all four pieces of wood roughly to size, plane them smooth, and then run the edges of the two pieces that will make the two separate legs through the jointer to ensure they are square and true. They must fit flat and square against the center of the single leg.
2. Mark the center of the piece that will form the top, then scribe the circle.
3. Use your bandsaw to trim away the waste material from around the edge of the top.
4. Sand the edge of the top to its final shape. As you can, I used my sanding center along with its circle sanding attachment to do this. The setup provides a system to exactly trim a circle to size, and make it perfectly round which, in this case, is important. If you don't have such a setup, you could use a template and trimming bit in your router to do the job.
5. Sand the edges and the face of the top smooth using 220-grit sandpaper, and then set it aside until you're ready to assemble the piece.
6. Mark the shape on one of two separate legs and, using your bandsaw, carefully cut away the waste.
7. Sand the edges of the single leg to its final shape.
8. Use your finished leg as a template to mark out the other three legs: one separate, the other two on the larger single piece of wood.

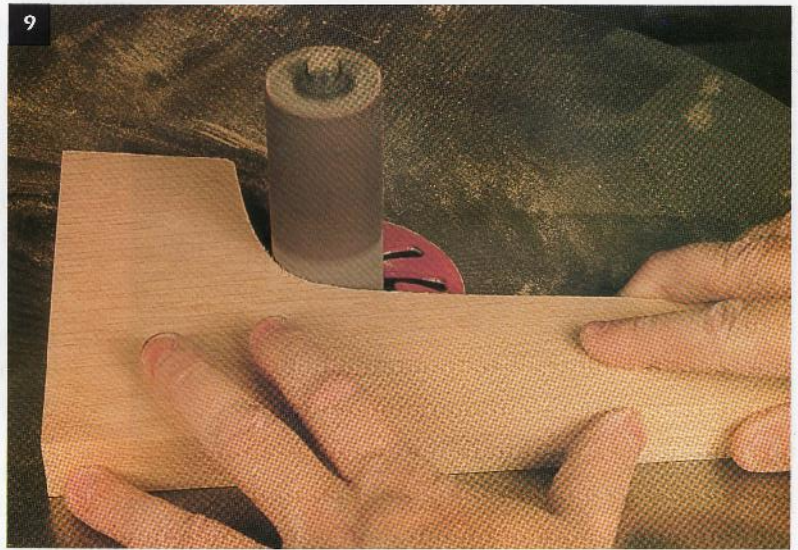


9. Repeat steps seven and eight to complete the shaping of the legs, then sand all of the surfaces of all three pieces smooth using 220-grit sandpaper. It's much easier to do your final sanding now than it would be to do it when the piece is assembled.

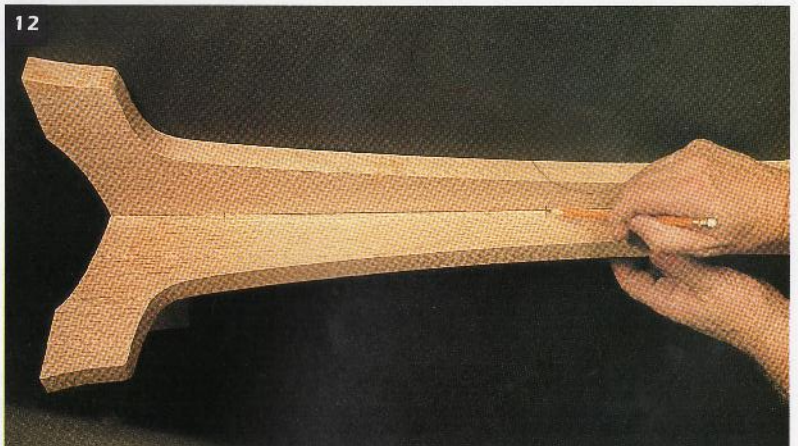
10. At this stage, you can reinforce the feet as I did. With the grain running top to bottom, the exposed feet are particularly vulnerable to shock which could cause them to break off. The answer, I decided, was to drill a half-inch hole in each foot, from the outer portion inward to beyond the point where the foot sweeps out from the upright center of the leg. Then I inserted a piece of half-inch dowel, suitably glued, into the hole. This, I felt, would not only strengthen the foot, but would also act as a shock absorber, protecting the foot even further.

11. Set the double leg section on the bench with one of the two separate legs on top of it, making sure it's positioned exactly in the center, and mark for biscuits or dowels. I used three. You could use more or less as you see fit.

12. Remove the leg, then reverse the double section so that the other side is uppermost. Now set the other separate leg in place and, making sure it's perfectly centered, mark for biscuits or dowels. If you're using dowels, slightly offset the positions so they don't clash with those from the other side.

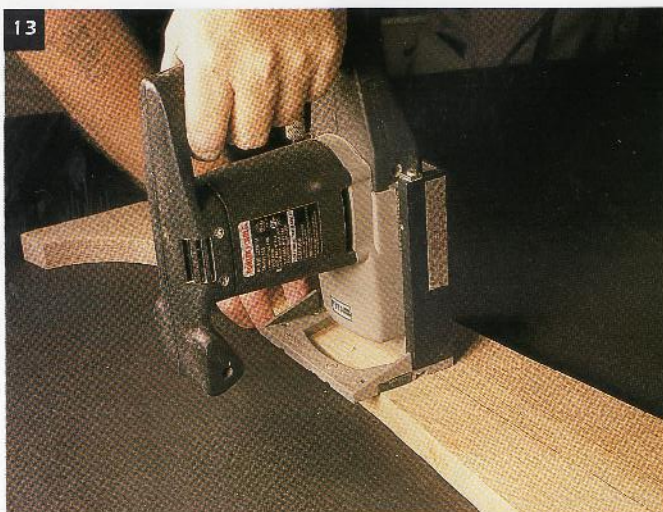


9. Carefully sand all the outer edges of the four leg profiles. They will be what you see first when the piece is complete.



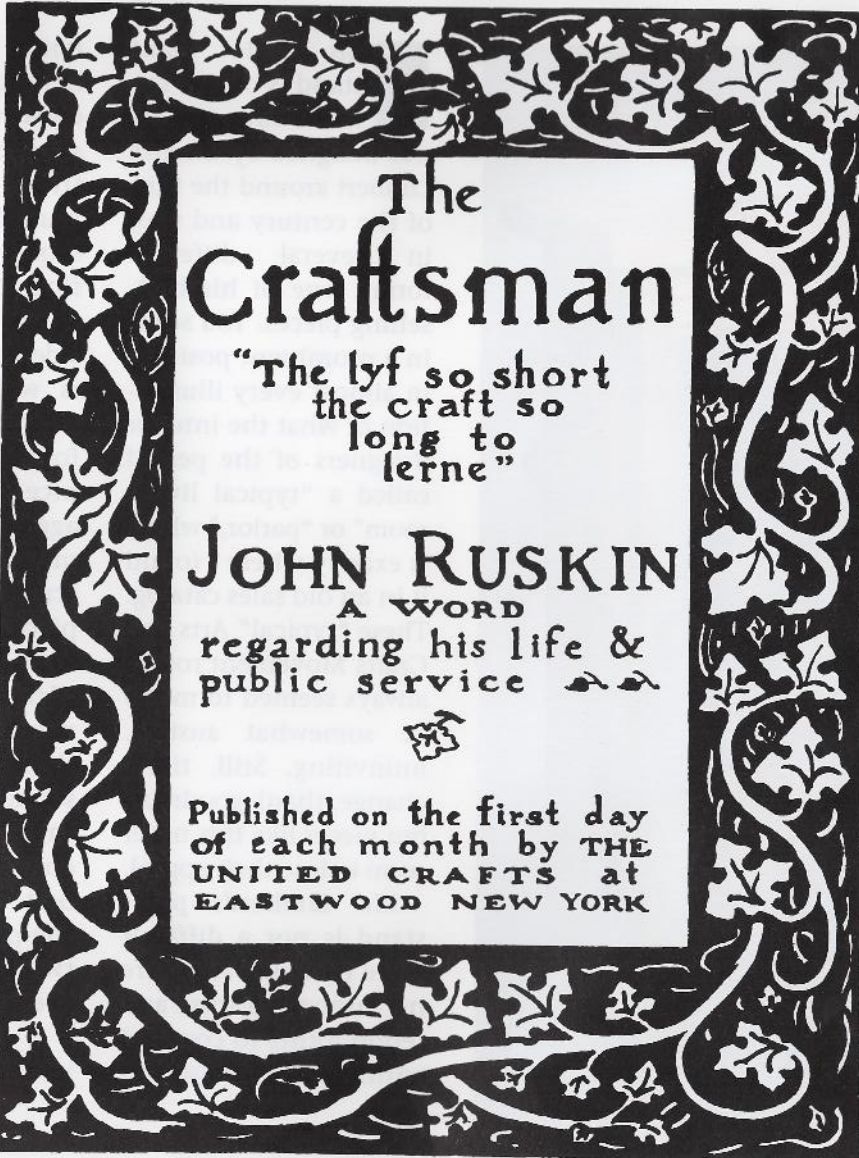
12. Stand the three leg sections together as if they were finished, then mark for biscuit slots; you'll need three or four biscuits down the length of each of the two single leg sections.

13



13. Take great care when milling the biscuit slots. If your machine is slightly out of line the sections will not fit properly together. Be sure to keep the marks toward the machine.

13. Cut the biscuit slots or drill holes for the dowels.
14. Glue, assemble and clamp the legs together. Make sure you clean away any glue that squeezes out from the joint. You'll have a terrible job on your hands if you leave it until the glue has fully cured. Then set the assembly aside overnight, or until the glue has fully cured.
15. When the glue has cured, remove the clamps and lightly sand any grain that has been raised during the gluing process.
16. Set the top on the bench, underside up, and set the stand in position, exactly in the center. Now mark its position so that you can remove and replace it if need be.
17. Drill pilot and pocket holes through the tops of the legs into the pedestal top.
18. Use four number 10 screws, two inches long, to secure the legs to the top.
19. Do any necessary final sanding, and then make ready to begin the finishing process.
20. If you've decided against fuming, use the stain of your choice to color the piece, then add a couple of coats of polyurethane for protection, sanding lightly between the coats.
21. If you've decided you'd like to try fuming, this is a good piece to start out on. You don't need to build a special plastic tent to contain the piece. A simple, large garbage bag will do the job nicely. Just stand the pedestal upright, place a small open container of ammonia between two of the feet, then slip the garbage bag down over the top, all the way to the floor, and hold it down using a two or three pieces of scrap wood, or even two or three building bricks. Be sure to do it in an out-of-the-way place, somewhere where it won't be disturbed, and where any escaping fumes will do no harm. Leave the piece in the bag for about 48 hours.
22. Finally, when the fuming is complete, give the piece a couple of coats of polyurethane for protection.



The
Craftsman
"The lyf so short
the craft so
long to
lerne"
JOHN RUSKIN
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regarding his life &
public service

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chapter twelve

LIMBERT PLANT STAND

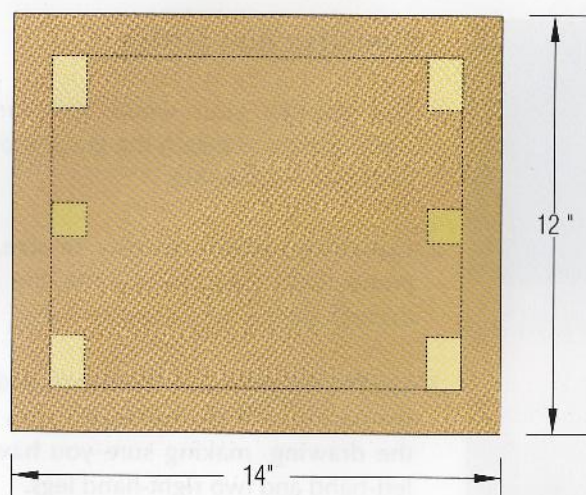


This little plant stand is one of my wife's favorites. It was designed by Charles Limbert around the turn of the century and was, in several different forms, one of his best-selling pieces. You see it in a prominent position in almost every illustration of what the interior designers of the period called a "typical living room" or "parlor," which is exactly where I found it in an old sales catalog. These "typical" Arts and Crafts Movement rooms always seemed to me to be somewhat austere, uninviting. Still, times change, thank goodness, but pieces like this never seem to lose their appeal.

Mr. Limbert's plant stand is not a difficult piece to make. There are no through mortise and tenon joints to contend with. Blind mortise and

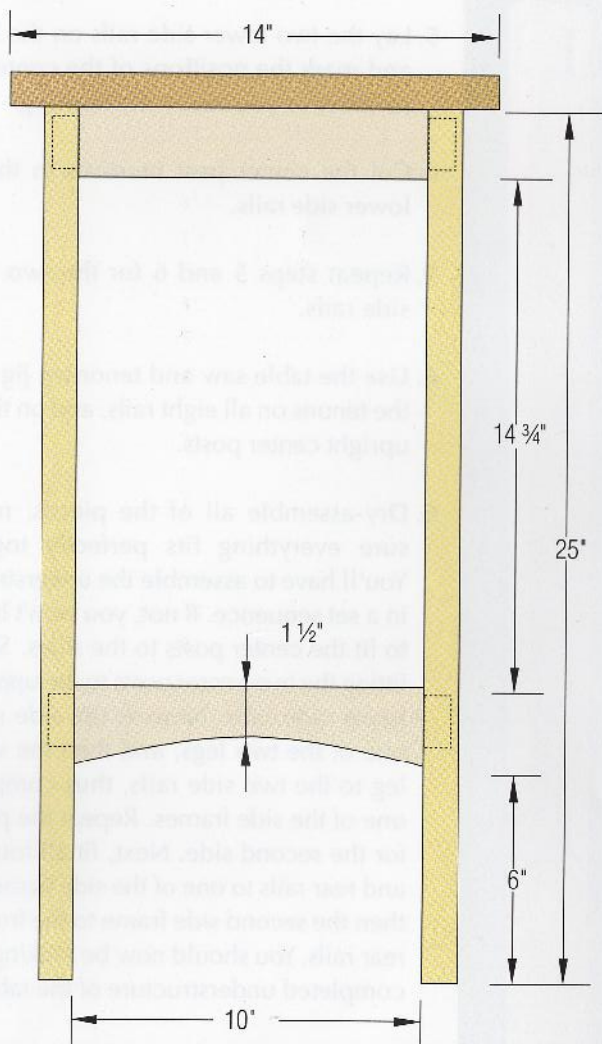
tenon joints are used instead. Although the construction is quite simple, there is one tricky area: assembly must be done in a set sequence. If not, you'll find you won't be able to fit the center posts to the side frames. The material is white oak, quarter-sawn, if possible, fumed for 48 hours to achieve a nice rich color. I managed to find enough material in my store of scrap stock to build the piece. It's always a treat to be able to use up some of those small pieces you never had the heart to throw away, hoping that sooner or later you'd use them up. But the pile continues to grow. Limbert would have finished the piece with a coat or two of shellac and some beeswax.

I used semi-gloss polyurethane.

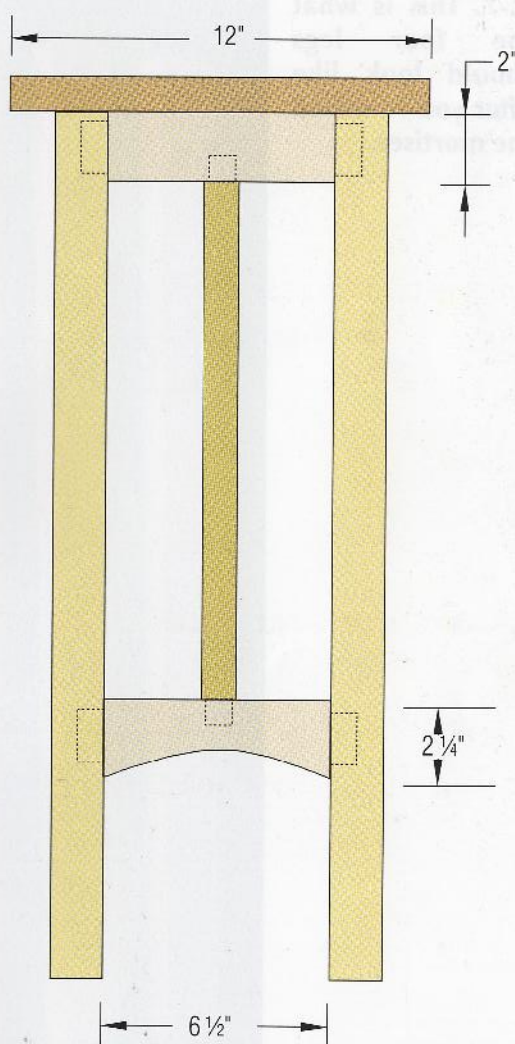


Plan

BILL OF MATERIALS	
Top:	1 @ 14" x 12" x 1"
Legs:	4 @ 25" x 1½" x 1"
Side Rails:	2 @ 8½" x 2½" x 1"
	2 @ 8½" x 2" x 1"
Front & Back Rails:	2 @ 11" x 2" x 1"
	2 @ 11" x 2¼" x 1"
Centerposts:	2 @ 16" x 1" x 1"
Shelf:	1 @ 8" x 10"



Front

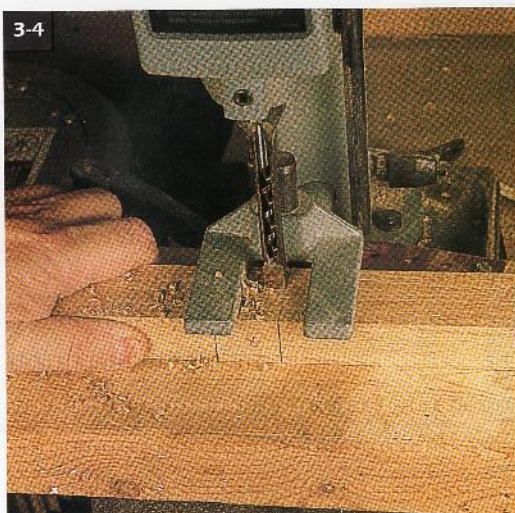


Side

Plant Stand by Charles Limbert



3.-4. Mark the positions (on the correct faces)—in relation to each leg—of the mortises. You can see the X which marks the face where the next mortise will be. The back legs should be mirror images of each other; so should the front legs.



6.-7. This is what the four legs should look like after you've milled the mortises.



Construction Notes

1. Sort through your wood and carefully select pieces to match the grain and color as closely as possible.
2. Cut all the pieces roughly to size, then plane them smooth and run the edges through the jointer to square them.
3. Lay the leg pieces on the bench and mark the positions of the mortises as you see in the drawing, making sure you have two left-hand and two right-hand legs.
4. Cut the mortises in the legs.
5. Lay the two lower side rails on the bench and mark the positions of the center post mortises as you see in the drawing.
6. Cut the center post mortises in the two lower side rails.
7. Repeat steps 5 and 6 for the two upper side rails.
8. Use the table saw and tenoning jig to cut the tenons on all eight rails, and on the two upright center posts.
9. Dry-assemble all of the pieces, making sure everything fits perfectly together. You'll have to assemble the understructure in a set sequence. If not, you won't be able to fit the center posts to the sides. Start by fitting the two center posts to the upper and lower side rails. Now fit the side rails to one of the two legs, and then the second leg to the two side rails, thus completing one of the side frames. Repeat the process for the second side. Next, fit all four front and rear rails to one of the side frames, and then the second side frame to the front and rear rails. You should now be looking at the completed understructure of the table.
10. Disassemble the understructure and sand all the pieces smooth, finishing with 200-grit sandpaper. It's best to do most of your finish sanding at this stage, rather than waiting until the piece is assembled. You'll find it much easier, not to mention faster.



11. Mark out the arches on the lower rails, cut them out on the bandsaw, and sand the edges smooth.

12. Glue, assemble and clamp the understructure.

13. Measure the diagonals of the top to make sure the structure is square. Make any necessary adjustments by altering the positions of the clamps, then set it aside until the glue has cured; overnight is best.

14. Trim the top to its finished size and sand it smooth, finishing with sandpaper of at least 220-grit. Make sure you smooth the end grains.

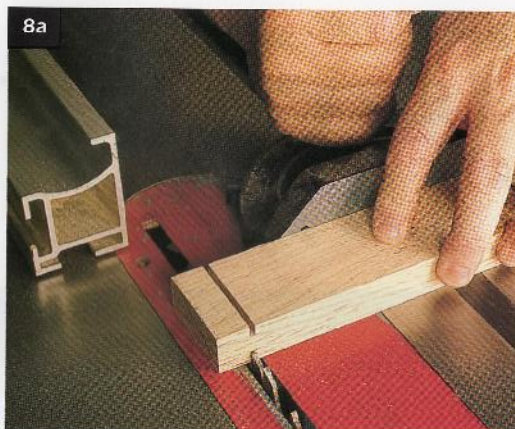
15. When the glue has cured, remove the clamps from the understructure and set it, upside down, in position on the underside of the top, making sure it's perfectly centered.

16. There are several ways you can fasten the top to the understructure: buttons, pocket holes and screws, or table irons. I prefer to use the homemade table buttons I described in chapter 9. They are quick, easy and, with the exception of the biscuits, free. I used six.

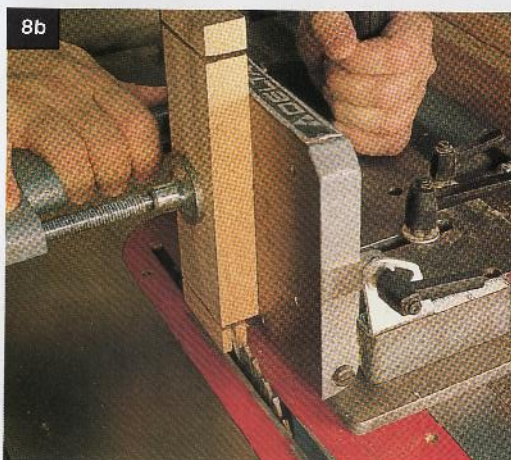
17. The lower shelf is cut slightly larger than the opening, then trimmed to a tight push fit, and secured in place from underneath with bead supports and brads.

18. When the assembly is complete, do any necessary final sanding with fine grit paper, making sure you ease all the sharp edges, in preparation for finishing.

19. In the best tradition of the Arts and Crafts Movement, I fumed my little plant stand. You can do something else, if you wish. However, fuming a small piece such as this is very easy to do, and the result is one that can only be achieved naturally over a great many years. Simply take your table to the garage, and set it on the floor in an out-of-the-way corner. Set a small, open container of ammonia on the floor beneath the



8. Mill the tenons: shoulder cuts first, then the cheek and bottom cuts.



If you can, use a jig to mill the cheeks of the tenons. The finished tenon will be square and true.

shelf and cover the whole thing with a large plastic bag, clear if possible. Use some odd pieces of scrap stock to hold the edges of the bag tight to the floor, and then leave it alone for about 48 hours.

20. If you're following all the traditions of the Arts and Crafts Movement, you'll use shellac and beeswax to finish the process. If not, you can use semi-gloss polyurethane, as I did. I did this for no other reason than it's quick and convenient. Also, the resulting finish is very durable and long-lasting.



chapter thirteen

ARTS & CRAFTS

TEA TRAY

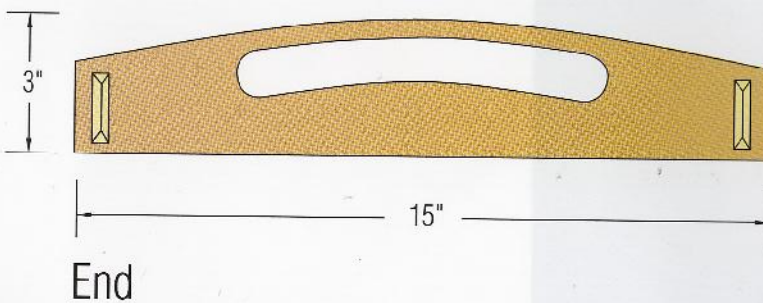
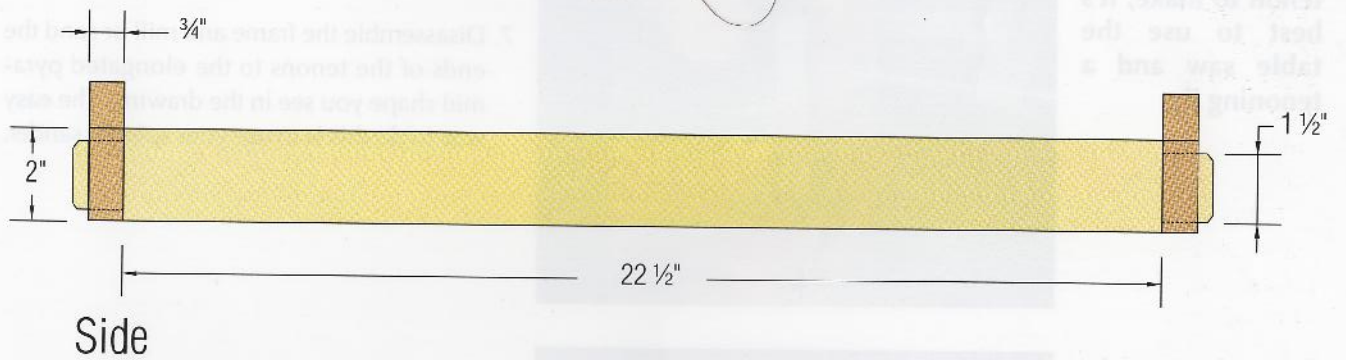
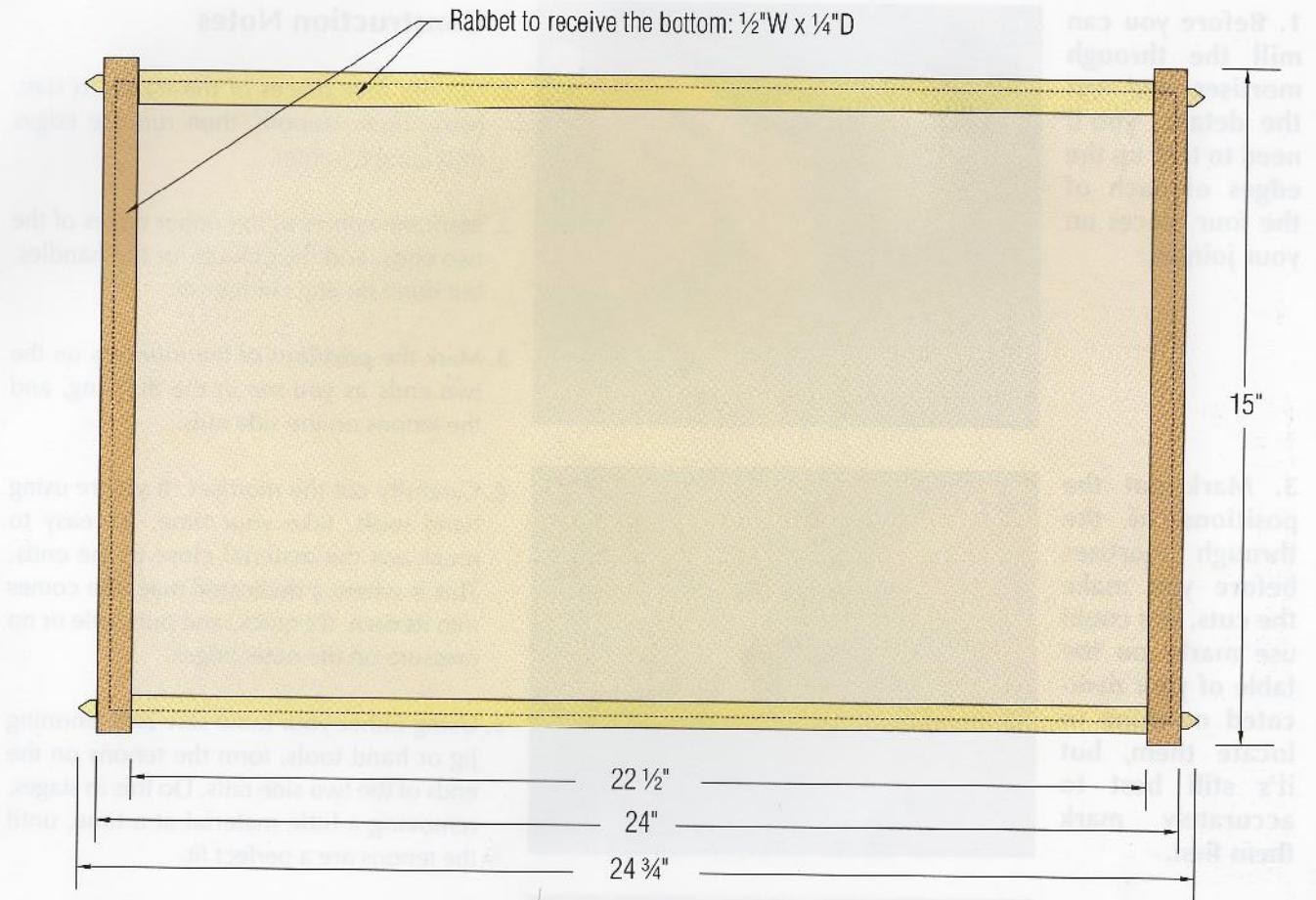


This little tray is typical of the Arts and Crafts Movement. I found the basic design in an old catalog and changed it just a little to suit my needs. Now it's of a size that can be used to hold a TV dinner, or similar snack.

Construction is very simple. Four pieces of white or red oak stock for the frame and four through mortise and tenon joints. For the bottom I used a piece of lauan plywood, sanded smooth

and stained to match the frame. I used it for practical reasons, mostly its stability. I used lauan plywood simply because I liked the grain structure of that particular piece. You could, of course use a single piece of oak planed down to 3/8" thick, but that would be expensive—it's a rare board that comes more than ten inches wide—and it would be subject to warping. Or you could build suitable boards but, again, there's a danger the piece might warp and

split. I did try a piece of 1/4" oak plywood, but the grain structure seemed somewhat overwhelming, hence the lauan. The bottom is set in a rabbet that brings it flush with the bottom of the frame. For the finish I chose one of the new stain/polyurethane one-step products. You could, of course, easily fume the frame—if you're using white oak—by putting it in a plastic garbage bag, along with a suitable small container of ammonia.



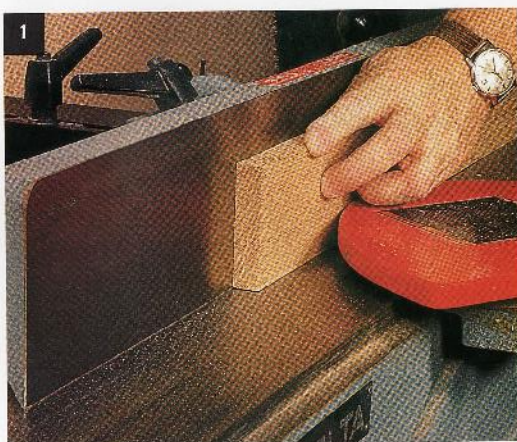
BILL OF MATERIALS

Ends:	2 @ 15" x 3" x $\frac{3}{4}$ "
Rails:	2 @ 24 $\frac{3}{4}$ " x 2" x $\frac{3}{4}$ "
Bottom:	1 @ 23 $\frac{1}{2}$ " 14" x $\frac{1}{4}$ " plywood

Arts & Crafts Tea Tray



1. Before you can mill the through mortises and cut the details, you'll need to true up the edges of each of the four pieces on your jointer.



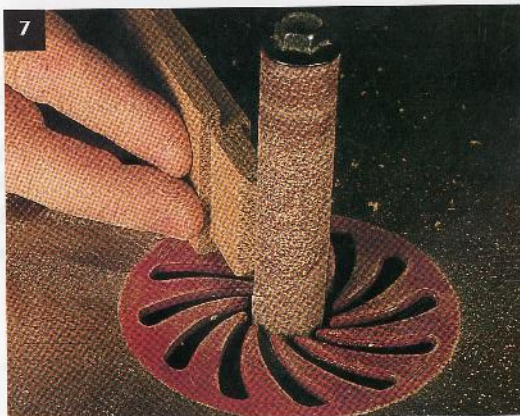
3. Mark out the positions of the through mortises before you make the cuts. You could use marks on the table of your dedicated machine to locate them, but it's still best to accurately mark them first.



5. When you have a large through tenon to make, it's best to use the table saw and a tenoning jig.



7. You don't need a spindle sander to form the ends of the through tenons, but it makes the job very simple.



Construction Notes

1. Cut the four pieces of the frame to size, plane them smooth, then run the edges through the jointer.
2. Mark the curves to the upper edges of the two ends, and the cutouts for the handles, but don't do any cutting yet.
3. Mark the positions of the mortises on the two ends as you see in the drawing, and the tenons on the side rails.
4. Carefully cut the mortises. If you're using hand tools, take your time. It's easy to break out the material close to the ends. This is where a dedicated machine comes into its own. It's quick, and puts little or no pressure on the outer edges.
5. Using either your table saw and tenoning jig or hand tools, form the tenons on the ends of the two side rails. Do this in stages, removing a little material at a time, until the tenons are a perfect fit.
6. Dry fit the pieces to make sure you have a perfect fit and a square frame.
7. Disassemble the frame and mill or sand the ends of the tenons to the elongated pyramid shape you see in the drawing. The easy way to do this is to use your spindle sander.



8. Mill the rabbets that will receive the bottom. How deep these should be will depend on the material you will use for the bottom. I made mine 1/2" wide by 5/16" deep.

9. Use your bandsaw to cut the curves to the upper edges of the two ends.

10. Drill starting holes and jigsaw the cutouts for the handles.

11. Sand all four pieces smooth. You should finish by using sandpaper of at least 220-grit.

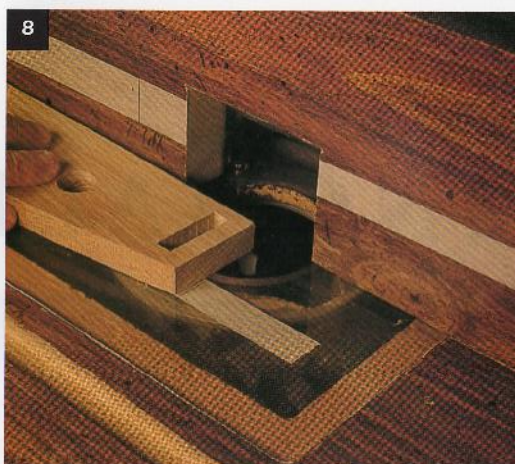
12. Glue, assemble and clamp the frame, then set aside until the glue has cured, preferably overnight.

13. When the glue has cured, remove the clamps and measure for the bottom panel.

14. Cut the bottom panel, then sand it smooth, finishing with sandpaper of at least 220-grit.

15. Fit the bottom panel to the frame and secure it in place using some 1" wire brads.

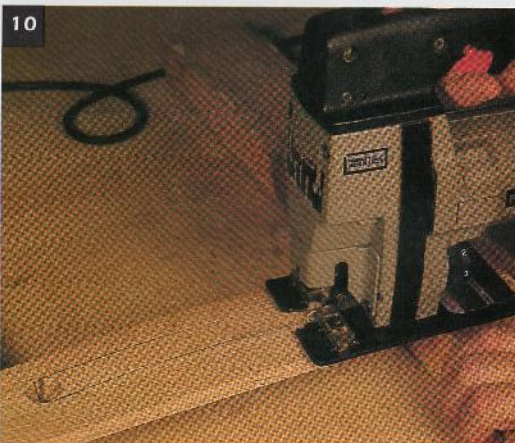
16. Do your final finish sanding and then apply your stain—or you can fume the piece, and then add a couple of coats of clear satin polyurethane for protection.



8. Table-rout the rabbets to receive the tray bottom. Fasten a strip of tape to the table, mark the start and finish point on the tape, then, plunge the wood toward the back fence and run the rabbet until the finishing point appears.



9. These are the sides and ends of the tray. The ends have holes the size of the finished handle cut ready for the saber/jigsaw.



10. There's no substitute for the saber/jigsaw when you have a cutout like this to make.



11. And there's no substitute for the spindle or drum sander when you have this type of sanding to do.



chapter fourteen

STICKLEY WRITING TABLE



In the original drawing that appeared in the pages of Gustav Stickley's *The Craftsman* magazine, this piece didn't look very attractive. What appealed to me, though, was the idea of putting book shelves in the ends of the table where normally drawers would go. So, I must admit to a selfish motive when I chose it for inclusion; I needed a writing table, and this one seemed to fit the bill. I've not

seen one anywhere, before or since building it, and I could have sold it many times over. Better yet, it fit the purpose for which it was designed admirably. The table top is big enough to allow the user to spread out, and the book shelves, the unique feature of this table, are within easy reach.

As always, I thought from reading Stickley's single paragraph of instruction, that the piece would

be fairly easy to build; I was wrong. Here's what the man had to say, "The construction is not at all hard, the main point being to have the lower parts securely fastened to the top with table irons, and the brace firmly fastened at the ends." Other than a comment about the usefulness of the piece, and another about its unique recessed book shelves, that, along with a bill of materials, was the extent of Stickley's



instructions. Even so, it did look simple enough. Unfortunately, looks can be deceiving. The overall dimensions were the only things that worked.

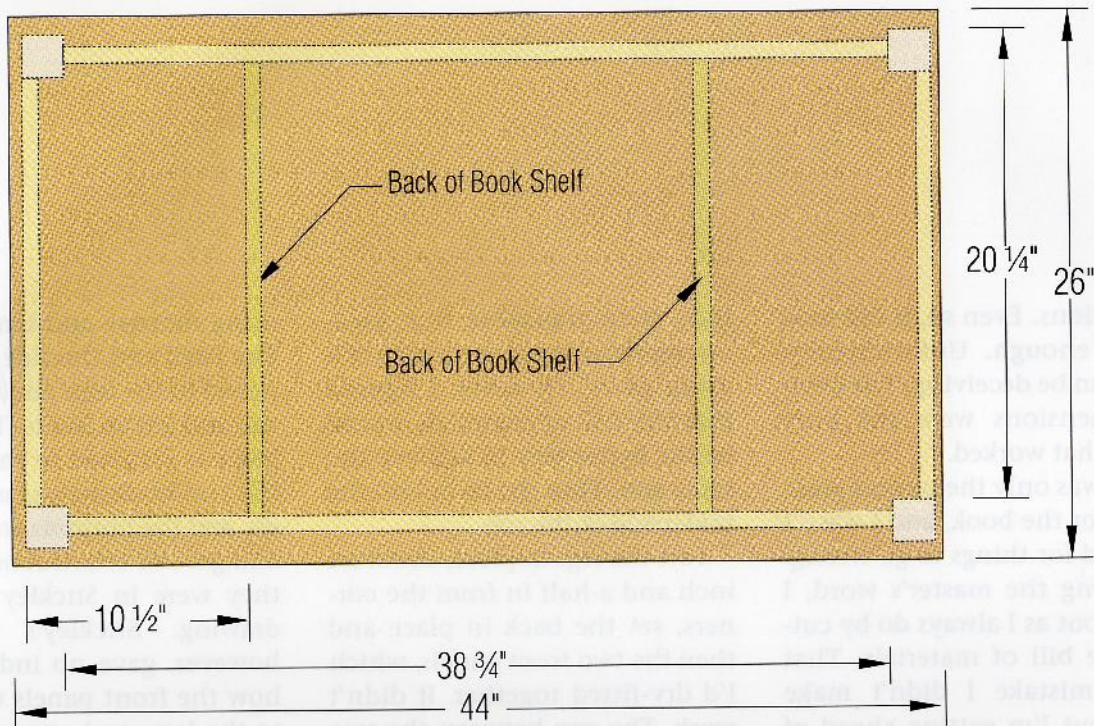
This was only the second piece I built for the book, and I wasn't prepared for things to go wrong. So, taking the master's word, I started out as I always do by cutting the bill of materials. That was a mistake I didn't make again, but I'm getting ahead of myself. Next, I built the front panels and the top. Then I went to work on the legs. So far, so good. It was at this point, however, that things started to go wrong. The following morning, I took the top out of the clamps and spent the first hour sanding it smooth. I like to do most of my sanding in the morning; no, that's not quite true. I don't like sanding at all. I do it in the mornings to get it out of the way. Anyway, I sanded both sides then turned it downside up on the bench and began laying out the position of the understructure according to Stickley's bill of materials. His drawing gave just the overall dimensions, and there was a small scale such as those you find on maps to work out the mileage. The idea being that you take a rule, measure a given sec-

tion, then transpose that measurement to arrive at the size of a given piece. However, I figured that the bill of materials would be the better way to achieve the same end. Thus the layout on the underside of the top.

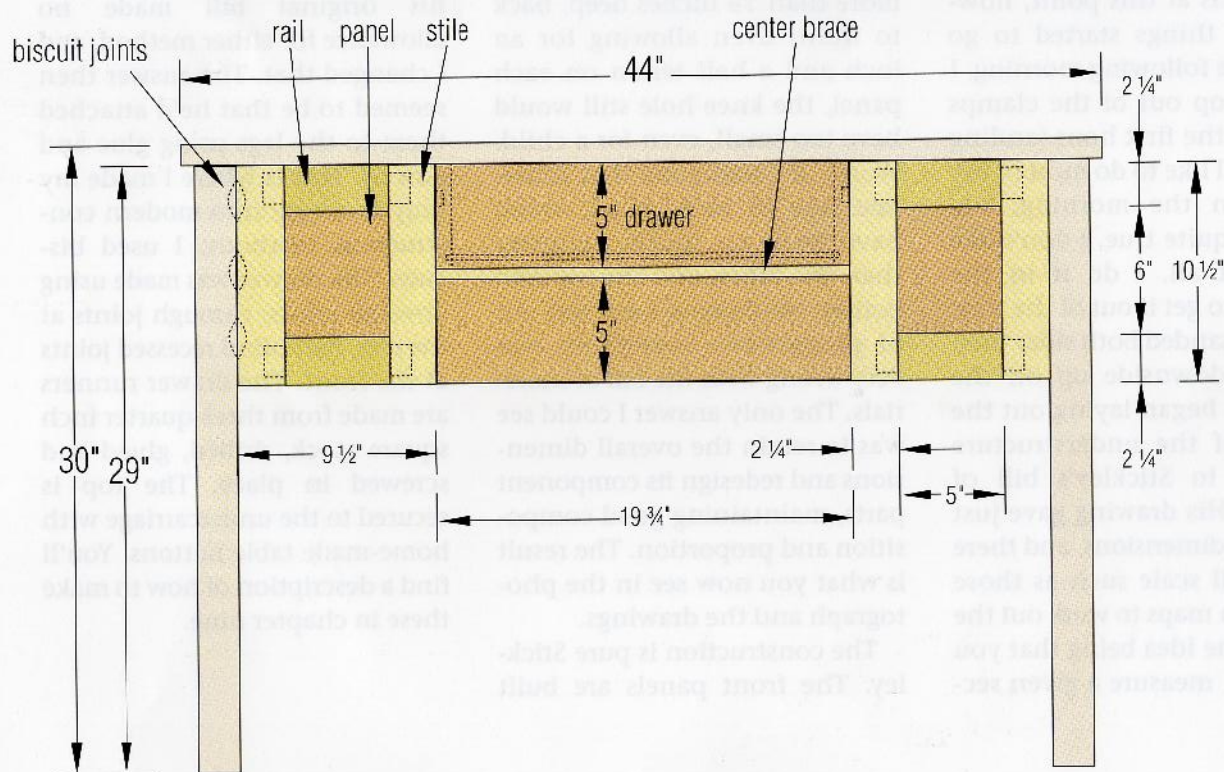
I set the legs in place, about an inch and a half in from the corners, set the back in place and then the two front panels, which I'd dry-fitted together. It didn't work. The gap between the two front panels (the knee hole) was less than 13 inches wide and the proposed book recesses were more than 14 inches deep, back to front. Even allowing for an inch and a half tenon on each panel, the knee hole still would have too small, even for a child. Worse, if I had gone that route, one side of each panel would have been so much narrower than the other, and the top and bottom would have been way out of proportion. Something was very wrong with the bill of materials. The only answer I could see was to retain the overall dimensions and redesign its component parts, maintaining good composition and proportion. The result is what you now see in the photograph and the drawings.

The construction is pure Stickley. The front panels are built

using mortise and tenon joints. The back and the side braces are joined to the legs, also using mortise and tenon joints. The underbrace is fastened to the backs of the two bookshelves using dowels, and the bottoms are of rabbet and groove construction, just as they were in Stickley's original drawing. Stickley's drawings, however, gave no indication of how the front panels were fixed to the legs, so I assumed at first that they must have been mortise and tenoned, perhaps even tongue and grooved. Whatever, his original bill made no allowance for either method, and I changed that. The answer then seemed to be that he'd attached them to the legs using glue and dowels. This is where I made my only concession to modern construction methods; I used biscuits. The drawer was made using dovetail joints: through joints at the rear, half-blind recessed joints at the front. The drawer runners are made from three-quarter inch square stock, drilled, glued and screwed in place. The top is secured to the undercarriage with home-made table buttons. You'll find a description of how to make these in chapter nine.

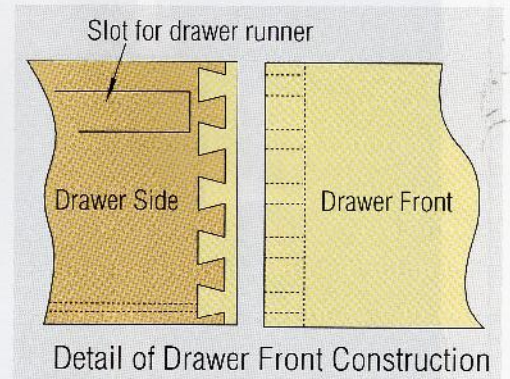
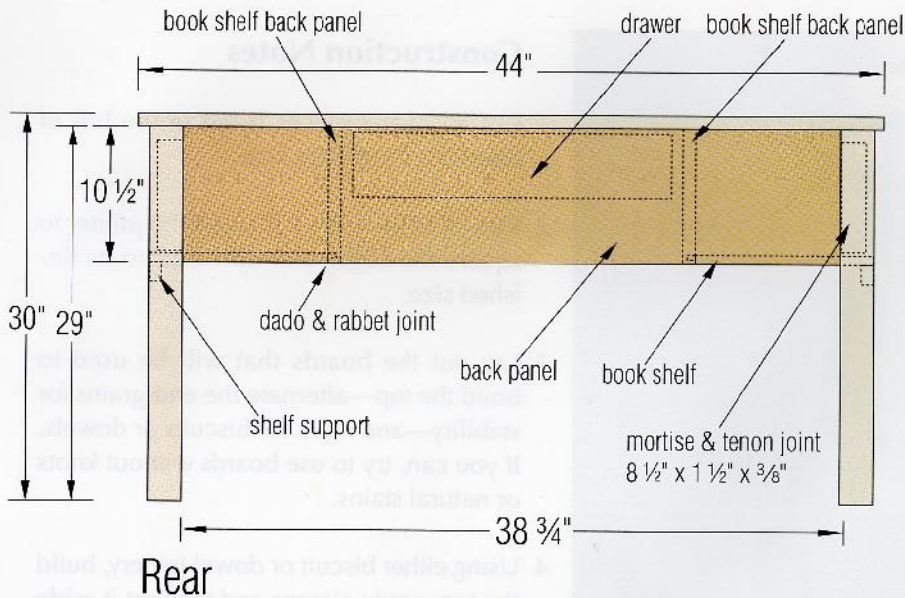


Plan



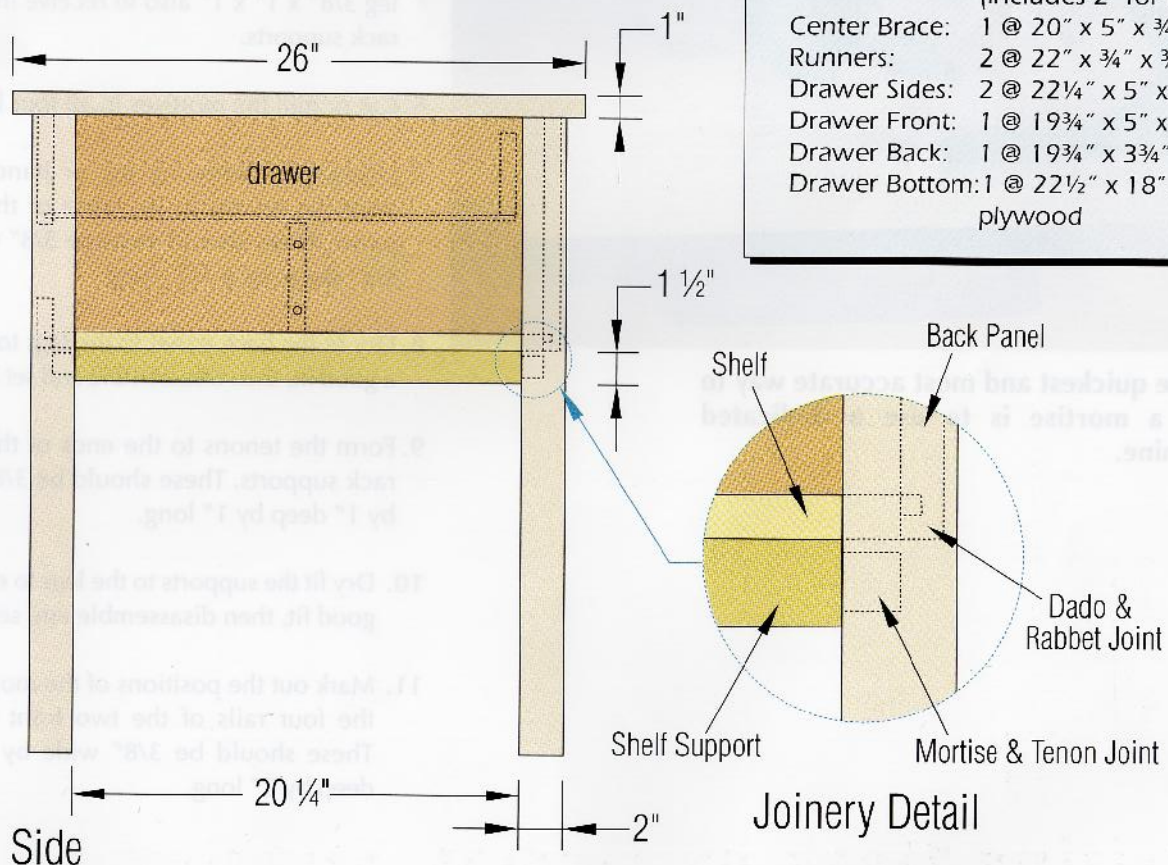
Front

Writing Desk by Gustav Stickley



BILL OF MATERIALS

Legs:	4 @ 29" x 2" x 2"	Panels:	2 @ 7" x 6" x 1/2"
Top:	1 @ 44" x 26" x 1"	Back:	1 @ 41 3/4" x 10 1/2" x 3/4" (includes 3" for tenons)
Stiles:	4 @ 10 1/2" x 2 1/4" x 3/4"	Book Shelf:	2 @ 22 1/2" x 10 1/2" x 3/4"
Rails:	4 @ 8" x 2 1/4" x 3/4" (includes 3" for tenons)	Book Shelf:	2 @ 22 1/4" x 11" x 3/4" (see pattern)
		Supports:	2 @ 22 1/4" x 1 1/2" x 3/4" (includes 2" for tenons)
		Center Brace:	1 @ 20" x 5" x 3/4"
		Runners:	2 @ 22" x 3/4" x 3/4"
		Drawer Sides:	2 @ 22 1/4" x 5" x 3/4"
		Drawer Front:	1 @ 19 3/4" x 5" x 3/4"
		Drawer Back:	1 @ 19 3/4" x 3 3/4" x 3/4"
		Drawer Bottom:	1 @ 22 1/2" x 18" x 1/4" plywood





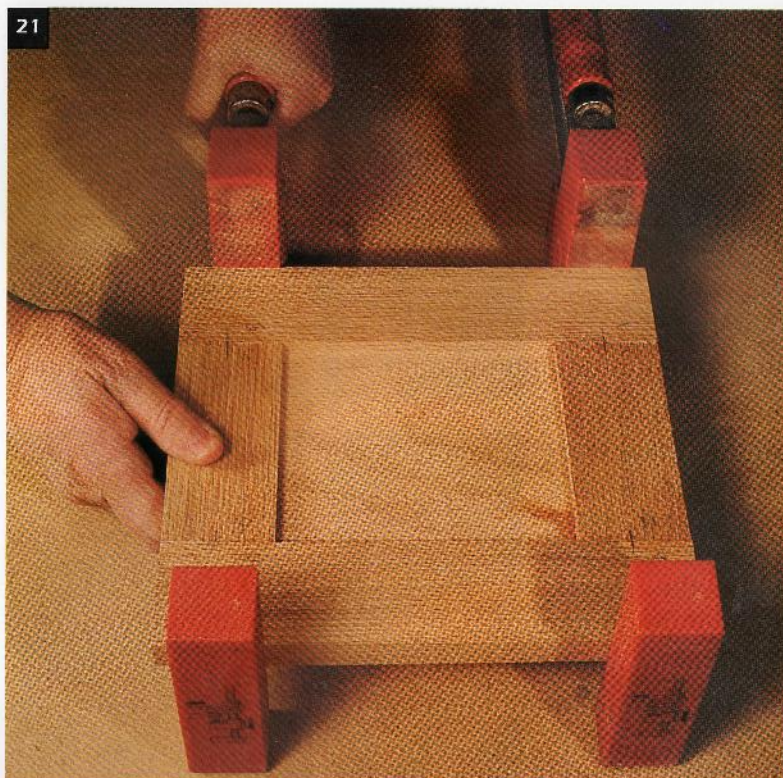
6. The quickest and most accurate way to mill a mortise is to use a dedicated machine.

Construction Notes

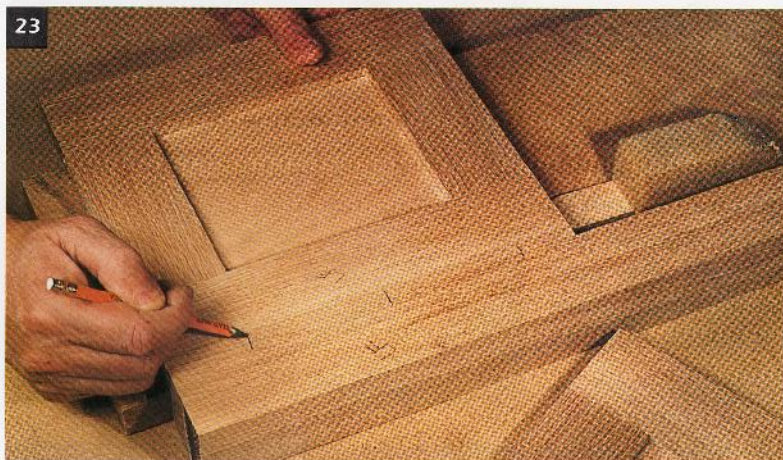
1. Cut all of the pieces listed in the bill of materials roughly to size.
2. Run all of the pieces through the jointer to square the edges and trim each to its finished size.
3. Lay out the boards that will be used to build the top—alternate the end-grains for stability—and mark for biscuits or dowels. If you can, try to use boards without knots or natural stains.
4. Using either biscuit or dowel joinery, build the top, apply clamps and then set it aside overnight, or until the glue has cured.
5. Take each of the four legs and mark the position of the $\frac{3}{8}$ " mortises as laid out in the drawing—two to each back leg (one $\frac{3}{8}$ " x $1\frac{1}{2}$ " x $8\frac{1}{2}$ " to receive the back panel and one $\frac{3}{8}$ " x 1 " x 1 " to receive the book rack supports) and one to each front leg $\frac{3}{8}$ " x 1 " x 1 " also to receive the book rack supports.
6. Cut or mill the mortises in all four legs.
7. Using your tenoning jig, or hand tools, form the tenons to the ends of the back panel. These should measure $\frac{3}{8}$ " wide, $1\frac{1}{2}$ " deep, by $8\frac{1}{2}$ " long.
8. Dry fit the back panel to the legs to ensure a good fit, then disassemble and set it aside.
9. Form the tenons to the ends of the book rack supports. These should be $\frac{3}{8}$ " wide by 1 " deep by 1 " long.
10. Dry fit the supports to the legs to ensure a good fit, then disassemble and set aside.
11. Mark out the positions of the mortises to the four rails of the two front panels. These should be $\frac{3}{8}$ " wide by $1\frac{1}{2}$ " deep by 2 " long.



12. Mill the mortises to the panel rails.
13. Form the tenons to the ends of the front panel rails. These should be $3/8" \times 1\ 1/2" \times 2"$.
14. Use either your table saw or router table to mill a groove, $1/4"$ wide by $1/2"$ deep, to the inside edges of the rails and stiles. This is to receive the center panel.
15. Plane the center panel to its finished thickness of $1/2"$.
16. Use your table saw and tenoning jig to mill a tongue, $1/4"$ wide by $1/2"$ deep, around the edges of the center panel.
17. Dry fit the two front panels to ensure everything fits together properly, then disassemble and it set aside.
18. Using your table saw, mill the $5/16"$ wide by $1/2"$ deep grooves into each of the bookcase back panels as laid out in the drawing, and set them aside.
19. Using your table saw and stacked dado head, mill the rabbet to the rear edge of each of the two bookshelf bottoms, and set them aside.
20. Sand all of the pieces smooth to 220-grit and prepare to assemble the understructure.
21. Glue, assemble and clamp the two front panels, then set them aside overnight, or until the glue has cured.
22. Glue, assemble and clamp the back panel to the two rear legs then set the structure aside overnight or until the glue has cured.
23. Remove the clamps from the two front panels, then lay them in place against the two front legs and mark for biscuit slots or dowels.
24. Place each of the two book shelf back panels in place against the appropriate ends of the two front panels and mark for biscuit slots.

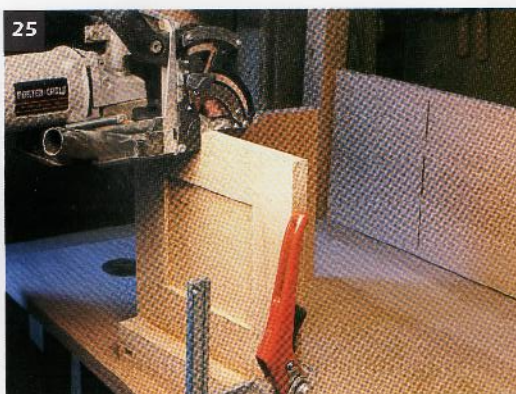


21. Glue, assemble the panel, clamp and ensure each face frame is square, then set them aside until the glue has fully cured.

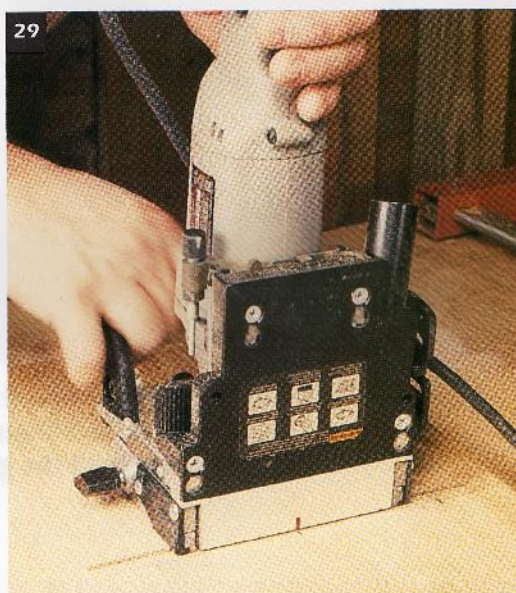


23. Set the panel in place against its front leg. You can raise it up by placing a piece of wood under it. Mark for biscuit slots.

25. Clamp the frame/leg assembly to the bench and mill the biscuit slots. Be sure to keep the pencil mark toward the machine.



29. Mill the slots to the flat section of the back panel making sure you keep the pencil mark to the machine.



31. After you've assembled the face frames to the legs you'll need to set the inside panels in place against the edge of the face frames and mark for biscuit slots.



33. When you've assembled the understructure, clamp it, and stand it on a flat surface. Ensure that all is square or the drawer will bind and may not slide at all.



25. Mill the biscuit slots.

26. Glue, assemble and clamp the two front panels to the two front legs and set them aside until the glue has cured.

27. Remove the clamps from the back section, then lay it inside-up on the bench.

28. Set the ends of the two book rack back panels in place on the inner surface of the rear section and mark for biscuit slots.

29. Mill the biscuit slots.

30. When the glue has fully cured on the two front legs and panel sections, remove the clamps and prepare to assemble the front and rear sections to the book rack back panels. Do this by raising the rear section up off the bench and supporting it upon two lengths of 2x4. This will provide room to apply clamps once the structure is glued and assembled.

31. Using biscuits, glue and assemble the book rack back panels to the inside face of the rear section.

32. Glue and assemble the two book rack support bars in place to the rear legs.

32. Using biscuits, glue and assemble the two front panel and leg sections to the ends of the book rack back panels and book rack support bars.

33. This completes the assembly of the understructure. Now you'll need to apply clamps to pull everything tightly together. Once you've applied the clamps, clean away any glue that might have squeezed out of the joints, and leave the structure in the clamps, still on the bench, overnight or until the glue has fully cured.

34. When the glue has fully cured, remove the clamps from the understructure and, while it's still on the bench, glue and screw the drawer runners in place in the knee hole.



35. Set the understructure on the floor and set the bottom panels of the book rack in place, in their grooves, and on the support bar.
36. Secure the bottom panels in place on the support bar with just a couple of dabs of glue.
37. Use dowels and glue to secure the center brace in place, in the knee hole, between the two rear panels of the book racks.
38. Mill four biscuit slots around the inside top edges of the book rack cavities: one at the front, one at the rear, two to the back panel; eight in all. These will accommodate your homemade table buttons. (see chapter nine)
39. Using the table saw, mill the slots that will receive the drawer bottom to each of the two sides and front section of the drawer.
40. Using dovetail joints dry, build the drawer frame, then slide it into place in the understructure to make sure it fits properly. If not, make the necessary adjustments.
41. Glue, assemble and clamp the drawer frame, then set it aside until the glue has fully cured.
42. When the glue has cured, remove the clamps and slide the drawer bottom into its slot and secure with a couple of brads.
43. Set the top on the bench, underside up, and then set the understructure in place on top of it ready for assembly. Make sure it's perfectly centered.
44. Secure the top to the understructure using eight homemade table buttons.
45. Use a fine grit sandpaper and finish sand all of the exposed surfaces, breaking all the sharp edges.

45



45. To make sure you sand away all the imperfections in the upper surface of the desktop, cover it with pencil marks. When you've sanded them all away, you can move on to a finer grit sanding paper.

46. If you're going to fume the piece, now's the time to do it. The table will fit easily into a simple plastic box tent 48" long by 36" wide and 36" high.
47. If you've decided to use stain, you can do that now.
48. Once you have colored the piece, use a fine grit paper to wipe away any grain that might have been raised in the process.
49. Apply two or three coats of semi-gloss or gloss polyurethane, sanding lightly between each coat, to provide surface protection.
50. Allow the polyurethane to dry, slide the drawer in place, and move the piece from the shop to your home.



chapter fifteen

SMALL BOOKSHELF

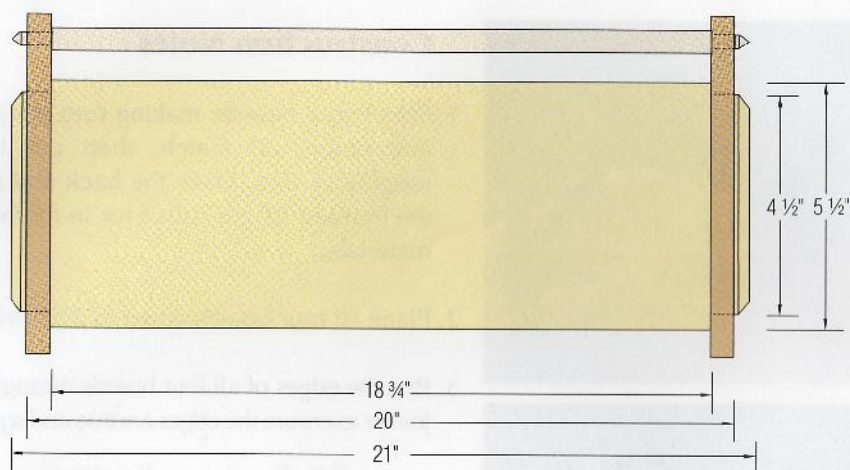


This is an intriguing little piece. I found the original in an antique shop. It wasn't labeled Arts and Crafts, but the design, the exposed tenons, the approximate date of the piece, and the material it was

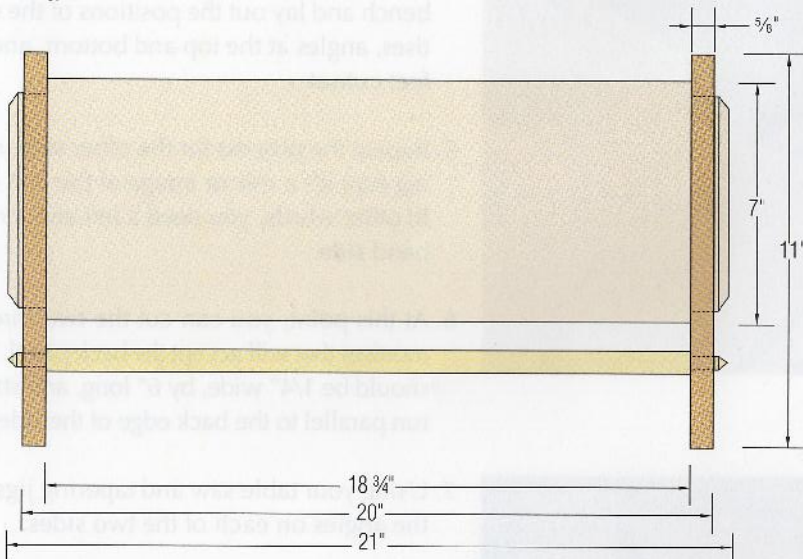
made from—oak—all pointed in that direction. Anyway, it fits well in this book, and it's a nice, simple little piece anyone can build.

Construction is very basic, and a fine exercise in fundamental joinery: just four boards and four

through mortise-and-tenon joints. Metal fasteners are not used. The material is, of course, white oak, and the finish can be anything that fits in with your home décor.



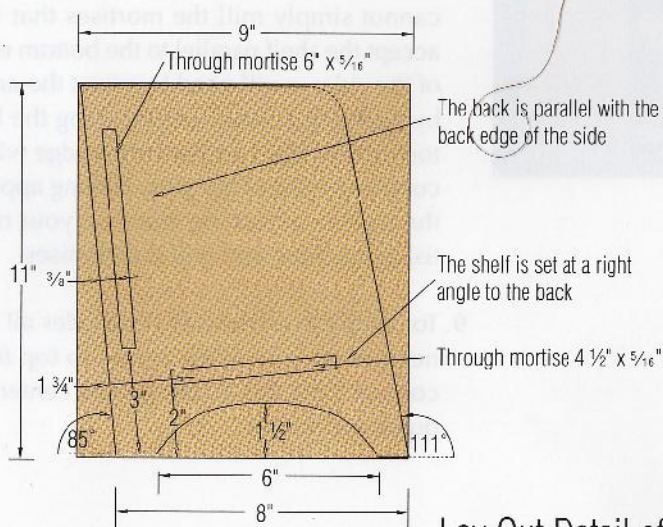
Plan



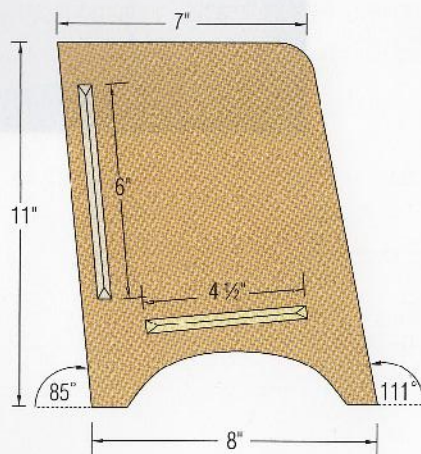
Front

BILL OF MATERIALS

Sides:	2 @ 9" x 11" x 5/8"
Back:	1 @ 21" x 7" x 5/8"
Shelf:	1 @ 21" x 5 1/2" x 5/8"



Lay Out Detail of Side



Arts & Crafts Bookshelf

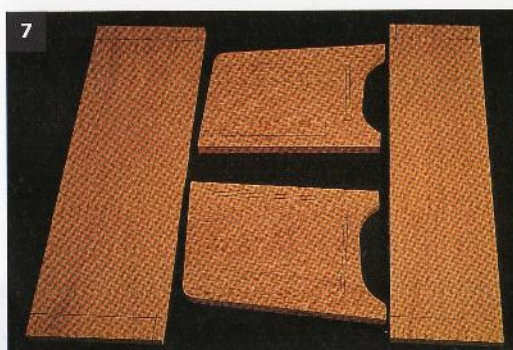


6. I cut the details before milling the through mortises, but you could mill them first; it makes no difference. You would, however, need to cut the angle between the back and bottom edges. This ensures the through mortise for the shelf will also be at the correct angle.

To mill the second slot, adjust the back fence and turn the piece 90°.



7. This is how the two sides, back and shelf should look when they've been cut out.



Construction Notes

1. Select your boards, making sure the grain and colors all match, then cut them roughly to size. Make the back and shelf the finished length called for in the bill of materials.
2. Plane all four boards down to 5/8" thick.
3. Pass the edges of all four boards through the jointer to ensure the edges are true and square.
4. Lay one of the ends, inside up, on the bench and lay out the positions of the mortises, angles at the top and bottom, and the feet cutout.
5. Repeat the process for the other side, making sure it's a mirror image of the first side. In other words, you need a left and a right-hand side.
6. At this point, you can cut the two through mortises that will accept the back panel. They should be 1/4" wide, by 6" long, and should run parallel to the back edge of the side.
7. Using your table saw and tapering jigs, cut the angles on each of the two sides.
8. Because the plane of the bottom shelf should be at a right angle to the back, you cannot simply mill the mortises that will accept the shelf parallel to the bottom edge of the side; you'll need to adjust the angle by applying a small wedge along the bottom of the side. I applied my wedge with a couple of dabs of hot glue. Having applied the wedge, adjust the fence on your mortising machine and mill the mortises.
9. To complete work on the two sides all you need to do is to make curves to top front corners. I did this at the sanding center. It's quick and simple.

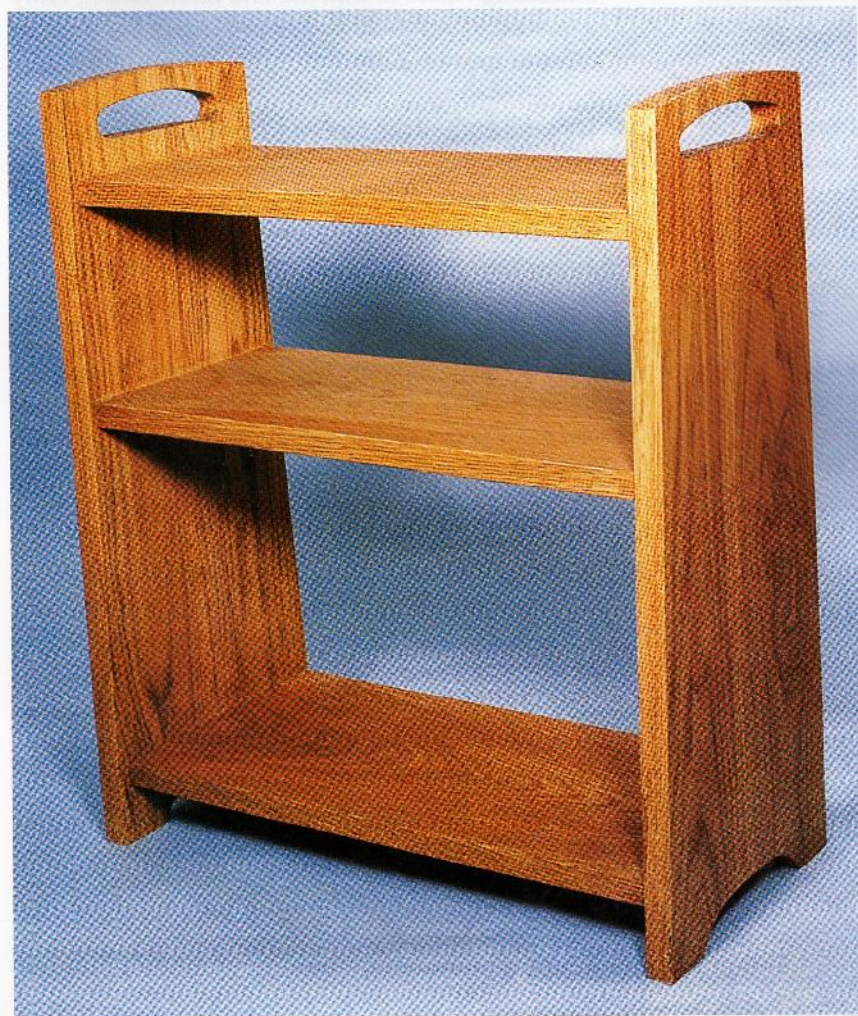


10. You can cut the tenons to the shelf and back either by hand, with a tenoning jig, or with a stacked dado head installed in the table saw. I prefer the tenoning jig, but the stacked dado head would do just as good a job, and quicker.
11. If you decide to use the stacked dado head, skip steps 12 through 17 and start again at step 18.
12. If you decide to use the table saw, you'll need to cut the cheek shoulders first, then the edge shoulders, and finally the cheeks.
13. At the table saw, either add a sacrificial fence to your rip fence, or slide it backward to use it as a stop.
14. Set the fence so that the edge of the blade farthest away is exactly one inch away, and set the blade to cut $3/16$ " deep.
15. Use your miter gauge and mill the shoulder cut to both sides and both ends of the shelf and back panel.
16. Reset the blade to cut at a depth of $3/8$ " and then make the edge cheek cuts, nibbling away the waste as you go.
17. Finally, use your tenoning jig to mill the cheeks.
18. If you decide to cut your tenons using a stacked dado head, you can do it either on the table saw or the radial-arm saw. Either way, you should set the machine stop/rip fence to cut a tenon 1" long, and the depth of cut to $3/16$ ". Note: it's better to make the tenons slightly on the large side, and then make adjustments. A perfect tenon is key to the finished appearance of the piece.
19. If you're using the table saw, use your miter gauge to make the first pass, then flip the board and make the second pass. Repeat the process for the other end of the board. If you're using the radial-arm saw, simply set the end of the piece against the stop and then make first one pass and then another to remove the last little bit of waste.
20. At the table saw, increase the depth of cut to $3/8$ ", turn the board on edge and mill the edge shoulders. If you using the radial-arm saw you'll need to make the edge shoulder cuts at the band saw or with a hand saw. Don't try to do it on the radial arm saw.
21. Having completed the tenons, it's time to dry fit the four pieces together. The tenons should slide easily into and through the mortises, but there should be no gaps showing around the exposed tenons on the outer faces of the sides.
22. When all of the pieces fit properly together, take a small piece of $1/4$ " plywood, lay it against the side of each of the exposed tenons, and make a pencil mark indicating where to trim the end of the tenon. Only a quarter inch should be left projecting beyond the faces of the two sides.
23. Trim the ends of the tenons to length, then go either to the sanding center or spindle sander to form the elongated pyramid profiles. Take some time over this. These exposed ends are the focal point of the piece, and they need to look as nice as you can make them.
24. Prior to assembling the piece you'll need to do your finish sanding. Start with 50- or 80-grit sandpaper and work your way through the grades, finishing with 220-grit paper. If you've decided to stain the piece, it's a good idea to do so before you assemble it.
25. When you assemble the piece, you should do so with care, more so than normal. If glue squeezes out of the joints, you'll find it almost impossible to completely clean away. Try applying the glue sparingly only to the inner faces of the tenons. That way no glue will be present on the exposed pyramid profiles. You may find some is pushed through and out onto inner surfaces of the sides, back and shelf. If so, use a damp sponge to clean it away.
26. Clamp the assembly and set it aside until the glue has cured, preferably overnight.
27. When the glue has fully cured, remove the clamps and do any necessary final sanding.
28. To finish the piece you can fume it for 48 hours, and then add a thin coat of stain/polyurethane finish, or you can simply stain it to the color of your choice, if you haven't already done so, and then apply a coat of either clear gloss or semi-gloss polyurethane for protection.



chapter sixteen

LIMBERT MAGAZINE STAND

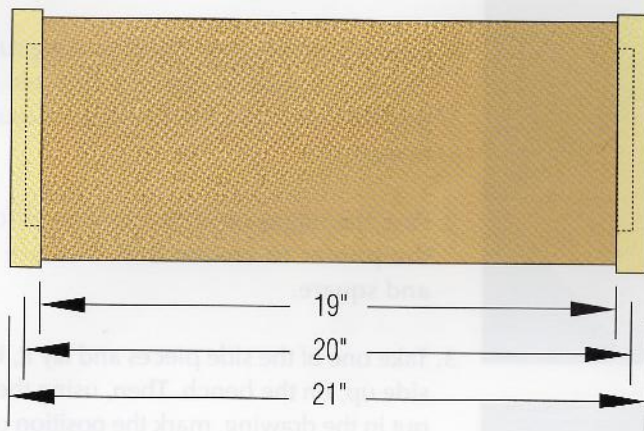


This is another piece I found in one of Charles Limbert's catalogs. It's one of those simple little pieces you wouldn't give a second glance to, unless you happened upon it in just the right setting. It's listed in Limbert's catalog as a magazine

stand. In fact, it could serve a number of purposes: plant stand, bookshelf, etc. Its best feature, though, is its simple and elegant design. And, small as it is, it's a typical Limbert piece, right down to the cutout handles. The gentle slope of the

sides, and the barely discernable curve over the handle cut-outs, plus its small size, make it a piece that will fit into any style of home.

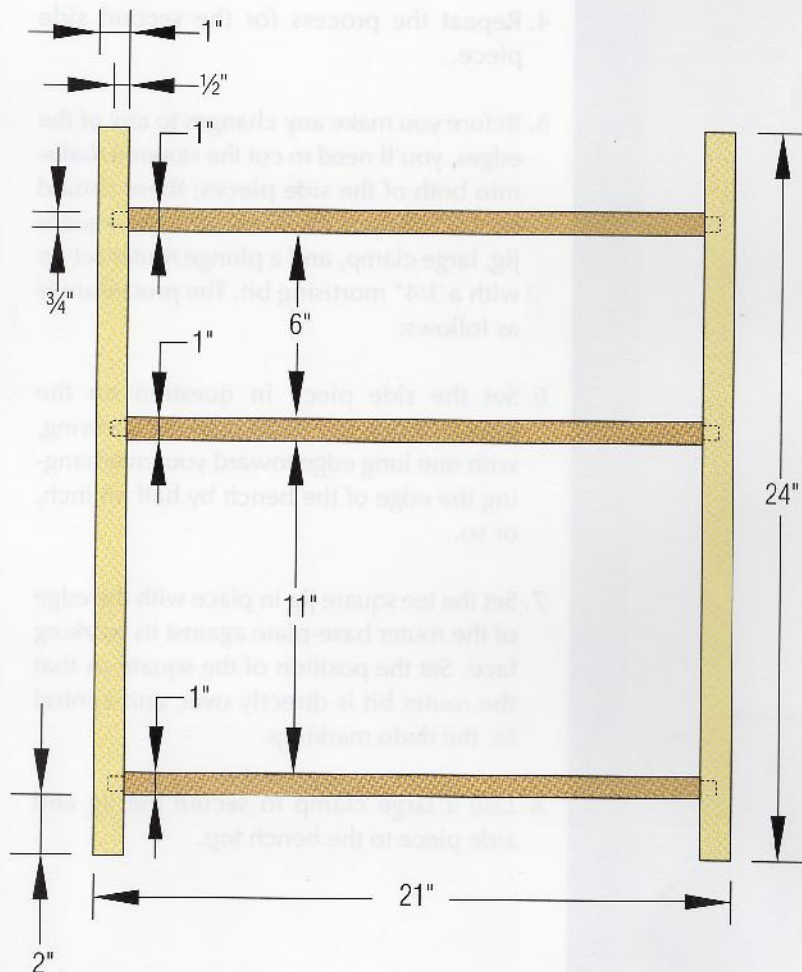
It's a simple piece to make, comprising just five pieces of stock. I made the one you see in the photograph from odds and ends of white oak stock I found lying around the shop. The shelves are joined to the sides by way of stopped dados, cut with the aid of a tee-square jig and a plunge router set up with a 3/4 inch mortising bit. The sloped sides were milled on the table saw, the cutout handles were made with my jig-saw, and the arches above the handles were done on the band-saw. The front and rear edges are cut square, and slightly set back from edges of the sides, thus eliminating the need for angled edges. Finally, the piece was sanded smooth using a range of sandpapers from 60-grit all the way through 320-grit. To finish the piece I fumed it for 48 hours, the wiped on a thin coat of Step-Saver stain/polyurethane combination finish, then a final coat of semi-gloss polyurethane. It now occupies pride of place beside the mantle in my living room.



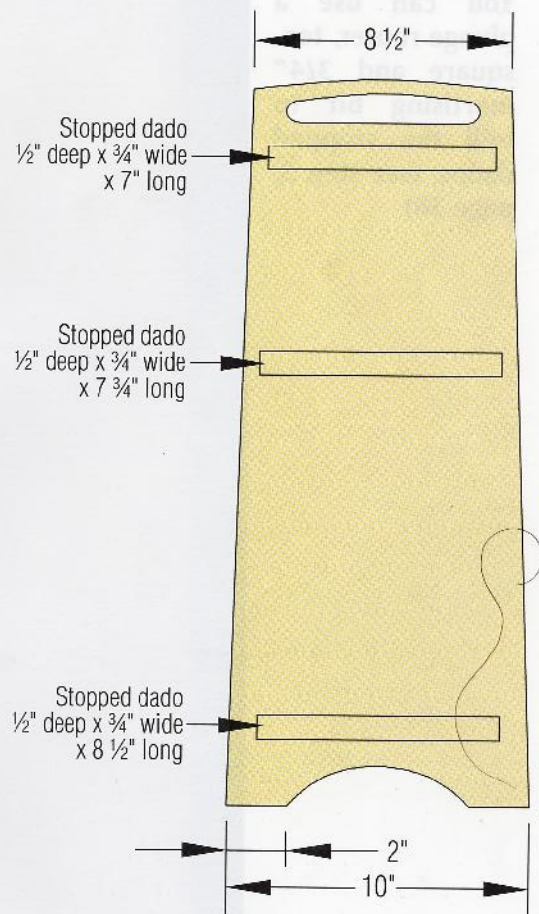
Plan

BILL OF MATERIALS

Sides:	2 @ 24" x 10" x 1"
Top Shelf:	1 @ 20" x 8" x 1"
Middle Shelf:	1 @ 20" x 8 $\frac{3}{4}$ " x 1"
Bottom Shelf:	1 @ 20" x 9 $\frac{1}{2}$ " x 1"



Front



Side

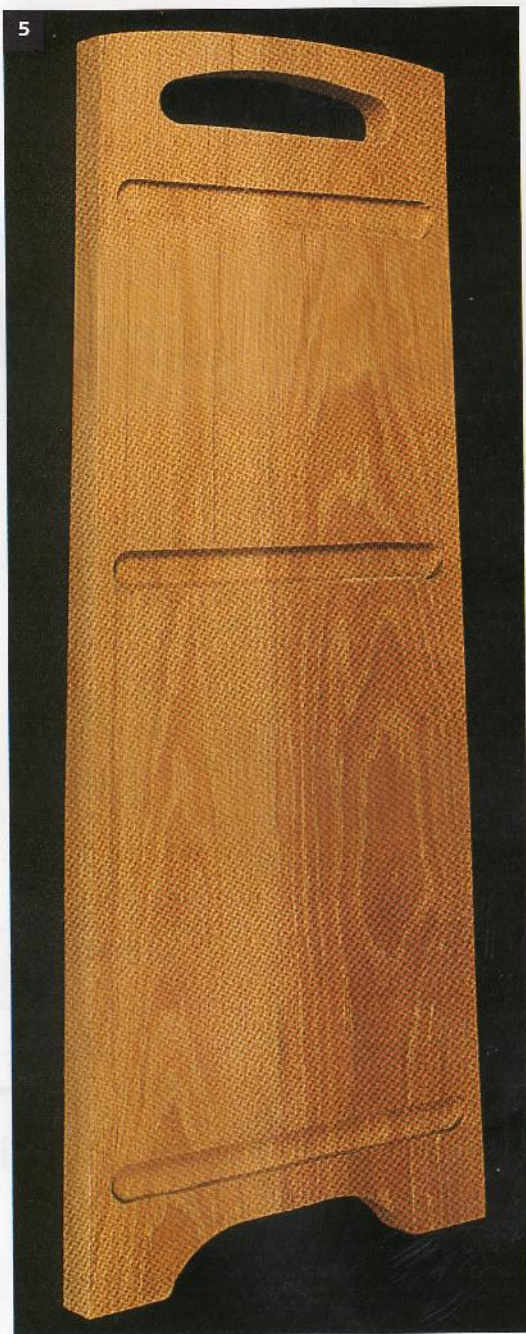
Magazine Stand by Charles Limbert



3. This is how the side blanks should look after you've made the basic lay out.



5. This is how it should look after you've milled the stopped dados and the handle hole. You can use a plunge router, tee-square and 3/4" mortising bit to mill the stopped dados. (see step 5, page 38)

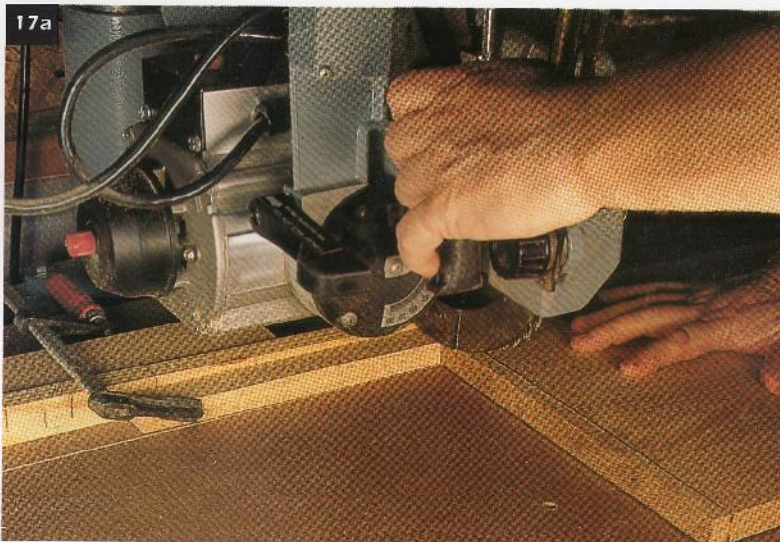


Construction Notes

1. Carefully select your wood, making sure of as close a match—grain, color, etc.—as possible, then cut the five pieces roughly to size.
2. Pass the edges of all five pieces through the jointer to ensure that they are true and square.
3. Take one of the side pieces and lay it, inner side up, on the bench. Then, using the layout in the drawing, mark the position of the stopped dados, handle cutouts, feet cutouts, and the arched curves at the top.
4. Repeat the process for the second side piece.
5. Before you make any changes to any of the edges, you'll need to cut the stopped dados into both of the side pieces; these should be 1/2" deep. I do this with a tee-square jig, large clamp, and a plunge router set up with a 3/4" mortising bit. The procedure is as follows:
6. Set the side piece in question on the bench, inside up, dado marking showing, with one long edge toward you, overhanging the edge of the bench by half an inch, or so.
7. Set the tee square jig in place with the edge of the router base-plate against its working face. Set the position of the square so that the router bit is directly over, and central to, the dado markings.
8. Use a large clamp to secure the jig and side piece to the bench top.



9. Plug in the router and position it against the working face of the jig and above the starting point of the first dado—we'll be making the cut from front to back on the right-hand side of the jig. Now, turn on the machine, plunge the bit into the stock, and carefully make the pass. Be sure to keep the machine tight against the working face of the jig, and to stop at the appointed place on the layout. When you reach the stopping point, release the plunger, turn off the machine, wait until the bit stops spinning, and then remove the machine from the stock.



10. Repeat the process for the other five stopped dados. Having cut all of the stopped dados on both side pieces, you can proceed to the next step.

11. At the bandsaw, cut the curves to the tops of both side pieces, and the cutouts for the feet.

12. Drill 3/8" access holes inside the outlines of the handle cutouts.

13. Use your jigsaw to make the cut-outs for the handles.

14. Set your tapering jig to 1.5°, and carefully mill the slopes on both sides of the two side pieces.

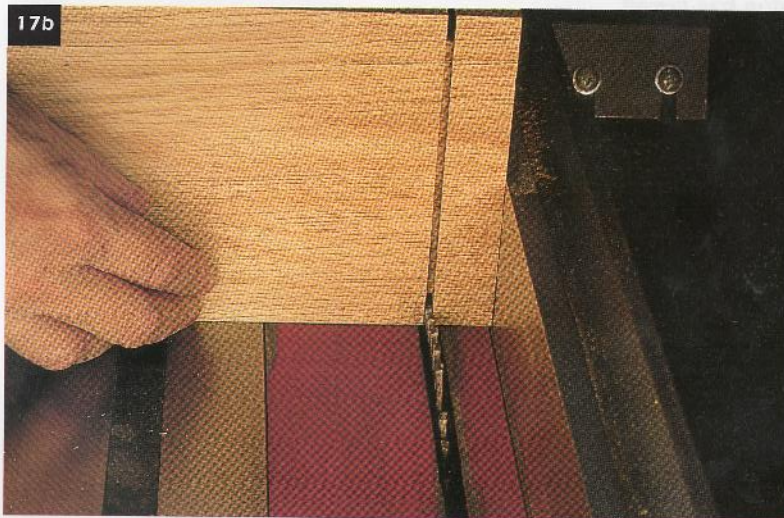
15. Sand the faces and edges of all five pieces smooth, starting with 50- or 60-grit sandpaper, then 80-grit, 120-, 220- and, finally, 320-grit.

16. Use your spindle sander, or a drum sanding attachment in your drill press, to sand smooth the insides of the handle cutouts and the feet.

17. Use your radial arm saw or table saw to mill the tenons on the ends of the shelves. The tenons are 3/4" thick by 1/2" long, and their side shoulders are 1/2" wide.

17. I used my radial arm saw to make the shoulder cuts for the tenons of the shelves; you could, of course, use your table saw and a stacked dado head to mill the tenons and save several operations.

Mill the small shoulder cuts next.

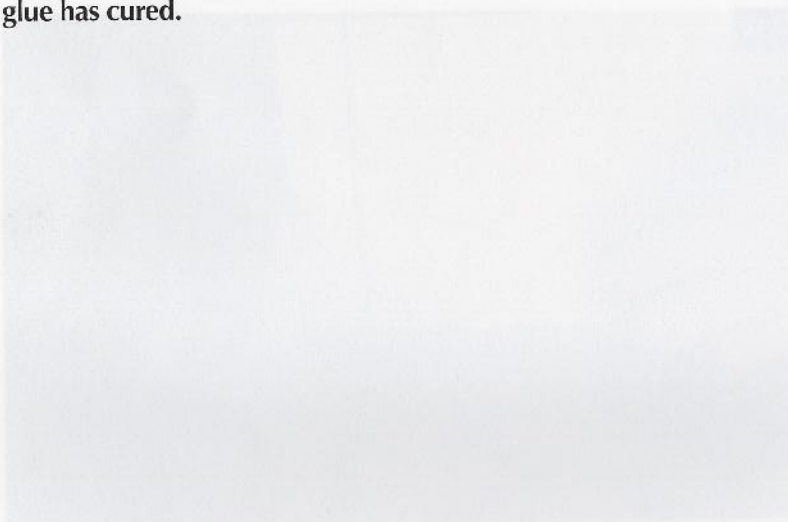


18-22



18. - 22. Glue, assemble and clamp the piece, then stand it on a flat surface to ensure that all is square before leaving the structure until the glue has cured.

18. Set one side piece on the bench, inside up, and spread a little glue around the insides of all three stopped dados.
19. Carefully set the three shelves in place in the stopped dados, and clean away any excess glue that might squeeze out.
20. Spread a little glue around the insides of the three stopped dados in the second side piece, then carefully set it in place on top of the ends of the three shelves already in place in the first side piece. Now, with a hard rubber mallet, carefully drive the sections together.
21. Set the structure on its feet and clamp it along both sides, using two clamps on each side.
22. Lay the clamped structure on its side and measure the diagonals to ensure everything is square. If not, make the necessary adjustments by moving the clamps and then retightening them. Now set the structure aside until the glue has fully cured, preferably overnight.





23. Once the glue has cured you can remove the clamps and, if you like, reinforce the joints with toenail screws. Drill pilot holes, from the underside, diagonally through each shelf into the side, taking care not to break through to the outer face of the shelf; two holes per joint should be sufficient. Countersink the pilot holes, then drive in number 6 x 1 1/2-inch screws.

24. Wipe over the entire structure with 320-grit sandpaper to remove any raised grain, and clean away any dried glue that might be showing around the joints.

25. Either fume the piece for at least 24 hours, or apply a coat of stain.

26. Do any necessary final sanding, then apply one or two coats of polyurethane—gloss or semi-gloss, whichever suits you best. Personally, I like semi-gloss. The finish is not quite as hard-looking as it can be with a full-gloss product.

23



23. After assembling the piece, I always drill pilot holes, countersink them, then toenail screw the shelves from the underside to give added strength to the finished piece.





chapter seventeen

FRANK LLOYD WRIGHT PRINT STAND



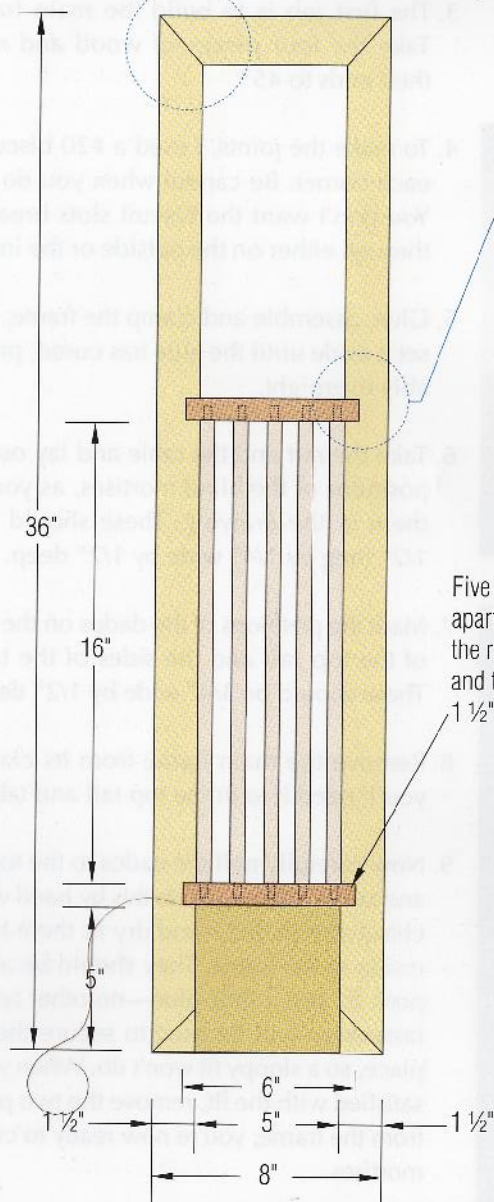
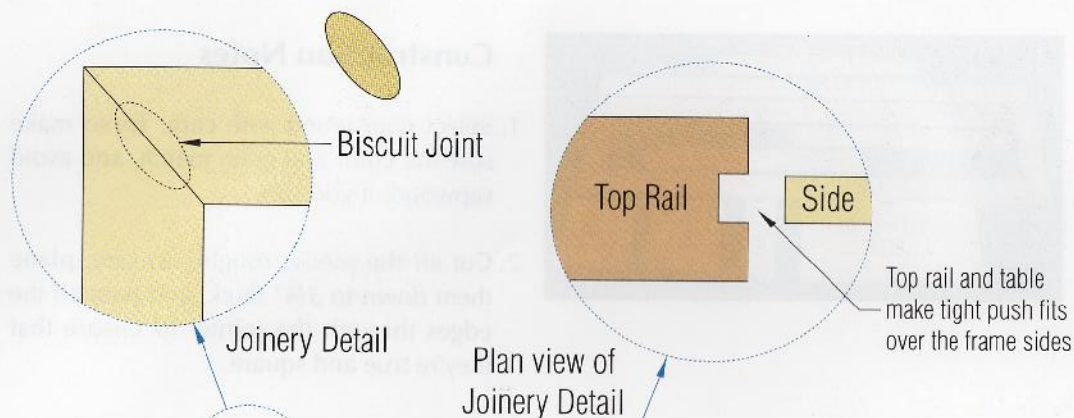
This is the only piece representative of Frank Lloyd Wright's furniture designs in this book. I found it in a coffee table book about the Arts and Crafts movement featuring all sorts of furniture, lamps, wallpapers and every imaginable decorative device. It was featured in two different photographs of a single room setting. One was an overall shot of the room; the other was a closeup. In both shots it was the central feature of the room, striking, elegant and sophisticated, which is not usually the case with Arts and Crafts furniture. It was described as a print stand, but was adorned with a single white rose in a slim glass vase.

This is a unique piece. You won't find its like for sale anywhere, and it will make a wonderful addition to your living room, or formal dining room. Never a visitor stops by home that doesn't make a comment about it.

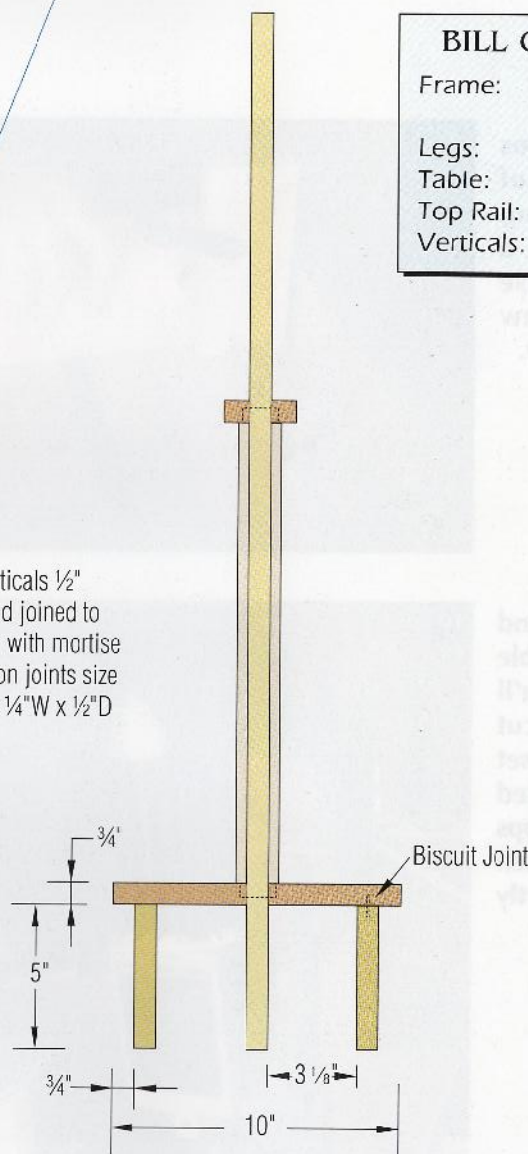
By measuring and proportioning the other furniture, and estimating the size of the vase and its rose, I was able to come with accurate dimen-

sions. The frame itself I could see was mitered at the corners; no problem there. The table section I could see was made from a single piece of stock, and was recessed at the edges to fit around the edges of the vertical frame. The leg pieces, I felt, must have been either mortised and tenoned, or doweled to the table; I used biscuits. As to the square spindles, they had to have been mortised and tenoned to the table and upper rail.

Wright's original wasn't stained or fumed at all. It was made from quartered white oak, then lacquered to a dull luster, which suited its surroundings well. I didn't have any quartered white oak, but I did have enough scrap plain sawn white oak to build the piece, which I regarded as something of a bonus. It's always nice to be able to use up some of the off-cuts. To match my own décor, I colored my piece with light oak stain and finished it with a coat of semi-gloss polyurethane.



Front View



Side View

BILL OF MATERIALS

Frame:	2 @ 36" x 1 1/2" x 3/4"
	2 @ 8" x 1 1/2" x 3/4"
Legs:	2 @ 5" x 5" x 3/4"
Table:	1 @ 10" x 6" x 3/4"
Top Rail:	1 @ 6" x 2 1/2" x 3/4"
Verticals:	5 @ 17" x 1 1/2" x 3/4"

Print Stand by Frank Lloyd Wright

2. These are the pieces you'll need to make for the print stand.



9. To cut the dados on the edges of the upper section, clamp it to a board and use your table saw and miter gauge.



10. To mill the blind mortises in the table of the stand you'll either need to cut them by hand or set up your dedicated machine with stops to ensure each mortise is in exactly the right place.



Construction Notes

1. Select your wood with care. Try to make sure the color and grain match, and avoid sapwood, if you can.
2. Cut all the pieces roughly to size, plane them down to 3/4" thick, and pass all the edges through the jointer to ensure that they're true and square.
3. The first job is to build the main frame. Take the four pieces of wood and miter their ends to 45°.
4. To make the joints, I used a #20 biscuit at each corner. Be careful when you do this. You don't want the biscuit slots breaking through either on the outside or the inside.
5. Glue, assemble and clamp the frame, then set it aside until the glue has cured, preferably overnight.
6. Take the rail and the table and lay out the positions of the blind mortises, as you see them in the drawing. These should be 1 1/2" long by 1/4" wide by 1/2" deep.
7. Mark the positions of the dados on the ends of the top rail and the sides of the table. These should be 3/4" wide by 1/2" deep.
8. Remove the main frame from its clamps, you'll need it to fit the top rail and table.
9. Now carefully mill the dados to the top rail and table—it's best to do this by hand with a chisel and mallet—and dry fit them to the inside of the frame. They should be a tight push fit. Just a little glue—no other type of fasteners—will be used to secure them in place, so a sloppy fit won't do. When you're satisfied with the fit, remove the two pieces from the frame; you're now ready to cut the mortises.
10. Cut the mortises in both the top rail and the table. I used my dedicated machine, but you could do them by hand, or with an attachment on the drill press.



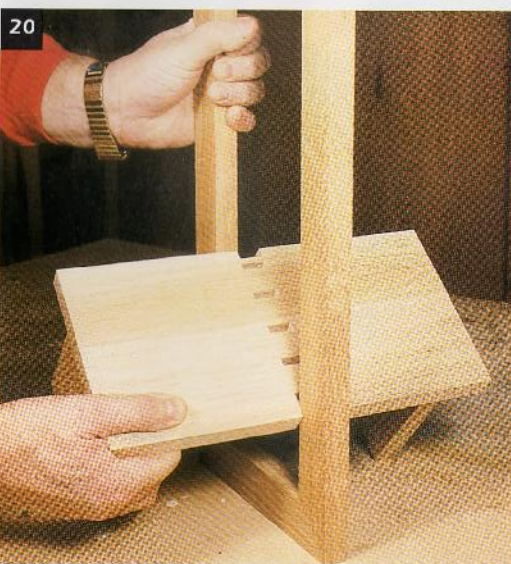
11. Having cut all the mortises you can now form the tenons on the ends of the five verticals. These should be 1 1/2" long by 1/4" wide by 1/2" deep.
12. At the table saw, make the face shoulder cuts first, then the edge shoulder cuts and nibble away the waste.
13. Use your tenoning jig to cut the cheeks; start out by making them a little over-size, and trim them down to make a good fit. Set them aside until you're ready to assemble them.
14. Take the table and set it on the bench, underside up, and mark the positions of the legs as you see them in the drawing.
15. Set the legs in position on the underside of the table and mark for biscuit slots, or you can use dowels, if you prefer. You'll need two biscuits or dowels per leg.
16. Carefully mill the biscuit slots, or dowel holes.
17. Do your finish sanding, starting with a coarse-grade sandpaper and working your way through the grades to a fine paper, at least 320-grit.
18. Glue, assemble and clamp the legs to the table, making sure they are square and true, then set the structure aside until the glue has cured.
19. When the glue has cured, remove the clamps and apply a little glue to the insides of the dados.
20. Stand the main frame on end on the bench, slip the leg/table assembly through the opening, and then carefully push the glued dados into position over the edges of the frame.



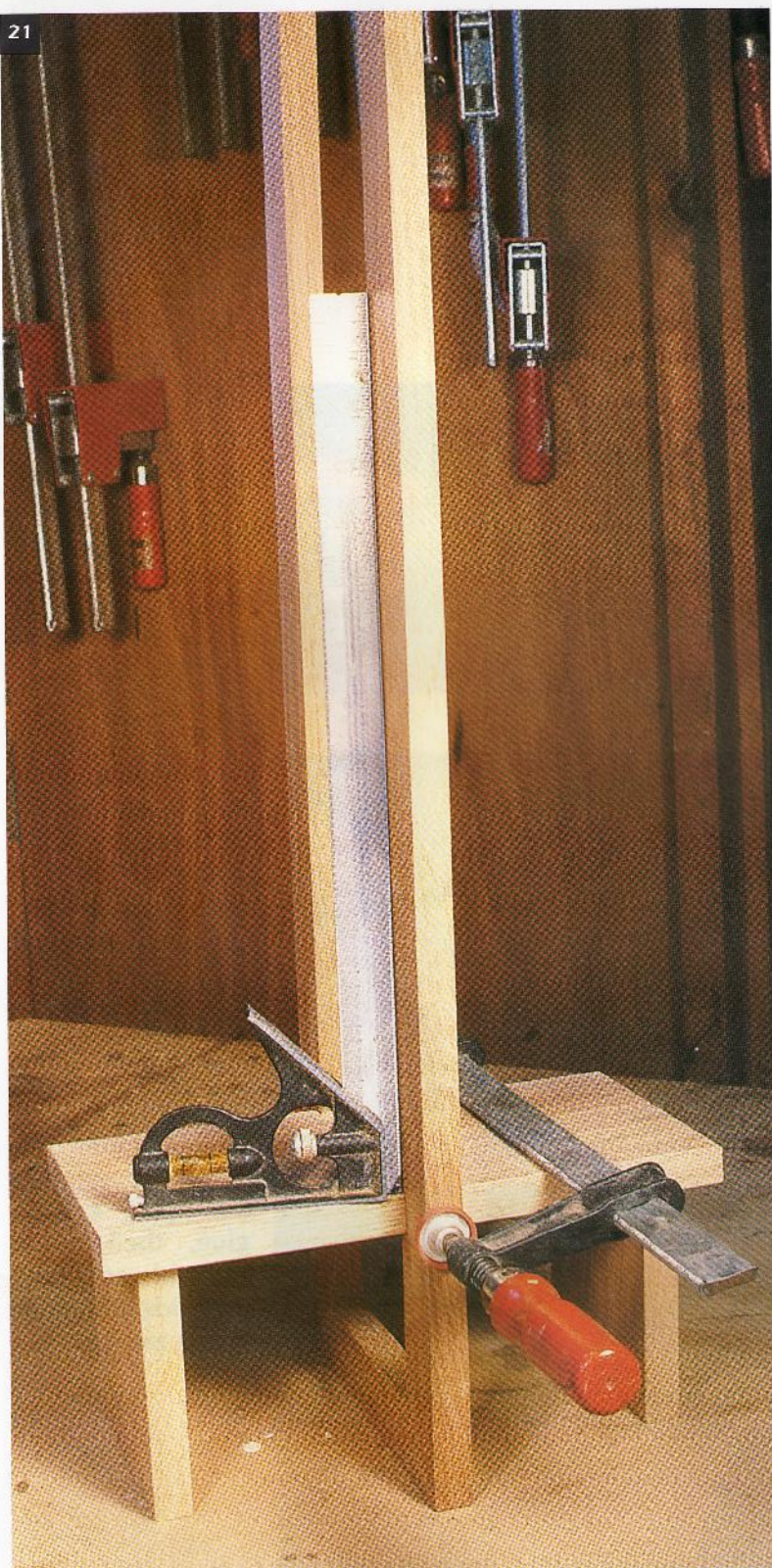
17. After you've assembled the main frame, you'll find a detail sander is ideal for getting inside for final smoothing.



18. Assemble the two legs to the table of the stand using biscuits, then clamp the assembly and set it aside until the glue has cured.



20. Apply a little glue, then angle the table assembly and slide it in place inside the frame.

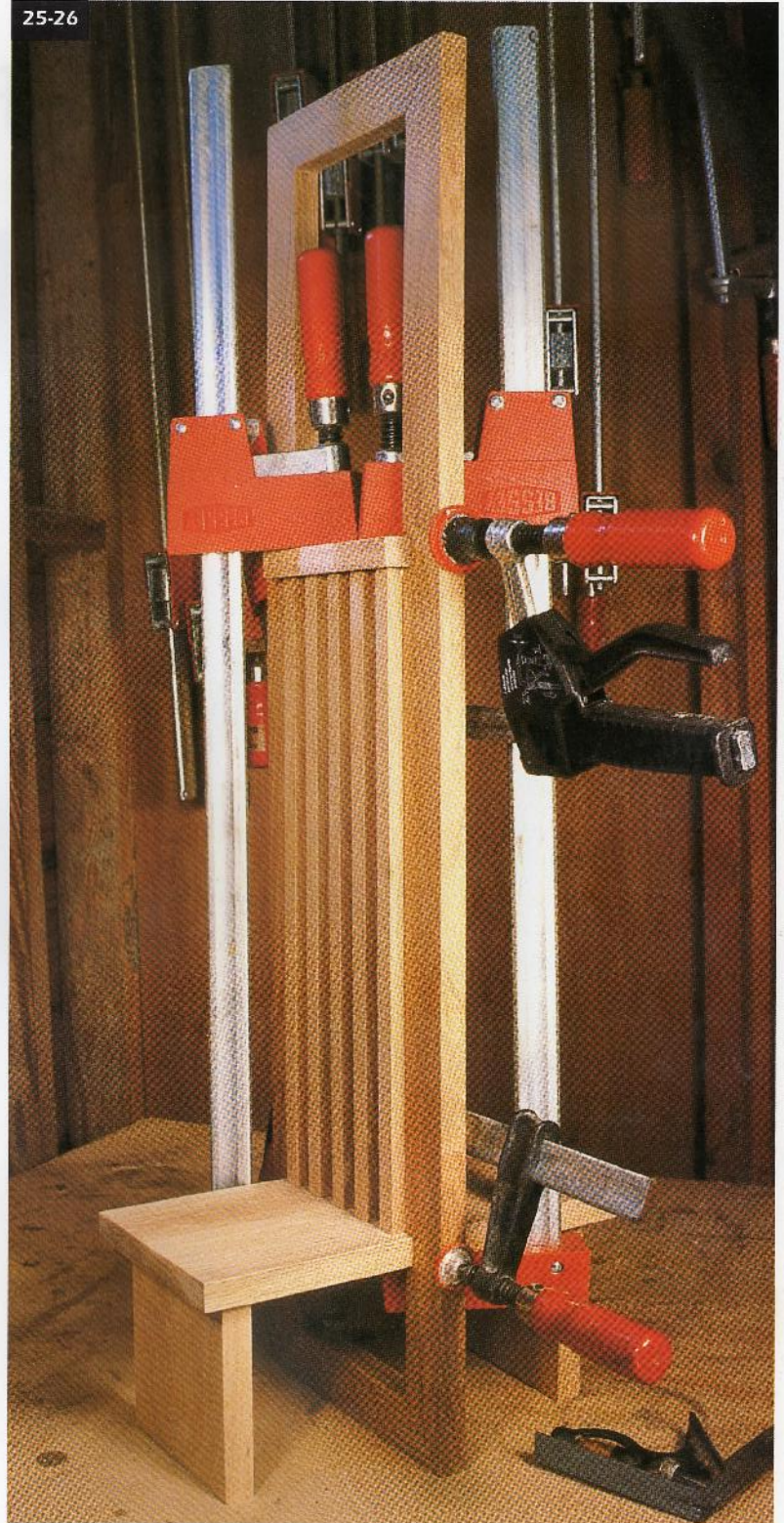


21. Clamp the table to the frame and ensure the frame is perfectly upright.

21. Make sure the frame is standing absolutely square to the tabletop, and the legs are standing squarely on the bench. If all is good, apply a clamp and leave the structure overnight, or until the glue has cured.
22. When the glue has cured, remove the clamp from the table/frame assembly and set it on its legs on the bench.



23. Apply a little glue to one of the tenons on each of the verticals, and then set them in position, in their mortises.
24. Now, apply a little glue to the tenons at the other ends of the verticals.
25. Apply a little glue to the dados in the top rail, slip it through the frame, then push it carefully down, over the edges of the frame and the ends of the tenons.
26. Apply a clamp across the length of the rail, and two more to pull it down tight over the tenons.
27. The assembly is now complete. All that remains is to remove the clamps, when the glue has cured do any necessary final sanding, and make a decision about the finish.
28. I used a light oak stain and a coat of semi-gloss polyurethane. The result was exactly what I was looking for. You could, of course, fume the piece, or use a darker stain. The possibilities are endless. This piece is so elegant I don't think it would be possible to spoil it.



25. - 26. Glue and assemble the verticals to the table, glue and slide the top rail in place inside the frame and onto the tenons of the verticals, then clamp and set the structure aside so the glue can cure.



chapter eighteen

LIMBERT COFFEE TABLE



22-28. Give and assemble the verticals to the table. Give and slide the top end in place inside the frame and into the corner of the verticals, then clamp and set the structure aside so the glue can cure.

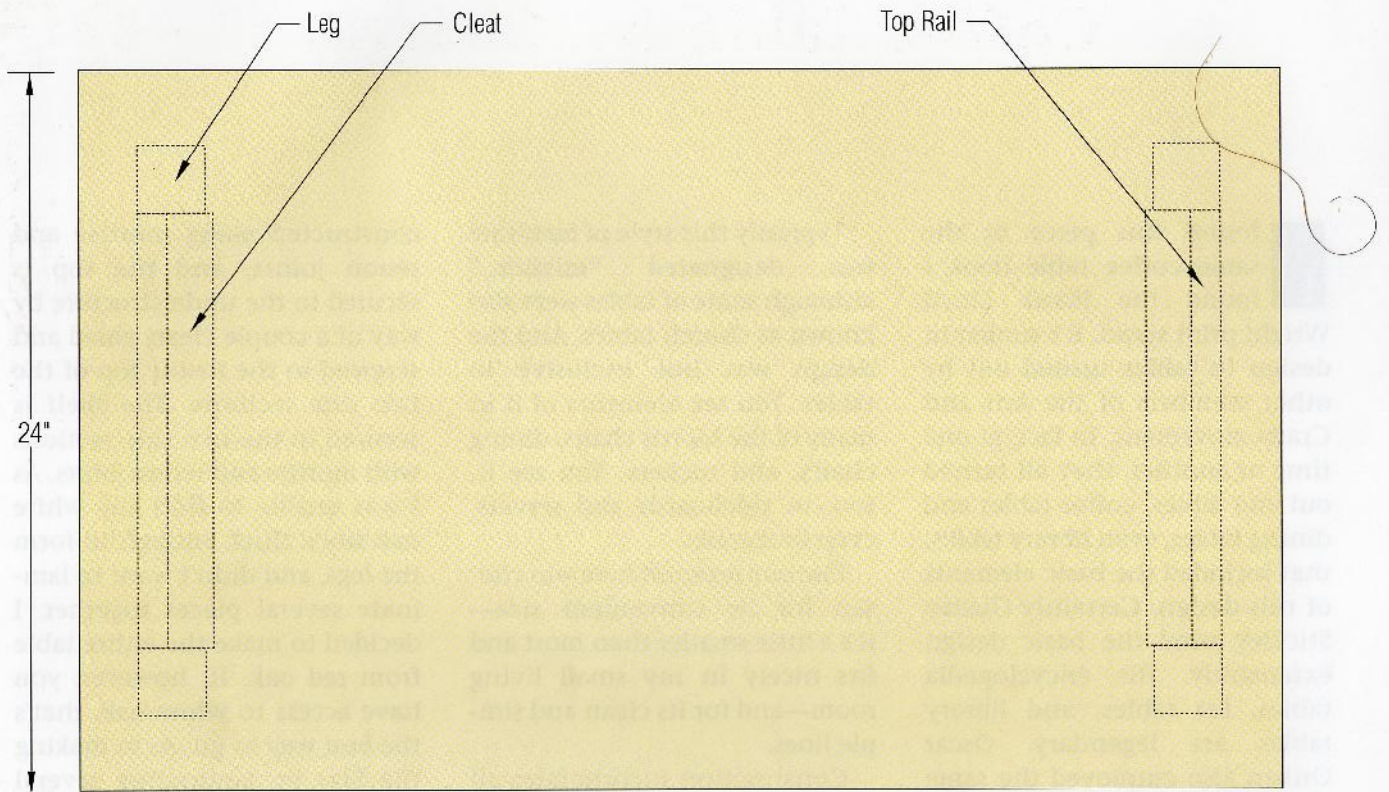
I found this piece in the same coffee table book I found the Frank Lloyd Wright print stand. It's similar in design to tables turned out by other members of the Arts and Crafts movement. In fact, at one time or another, they all turned out end tables, coffee tables and dining tables, even library tables, that included the basic elements of this design. Certainly Gustav Stickley used the basic design extensively. His encyclopedia tables, tea tables, and library tables are legendary. Oscar Onken also employed the same elements of design for his mission furniture, which was typically very heavy and somewhat more ornate than that of his peers. Charles Limbert's catalogs include a number of designs similar to this one. Some have innovative suspended lower shelves, all have the signature-spindled sides. And it's those spindled sides that make the basic design so appealing.

Typically this style of furniture was designated "mission," although some of tables were also known as church tables. And the design was not exclusive to tables. You see elements of it in many of the Morris chairs, dining chairs, and rockers. You see it, too, in sideboards and servers, even footstools.

The one featured here was chosen for its convenient size—it's a little smaller than most and fits nicely in my small living room—and for its clean and simple lines.

Construction incorporates all of the elements so typical of Arts and Crafts furniture, and will provide both a challenge and an interesting couple of weekends. Small as it is, it's a fairly heavy piece. The legs are cut from 12/4 stock and finished to 2 1/4" square. The top is built from several pieces of stock 5/4 thick and finished to a 1" thick. The boards were carefully selected to match the color and grain. The sides are

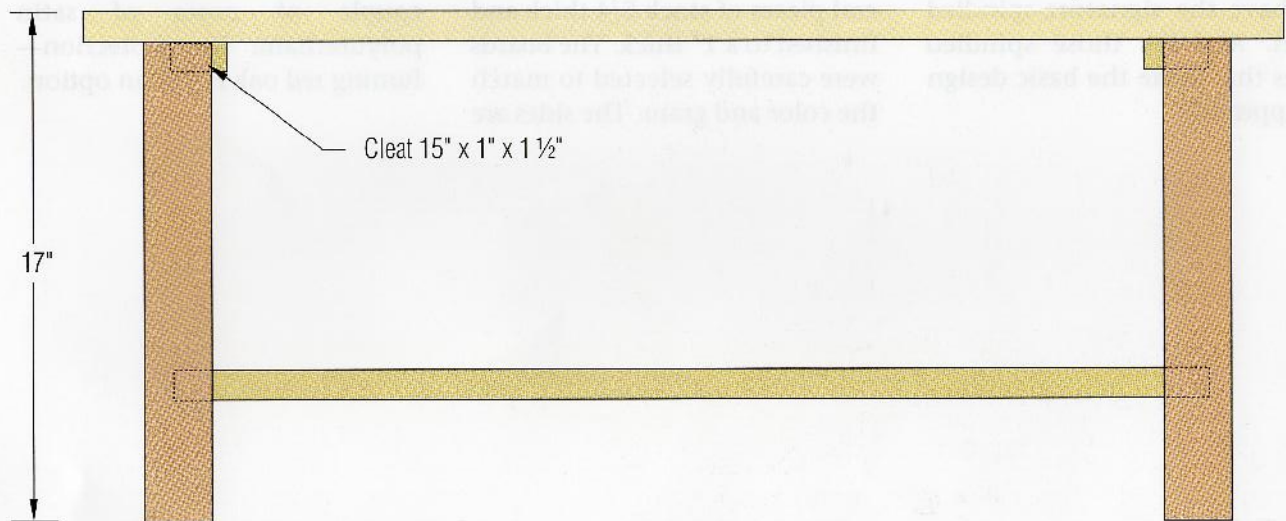
constructed using mortise and tenon joints, and the top is secured to the understructure by way of a couple cleats glued and screwed to the inside top of the two side sections. The shelf is secured to the two side sections with mortise and tenon joints. As I was unable to find any white oak stock thick enough to form the legs, and didn't want to laminate several pieces together, I decided to make the entire table from red oak. If, however, you have access to white oak, that's the best way to go. As to making the legs by laminating several pieces of stock, I've done it before with some success. Unfortunately, it's not always easy to match grain and color, and the joint, no matter how good a job of planing the faces, always seems to show. For the finish I chose a golden oak stain with a couple of coats of satin polyurethane for protection—fuming red oak is not an option.



40"

Plan

40"

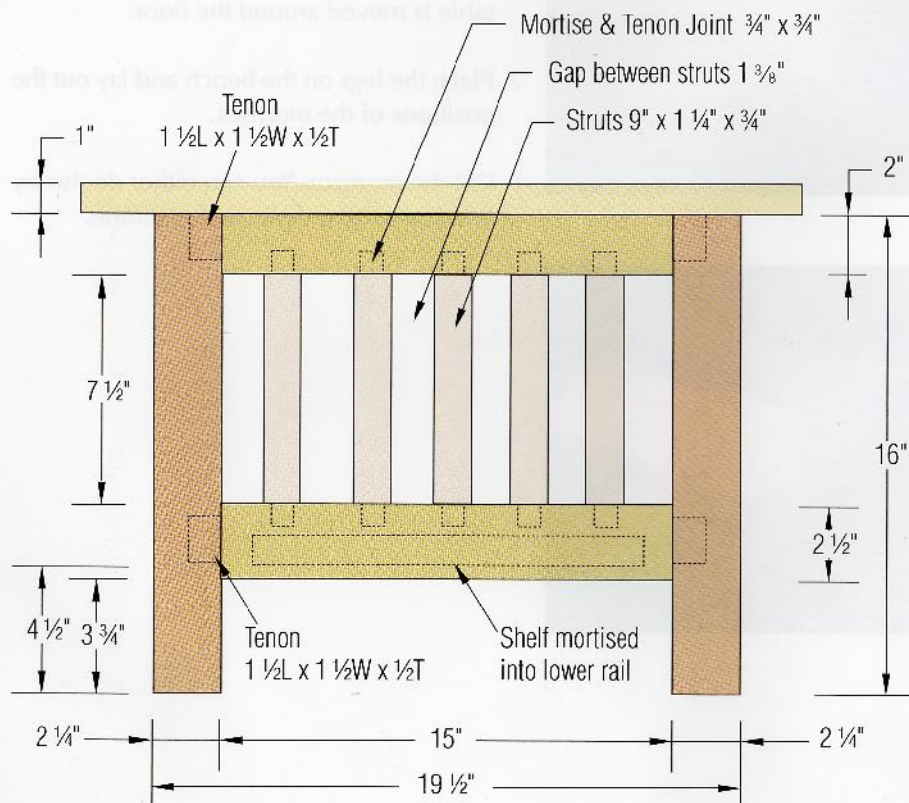


Front

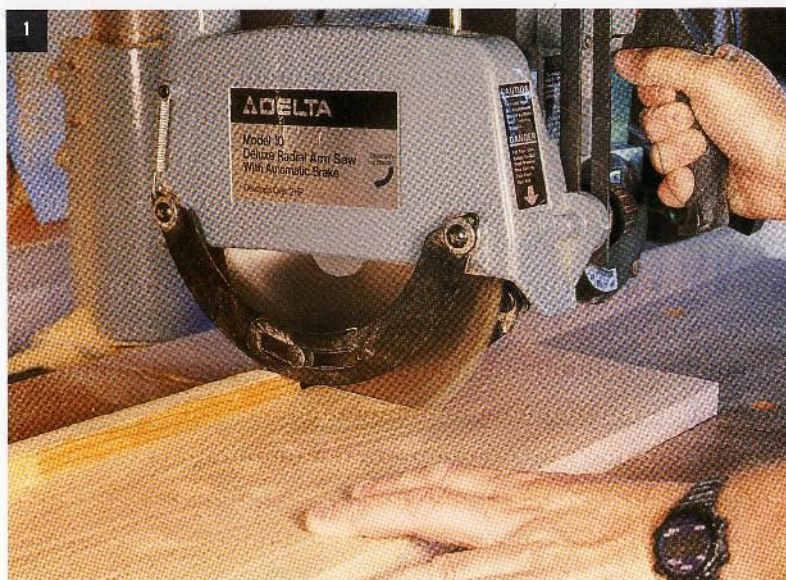
Coffee Table by Charles Limbert

BILL OF MATERIALS

Legs:	4 @ 16" x 2¼" x 2¼"
Lower Rails:	2 @ 18" x 2½" x 1" (allows for tenons)
Top Rails:	2 @ 18" x 2" x 1" (allows for tenons)
Top:	1 @ 40" x 24" x 1"
Shelf:	1 @ 33½" x 13" x 1"
Struts:	10 @ 9" x 1¼" x ¾" (includes tenons)
Cleats:	2 @ 15" x 1½" x ¾"



End View



1. It's essential to build this table that all cuts are perfectly square. Check your machines before you make the first cut.

2. Every piece of wood must be true and square if this piece is to go together properly; the jointer will play a big part in this project.



5. The legs must be true and square; if not, the end frames will be out of true, and this will be transferred to the lower shelf.



Construction Notes

1. Choose your wood with care, especially the pieces that will form the top. Plane all the pieces to the required thickness, and then pass all the edges through the jointer to ensure that all are true and square.
2. Lay out the boards for the table top—be sure to alternate the direction of the end grains to ensure stability—and mark for biscuit slots or dowels. Biscuit slots should be placed nine or ten inches apart.
3. Mill the biscuit slots, or drill the dowel holes.
4. Glue, assemble and clamp the tabletop, then set it aside until the glue has cured, preferably overnight.
5. Cut the leg sections to their final length, and then plane them down to $2\frac{1}{4}'' \times 2\frac{1}{4}''$.
6. Take the legs to the sanding center and round the corners at the bottom of each leg so that they won't split or chip when the table is moved around the floor.
7. Place the legs on the bench and lay out the positions of the mortises.
8. Cut the mortises. You can either do this by hand, or with a dedicated machine.



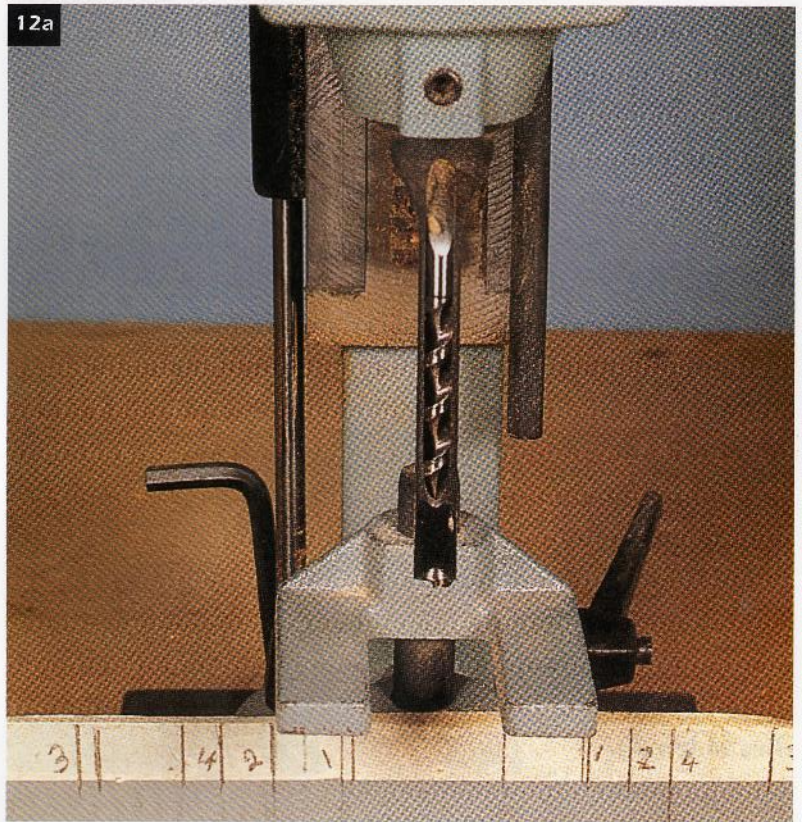
9. Sand the legs smooth starting with 50- or 60-grit sandpaper and working your way through the grades to at least 220-grit—320- is even better—and make sure you ease all the sharp corners. Then set the legs aside until you're ready to begin assembly.

10. Place the lower side rails on the bench, inner side up, and lay out the positions of the mortises that will receive the lower shelf. You can use two mortises, as I did, or you can use one long one; it makes little difference.

11. Now lay out the positions of the spindles on the edges of both the lower and upper rails.

12. Carefully cut all of the mortises in all four rails.

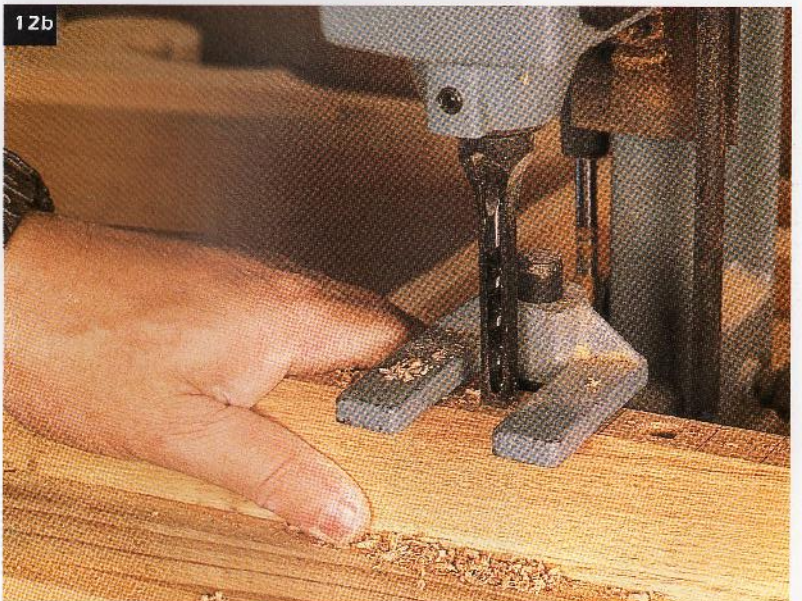
12a



12. To mill the mortises that will receive the spindles it's essential that all of them are perfectly aligned. You can do this by marking the back fence of the machine, like this.

Even having marked the back fence of the machine, it's still a good idea to mark the positions of the mortises on the wood itself.

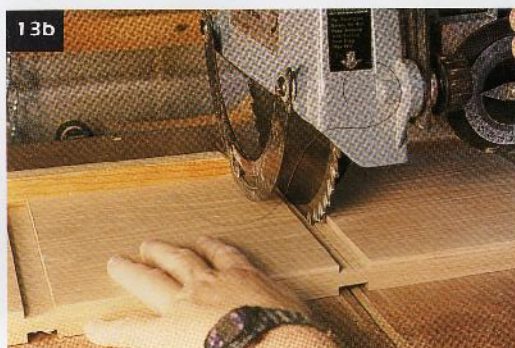
12b



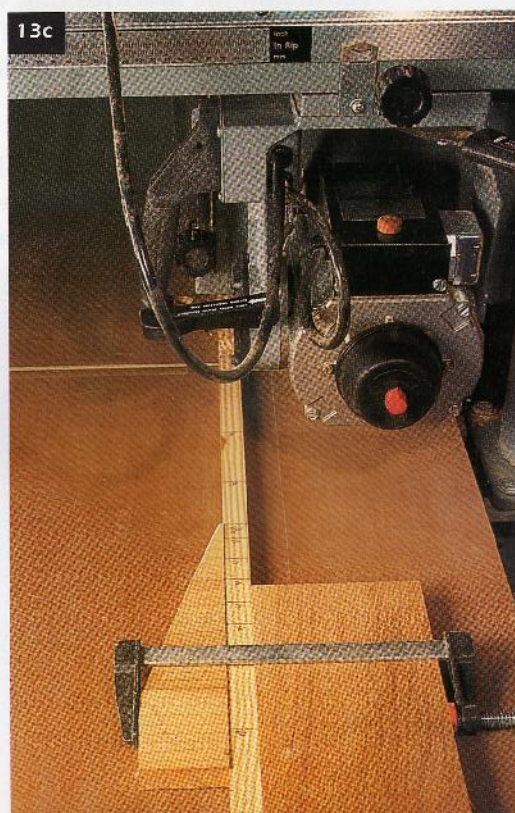
13. To make the spindles you can either mill the tenons on the table saw, or with the radial arm—several in one piece—like this.



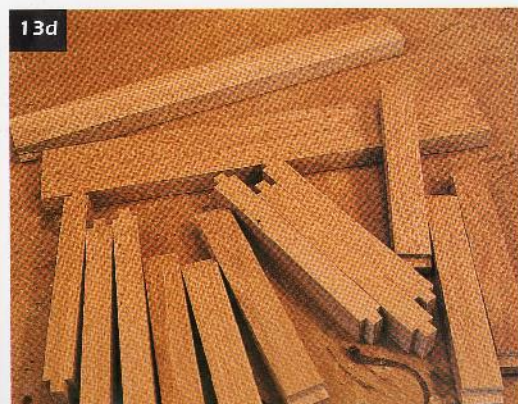
To separate the pieces that will form the spindles, it's a simple matter to cut through the center of the tenons. From there, all you need do is rip the spindles to length.



To ensure all the spindles are exactly the same length, you should set up your machine with a system of stops.



13. Cut the tenons on the ends of the rails. You can do this by hand, at the table saw, or with a stacked dado head set up in your radial arm saw. Start out by using the first tenon as a gauge from which all the others can be cut: make it a little oversize, dry fit it, then make the necessary adjustments for a perfect fit.



Having made the rip cuts, you'll be left with your spindles. To finish them, it's simply a matter of returning to the radial arm saw—or table saw—set up with a dado head, and finishing the tenons.



14. Repeat the process for all of the spindles, dry fitting each one as you go.
15. When all of the tenons have been formed, dry fit both sides to make sure everything works correctly, then disassemble them and make ready to do the job for real.
16. Sand all the pieces of both side sections smooth, finishing with 220-grit sandpaper. It is much easier to do it now, before final assembly, than later when it would be difficult to get in between the spindles.
17. Glue, assemble and clamp both sides. Measure the diagonals to ensure that they are square and true, make any necessary adjustments to the clamps, then set them aside until the glue has cured.
18. Form the tenons on the ends of the lower shelf.
19. Remove the clamps from the two side sections and dry fit the shelf. Break it down again and set the pieces aside.
20. Take the two cleats, drill and countersink three pilot holes through the narrow edge, and two pilot holes through the broad face. You'll use the three holes to screw the cleat to the top rail on the table's side section. Then the two holes to screw the assembly to the table top.
21. Place one of the two side sections on the bench and place one of the cleats in position at the inside top. The pilot holes should be positioned so that you can screw the cleat to the side section, and the side section to the tabletop.
22. Apply a little glue to the cleat, then fasten it in place with #6 x 2" screws.
23. Repeat the process for the second side section.
24. Sand the lower shelf smooth. Apply a little glue to both of the tenons and then assemble the two side sections and shelf into one unit. Apply clamps at the point where the shelf joins the side sections, but take extreme care to ensure that joints are true right angles. If not, the finished table will look very strange. Now leave the structure alone until the glue has cured.
25. When the glue in the understructure has fully cured, remove the clamps, set the top on the bench—under side up—and the understructure in position on the table top.
26. Make sure the understructure is centered on the top, then secure the understructure to the top using #10 x 1 5/8" screws.
27. Do any final finish sanding in preparation for finishing.
28. If you've used white oak throughout, you can either fume or stain the piece, or both. If not, you'll need to choose an appropriate stain.
29. Finish the project by applying a couple of coats of polyurethane—either satin or semi-gloss would be a good choice.



chapter nineteen

STICKLEY HANGING BOOKSHELF



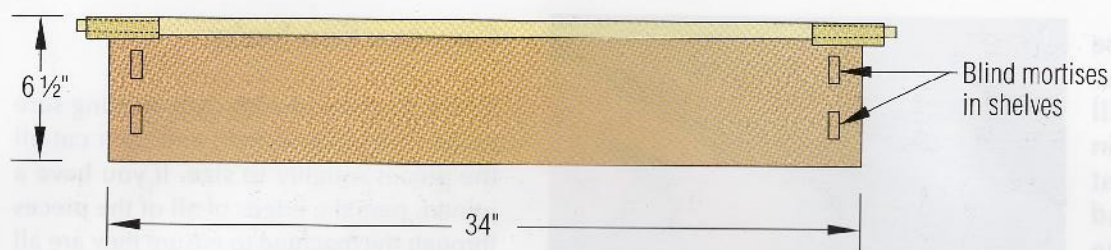
This is another piece from Stickley's *The Craftsman* magazine. When I saw the original, hand-drawn illustration, I wasn't really impressed. Over a period of time, however, as I flipped back and forth through the pages, something about it caught my interest and I decided to build one. I've never seen anything quite like it anywhere else. It's fun to build, functional, and will add aesthetically to any home.

This is not a difficult piece to build, although it does require some basic joinery skills and, if

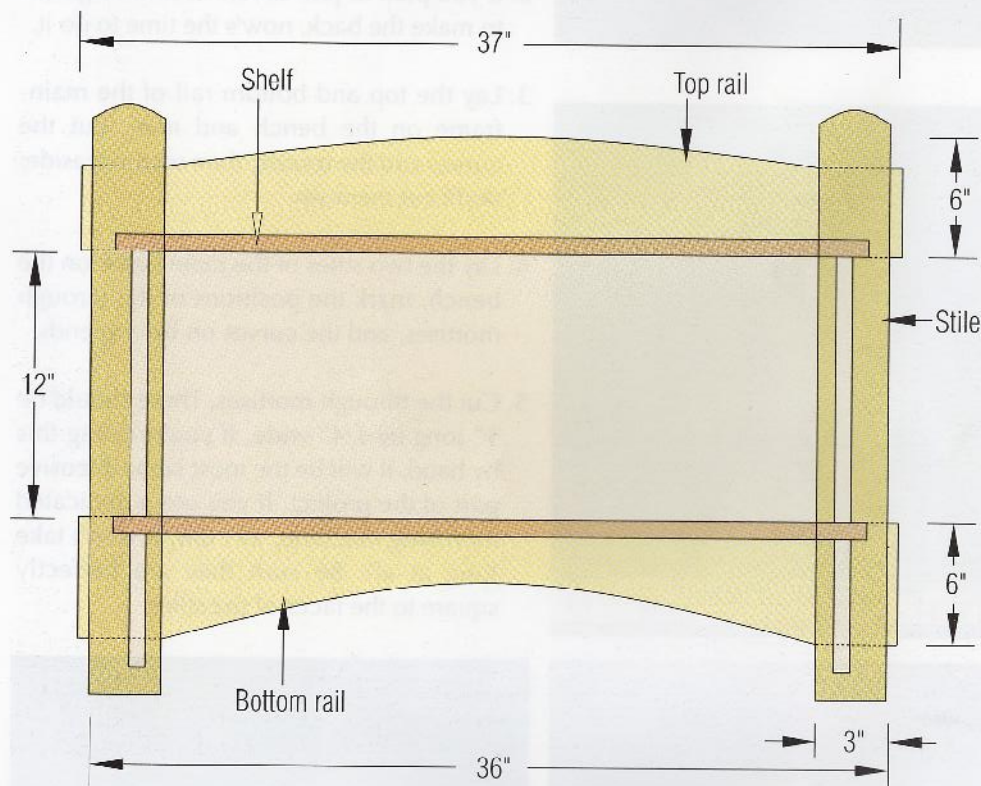
you're using hand tools, a lot of time and patience. The through mortises in each of the rails must be accurately cut: perfectly square. If not, the resulting frame will be twisted, and probably useless. The upper and lower curves to the two stiles were hand-drawn; you can use a springy ripping as a guide. The shelf supports were also hand-drawn. The shelves and support rails between them are assembled separately as one structure, and then added to the rear frame. The support rails between the two shelves are fas-

tened in place using mortise and tenon joints. For the back, you should use either a single piece of oak, planed down to 3/8", or you can use several smaller boards tongue and grooved together, or you can take the easy road and use a piece of 3/8" oak plywood.

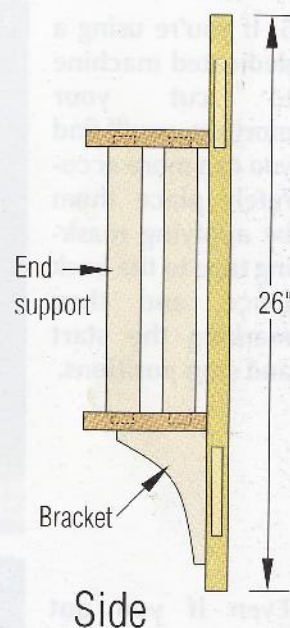
For the finish I used a Minwax stain—Provincial—and a couple of coats of satin polyurethane. True followers of the movement will, of course, want to fume their bookshelf.



Plan



Front



Side

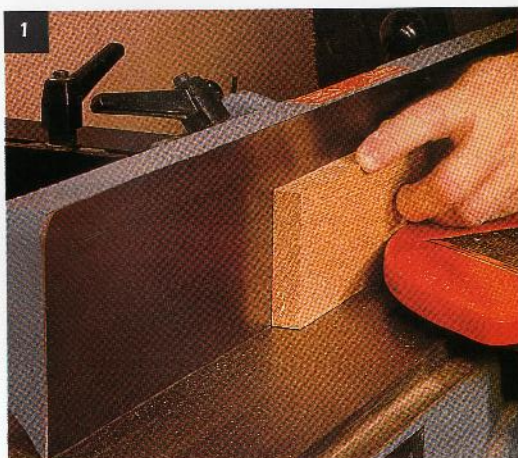
BILL OF MATERIALS

Main frame Stiles:	2 @ 26" x 3" x 3/4"
Top Rail:	1 @ 37" x 6" x 1/2"
Bottom Rail:	1 @ 37" x 6" x 1/2"
Main frame Back:	1 @ 30 3/4" x 12 3/4" x 3/8" (plywood)
Shelves:	2 @ 34" x 6" x 5/8"
End Supports:	4 @ 13" x 1 1/2" x 3/8"
Shelf Brackets:	2 @ 6" x 5" x 3/4"

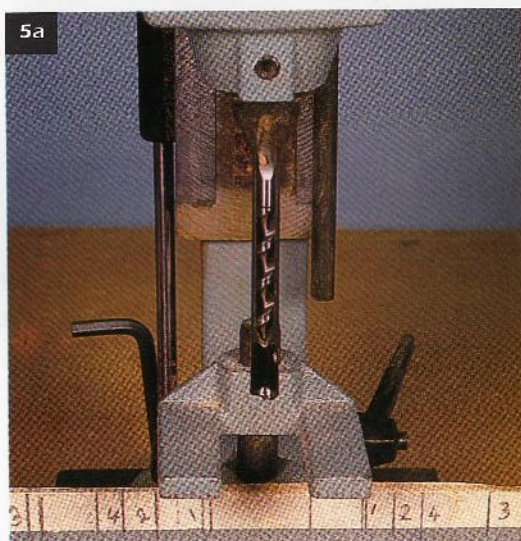
Hanging Bookshelf by Gustav Stickley



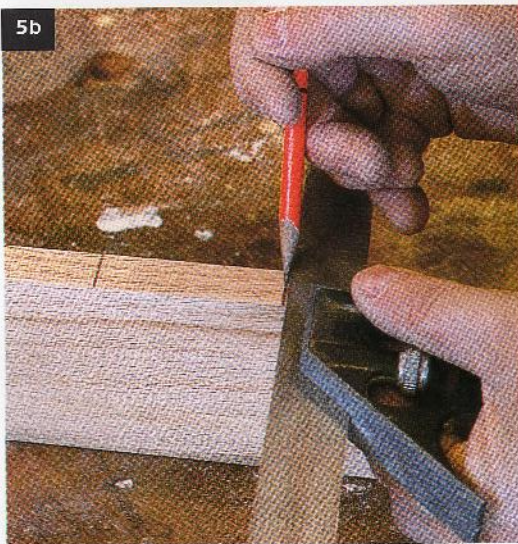
1. First prepare the edges of the wood that will form the main frame: they must be true and square. If not, the through mortises will run off, resulting in a twisted frame.



5. If you're using a dedicated machine to cut your mortises, you'll find you can more accurately place them by applying masking tape to the back fence, and then marking the start and stop positions.

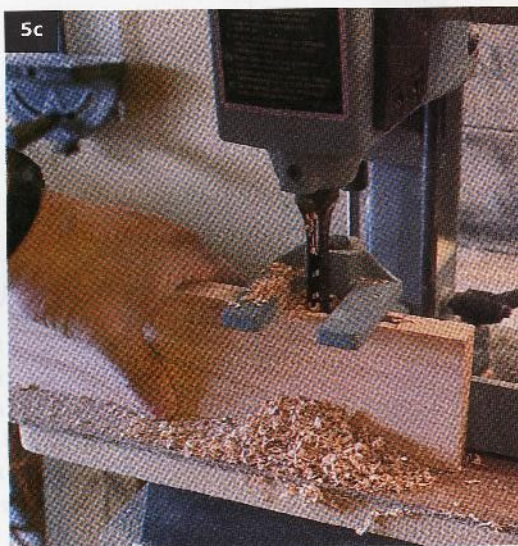


Even if you put guide marks on your machine, it's still best to mark the exact positions of the mortises on the wood itself.



Construction Notes

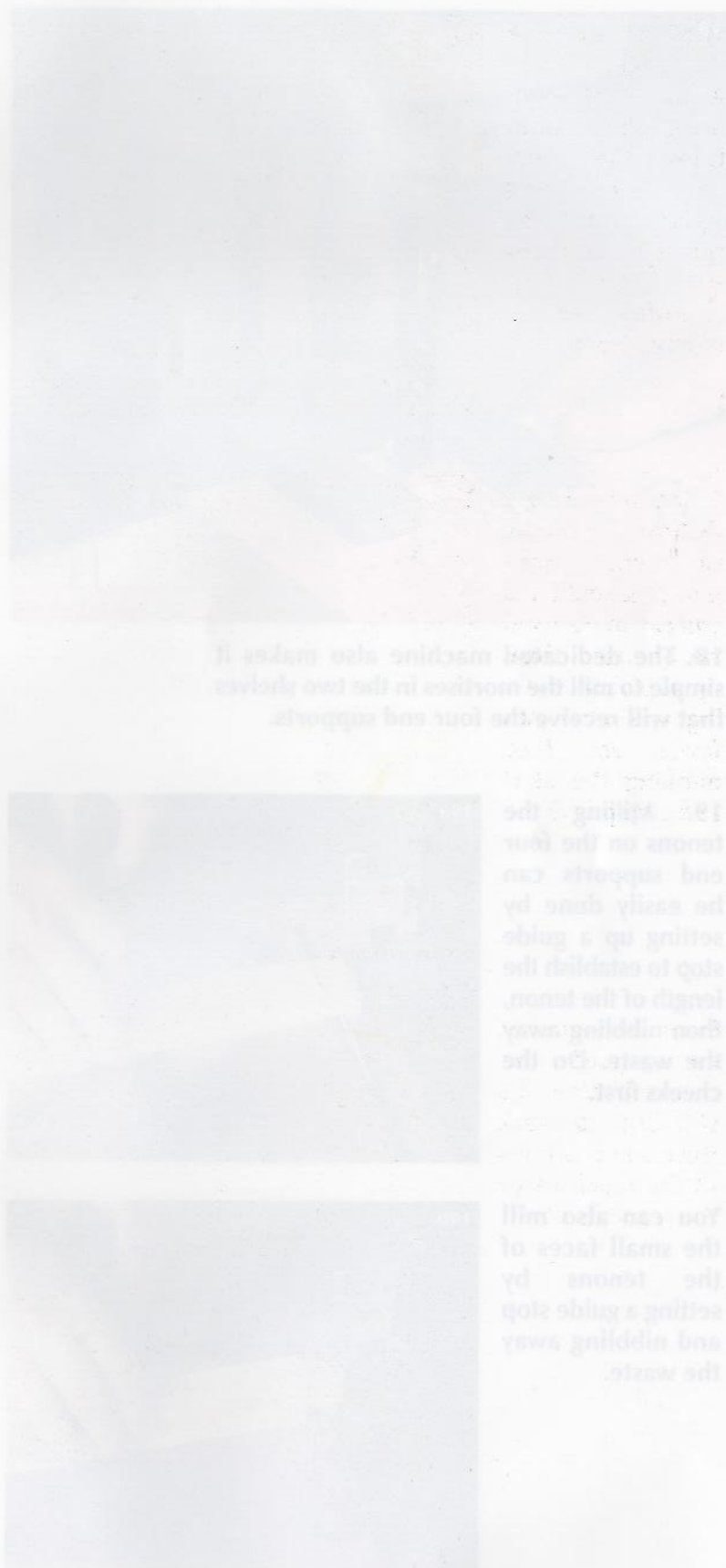
1. Select your wood with care, making sure color and grains match, and then cut all the pieces roughly to size. If you have a jointer, pass the edges of all of the pieces through the machine to ensure they are all true and square. Plane all the pieces to the required thickness as laid out in the Bill of Materials.
2. If you plan to join several boards together to make the back, now's the time to do it.
3. Lay the top and bottom rail of the main frame on the bench and mark out the curves and the tenons, then set them aside; don't cut them yet.
4. Lay the two stiles of the main frame on the bench, mark the positions of the through mortises, and the curves on the top ends.
5. Cut the through mortises. These should be 3" long by 1/4" wide. If you're doing this by hand, it will be the most labor-intensive part of the project. If you use a dedicated mortising machine, as I did, it won't take long at all. Be sure they are perfectly square to the faces of the stiles.



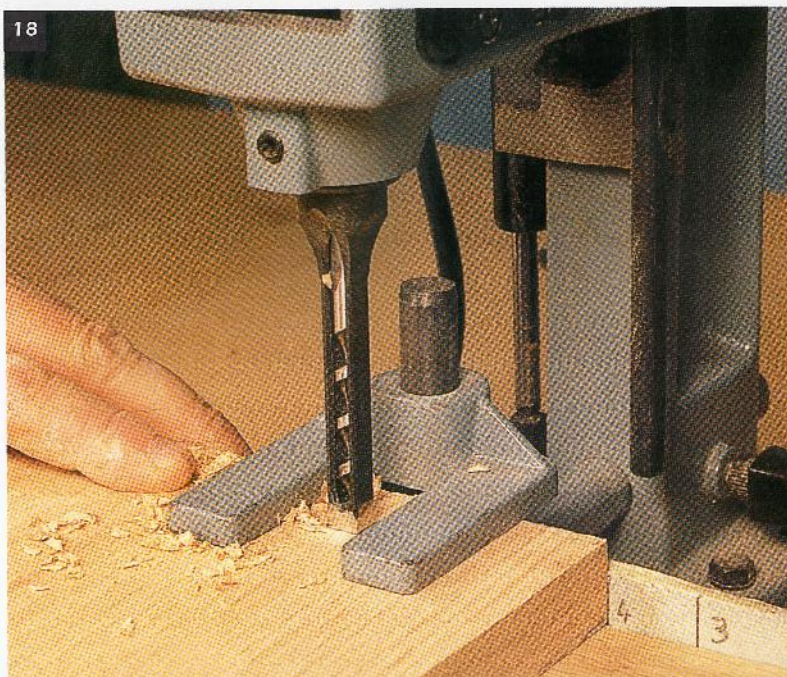
Be sure that the stock is held firmly against the back fence in a perfectly upright and square position.



6. Mill the stopped rabbets to the back inside edges of the stiles and rails of the main frame. These will receive the back, and should be $\frac{3}{8}$ " wide by $\frac{1}{2}$ " deep. I milled each piece individually on my router table. You could, of course, leave this step until the frame has been assembled, then mill the rabbets in one operation using a hand-held router and flat-bottom bit. Either way, you'll need to clean out and square the corners with a chisel.
7. Either at the table saw or radial arm saw, cut the tenons on the ends of the main frame rails. You can do this either with a stacked dado head or a tenoning jig. Either way, it's a good idea to mill each tenon individually as follows: Start by making each tenon a little over-size, then trim it to perfectly fit its mortise.
8. Trim the ends of the tenons to length. They should extend beyond the edge of the frame by about $\frac{3}{8}$ ", perhaps a little more. What pleases you best is the way to go.
9. Form the pyramid profiles on the ends of the tenons. You can do this either with a hand-held plane, at the sanding center, or on a spindle sander. You could even do it carefully with a sharp chisel.
10. At the bandsaw, or with a jigsaw, cut the curves on the top and bottom rails, and the curves on the tops of the stiles.
11. Drill the hanger holes at the top ends of the two stiles. These should be $\frac{3}{8}$ " diameter and slightly countersunk.
12. Sand everything smooth, starting with a coarse grit sandpaper and working your way through the grades to at least 220-grit. Make sure you ease all of the sharp edges.

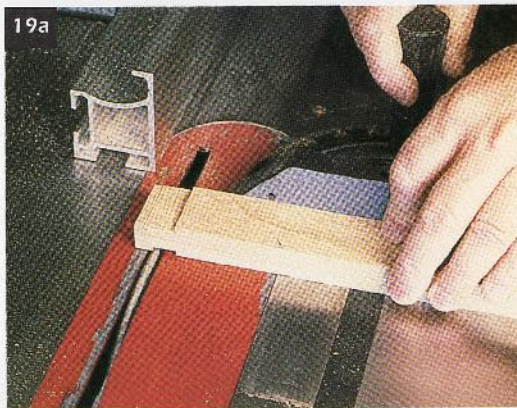


18



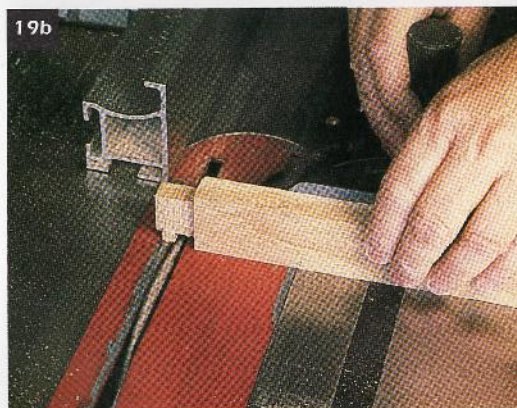
18. The dedicated machine also makes it simple to mill the mortises in the two shelves that will receive the four end supports.

19. Milling the tenons on the four end supports can be easily done by setting up a guide stop to establish the length of the tenon, then nibbling away the waste. Do the cheeks first.



19a

You can also mill the small faces of the tenons by setting a guide stop and nibbling away the waste.



19b

13. Dry fit the pieces of the frame to ensure the result is true and square, and that the frame is not twisted.

14. If everything fits together properly, disassemble the structure and prepare for final assembly.

15. Apply a little glue to the faces and edges of the tenons, but be sure to leave the very ends and a little more clear of glue. This way you won't have a lot of awkward cleaning up to do on and around the pyramid profiles.

16. Assemble the frame, clamp it, and set it aside until the glue has cured, preferably overnight.

17. Trim the two shelves to their finished length, lay them on the bench and mark the positions of the blind mortises.

18. Mill or cut the blind mortises.

19. Form the tenons to the four end supports, making sure you have a good fit and clean shoulders.

20. Sand all of the pieces smooth, starting with a coarse grit sandpaper and working your way through the grades to at least 220-grit. Make sure you ease all of the sharp edges.

21. Dry fit the pieces together to ensure a perfect fit.

22. If every thing fits together properly, disassemble the shelf section, the reassemble it using a little glue to secure the tenons in place. Apply clamps, measure the diagonals to ensure the structure is square, then set it aside until the glue has fully cured, preferably overnight.



23. Lay out the curves on the two pieces that will form the shelf brackets, then use the band saw to cut them out.
24. Sand the shelf brackets smooth, paying particular attention to the curved edges. Also ease the sharp corners.
25. When the glue has cured in the shelf section, remove the clamps and set it on the bench, back side up.
26. Set the main frame in place on the shelf section—the rabbets should be facing up—and center it. This should be simple to do because you haven't, as yet, fastened the back panel in place.
27. Having perfectly aligned the main frame and shelf section, drill and countersink pilot holes through the frame and into the edges of the shelves, taking care to ensure they are in the center of the edges of the shelves.
28. Use #6 x 2" long screws to secure the main frame to the shelf section.
29. Apply a little glue to the two blind edges of the shelf brackets, set them in position and, with the aid of a couple of small blocks, apply clamps and set the structure aside until the glue has cured.
30. When the glue has cured, set the structure on the bench, backside up, and drill and countersink two pilot holes through the main frame into each of the shelf brackets.
31. Drive #6 x 2" screws through the pilot holes into the shelf brackets. This will give the supports a lot of extra strength.
32. Finally, set the back in place in its rabbets and secure it with some small brads or screws.
33. To finish the piece, you can either fume it and apply a little stain, or you can use one of the new one-step stain/polyurethane finishing products.

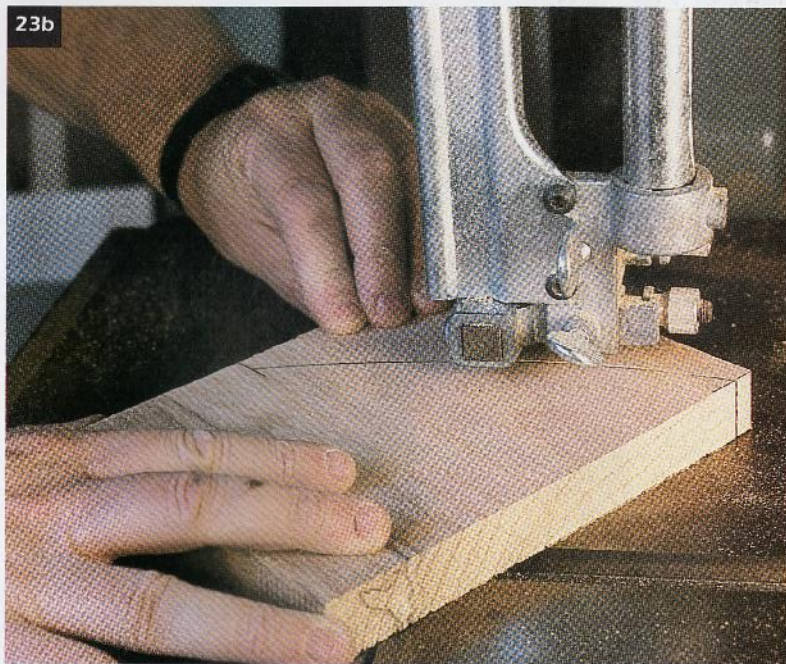
23a



23. You can, of course, use a compass to scribe the radius of the shelf supports, but I simply use a template.

The easiest way to cut the curve to the shelf supports is to use the bandsaw. You could use either a jigsaw or scrollsaw.

23b







chapter twenty

ONKEN BOOK STAND

This is a piece I've included more because of who designed and built it, and where, than for its aesthetics; at least, that was my original intention. I can't say that, in the beginning, and from what I could see in the illustration, I liked the piece at all.

Onken operated The Shop of the Crafter, in Cincinnati, during the early years of the 20th century. Little is known of his organization today, although Onken-designed pieces still continue to surface. He is the only member of the Arts and Crafts Movement that did operate out of Cincinnati, at least that we know of, and that alone makes him important, and worthy of inclusion here.

I searched Oscar's single available catalog through and through, trying to find a piece I thought was appropriate for this book and, more important, one I liked. Of all the hundreds of items in the catalog only two came even close to what I was looking for. With these two exceptions, every piece in the catalog was ornate well beyond the limits of my taste. Most were strangely shaped, some bordered

on the weird, some even had cabriole legs, many were heavily carved with motifs and western designs; they all were classed as "mission" furniture. Some of the pieces were so way out that I wondered if they ever sold at all. Still, there's no doubt that Oscar Onken turned out a top quality product, and even the weirdest of his pieces had an appeal all their own. Anyway, the two pieces I had to choose from were both very much in the Onken style of Arts and Crafts; both were bookstands. Of the two, one was decidedly more ornate than the other. It was similar in design to the one described here, but was heavily carved and featured large, recessed hearts at the tops of the sides; not at all what Gustav Stickley would have approved of. Even the one I finally chose goes a little beyond the accepted parameters of Arts and Crafts design. Still, it does have a certain appeal and, having built the piece, I've grown to like it. It now occupies a place beside the fireplace in my dining room.

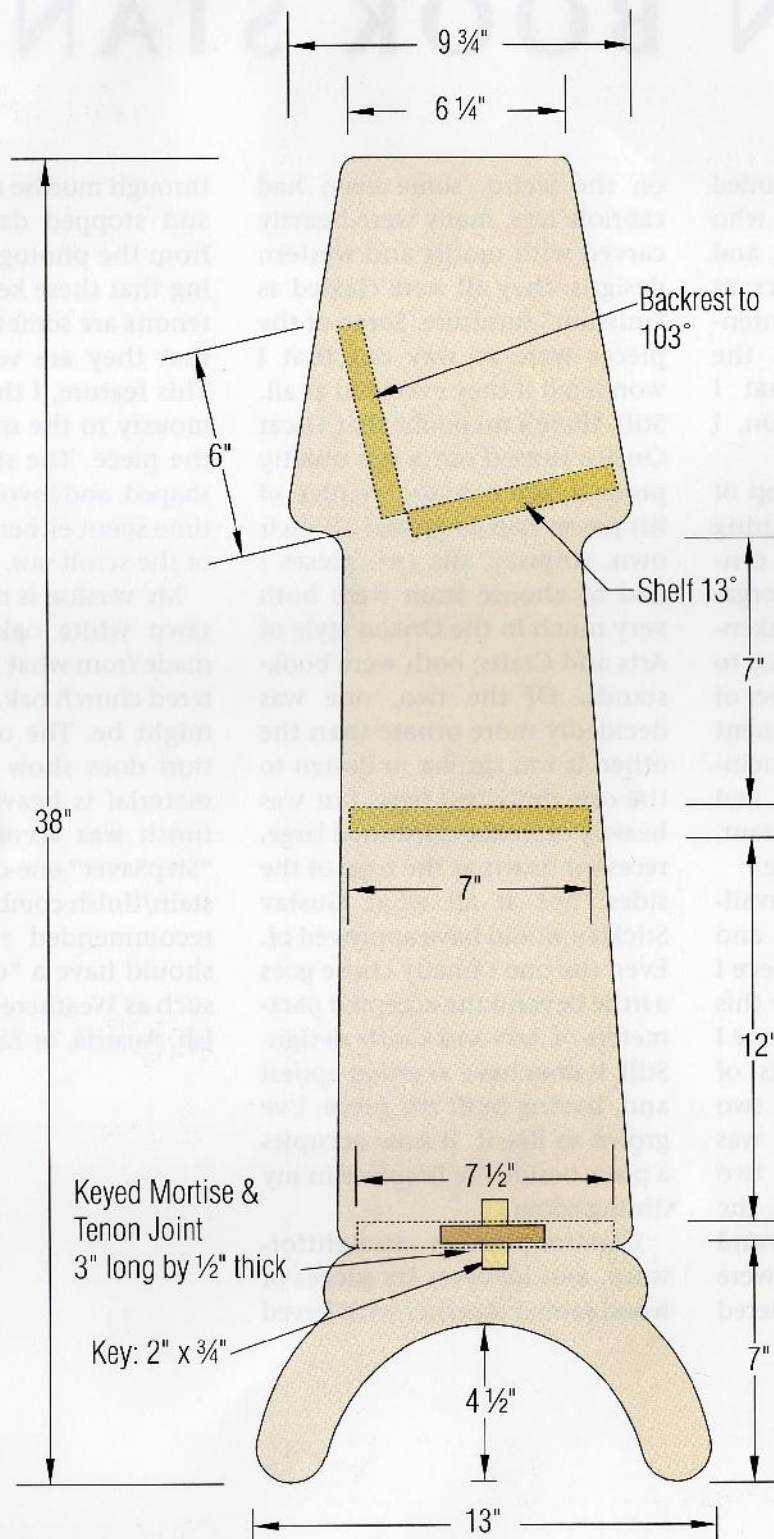
Construction is straightforward, and involves six pieces of wood joined together with keyed

through mortise and tenon joints and stopped dados. You'll see from the photograph and drawing that these keys and through tenons are somewhat unusual in that they are very low profile. This feature, I think, adds enormously to the overall appeal of the piece. The sides are heavily shaped, and involve some quality time spent either at the bandsaw or the scroll saw.

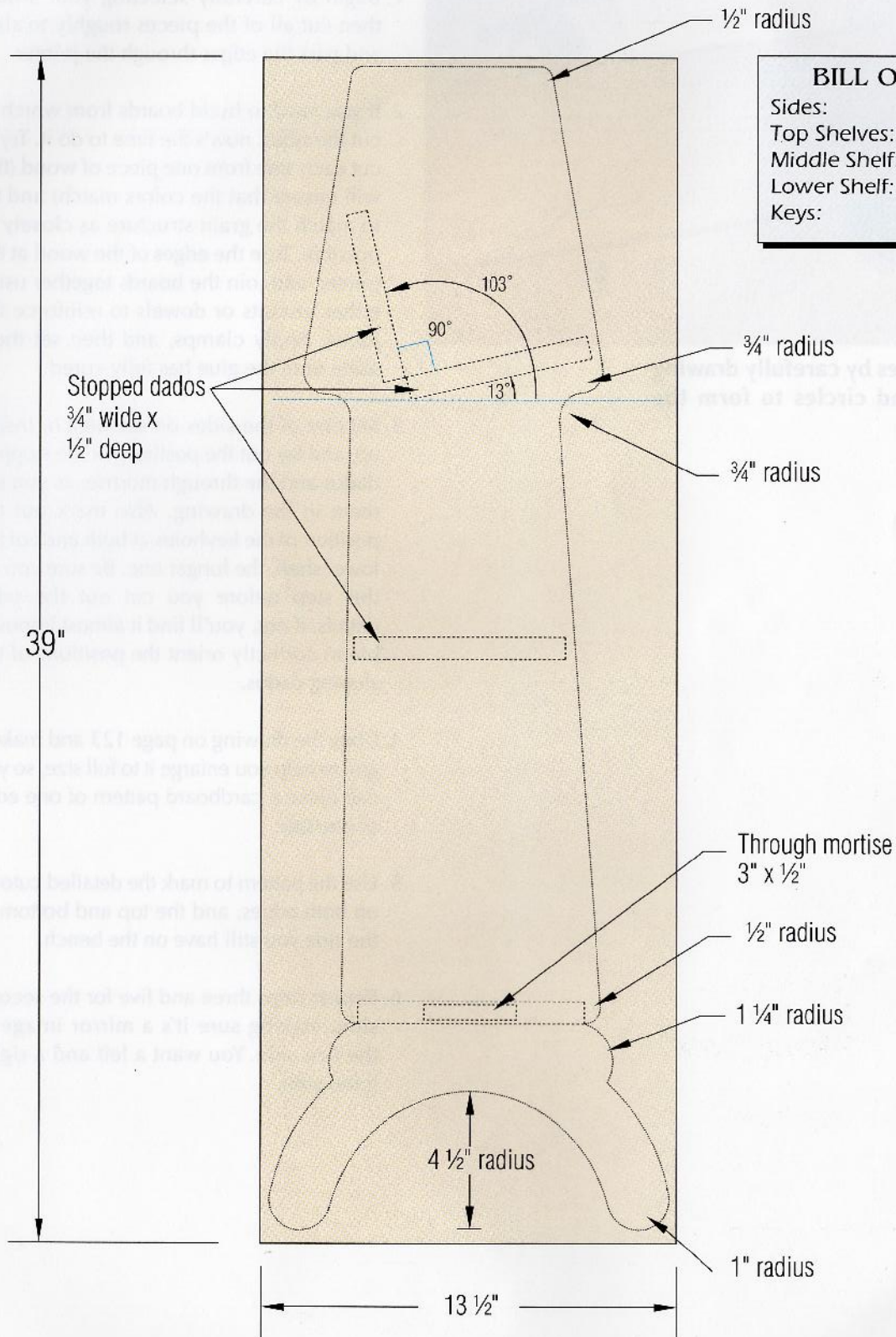
My version is made from plain sawn white oak; Onken's was made from what he called "quartered church oak," whatever that might be. The original illustration does show that the stock material is heavily figured. My finish was accomplished using "StepSaver" one-coat Golden Oak stain/finish combination. Onken recommended that his pieces should have a "dull wax finish, such as Weathered, Fumed, Flemish, Austria, or Early English."



Book Stand by Oscar Onken



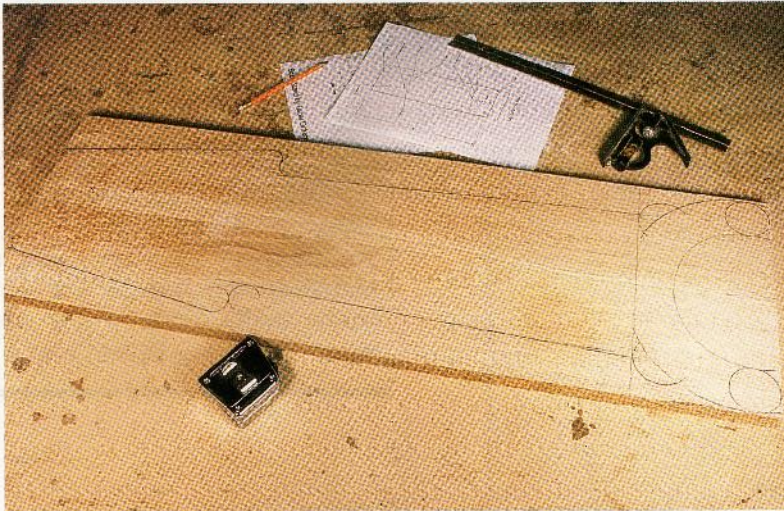
Side



BILL OF MATERIALS

Sides:	2 @ 38" x 13" x 1"
Top Shelves:	2 @ 20" x 6" x 3/4"
Middle Shelf:	1 @ 20" x 8" x 3/4"
Lower Shelf:	1 @ 24" x 8" x 3/4"
Keys:	2 @ 2 1/2" x 3/8" x 1"

Lay Out Of One Side



5. Lay out the sides by carefully drawing all the angles and circles to form the final shape.

Construction Notes

1. Begin by carefully selecting your wood, then cut all of the pieces roughly to size, and pass the edges through the jointer.
2. If you need to build boards from which to cut the sides, now's the time to do it. Try to cut each side from one piece of wood (this will ensure that the colors match) and try to match the grain structure as closely as possible. True the edges of the wood at the jointer, and join the boards together using either biscuits or dowels to reinforce the joints. Apply clamps, and then set them aside until the glue has fully cured.
3. Set one of the sides on the bench, inside up, and lay out the positions of the stopped dados and the through mortise, as you see them in the drawing. Also mark out the position of the keyholes at both ends of the lower shelf, the longer one. Be sure you do this step before you cut out the edge details; if not, you'll find it almost impossible to correctly orient the positions of the sloping dados.
4. Copy the drawing on page 123 and make a grid to help you enlarge it to full size, so you can make a cardboard pattern of one edge of one side.
5. Use the pattern to mark the detailed cutouts on both edges, and the top and bottom of the side you still have on the bench.
6. Repeat steps three and five for the second side, making sure it's a mirror image of the first side. You want a left and a right-hand side.

7. At this point, you'll need to form the stopped dados in both side sections. Be sure to do this before you cut out the edge details. If not, you'll have great difficulty locating both the tee-square jig, and the straightedge.

8. Use a tee-square jig, and a router set up with a 3/4" mortising bit, to form the stopped dados—one in each side section—for the middle shelf.

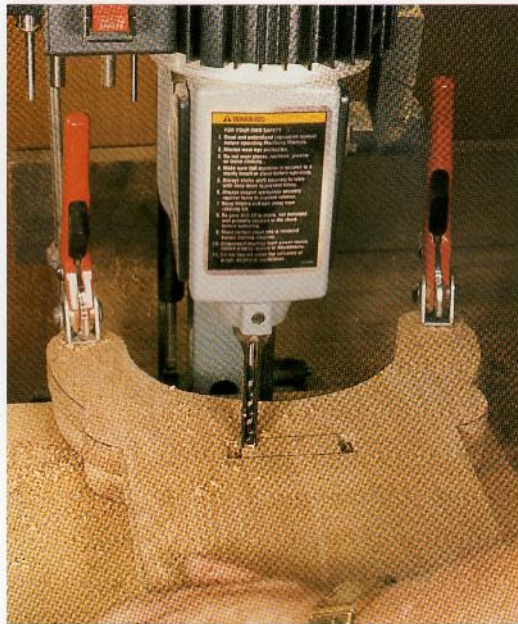
9. Use a straightedge and your router to form the angled stopped dados that will receive the upper shelves—two to each side section.

10. Mill the through mortises that will secure the lower shelf to the two sides—one to each side section. You'll probably have to do this step by hand.

11. Trim all four shelves to their finished lengths and use a jigsaw to cut out both sides, following your layout of curved and sloping lines.

12. Cut the shoulders to the three 20"-long shelves that fit into the stopped dados.

13. Cut the shoulders that will form the tenons at the ends of the longer lower shelf. These tenons are very basic, being the same thickness as the shelf, thus requiring no more than the two shoulder cuts to complete.



10. If you're using a dedicated mortising machine you'll have to wait to cut the through mortises for the lower shelf until you've cut out the feet; otherwise you won't be able to get the blank back into the machine far enough. Try this set-up.



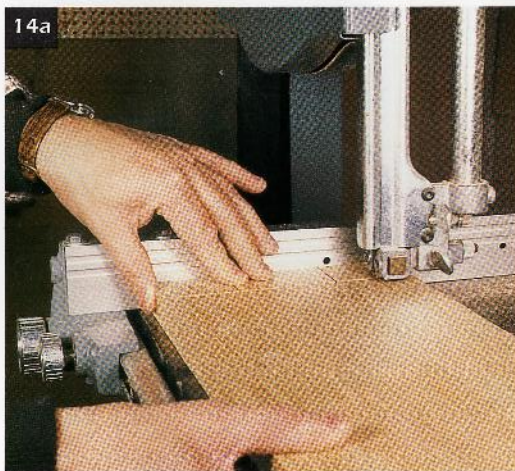
Use a sharp chisel to clean up the insides of the through mortises.



11. Use your jigsaw to cut out the blanks for the sides; you'll find it a little difficult to maneuver the blank on your bandsaw.



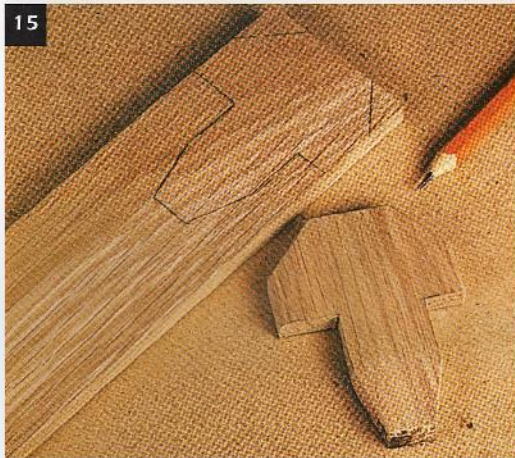
14. If you have a rip fence for your bandsaw it will make cutting the shoulders on the large through tenon a simple operation.



Dry fit the lower shelf and the sides to mark out the through mortise that will receive the key.



15. The two keys can be cut from a small piece of scrap, and should look something like this before sanding.



14. Cut the keyholes in both ends of the longer lower shelf. You can do this by hand, or you can do it at the mortising machine.

15. Use two pieces of stock $\frac{3}{8}$ " thick by 2 $\frac{1}{2}$ " long by 1" wide to form the keys that will secure the lower shelf to the two sides. Cut the key according to photo 15.

16. Dry fit all the pieces to ensure they all go together properly, then disassemble them and proceed to the next step.

17. Use a $\frac{1}{2}$ " roundover bit in your router to finish the edges on all four shelves.



18. At this point you'll need to do your finishing sanding. Start out with a coarse grade sandpaper, and then work your way through the grades to at least 220-grit. Pay strict attention to the detail work. If you have a spindle sander, this is where it will come into its own. If you have a detail sander, that will be useful too. Spend some quality time finishing the ends of the tenons, and the keys; these are a prominent feature of the piece and must be nicely finished.



18. A spindle sander is the ideal tool for smoothing the inside radius of the side blanks. If you don't have one, consider getting a drum sanding attachment for your drill press.

19. Ease the sharp corners around both of the two sides.

20. If you have chosen to use a stain, it's best that you apply it now while the piece is still awaiting assembly. If you're going to fume the piece, you can leave it until after final assembly.



You can't beat a detail sander for getting into all those awkward little places.

21. Glue, assemble and clamp the piece. Check that it stands squarely and upright on the bench. Clean away any glue that might have squeezed out, then set it aside until the glue has fully cured, at least overnight.

22. Remove the clamps, apply a little glue to the inside faces of the two keys, and then drive them gently into place. Do not apply too much force; you don't want to split the tenons.

23. If you've decided to fume the piece, now's the time to do it.

24. Do any necessary finish sanding, to remove any grain that might have been raised during the previous steps, and then apply a coat of beeswax or, for a more durable finish, satin polyurethane.



21. It's essential that you clamp everything securely on a flat surface; if not, you may find you have a wobbly stand.

SUPPLIERS

Hardware

Ball & Ball - reproduction hardware
463 West Lincoln Highway
Exton PA 19341
800-257-3711

Craftsman Hardware Co. - reproduction hardware
PO Box 161
Marceline, MO 64658
800-376-2481

Renovator's Supply - antique hardware
Millers Falls, MA 01349
800-659-2211

Rockler Woodworking
and Hardware - Stickley hardware
4365 Willow Dr
Medina MN 55340
800-279-4441

Stains and finishes

W. D. Lockwood & Co. - wood dyes
81-83 Franklin St.
New York NY 10013
800-966-4046

Old Mille Cabinet Shoppe - antique finishes
1660 Camp Betty Washington Road
York, PA 17402
717-755-8884

Star Finishing Products Inc. - finishes
360 Shore Dr.
Hinsdale, IL 60521
800-323-5390

Woodworker's Supply - water-based finishes
5604 Alameda Place
Albuquerque, NM 87113
800-645-9292

General Woodworking Supplies

Constantines
2050 Eastchester Rd
Bronx, NY 10461
(800)-223-8087

Highland Hardware
1045 N. Highland Ave.
Atlanta, GA 30306
800-241-6748

McFeely's
1620 Wythe Rd.
Lynchburg, VA 24506-1169
800-443-7937

Trend-Lines
135 American Legion Hwy
Revere, MA 02151
800-767-9999

Woodcraft Supply Corp.
PO Box 1686
Parkersburg, WV 26102-1686
800-225-1153

ARTS & CRAFTS FURNITURE

Projects You Can Build *for the* Home

BLAIR HOWARD



Step-by-step
instructions for
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projects.



Arts & Crafts furniture and the Craftsman-style furniture of Gustav Stickley have enjoyed an astonishing resurgence in popularity. Here Blair Howard presents 15 projects for the woodworker. These projects represent the work of not only the most famous members of the movement but also of such designers as Oscar Onken and Charles Limbert, whose works are not commonly presented in other woodworking project books. Howard gives solid, concise information on how to choose lumber and obtain hardware, what tools to use, how to make the joints, and how to apply a finish, including the traditional fumed-oak finish. Each project contains step by step instructions together with measured drawings and a bill of materials.

Projects include:

- ◆ Writing Desk by Gustav Stickley
- ◆ Magazine Stand by Charles Limbert
- ◆ Book Stand by Oscar Onken
- ◆ Book Case by Charles Limbert
- ◆ Print Stand by Frank Lloyd Wright

...Plus eight more projects.

All of the projects were chosen for their popularity, such as the book case and coffee table, and for their ease of construction, for example, the Stickley mirror, the tea tray and the Limbert pedestal. All projects involve basic construction techniques and will complement any home style.

Blair Howard is a furniture designer and builder. He is an experienced writer and woodworker living in Tennessee. This is his third furniture book.

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