

WOODWORKER'S HANDBOOK

A PRACTICAL POWER TOOL MANUAL
by The WALKER-TURNER CO. INC.

WOODWORKER'S HANDBOOK

A PRACTICAL MANUAL
for Guidance in Planning, Installing and
Operating Power Workshops

Published by
WALKER-TURNER CO., Inc.
Plainfield New Jersey

To
the *Home Craftsman*
who applies his time, thought, and
effort to the constructive things of life
and, in so doing, brings happiness to
others, this book is cordially
dedicated.

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PREFACE

In preparing this, the third **Driver Manual**, we have endeavored to submit projects that would appeal to the man who is just becoming interested in tools and their use, as well as to the advanced craftsman. Above all we have tried to confine our views to facts—to solving the problems that beset every user of tools, in simple, practical ways which are the result of intimate contact with wood-working tools and their uses.

Each project described here has been carefully worked out by an experienced furniture designer whose creations in finished furniture are on display in salesrooms the country over. First the rough drawings were sketched, then each separate part was made, and the piece assembled and finished. Every step and problem has been submitted to craftsmen not nearly so expert to be sure the operations would not entail too much skill for the average amateur. Every mechanical operation was performed with stock "Driver" Power Tools and accessories.

Many craftsmen who are capable of doing excellent work have been disappointed with the result of their efforts in building a project mainly because the design or proportions were incorrect. After all it is just as easy to build correctly and certainly there is more satisfaction when the article made is a thing of appealing beauty and symmetry.

We have attempted to place before you all the available information on the subjects covered. If you find this book helpful in your work we will be fully repaid by knowing that we have rendered a definite service. If we have not we would welcome your calling any shortcomings to our attention.

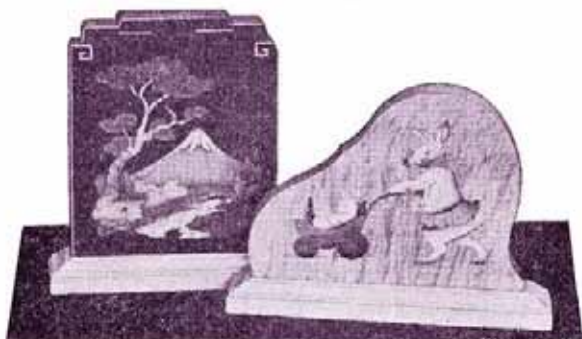
Please feel that the services of our furniture designers are at your command to answer any problems you may encounter in woodworking just as our engineers are always ready to help you with mechanical problems.

Educational Dept.,
Walker-Turner Co., Inc.

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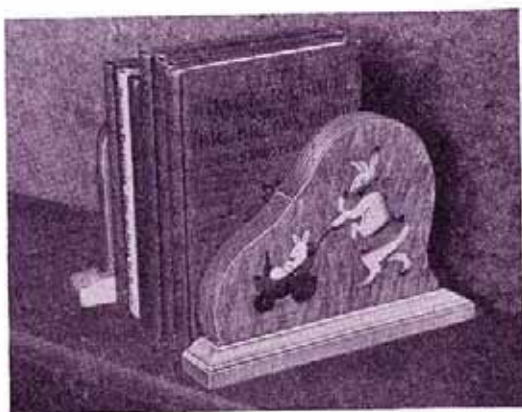
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BOOK ENDS OF RARE WOODS



EVERY home, no matter how modest or how pretentious, has a place for these very attractive book ends. Genuine rare woods always lend charm to decorative articles such as these. Gifts and novelty shops everywhere demand high prices for these book-ends, yet the home craftsman can, with little effort or equipment, transfer these inlaid veneers to blocks of wood and readily shape them.

We do not suggest that you cut these various woods out to form the design, although some "old timers" do. The designs shown are available throughout the United States. If you have difficulty in obtaining any particular designs your tool store can get them from the publishers of this book. The kinds of wood in these designs and their sources are given below.



Bubinga — Couga (Africa)
Mahogany — Africa
Birds' Eye Maple — United States

SUNBURST

Rosewood — East Indies
Boxwood — Guianas (S. A.)
Stained Green — France

Thuya — Morocco

BURL

Birds' Eye Maple — United States

Prima Vera — Central America
Pearwood — Switzerland
Harewood — England
Walnut — United States
Oak — United States

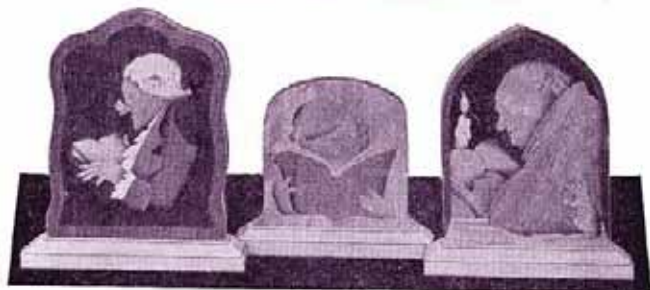
MONK IN CELL

Satin — West Indies
Holly — Mississippi
Mahogany — Africa
Boxwood — West Indies
Yellow and Black — United States

Mahogany — Africa

GOTHIC

Lacewood — Australia



MOUNTAIN

Harewood — England
Walnut — United States
Pearwood — Switzerland

Tamo — Japan
Redwood Burl — California
Zelra — Africa

Figured Ash — England

RABBIT

Thuya — Morocco
Holly — Mississippi
Bird's Eye Maple — United States

Satin — West Indies
Boxwood — Guianas (S. A.)
Stained Woods — U. S. and France

PRUDE

Pearwood — Switzerland
Holly — Mississippi
Boxwood — Guianas (S. A.)

Harewood — England
Walnut — United States
Stained Woods — U. S. and France

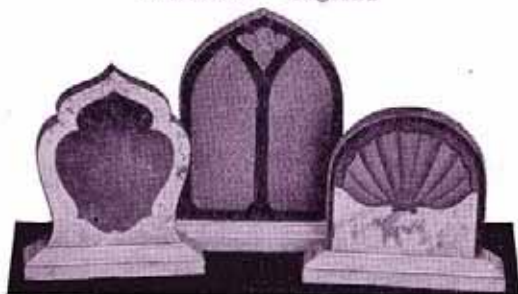
THE HAPPY MONK

Arodire — Africa
Pearwood — Switzerland
Holly — Mississippi

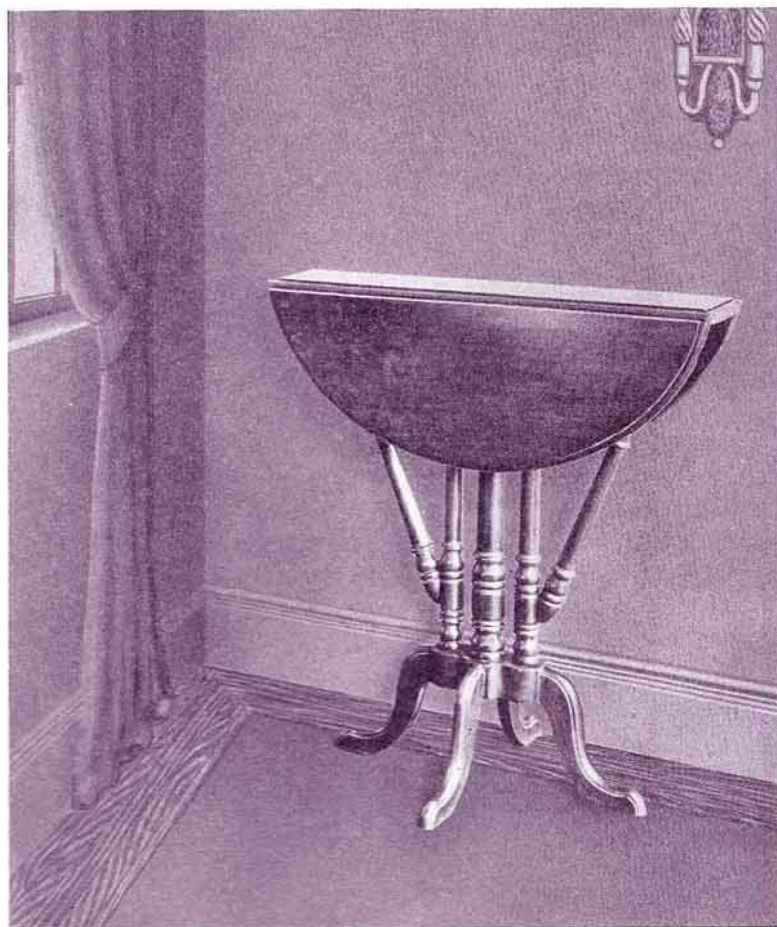
Purple — France
Lacewood — Australia
Harewood — England

Two types of these designs are available, one with a fabric backing, the other backed with paper. They require different treatment.

Those with the fabric back are glued to a block of wood, of any desired thickness, then sawed out to shapes shown here or others that may be preferred. Liquid glue is applied both to the block and to the fabric side of design. Casein glue should not be used as it may stain through the delicately colored woods. After glueing, put design in place on block and clamp it tightly until dry. Saw out the block to shape and sand face lightly with finest grade sand paper. A coat or two of thin shellac, each sanded off, followed by an application of wax gives an excellent finish. With the paper-backed designs it is necessary to glue them face down on the block. Then, after glueing, the paper is sanded off. Inlay borders and decorative designs are also available which lend distinction to furniture and numerous other articles. They may be used as inlays or overlays. For inlaying instructions, see the article on the Drill Press.

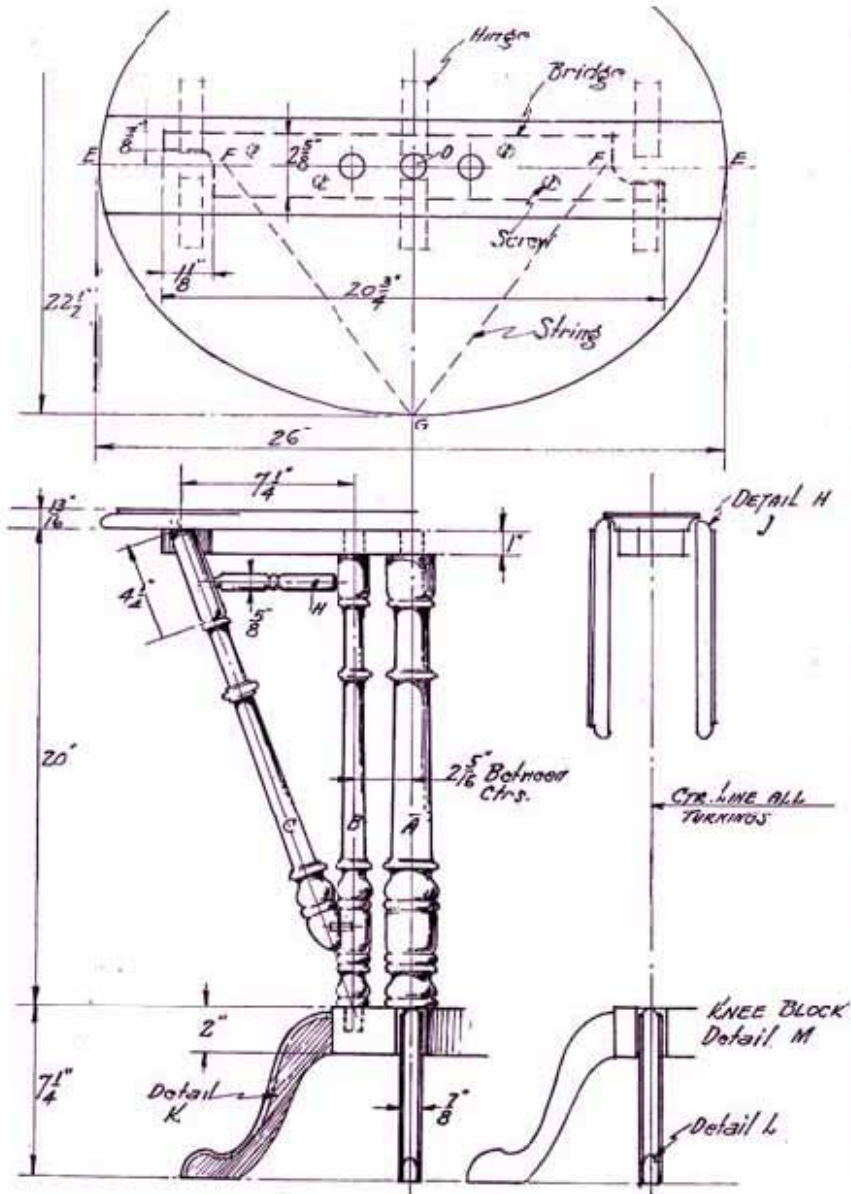


A DROP LEAF SIDE TABLE

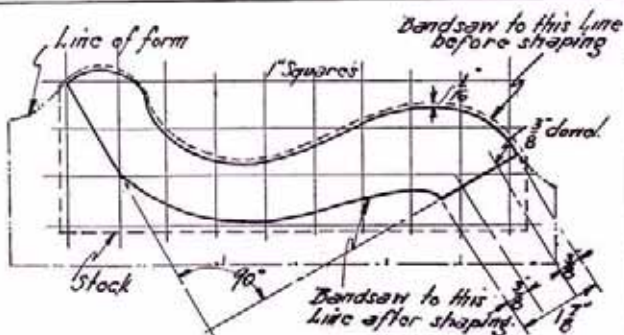
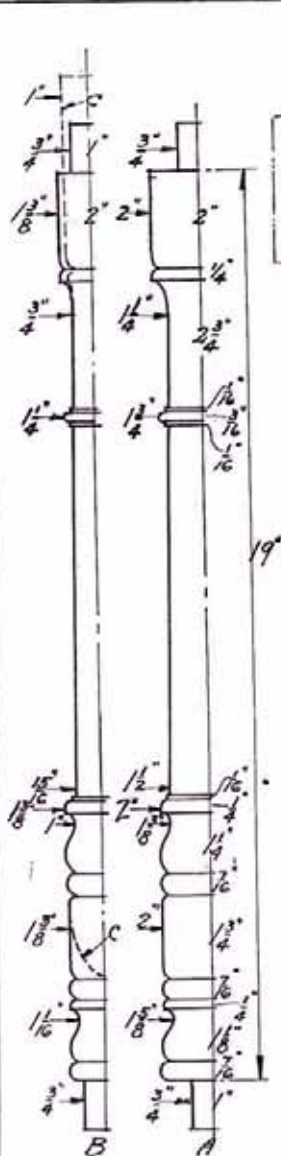


BACK in the days when our country was in the making, candles were the source of light. The forms and shapes which the candle "withes" or tables took, as an accessory to the candle and candlestick, were many.

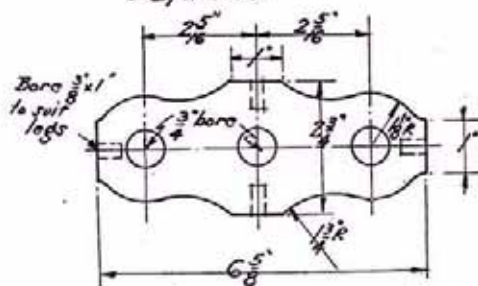
Taking this idea, and combining it with the drop leaf idea, gives us the nucleus of a very beautiful creation. Usable as a bedside night table, under a window for plants, in the living room as a side table, or in the hallway as a little reception table, it makes a mighty pleasing little addition to the home and is of such a simple style as to fit in with almost any scheme of decoration.



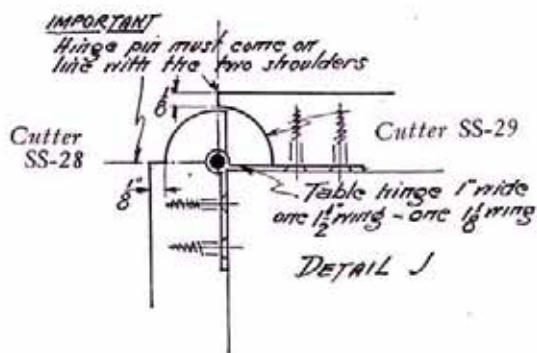
Designed & drawn by Lester A. Barber



DETAIL K.



KNEE BLOCK - DETAIL M



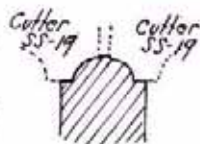
DETAIL J

Making the Turned Parts

First make your turning template, and note that the length dimensions of all turnings are alike except the wing turnings which are slightly different at each end. Make the template to suit the larger turning A. After using, change the marked sizes to suit turning B, then later change sizes again to suit turning C.

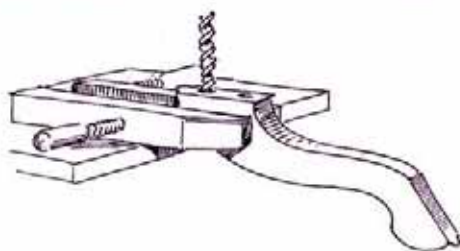
Allow for plenty of dowel turned on the ends; they can always be cut off later.

Next make the form for the shaping of the legs. Use as a base for this a piece of wood exactly the same shape as the front or knee side of the leg. The back, heel and shoulder of the legs are bandsawed and drum sanded to shape later. This allows a firm screwing down of the leg stock to the form. Sand the front or working edge smooth and exactly to shape. Remember that any irregularities in this edge are going to show up on the finished leg. Now turn a hard wood collar $1\frac{1}{8}$ " in diameter with a $\frac{1}{2}$ " hole, of the same thickness as your form, bevel the edges about $\frac{1}{8}$ ". Using the small radius of cutter number SS-18 the collar is put above the cutter and the cut made on the bottom edge of the stock. The form bearing against the collar develops the shape. Don't forget to paraffin both form and collar. After cutting one edge of each leg, turn the form over, and repeat the cut on the other edge. This will leave a ridge



DETAIL L.

in the middle which is carefully drum sanded to shape. The final hand sanding will eliminate all traces of it. Now from a cardboard template, mark off the balance of the leg shape on your stock, bandsaw it out and drum sand to shape to a smooth flowing curve. Check the angle at the knee with the toe angle to make sure it is exactly 90° .

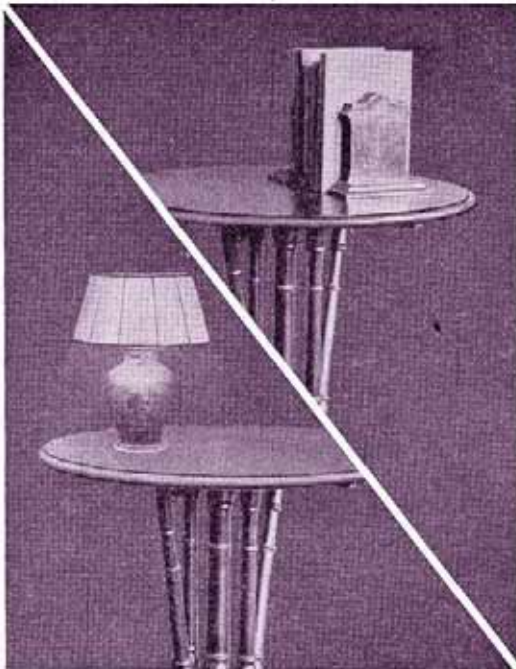


Knee Block and Bridge Piece

The knee block, in which the pedestal is fastened and the wings swivel, is bandsawed and sanded to shape with the 1" lathe sanding spindle, bored for the dowels of the legs, which are glued into place. Set this assembly on a level surface to let the glue set.

Now get out your bridge piece, using maple or birch, boring holes for the turning dowels and screw holes. Countersink the screw holes.

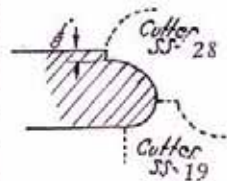
In making the top, a 4" wide x 27" piece for the centre and two



pieces 27" long x 10" wide are jointed on the edges. With cutter SS-28 run the cove on each side of the 4" piece. With cutter SS-29 run the round on one edge of each of the 10" wide pieces. Fit the hinges and make sure that the leaves hinge and fit properly before going any further. It is necessary to rout out to a depth of $3/32$ " for the hinge wings and a groove $5/16$ " deep for the hinge center. When you are satisfied with the fitting and working of this, lay out and bandsaw the top to the

elliptical form. All subsequent operations on the top are made with the leaves and center hinged together and treated as you would a one-piece top. On the plan, note points marked. Distance ED is laid off from point G to where it crosses line EE at FF. With pins driven in at FF and a string tied in the form of a triangle FFG start with a pencil at G and swing around inside the string, keeping the string taut. A perfect ellipse will result.

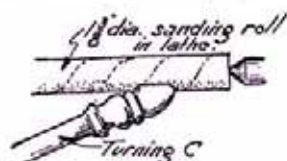
Now very carefully bandsaw and then sand to this line. Finish the edge as if it were to be left square, with no bumps or hollows, since we are going to use this edge as a form for shaping. With a collar $13/16$ " in diameter and cutter SS-28 on under it on the shaper spindle adjust the height to give a $1/8$ " shoulder and run this all around the edge of the top, keeping against the collar firmly. (A strip of wood bradded across the upper side of the top will assist in the handling and keep the leaves from dropping down.) Turn the top over, and with cutter SS-18 round the other edge of the top. The junction of the two cutters and the rubbing of the wood against the collar will leave a slight flat on the moulded edge which is sanded off easily, resulting in a pleasingly moulded top.



Assembling

Lay out the angle at which the swivel and wing turnings meet

full size and with the turning laid on this, mark off the location of the fitting, the holes for the dowels and the bracket piece H. Mark lines on the turning C showing line of center of dowel. With C held in clamp on drill press table bore the holes, then sand C on a $1\frac{3}{8}$ " sanding spindle, holding at a proper angle while so doing. Study



this operation carefully and be sure you understand it before actually doing it. Study the sketch. Assemble turnings BC and H to form triangles, to dimensions given.

With turnings slipped, but not glued in the bridge and the knee block, drive and glue the pedestal turning A into place. Test the alignment of the bridge with the long center of the knee block and let the glue set. Then screw the bridge to the top. See that turnings C fit into the depressions at the bridge ends and the leaves drop properly. Give the entire table a final sanding with fine paper and the table is ready for finishing.

Since the hinges are concealed the table is finished in assembled form, with the leaves dropped, while working on the top, which is always worked on last in each application.

In a brown mahogany the table presents a handsome appearance, although a deep cherry red will also present a very striking note as to color. In walnut, a rich brown may be used. (See finishing instructions.)

BILL OF MATERIAL

Pieces T. W. L.

1	$\frac{3}{4}$ "	4	26"
2	$\frac{3}{4}$ "	10	26"
4	1"	$3\frac{1}{2}$ "	10"
1	2"	3"	7"
1	$2\frac{1}{4}$ "	$2\frac{1}{4}$ "	24"

Pieces T. W. L.

2	$1\frac{1}{2}$ "	$1\frac{1}{2}$ "	24"
2	$1\frac{1}{2}$ "	$1\frac{1}{2}$ "	22"
1	1"	3"	21" Birch

The hardware accessories may be ordered direct from the publisher of this handbook. Items shown come prepaid.

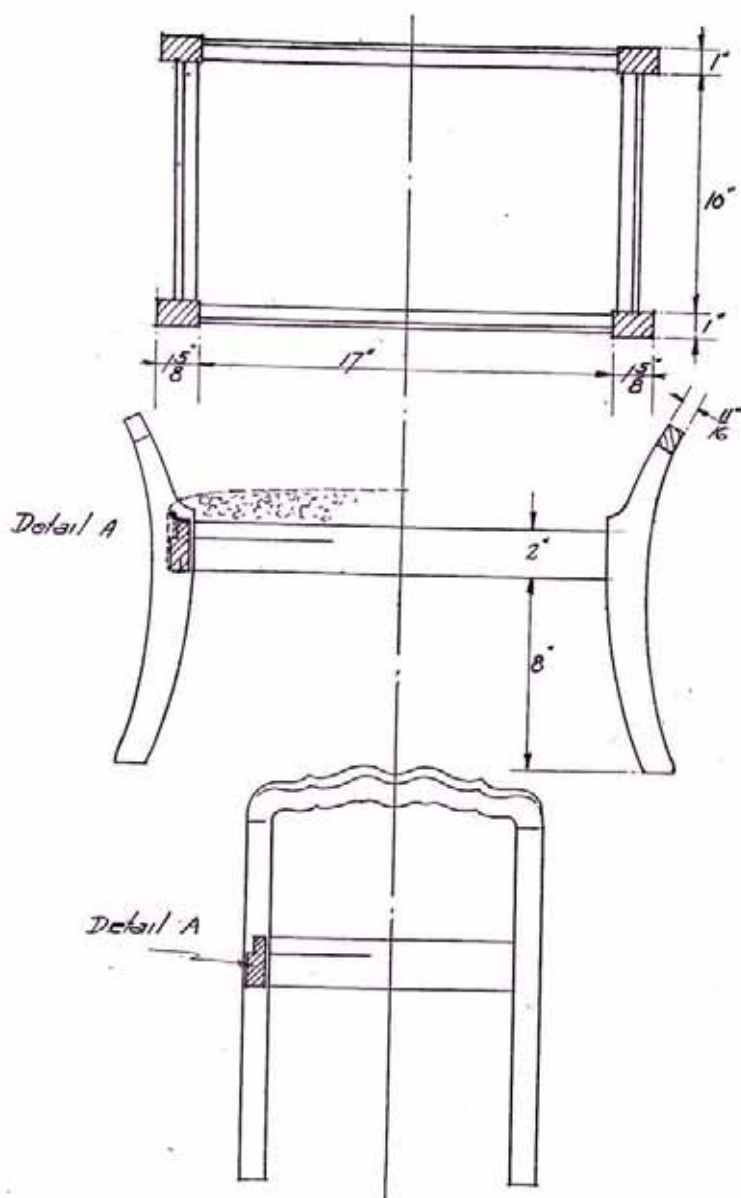
No. MC-2300 Hinges (6 needed).....\$.20 each

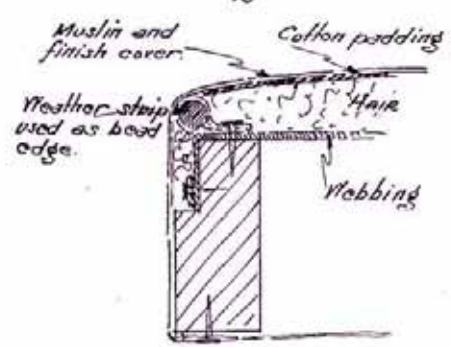
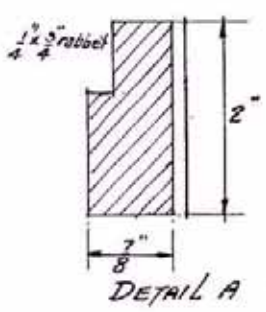
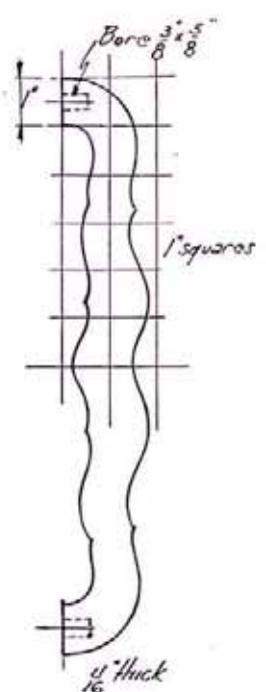
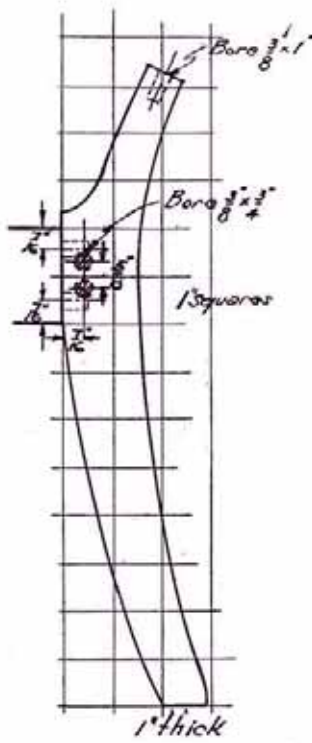
FIRESIDE FOOT STOOL



THE lumber selected for this particular foot stool or fireside bench was birch, since it has a close grain, great strength and takes a finish to match almost any wood. Walnut, mahogany or even the softer woods such as gum or poplar may be used, but the life of the bench will be considerably shortened.

The first thing to do, of course, is to lay out the patterns for the legs and top rails. Cut them from fairly heavy paper, and maneuver them together at one end of your piece of lumber so as to get them out with the least possible waste. The four rails should be ripped





Detail of upholstery

off one side of the board, which leaves us four inches of board on which to work. Now carefully bandsaw the legs and top rails out, leaving the line showing. Then carefully sand them, using the sanding machine for most of the leg, except the small curve just above the point where the rails join, which can be done better on the sanding drum, mounted on the shaper. The top rail is sanded to shape, with the exception of the sides, on the drum. It might be well to point out that at the top ends of the legs and the ends of the top rails, where the two join, leave a little stock extra, for fitting, to be taken off after assembly.

Making the Side and End Rails

Now take your side and end rails, and run a rabbet on one side of each, $\frac{3}{4}$ " wide by $\frac{1}{4}$ " deep. They need only be rough, since they will be entirely covered with the upholstery. Now cut them accurately to length, test the ends for squareness. Now lay off the centers for the dowels, on the ends and drive a small brad in at each point, cutting the brads off to allow about $\frac{1}{16}$ " to project.

On the legs, lay out the location of the rails. Then by carefully holding a rail in its proper place, and then pressing the two together, an accurate location will be transferred to the leg for the dowel holes. Pull out the brads, and make the centres more definable with a sharp centre punch. Number each rail end and its location on each leg.

The dowel holes are next in order. Use the drill press or the boring table on the lathe. On the latter, clamp a piece of wood across the table as a backing, testing for squareness. The holes must be a driving fit for the dowels to insure rigidity in the bench.

Assembling

The top rails, end rails and legs are assembled and glued together first. After the glue has set, they are finished up at the joints between the top rails and legs and then the side rails are set in place. It will be necessary to run the drill into the holes of the legs before this operation, since the dowels of the side rails run into those of the end rails.

This has a key effect on the end rail dowels, which adds to the strength.

Finishing and Upholstering

The bench is now ready for finishing which may be in any desired stain or color. A filler of the same color as the stain should be used. Three coats of shellac should be applied and sanded and then the surface well waxed.

To upholster the bench, stretch the webbing across, tacking it into the rabbet on the rails, weaving the webbing over and under the crossing strips. Then along the edges of the rails tack a strip of weather strip (of the roll type). Cover this with the muslin, tacking on one side and one end only. Stuff hair under this cover, arranging it to produce no lumps. When you get to the loose sides, start tacking at one corner and proceed along the side, stuffing in hair as you go. When the cover is completely in place, final arranging of the hair to eliminate lumps or pockets may be done by jabbing an ice pick through the muslin and pushing the hair where you wish it.

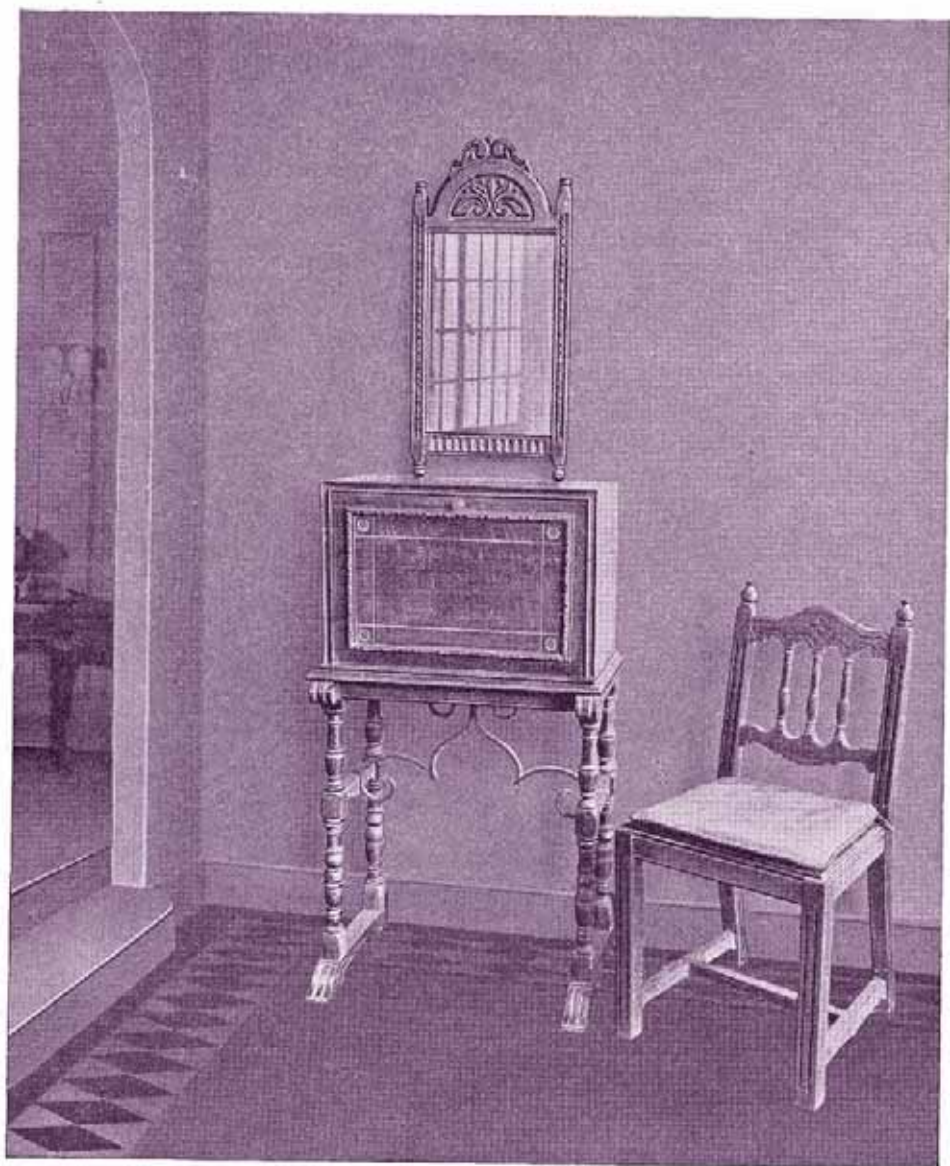
In putting on the final covering, cut out a paper pattern which will fit on the top, cutting in at the corners on a forty-five degree angle to almost the point where the inside corners of the legs come. Then these corners are cut out, the edges folded under, the cover stretched into shape and tacked fast to the under side of the rails. A final finishing touch is to tack a piece of muslin under the bottom, as a dust cover and to prevent the hair which works loose from falling. Brass headed tacks may be run along the bottom edge of the rails if desired, but are not really necessary.

An alternate finish which produces a dainty little stool for milady's boudoir is to lacquer the wood in a pastel shade and upholster it with a gay matching cretonne.

BILL OF MATERIAL

Pieces	T.	W.	L.	Pieces
1	1	6	72" Birch	1 package cotton batting
3	yards		webbing	$\frac{1}{2}$ pound curled hair
$\frac{1}{2}$	yard		unbleached muslin	$\frac{1}{2}$ yard upholstery covering

AN ITALIAN CABINET ENSEMBLE



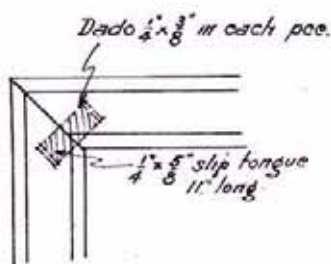
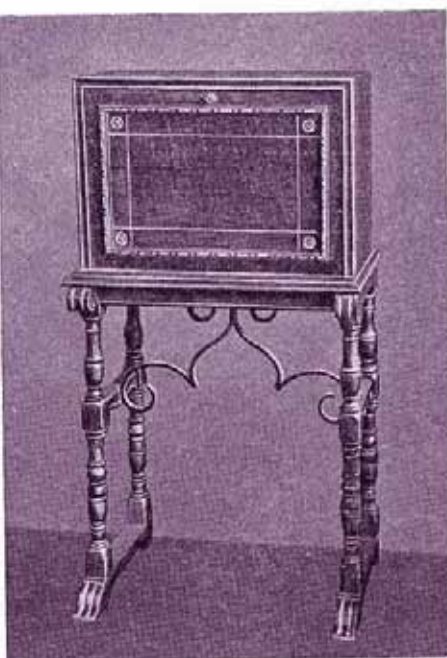
The Cabinet

WHICH may be used as a dainty little desk to grace milady's boudoir. Or it may be employed as a radio cabinet, telephone cabinet or even as a hall console piece, to fill that empty gap in an otherwise easy-to-furnish hall. Of a design that borders on the line between Spanish and Italian, it may be used to piece out a scheme of decoration in either style.

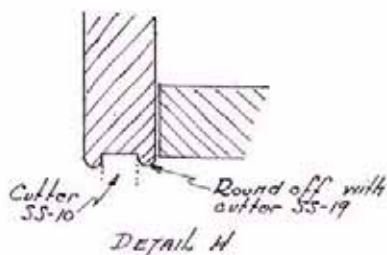
Carving Effects are Easily Done

The cabinet itself is made of solid walnut, with mitred and slip tongue joint. This is easily accomplished on the bench saw, through the medium of the

tilting table. The dado is run with the table tilted, and the panels



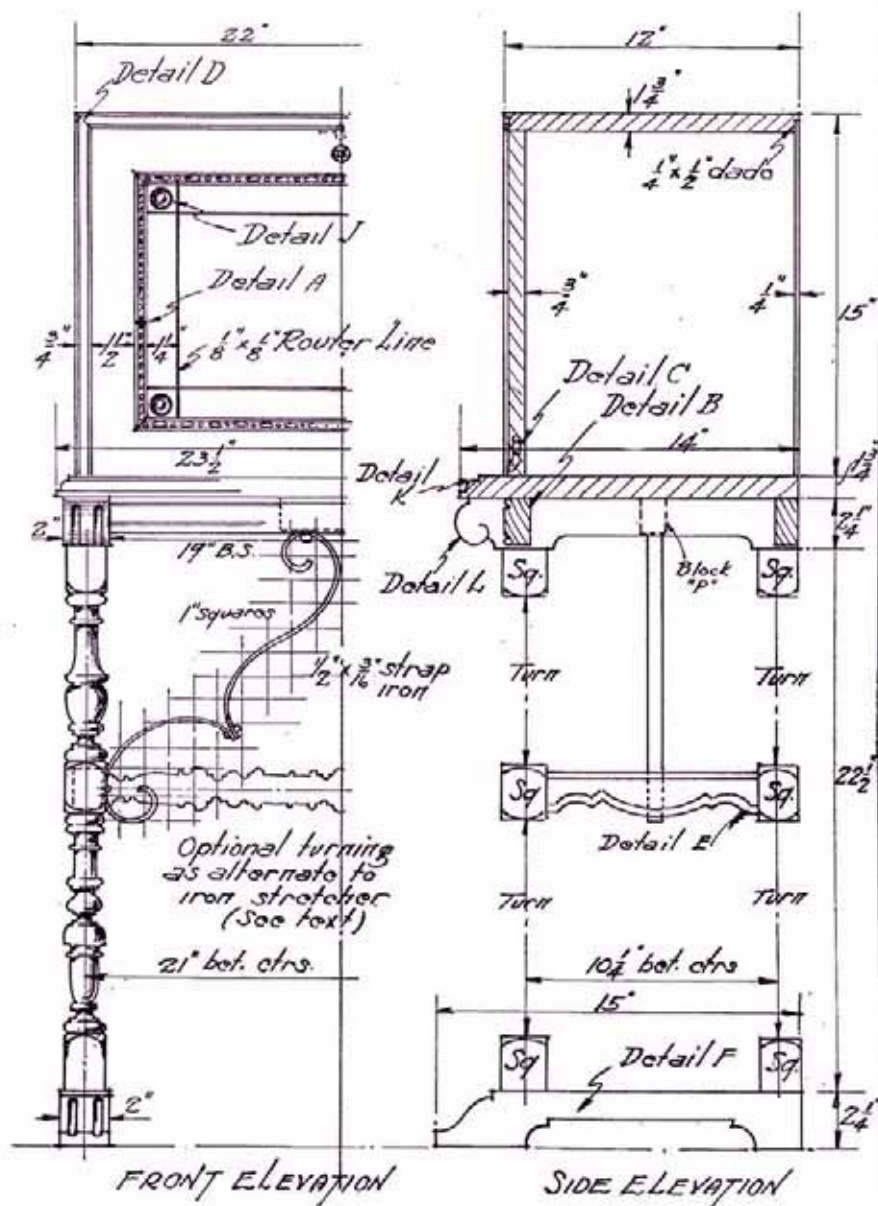
DETAIL D



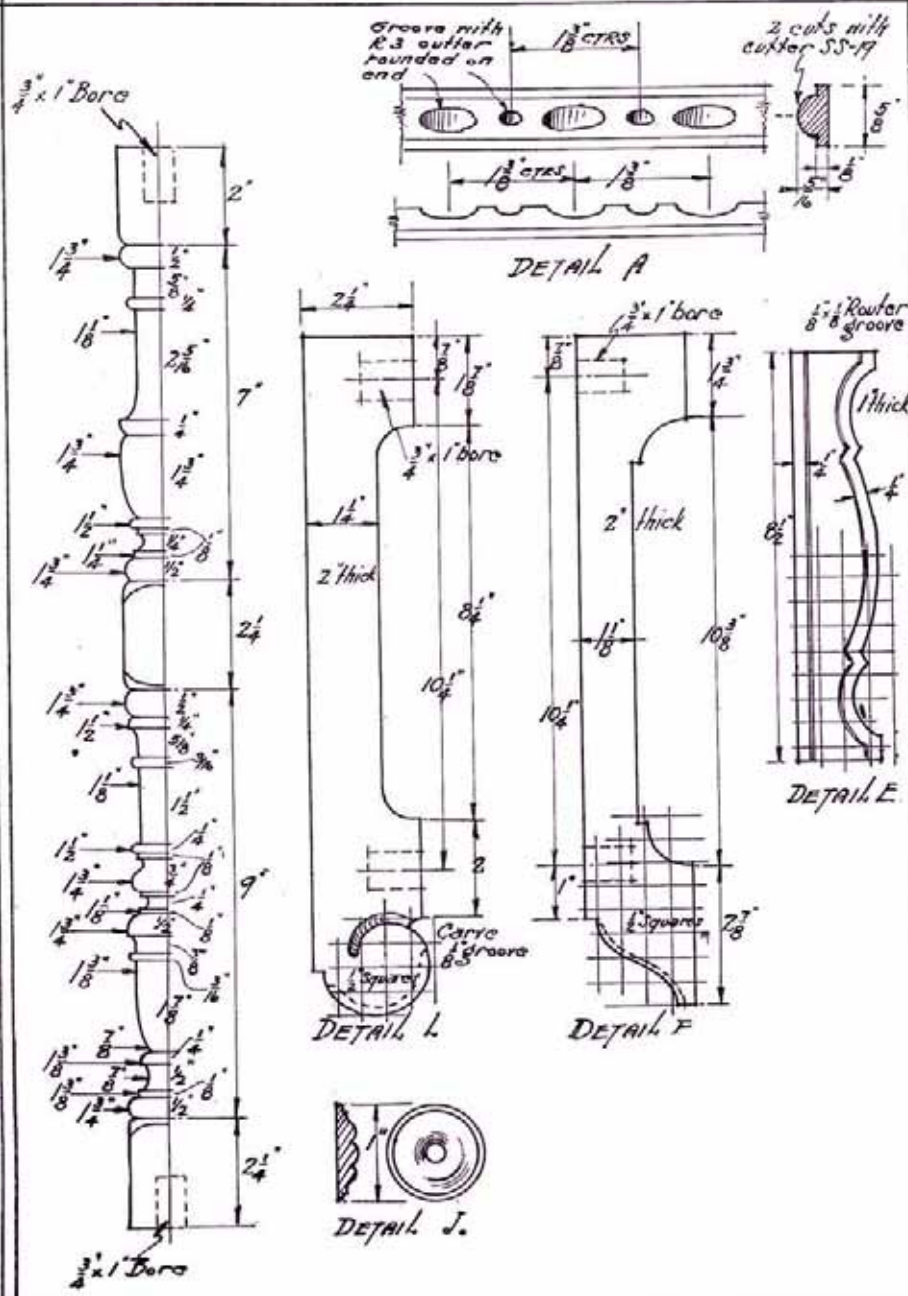
DETAIL H

above the cutters, the fence, used as a guide, stopping the cut 1 inch from the front ends. The door is of glued-up stock of 2 pieces with the router lines cut on the drill press with cutter R-1.

The rosettes are face-turned on the lathe, and applied with a brad and glue. The moulding used to embellish the front is first run on the shaper or drill press to give the shape shown in Detail A. Then with a router cutter R-3, which has been ground to a round end, and the moulding between guide strips clamped on the bed of the drill press, spot or drill down into the bead part way, which will produce



Designed & drawn by Lester A. Burfoot.



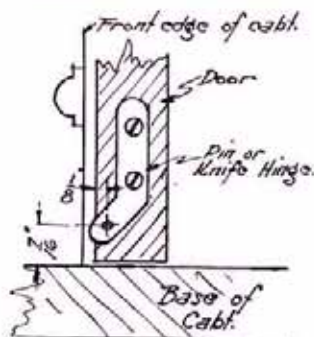
an oval depression, about $\frac{1}{4}$ " long. Move the moulding $\frac{5}{8}$ ", run router down to the same depth as before, and while the cutter is down, move the moulding to the left until a depression $\frac{3}{4}$ " long is formed. If at all possible, make enough moulding in one strip, allowing several inches extra for waste in mitring and matching corners for the four pieces necessary.

The back of the cabinet is rabbeted to take the plywood, with a $\frac{1}{4}$ " x $\frac{1}{2}$ " rabbet.

Interior

No specific dimensions are given for the interior, other than a suggested arrangement of shelves for desk or telephone cabinet.

Individual taste will govern the arrangement. Note, however, the construction as indicated which will make a self supporting unit, which is finished separately from the cabinet, and put in place completely assembled, by screwing fast to the top of the cabinet.



DETAIL C.

the lathe centers and turn. The rounding of the square portion of the turning is best done with a $\frac{1}{2}$ " round nose or gouge chisel, taking a very light cut. On the square stock, locate and mark, on all four sides the position of the squares. The lines will be seen while the stock is revolving.

Turning the Legs

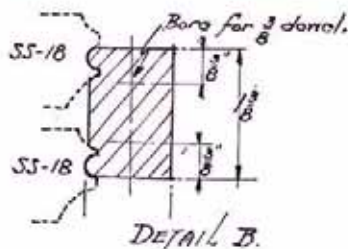
Make the template for the turning as indicated. Get out the post lengths and carefully joint them to $1\frac{3}{4}$ " square.

Very, very carefully center the ends for

Cabinet Base and Parts

The base of the cabinet is a solid piece, with a moulded edge shaped with cutter SS-19. The cabinet is doweled to the base with three $\frac{3}{8}$ " dowels each end.

The door is hinged through the medium of what is known as a knife or pin hinge, offset type, No. 1595 which will make the best appearance. Make sure that the moulding on the door clears the edge of the cabinet bottom and rests in a horizontal position when open. A desk lid support No. 620 is mounted on each side to take the strain off the lid. A bullet or spring type catch No. 684 or lock is used to keep the lid closed. A knob, No. H-971, is suggested for the lid.

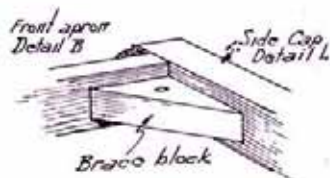


Brackets and Stretchers

The upper brackets and the base stretchers may be gotten out now. Since the machine work on both requires the same set ups, work them together. The pieces are bandsawed to shape, sanded and finished and the flutes on the front ends run in with cutter SS-7 on the drill press, using one or more SS-14 collars as a depth gauge. Bore for the $\frac{3}{4}$ " dowels which were left on the ends of the turnings.

The end stretchers are gotten out next. Bandsaw a form to the shape between the $\frac{1}{8}$ " router lines shown on the sides. With this tacked on either side and used as a guide against the pin on the board described among the jigs, the line may be run accurately to shape, on each side of the piece. With brads locating the dowel centers, transfer these centers to the middle square section of the legs and bore for the dowels.

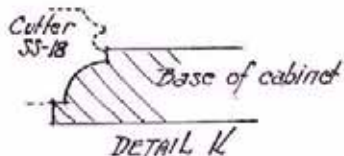
Assemble the legs and end stretchers. While the glue is hardening, get out the front and back aprons. The front one has a bead moulded on each edge with cutter SS-18. Locate the dowel centers and put in brads.



DETAIL N

Ironwork Stretcher

If the ironwork stretcher is to be used, it is easily made, with two small monkey wrenches and a vise, the jaw of the wrenches being closed almost to the thickness of the iron used which may be $\frac{1}{2}$ "x $\frac{1}{8}$ ", $\frac{1}{2}$ "x $\frac{3}{16}$ ", $\frac{5}{8}$ "x $\frac{1}{8}$ ", or $\frac{3}{16}$ " as availability will decide. With one end between the jaws of a wrench which is mounted in the vise, with the handle horizontal and the jaws upright, use the other wrench as a lever to bend the iron. Very little effort is needed to bend the iron. As the bend is made, move the iron forward in the vise-held wrench, take a new bite with the hand-held wrench and bend again. It will be necessary to make a full size detail of the shape of the iron, against which you check the bends as you make them. It is remarkably easy to get the hang of it.



DETAIL K

After the shapes are completed, lay them aside, until later and make the base for the cabinet, moulding edge as shown.

Assembling

The leg assemblies and the aprons may now be bored for dowels and assembled in complete form.

After the glue has hardened, the entire base assembly is fastened to the cabinet assembly with four No. 10x1½" flat head wood screws, run through triangular shaped blocks which have been glued into the corners of the base assembly, (See detail N.) which are set ⅛" below the top of the aprons.

A block "P", about 6 x 1½" x 1½" is fastened with screws and glued on the under side of the cabinet base, centring it both ways. Turn the cabinet upside down and lay the iron brackets in place, resting on this block "P", and leaning against the side stretcher. After adjusting until they are evenly placed, mark the location of and bore holes for No. 10 R. H. Blue wood screws. Bore the holes and mount the brackets in place and the cabinet is ready for finishing.



*Telephone type
inferior*



*Writing desk
inferior*

For those who might prefer a wooden stretcher, a suggested turning is shown. Using the various groups of beads and shapes of the legs (dimensions of which are given), and re-grouping these, a nice stretcher will result. Dimensions were purposely omitted, to include a problem for the craftsman.

Don't use both the ironwork and the turned stretcher.

For finishing instructions see those given for the mirror of this group.

BILL OF MATERIAL

Pieces	T.	W.	L.
1	¾"	12"	22"
2	¾"	12"	16"
1	¾"	15"	21"
1	¾"	14"	24"
2	1 ¼"	2"	14 ½"
2	2"	2 ¼"	15"

Pieces	T.	W.	L.
2	1"	2"	8 ½"
2	¾"	2"	19 ½"
4	1 ¼"	1 ¼"	26"
1	piece ¼" plywood panel 21 x 15" in birch or poplar		

The list of hardware accessories may be ordered direct from the publisher of this handbook. Items shown come prepaid.

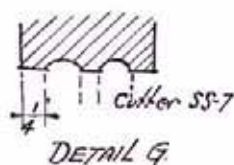
No. H-971 Antique Knob.....\$.15	No. 1595 Hinge (per pair)....\$.20
No. 683 Bullet Catch (with stop) .10	No. 620 Lid Support..... .18

AN ITALIAN CHAIR

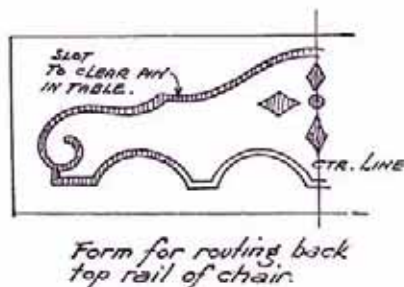
SOMETHING a little different for the home craftsman! Something not usually offered as a project to be attempted by the average amateur, and yet there is really nothing hard about it. The paramount thing is to work accurately, working each piece out as if it were a finished project. Then the assembly should be a fairly easy matter. Solid walnut is used.

Shaping the Legs

Suppose we start with the legs. The template for the

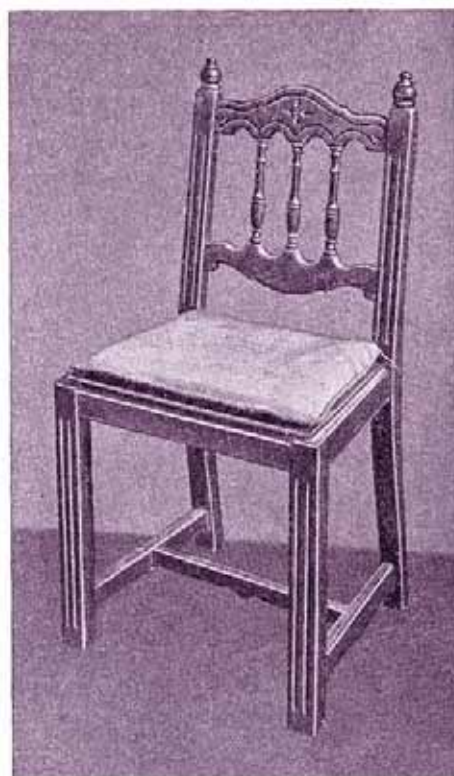


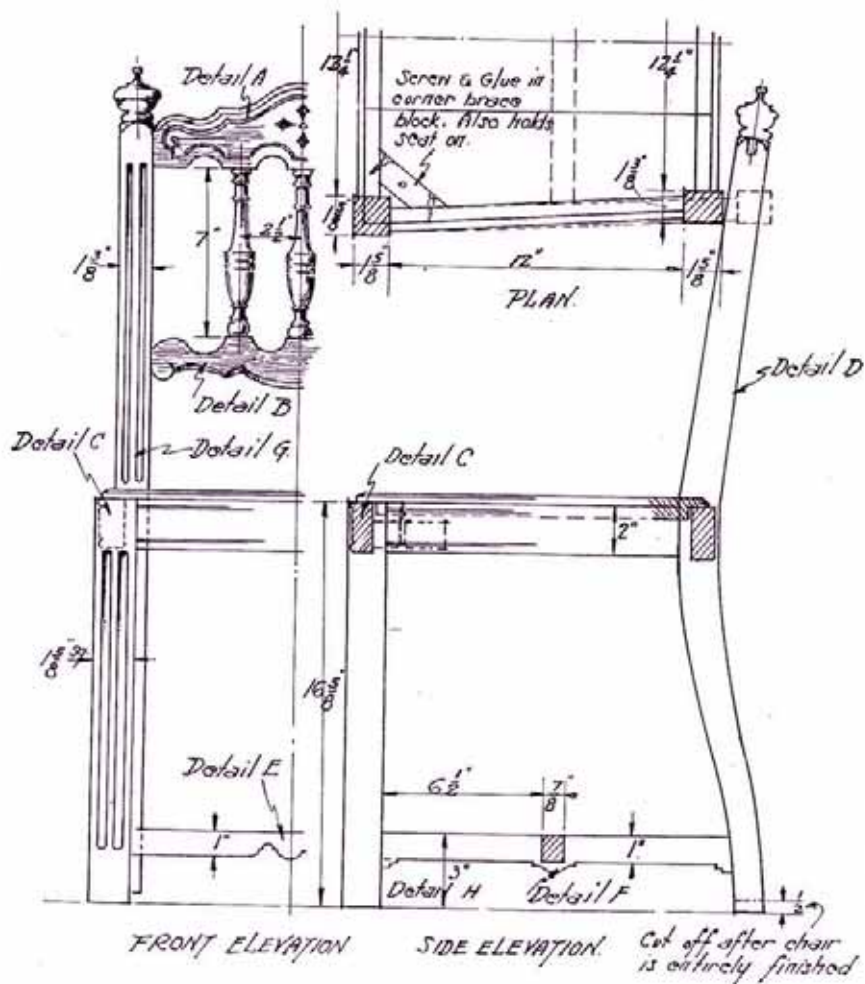
back leg shapes are carefully laid out and band-sawed to shape. Then with a small hand plane and a metal type adjustable spoke shave, work the curves smooth, so as to leave no bumps or hollows. The front legs are simply squares. With cutter SS-7 and the auxiliary spindle in the drill press, with a depth washer SS-14, cut the flutes in both back and front legs, stopping the flutes at points shown.



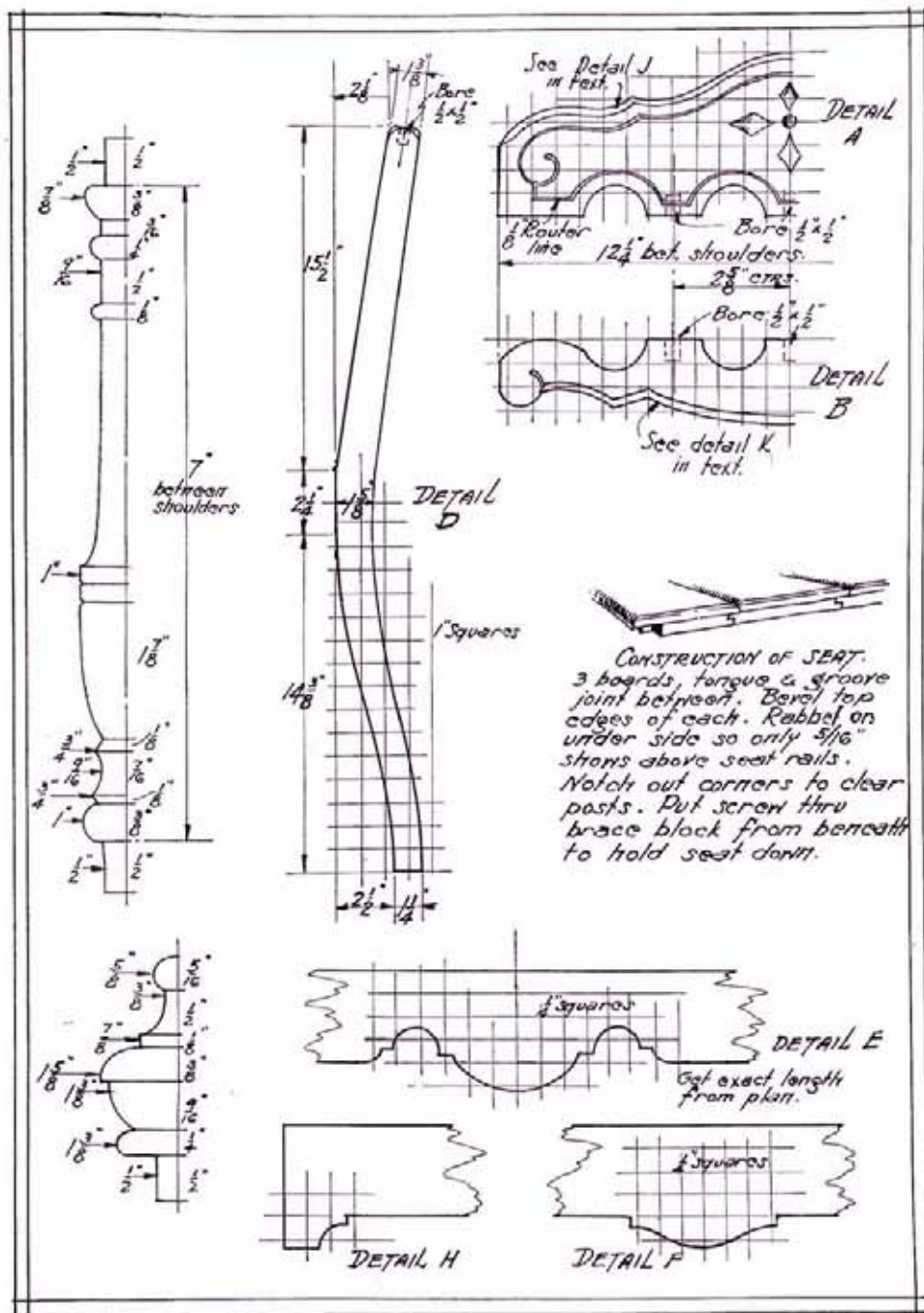
Making the Top Rail

Now take the top rail of the back. Trace off the entire back on a piece of $\frac{1}{4}$ " thick plywood panel and on the jig or band saw, saw out carefully between the $\frac{1}{8}$ " wide spaces where the router line will be. Keep these pieces and again trace the pattern of the back to another piece of board.

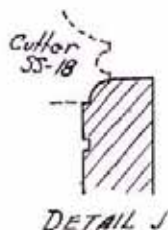




Designed & drawn by Lester A. Burton.



Glue the sawed-out parts to this board in the position shown on the traced pattern. The result will be that shown in the illustration, which will be your form. A good idea of the appearance may be gotten by referring to the photograph of form used in carving top



of Italian Mirror. Invert this form over your board with the pin, which is centered under the $\frac{1}{8}$ " router bit No. R. 1. Now fasten a piece of $\frac{3}{4}$ " lumber on this form board so it will include the entire pattern, run your drill press spindle down so the bit cuts $\frac{1}{8}$ " deep, lock it there and move the board around so the pin will follow the groove. This will cause the bit to duplicate the lines of the form on your stock. Band saw to the balance of the outside shape, run a quarter round, cutter SS-19, along the top front edge, drum sand it carefully on the edges. Now there is absolutely nothing hard about it. Care must be taken in making the pattern, since every bump or irregularity in the groove formed by the sawed out pattern will be transferred to the finished piece. That means that all edges on the pattern will have to be filed smooth. Put a little paraffin on the edges of each piece before glueing it to the form, making the pin glide easier.

Bottom Rail and Other Parts

The bottom back rail is gotten out on the band saw only, there being no router lines. Run a cove cut across the bottom as indicated, with cutter SS-7, on the drill press.

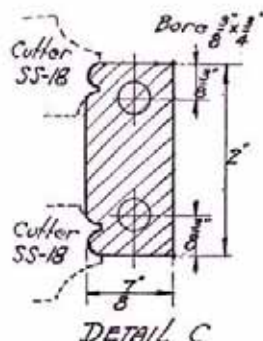
Make the three spindle turnings.

Now get out the back seat rail, which is a straight piece. Locate and put brads where the dowels will come in each end of the top rail, bottom back rail and back seat rail. With the back legs lying on their sides, transfer the location of the dowel centers to them.

Drill $\frac{3}{8}$ " holes $\frac{3}{4}$ " deep for dowels in these pieces. Where the turned back spindles enter the top and bottom back rails, bore $\frac{1}{2}$ " x $\frac{3}{4}$ " holes.

Assemble These Parts

Now assemble, without any glue, all these parts, to see that everything goes together nicely. If so, put glue in all dowel holes, a little on the ends of the back and seat rails and clamp this together as a unit. Lay the whole thing on a flat surface while so doing, to get a level assemblage.



Now get a piece of paper large enough to draw out a full size plan of the seat and of the legs where the stretchers meet them. It is from this plan that you will get your lengths and angles for the seat rails and stretchers.

Side Rails and Stretchers

The front and side seat rails have a bead (cutter SS-18) run along each edge on the shaper or drill press. The side rails have a slight angle at each end. Determine this angle and tilt the saw table enough to cut them off at that angle. Try the cut on waste lumber and check it against your drawing. Locate the dowel centers on all three rails and transfer centers to the legs at proper locations. Bore dowel holes and assemble the front legs and rail, checking on the fit.

Get out the side stretchers, band or jig sawing the under shapes. Get the angles and lengths of the stretchers from your plan layout. Locate dowel centers (only 1 dowel used at each joint) and transfer the centers to legs.

Assemble the three stretchers together as a unit, glue them and set aside to dry. Assemble front legs and front rail only, as a unit and set aside to dry.

Assembling the Three Units

You now have three units to assemble, instead of a bunch of parts. With liquid glue, or casein glue, assemble these units in a complete frame at one time. With door clamps hold it together. Check, with a rule, the diagonal distance between the left back leg and right front leg and vice versa. When it measures the same both ways, the frame is squared. Let it dry in this position, with all 4 legs resting on a level surface.

The seat is solid stock, rabbeted out to fit down into the frame. Triangular seat blocks are glued into the four corners of the frame, and bored for wood screws, serve two purposes. They stiffen the frame and hold the seat down.

Finishing, and Cushion

Finishing instructions are identical with those for the mirror.

The seat cushion is a pillow, the shape of the seat, of plain red or bluish green velvet, with a rope cord of tan or gold sewed at the side seams. Two ends are left at each corner, with tassels, and with these, the cushion is tied to the legs.

The entire chair, therefore, has been machine made. If you used care in your measurements, and a little care in your machine work there is no reason why your chair should not be the equal of any that any skilled woodworker might turn out.

AN ITALIAN CONSOLE MIRROR

CARRYING out the scheme of decoration for our console group, here is a beautiful little piece that alone is a dainty addition to any home and a decoration on any wall. And it can be made, almost in its entirety, on the drill press. In fact, if we turn the ends of the side pieces on the drill press (and it can be done) the entire frame is made on the drill press. Lay out a drawing of the mirror, full size. Your care in doing this and the subsequent transfer of patterns from drawing to form, is going to determine the appearance of the frame. Transfer the entire pattern of the top piece to $\frac{1}{4}$ " plywood and saw the parts out.

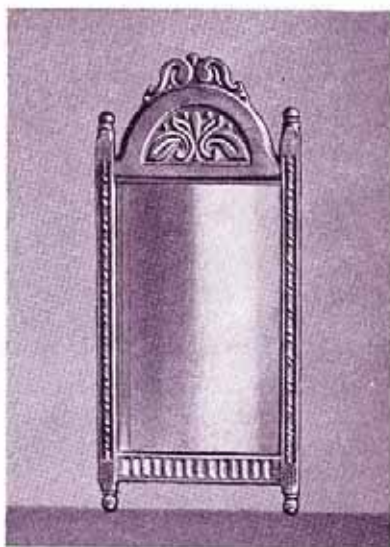
Transfer the entire pattern again, to a piece of flat board, and carefully locate and glue the parts of the $\frac{1}{4}$ " plywood pattern to this board (as you did on the chair back). Invert this over the pin on our routing table, and see that the pin will slide through all the slots, before starting to work.

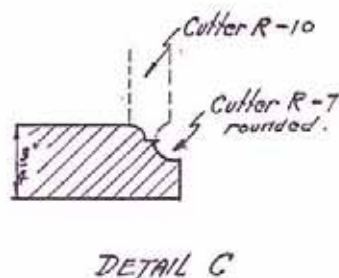
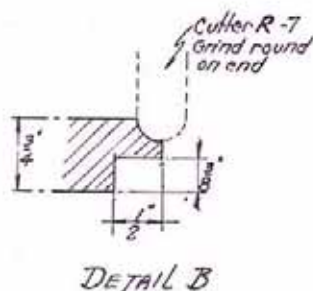
Carving the Top Piece

If so, we are ready to do some carving on the drill press. On the upper surface of this form nail your piece of stock to cover the pattern. With carving router R-10 in the collet chuck, run it down



to a depth of $\frac{1}{8}$ ". Rout out the entire pattern to this depth. Then go down another $\frac{1}{8}$ " and go over the entire pattern. Go just deep enough that the outside diameter of the cutter does not go down into the wood, to leave a square shoulder. You will see the carving ap-





used, gives $12\frac{1}{4}$ " x $18\frac{1}{4}$ " opening. Rip out eight triangular cross section pieces of wood about two inches long, and using these as wedges, nail them down into the corner of the rabbet. These hold the glass firm, and there being nothing touching the back of the mirror, no scratches will result.

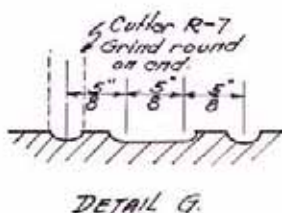
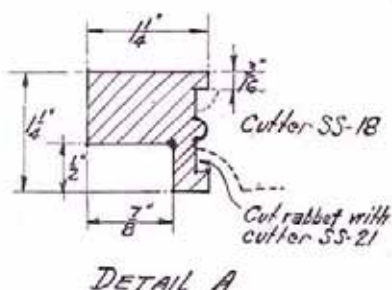
Finishing

To finish the cabinet, chair and mirror in antique walnut, which carries out the feeling of design, first wash coat the entire surfaces with a weak solution of stain. No filler is used, and just enough stain, water or oil, is used to get a uniform color. When this is dry, sand lightly to smooth, and give a coat of thin white shellac or clear lacquer. Sand again, with 4/0 paper. Prepare a mixture of rotten-stone, turpentine and a little japan drier, to the consistency of thin cream. Smear this over all surfaces, making sure to get it into all corners, and into the open pores of the wood. Just be-

get out the side pieces and turn ends at lengths shown. Rabbet back edges for mirror. With cutter SS-16 run two cuts on front, to leave bead in centre. On this bead, duplicate the spot routing which was used on the moulding on the cabinet drop lid, keeping the same centres.

The bottom piece is a length, with two beads like the chair rails. Now, with the guide form (as suggested in the accessory section) and a Router R-7, which has been ground to a round end, rout out the coves, on spacing indicated, using the adjustable stop blocks to run all coves to the same length. Rabbet back of this piece for glass.

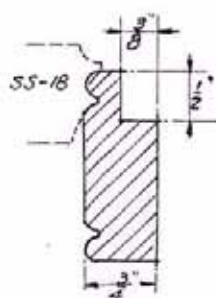
Locate and transfer centres for dowels. Bore and assemble. The mirror is 12" x 18" exact size, while the rabbet



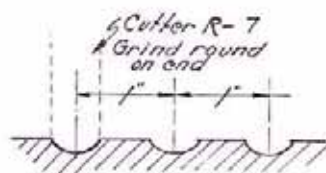
fore this dries, rub it off briskly with cloths. Do not dig it entirely out of the crevices and corners. The feeling of age is imparted by this dusty looking finish. To carry this finish further, into what is known as polychrome, if the beads of the leg turnings, portions of other turnings, the moulding on the drop front, rosettes, rosette design in chair back top rail are touched up with pompeian red before the rotten-stone mixture is applied, and not entirely wiped off, a very high grade appearance may be had.

After the rotten-stone application has been wiped off and allowed to dry, a light polishing coat of thin shellac or clear lacquer may be shot on as a preservative of appearance. It is not absolutely necessary and may be dispensed with at your own discretion. Then wax and polish.

If you have proceeded carefully and followed instructions you should have, even though you may class yourself as an amateur, a beautiful console set, fit to grace any home, no matter how pretentious.



DETAIL E



DETAIL F

BILL OF MATERIAL

Pieces	T.	W.	L.	Pieces	T.	W.	L.	Pieces	T.	W.	L.						
2	1 1/4	x	1 1/4	x	30"	1	3/4	x	8	x	11 1/2"	1	3/4	x	2	x	11 1/2"

THE HUMIDOR OR JEWEL BOX



HERE again is a little different use for the marquetrie banding and oval inlay motifs. While the tulipwood and ebony was used in the one pictured, any other banding may be substituted. A matched panel of four pieces of veneer may be used in place of the bees-wing stripe mahogany pictured, with the banding set in the veneer, with appropriate effect. It is another project on which a great many marquetrie effects may be worked out.

Making the Base

The base was designed with one eye as to design and nicety, and the other as to the grinding of a shaper cutter. Detail of cutter is shown about half size. Cut a cardboard or sheet metal template to the shape indicated, making it as accurate as possible. When you start grinding the cutter, SS-22, use a fine grit wheel and, observing the angle of the bevel on the back of the cutter wing, hold it against the wheel at the same angle. You will find that a pencil outline drawn, with the aid of the template, on the face of the cutter wing will show up even after dipping in water. As you grind away the metal, check frequently against your template. After the first wing is ground to shape, grind the other two as nearly the same as you can. Whet the cutting edges with an oilstone to get rid of the wire edge left by the wheel.

Take a piece of stock 48" long x 1½" wide x 1" thick, trace the shapes of the four sides of the base, allowing sufficient stock for

mitring. Bandsaw the shapes of the aprons, on this piece, but leaving the stock in one long piece until after the shaper operations.

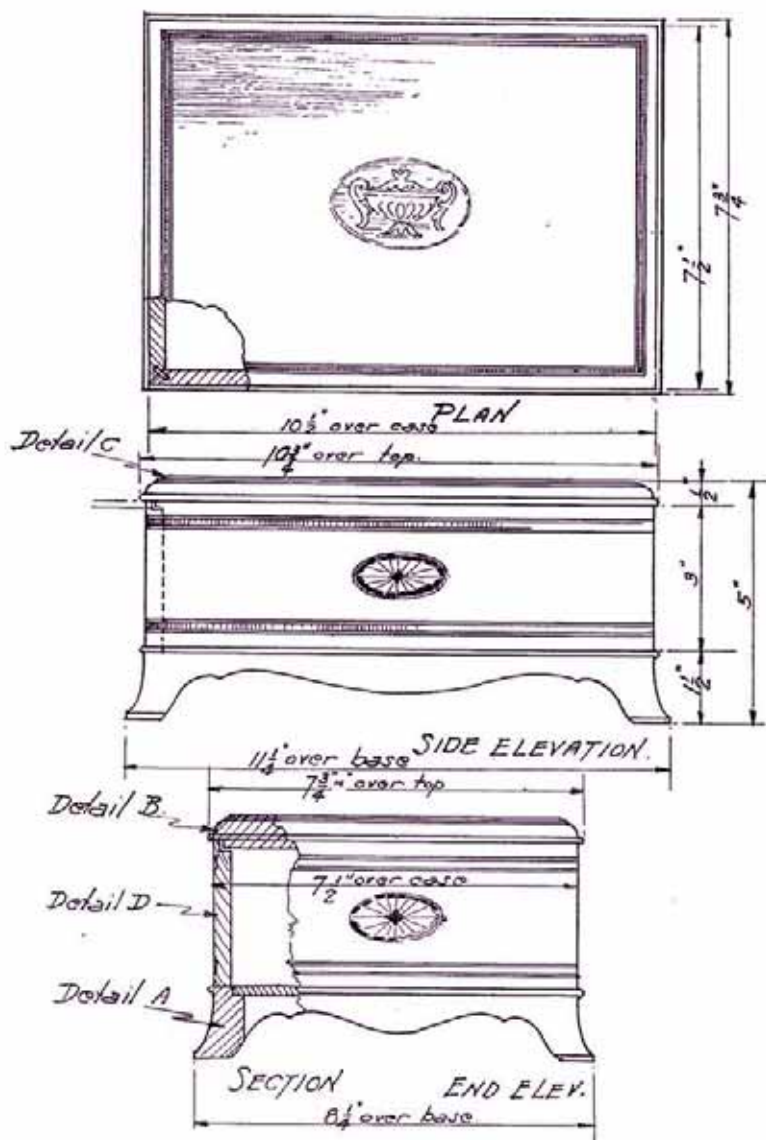
With this piece of work and your special cutter on the shaper adjust the shaper guide to take a cut about $\frac{1}{4}$ " deep as shown in detail in the sketches. Run this cut the full length of the stock. Set the shaper guide back to take another $\frac{1}{4}$ " depth of cut and run the stock through again. Adjust the guide to the final depth of cut, and run the stock through slowly. You have now a long piece of stock with the apron shapes bandsawed out and a cove shaped cut in one side. Since the cutter is only one inch wide, and the cut in this piece is $1\frac{3}{8}$ " wide, we raise the cutter $\frac{3}{8}$ " higher and run the stock through the shaper again. And we have still another cut to take, which may be done with the same cutter. Raise it another $\frac{3}{8}$ " and set the guide back so it will cut away all but $\frac{1}{4}$ " of the ledge projecting out above the cove cut. These last operations are shown as operations 3 and 4 on the sketch sheet.

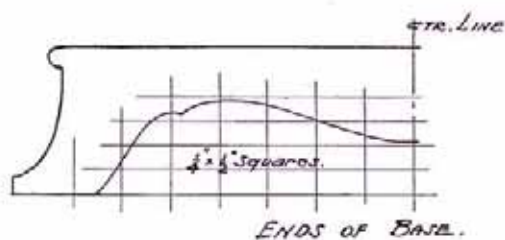
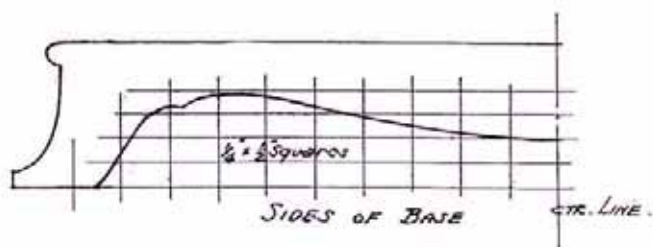
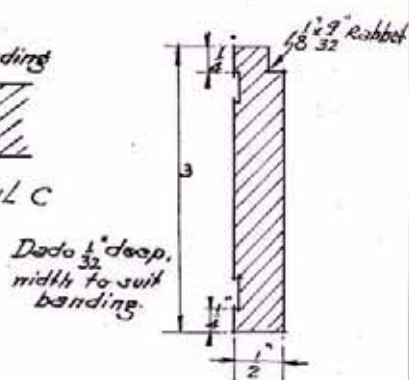
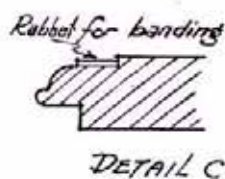
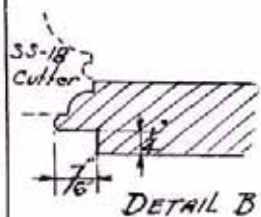
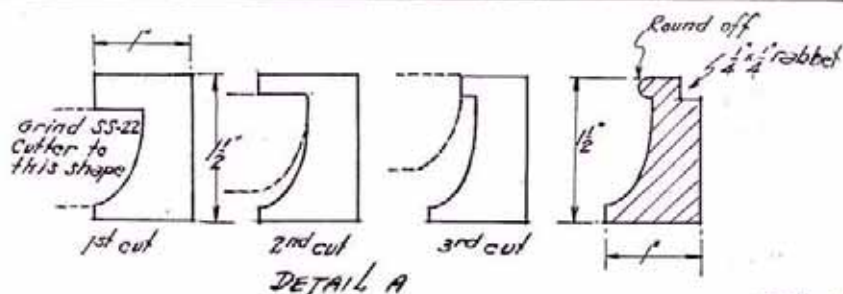
The 4 parts of the base are now mitred, which may be done on the bench saw in two ways; by using the mitre gauge or by tilting the table. Make sure you get the ends the same length as each other, likewise the sides. The simplest way is to cut them with a stop block clamped to the mitre gauge. Check the angle of the cut with some scrap wood first before cutting into your stock.

With the saw table level, the fence at a 45° angle, and a single dado saw on the spindle adjusted to take a cut $\frac{5}{16}$ " deep, run a dado $\frac{1}{8}$ " from the inside edge of the mitre for a slip tongue.

Glue a small block of wood into the cove at each end of each piece. Make 4 slip tongues 2" long x $\frac{1}{2}$ " wide x $\frac{1}{8}$ " thick with the grain running crosswise. With four small hand clamps or the frame clamping jigs to pull the corners together, put glue on the mitred surfaces and into the dadoes, put the slip tongues in place and clamp the frame together. Check for squareness with a small try square, and set on a level surface until the glue has hardened.

The sides are made by taking one piece of stock $\frac{1}{2}$ " thick x 40" long x 3" wide. Run a dado $\frac{5}{16}$ " wide, $\frac{1}{32}$ " deep and $\frac{1}{4}$ " from each edge (if other banding than the one pictured is used, make the width of the dado to suit). Into this set the banding, glued, cutting the end of each piece, as put in, to match the end of the previous piece. Then clamp the entire strip, face down on another board until the glue sets. Cut to length and mitre, then dado the mitred edge in practically the same way as the base was done. Clamp the corners in the same manner as you did the base, check to see that it is square and set on a level surface to harden.





Take a piece of stock $9/16''$ thick, $12''$ long and $9''$ wide and on each side of this lay a piece of crosslay veneer, glue on both sides with the grain running parallel to the $9''$ side, with the faces next to the $9/16''$ core glued. Now lay 2 pieces of veneer, with the grain running parallel to the $12''$ side, on the crosslay veneers. Put this between two flat boards covered with newspaper, and clamp as tight as you can with hand clamps. An old letter-press, if available, is ideal for this operation.

After the glue has hardened on this top, run a rabbet $1/8''$ deep x $3/4''$ wide all around the under side. On the upper side, outline the shape of the inlay, exactly centered, and cut out the veneer, to the depth of one thickness of veneer. Put glue on the inlay to glue it into place, and clamp it down with a board and a hand clamp. The inlay banding is mitred at the corners and set into a rabbet cut along the edges, as shown in detail. Put on two opposite sides at a time, clamping under strips until the glue sets.

The lid may also be constructed in box form using a piece of solid stock $1/4''$ thick, to which the side pieces are glued, being mitred at the corners. In this case, the top edge is rounded only. This presents a fine opportunity for another strip of banding on the sides, which should be narrower than that on the box proper. In a lid of this construction, the right way to construct it is to make the sides four inches high, assemble as already instructed, on this glue the $1/4''$ lid. The lid is cut off later, resulting in an accurate fit on the box.

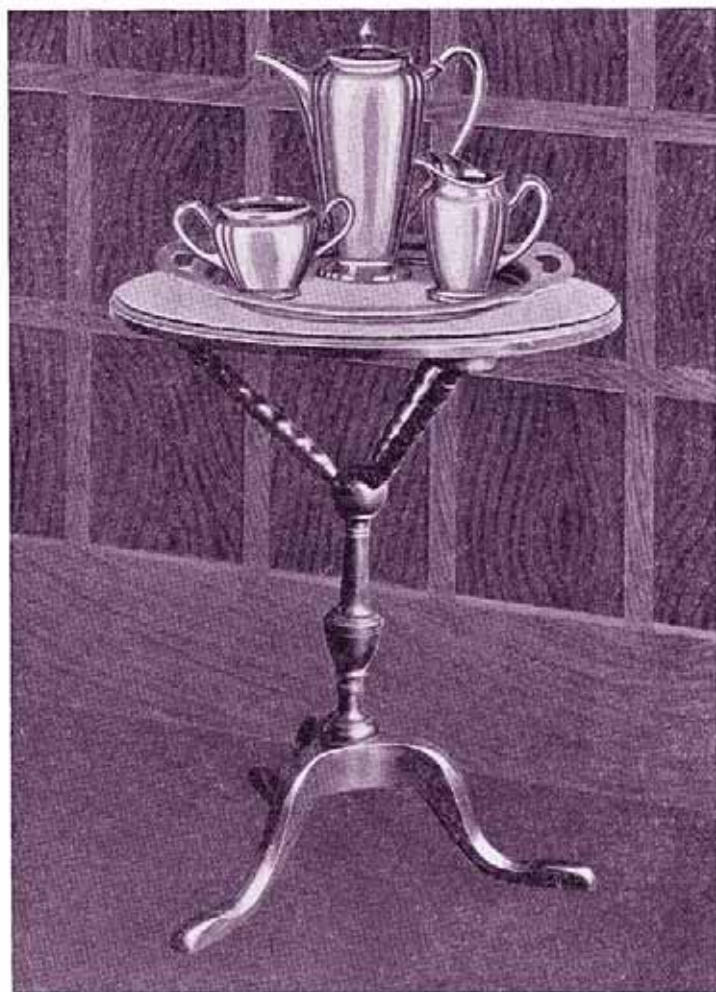
While the project has been called a humidior, it really needs a metal lining to complete it for that purpose. Cut a piece of copper sheet, bending to form a tray and solder the corners. The lid is also lined with copper and a clip soldered in the centre for holding a piece of sponge. For those who do not care to do the metal work, note that the dimensions are such that a standard box of cigars may be put in the box.

This project should be given a brushed or eggshell finish. A coat of selected stain, after shellacking all marquetry, then filler, two coats shellac sanded between coats and two coats of varnish, rubbed down with pumice stone, and polished, presents a good appearance and when brushed down with dry pumice stone on a dry brush gives us our eggshell surface.

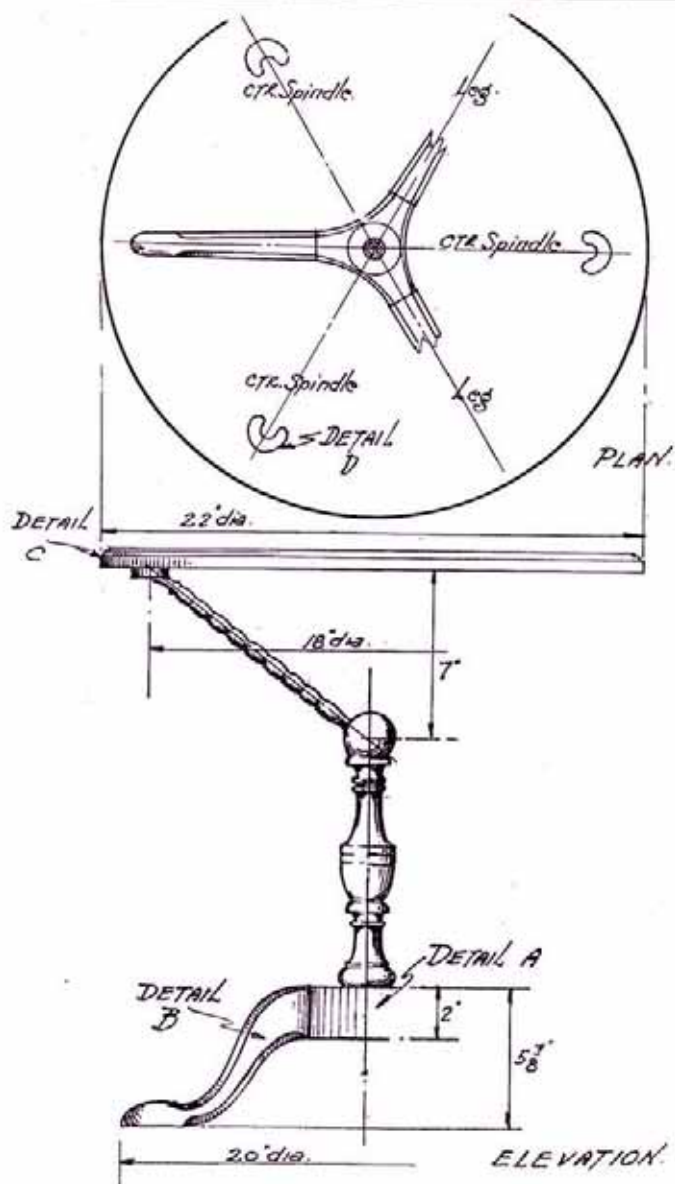
BILL OF MATERIAL

Pieces	T.	W.	L.	Pieces	
1	1	$1\frac{3}{4}$	$48''$	4	ID-22 Inlay
1	$\frac{1}{2}$	$3\frac{1}{2}$	$48''$	1	ID-24 Inlay
1	$\frac{3}{4}$	9	$12''$	1	Tube Inlay Banding, selected
1	$\frac{3}{4}$	8	$11''$		

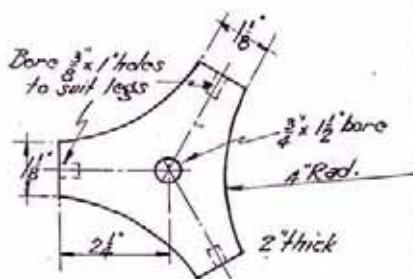
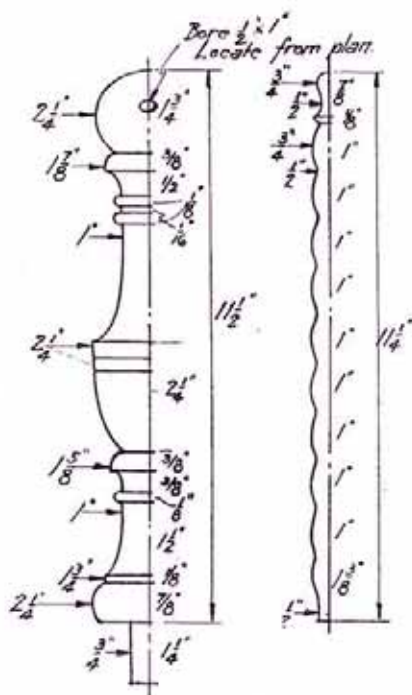
A TRIPOD STAND AND TABLE TOP



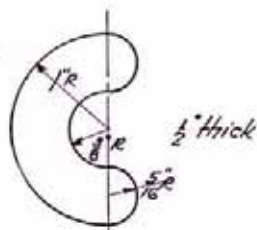
ALITTLE unusual in its assembly, in that the top may be lifted and carried away as a tray, is this little adaptation of an old Hepplewhite tripod stand. Hepplewhite was the famous American cabinet maker of the 18th century, who has left us many a priceless memento of his handiwork. The fact that many of them are copied today and are in popular demand (and try as we will no designer seems able to improve on their beauty) is ample proof of the correctness and beauty of their design.



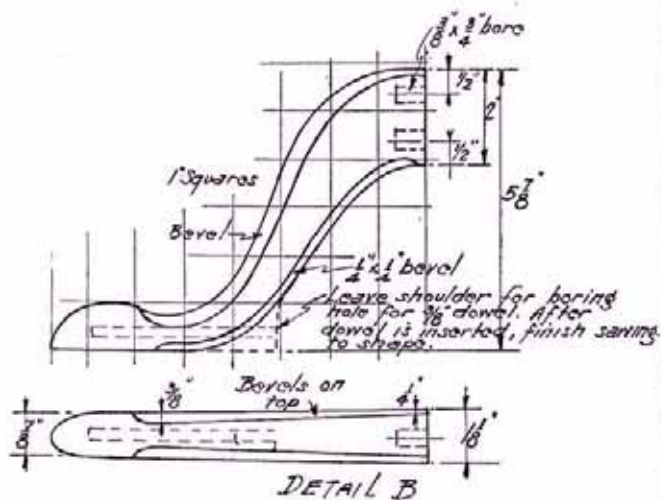
Designed & drawn by Lester A. Burton.



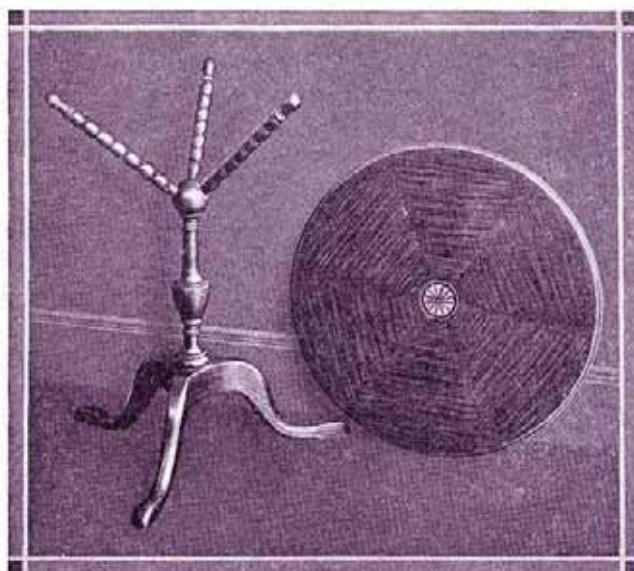
DETAIL A



DETAIL D



Adapting the idea of the old tripod stand and adding a matched crotch mahogany veneered top we have as a result a wonderful little coffee table. And it teaches many things to the newer craftsman, and gives fine practice to the more advanced.



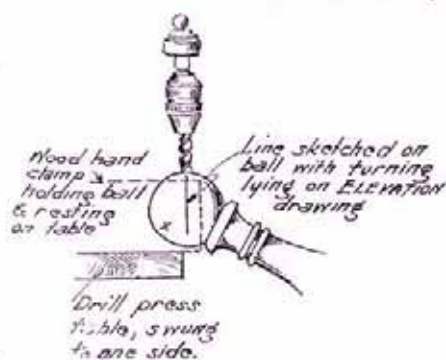
Making the Tripod Section

First, it is almost imperative that a full size layout or drawing be made, to get the shapes of the legs, turnings, the angles of the spindles, and the size and angles at which to cut the veneer for the top. Be particular in lay-

ing out the full size plan of the knee block and the ball top of the turning. Note that the spindles are on centres between the legs.

Bandsaw the legs, leaving a small shoulder on the inside so you can bore for the dowel which is inserted in the "toe" of the leg. This prevents the toe from breaking off under excess strain. Note how the grain is indicated. After the glue on these dowels has hardened the shoulder may be sawed off. The bevel is $\frac{1}{4}'' \times \frac{1}{4}''$ and is easily cut by tilting the bandsaw or jig saw table to 45° . Or it may be done by hand with a spoke shave. If the leg has been tapered properly the beveling should leave a uniform flat on the upper surface of the leg, with straight line edges. Locate centres for dowels.

The knee block is one piece, bandsawed and drum sanded. Transfer leg dowel centers. Bore for these and for $\frac{3}{4}''$ turning dowel.



Make your turning template and your spindle turning. Pay particular attention to the sphere at the top. Upend the turning and stand it upright on the exact centre of your plan and mark where the three centres for the spindles will come. To get the correct angle at which to bore the holes, lay the spindle on its side on the drawing, and sketch a line on the ball by sighting, which will be a continuation of the centre line of the spindle centre. Repeat for three spindle centres. Now clamp the ball in a wooden cabinet clamp and lay this clamp on the drill press table with turning hanging over, to adjust the angle, through the medium of your sight line and the drill. See sketch of this operation on the drawing. There is nothing hard about it, but take your time and get set up properly before doing the actual boring.



CROTCH
MAHOGANY
OR
WALNUT



STRIFE
MAHOGANY
OR
WALNUT



STRIFE
MAHOGANY
OR
WALNUT.

SUGGESTED ARRANGEMENT
OF VENEERS FOR TOPS.

Turn the three spindles with the ends a tight fit for $\frac{1}{2}$ " hole.

The assembly is easily done, but see that the spindles centre properly between the legs and that they are equi-distant from the centre to the ball-shaped ends. Check up with your drawing by inverting and stand on the drawing, resting on the ends of the spindles.

Making the Top

For the top, a solid top may be substituted for the veneered one, but remember, it will warp and it will not have the grace nor appearance of the veneered top. A five-ply veneered top of plain mahogany or walnut may be used instead of the matched veneer top, if desired, losing in this substitution only the appearance.

Crotch mahogany or crotch walnut is a cranky thing to handle, the natural grain of the veneer making it curl or warp badly. Six pieces of straight grain mahogany may be used with good effect, as suggested in the sketch. Note the direction of the grain. To match up the veneer, take six pieces of veneer of sufficient size and put them between two pieces of $\frac{1}{2}$ " or $\frac{1}{4}$ " board. With No. 18 or No. 19 brads, nail these together, clinching the brads over each side. Treat this as a solid board and carefully cut out the shape of a segment one-sixth of a circle or a 60° angle. Do all planing toward the point with a large plane or the jointer. Get it as nearly

60° accurate as you can. Remove the clamp boards. Take three of the veneer segments and tape them together with gummed paper tape, making sure the joints are good. Do the same with the other three. Clamp these two halves between two boards and plane the two edges straight. Now tape these two half circles together.

Using a compass, draw a circle the exact diameter of inlay motif No. ID-21 and cut out the veneer of the segments to as close a fit for the motif as possible. Cut away the veneer that surrounds the motif and set it in, with the paper side on the same side of your veneer as your taping. Tape it in.

Your core piece is made up of enough pieces of board to make a piece 23 inches square. It is better to use eight pieces 3 inches wide jointed and glued together, than two pieces 11½" wide, making a stronger core and with less likelihood of warping.

For home craftsmen who have not the facilities for properly handling glue, the casein type of glue is recommended for veneering, since its slow-setting qualities are ideal. A rather thick paste is used. Provide yourself with some kind of a roller or make a small edition of a rolling pin, with which to spread the glue. A wide trowel or putty knife may also be used.

It is assumed that the craftsman has provided himself with the veneering press, as outlined among the accessories.

Veneering

The procedure in veneering is as follows. Lay one-half of your press on a box or table, where you can slip the braces on and off. Lay a sheet of newspaper over the surface and on this lay your backing veneer. It is the usual thing that whatever veneer used on the face, is used on the back, except in the case where the back will be concealed, in which case any cheap veneer will do.

Now, coat both sides of a sheet of poplar veneer with the glue, spreading it to an even coat with the roller. Lay this on the backing veneer, with the grain at right angles to the backing. On this lay your core, which has been surfaced to 11/16" thick, and lay it with the grain parallel to the backing veneer.

Now coat both sides of another piece of poplar veneer and lay it on the core, again crossing the grain with the backing and the core. On this lay your matched veneer top, taping side out. If a solid sheet of face veneer is used, run the grain parallel to the core and the backing. You now have the backing, core and face grains running one way, with the poplar intermediate or "crosslay" veneers at right angles to them. Clamp this in the press, giving it all the pressure possible, clamping down first on the brace which crosses

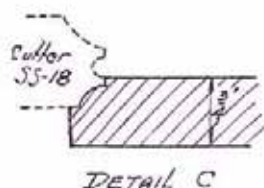
at the middle, following with the others so as to get an even pressure. Twelve to twenty-four hours should be allowed for the glue to set.

After taking the top out of the press, draw a circle 22 inches in diameter, using the centre of the inlay motif as a centre. Scrape and sand away all paper taping and bandsaw carefully to the circle drawn. Sand the edge as carefully as if it were going to be left square. With cutter SS-16 on the shaper and a collar $1\frac{1}{4}$ " in diameter as a bearing collar, cut a quarter round all around the top edge of the top. Be careful to hold the panel firmly down on the shaper bed while shaping. Sand the edge and the quarter-round.

With a cabinet scraper and sandpaper no coarser than 0/0, smooth the face veneer, finishing with 4/0 paper. Do not use a plane.

The little horseshoe-shaped collars are located on the back and glued in place. A ring made of three or more segments, 18" inside diameter, $20\frac{1}{2}$ " outside diameter and $\frac{3}{4}$ " thick may be used in place of these collars, if the top is to be lifted off frequently. Check the location by placing the assembled tripod in an inverted position on the back of the panel.

The model in the laboratory workshop was stained and finished in a deep cherry color on the mahogany, which brings out the grain of the crotch veneer used, with telling effect. It will look as well in brown mahogany or walnut. Hepplewhite and mahogany are a synonymous combination, and when one mentions the first he thinks of the other, and for this reason, mahogany is recommended.



BILL OF MATERIAL

Pieces	T.	W.	L.
3	$1\frac{1}{4}$	3	10"
1	2	5	5"
1	$2\frac{1}{2}$	$2\frac{1}{2}$	15"
3	1	1	13"
5	$\frac{3}{4}$	4	20"

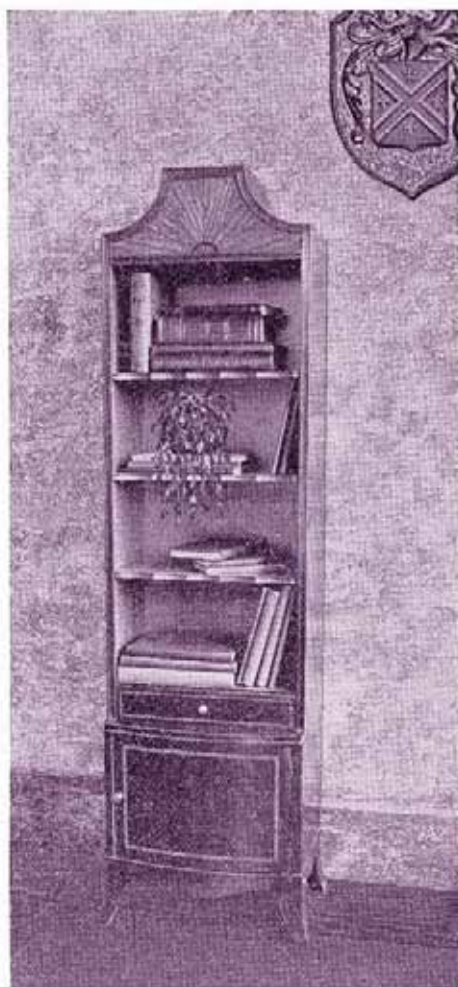
Pieces	
6	10 x 10" Crotch Mahogany Veneer
1	21 x 21" Mahogany Back Veneer
2	21 x 21" Poplar Crossbanding Veneer
1	1D-21 Inlay Motif

AN INLAID PIER CABINET

HERE is a pier cabinet which may be adapted to many uses, may be made in any combination of woods and is a striking creation in any combination.

Choice of Curved or Straight Door

First, for the craftsman who does not wish to do any veneer work, or bent panel work, a straight front door of solid wood may be substituted. A half round bead moulding, $3/16''$ wide may be substituted for the inlay strips on the door and the drawer. The drawer may be omitted if desired, and with all these changes, you still have a fine piece of furniture, simply because the basic design is good and the proportions are right. These are fundamentals, which, if wrongly carried out, will ruin the most elaborate piece turned out. Make any changes you wish in kinds of wood used, make it of poplar or gum and lacquer it, but adhere closely to the proportions.



How to Make the Curved Door

Start with the form for the curved door panel. Obtain seven pieces of pine or fir, free from knots, $2'' \times 6'' \times 24''$ long and a sheet of zinc $13'' \times 28''$. With a radius of 33 inches draw a curve as indicated for line A on the form, locating as indicated on the sketch. $13/16''$ back of this, or with a radius of $32 \frac{3}{16}''$ draw another line, noted at B. Bandsaw out the template on line A only and

transfer to the seven pieces of 2" x 6". Bandsaw them to this line, marking each upper and lower piece by number so you can re-assemble them in pairs. With door clamps, clamp the seven upper pieces together, likewise the seven lower which will give you two halves of a form. With the sheet of zinc laid between them clamp them together, and bend the projecting ends of the zinc down over the lower half. Take the whole thing apart, and on each of the lower pieces, bandsaw a line which is indicated by line C, or $\frac{3}{4}$ " from line A, for a distance of 22", leaving a shoulder at each end. Now nail them together, one at a time, keeping the ends even, then put the zinc on. The sketch shows how this is nailed down over the ends.

Now bandsaw the remaining seven, or upper pieces, to line B, and nail them together, to form the upper half of the form. With a plane, smooth this surface into an even curve, with no ridges or hollows. There is no need of sanding.

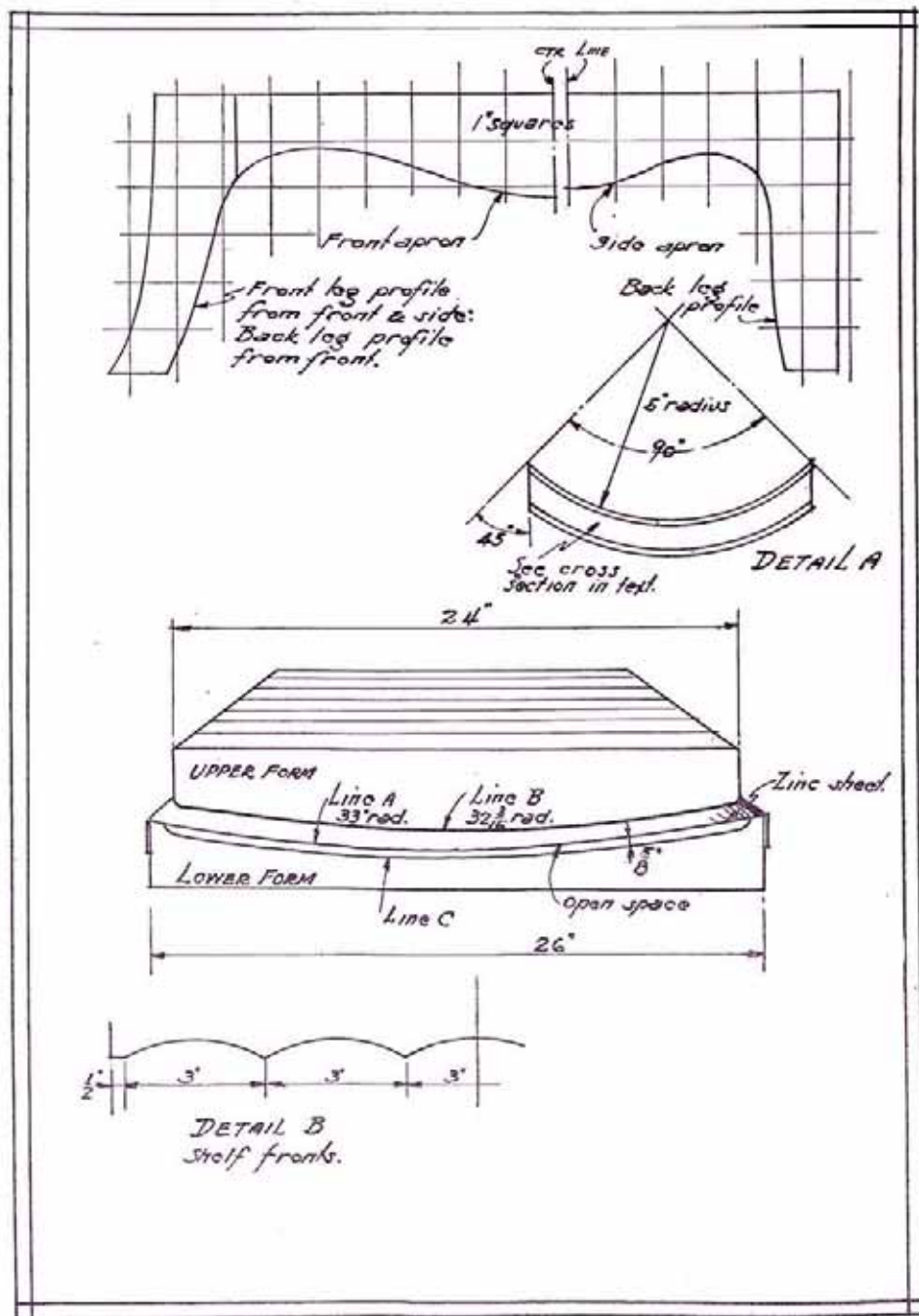
Curving and Veneering

Lay the face veneer on the zinc, grain crosswise, and on this a piece of poplar crosslay veneer, both sides coated with glue (see instructions for gluing in the text on the tripod table) with the grain running lengthwise. Then lay three sheets of $\frac{1}{8}$ " poplar core veneer, grain running crosswise, glued. On this lay a piece of poplar crosslay, grain lengthwise and on top of this a backing veneer, grain crosswise. Spread a sheet of newspaper over the backing and put on the upper half of the form, centring it above the lower form. Make sure the upper half of the form is located directly over the lower and with four large hand clamps, an old letter press, or auto screw jack as suggested in sketch, clamp the form together. Put the pressure on gradually, going from one corner to the diagonally opposite corner next, so you get an even pressure all over. The zinc sheet will accommodate itself to the curve and the whole will be drawn together. Allow 12 or more hours to dry.

The front of the top is veneered in the same way, except that the veneers and core are put in a flat press. The sunburst effect is gotten by cutting the face veneer in segments, taping together into a half circle form, with inlay motif set in at centre. (See instructions on tripod table top.)

Legs and Apron

The legs are bandsawed from solid blocks, bandsawing two ways from the same template for the front legs. Note the angle at which the front face is sawed, which is easily gotten by tilting the bandsaw

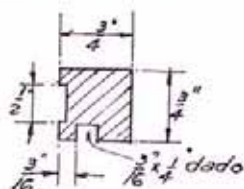


table, as shown clearly in the sketch. The back legs are different from the front legs in that looking from the front, the same template as the front legs or shape is used, while looking at the side, the back edge is straight and the forward face is a different curve. Details of the legs show this difference.

The front apron is a solid piece bandsawed on the front to a curve $33\frac{1}{4}$ " radius, with the back edge straight. The end aprons are flat pieces, bandsawed to shape. The back apron is a plain piece. Locate centres for dowels and transfer to legs. Bore for dowels and assemble in clamps, without glue, to check the fitting. If satisfactory, glue upon the rough, since the base is sanded in an assembled form.

Curved Portion of Top

The curved portion of the top is made in this way. First take six sheets of veneer and glue them together with the middle of the crosslay piece grain at right angles to the two outside pieces, to form two pieces of three-ply panel, 10 inches wide by 12 inches long. They will be a little less than $\frac{1}{8}$ " thick.



Cross section of curved segments of top

Now make four segments of circles as shown in detail, with the rabbet $\frac{1}{8}$ " deep by $\frac{1}{2}$ " wide on one face of each, a $\frac{1}{8}$ " x $\frac{1}{2}$ " dado on the concave face, and a $\frac{3}{16}$ " x $\frac{1}{4}$ " dado on the convex face of the front pieces only. The ends are cut on an angle of 45° . The faces of two of these pieces have dadoes or grooves cut in them to match the

dado of the ends, which can be cut easily with a router bit on which the end has been slightly rounded so as to give a flat bottom with coves at each side, as detailed. The top piece has a groove in the front edge, as in the segments. Now note that only the front and back corners of this top are mitred to receive the mitred ends of the segments.

The top of the cabinet section may be cut from solid stock. It will probably be necessary to glue up two or more widths to get the desired overall width. With the SS-7 cutter run a cove around the front edge, after bandsawing to the edges, which is a $33\frac{1}{4}$ " radius. Where this piece is notched over the sides, cut the notch carefully to get a square corner. Cut the side and back edges to accurate dimensions and square corners, not forgetting that it extends into dado in the side pieces.

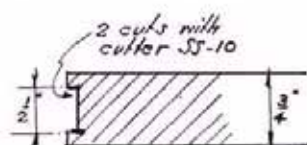
Making the Sides

The sides may now be made. The dados for the cabinet section top, the top over the drawer, and the drawer guides are run on the saw and the holes for the adjustable shelf supports are laid out and bored. The dado is run in the front edge, above the cabinet section. The overall length is now laid out, checking against the dado. Note that only the front and back corners of these ends are mitred to receive the segments of the curved top. Bandsaw the veneered canopy panel to shape and slip it into the dados when assembling. A dado $\frac{1}{4}'' \times \frac{1}{8}''$ is run on the inside of the cabinet side, at the upper end, $\frac{1}{4}''$ from the front edge, to match the dado in the top pieces. The back inside edges of the three top pieces and the sides have a $\frac{1}{2}''$ rabbet, $\frac{1}{4}''$ deep run in them for the panel back, and the cabinet is ready for assembling. Make a finish piece to go under canopy as shown in detail D.

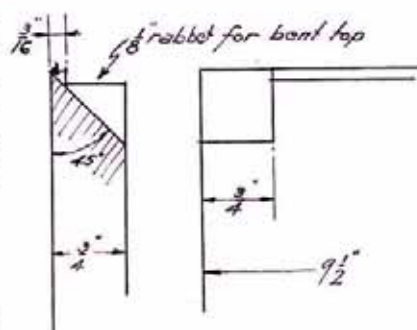
Assembling

Since we have no case clamp (which is a commercial affair and beyond our means) we will devise a simple but effective method. On each end of the top curved segments glue a small triangular piece as shown in the clamping sketch, marked **clamping block**. Put one of these on each side of the case ends and one on each of the four corners of the top. The entire case may be glued together at one time (if you have enough clamps; if not, proceed as follows). Put the drawer cover shelf and the cabinet section top into their dados, with glue and clamp the two sides together. Check to make sure of squareness.

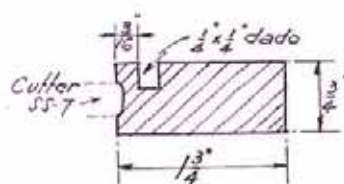
After this has dried in place, clamp the curved segments and top into place first slipping the canopy front panel into the end dados, with its finish rail in proper position below it. This panel will serve as a guide in squaring up the top. Let it set for 12 hours at least.



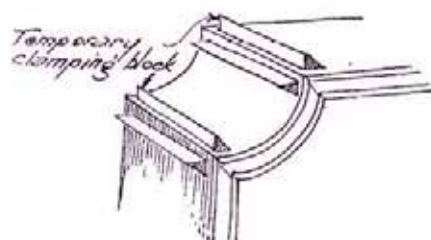
DETAIL G



DETAIL F
Mitering of cabinet ends
at top corners to receive
curved segments



DETAIL D



Inserting Inlay Banding In Door

You now have enough done to get accurate measurements for the curved door. Take these from the cabinet itself. Allow a little for hand fitting and trim on the saw, convex side to the table. If you are putting the

inlay in the door, lay it out on the door, and carefully cut out the veneer for the banding. With a sharp knife cut along the lines, going through the face thickness of veneer. With a $\frac{1}{4}$ " chisel, lift the face veneer out between the lines. Mitre the ends of your banding and glue it into place. Hot glue is best in this instance, since by holding the banding in place and rubbing with the face of a large hammer, this will chill the glue and set it almost instantly, eliminating any clamping.

In facing or finishing veneered work, a cabinet scraper is used, never a plane. It saves considerable sanding, and will not tear the veneer off. Hold the scraper blade at an angle to the direction of scraping to get a shaving effect.

Back and Bottom Panels—Shelves

Locate and brad the dowel centres on the bottom ends of the cabinet, transfer to the base section and bore for dowels. Glue the case to the base and clamp together, with clamps over the drawer cover shelf and aprons of the base. Great pressure is not necessary. See that the case sets square with the base by checking with a large square.

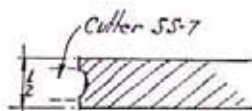
You can now get accurate dimensions for the back panel and cut this out.

The bottom panel may be cut out and put in place. Note that the front edge is bandsawed and cut to a 32" radius. It lays on top of the base section and is bradded in.

While the case glue is hardening, get out the shelves. Saw the front edges to shape and run the cove on the drill press with cutter SS-7.

Hinge the door in place and put in the spring door catch and handle or knob.

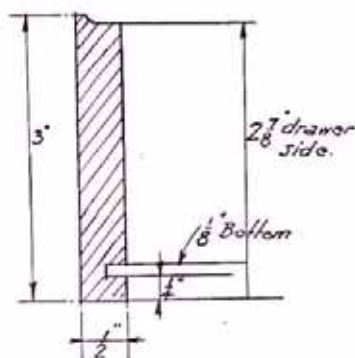
If you are putting in the drawer, make it now, taking measurements from the case itself. If you cannot handle the dovetail, or lack the facilities, set the sides into rabbets



DETAIL C

in the front and back drawer pieces. Rout out the grooves for the drawer front, which may be veneered or solid, and set the banding in. Cut the dados in the sides.

After assembling the drawer, set it in place and slip the guide support in from the back until it stops against the drawer front. Drive a brad in the back end to hold it there, pull the drawer out and finish nailing the guide in place. Put the panel back on, using No. 6 x $\frac{3}{4}$ " F. H. Screws.



DETAIL E

Final Sanding and Finishing

Remove the hinges, knobs and all hardware. Go over the entire cabinet with sandpaper. Remove the wedge-shaped strips which were temporarily glued on the tops and ends and clean off all traces of glue with a scraper and sandpaper, and finish.

If you used satinwood for the top front panel, give it a light wash coat of thin shellac all over. If of wood to be stained wash coat only, all the marquetry, banding or inlays with thin shellac. Then go ahead with your staining.

The model cabinet in the workshop here was given a jade green color on the inside and the shelves, by using brushing lacquer of that color. The outside was finished in a deep red-brown mahogany, which in combination with the rest of the cabinet makes one of the most striking pieces we have ever created.

BILL OF MATERIAL

Pieces	T.	W.	L.	Pieces	T.	W.	L.	Veneer
2	$\frac{3}{4}$ "	10"	58"	3	$\frac{1}{2}$ "	18"	13"	$\frac{1}{8}$ " Veneer
1	$\frac{3}{4}$ "	10"	7"					Stock for Core
1	$\frac{3}{4}$ "	12"	18"	2	$\frac{1}{20}$ "	13"	18"	Poplar Veneer
1	$\frac{3}{4}$ "	2"	16"	1	$\frac{1}{28}$ "	18"	13"	Mahogany
2	$\frac{1}{2}$ "	3"	16"	2	$\frac{1}{28}$ "	6 $\frac{1}{2}$ "	13"	Crotch
2	$\frac{1}{2}$ "	3"	10"					Mahogany
4	3"	3"	6 $\frac{1}{2}$ "	2	$\frac{1}{28}$ "	3"	8"	Crotch Mahogany
2	1 $\frac{1}{4}$ "	2 $\frac{1}{2}$ "	13"	2	$\frac{1}{28}$ "	3"	6"	Crotch Mahogany
2	1 $\frac{1}{4}$ "	2 $\frac{1}{2}$ "	7"	1	$\frac{1}{28}$ "	3"	16"	Mahogany
4	12"	9 $\frac{1}{2}$ "	16"	7	$\frac{1}{4}$ "	7"	16"	Plywood Stock
			Whitewood	1	$\frac{1}{28}$ "	16"	7"	Mahogany
1	$\frac{1}{4}$ "	16"	60"	6	$\frac{1}{28}$ "	4"	8"	Ceylon Satinwood
			Plywood, Birch	1				1D-21 Inlay Motif
			or Poplar					
2	$\frac{1}{4}$ "	16"	11"					
			Plywood, Birch					
			or Poplar					

The list of hardware accessories may be ordered direct from the publisher of this handbook. Items shown come prepaid.

Brass plated drawer pull\$.18	Solid brass drawer pull\$.25
Brass plated door pull20	Solid brass door pull30

CARVED WOOD MOULDINGS

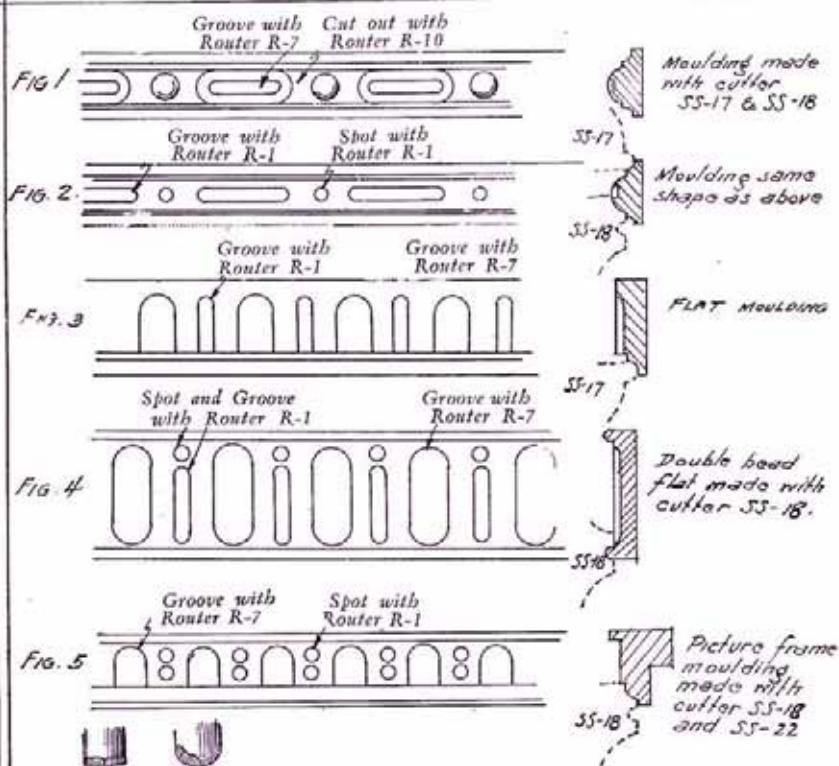
A NEW era of decorative possibilities is opened to the home craftsman with the development and marketing of the modern drill press. Speeded up to 7000 or 8000 R. P. M. and converted as suggested under the machine text, the possibilities seem to be unlimited. To adequately describe all these possibilities would require many pages and numerous drawings. Only a few of the many varied patterns of carved or routed mouldings are shown which may be easily turned out on the drill press. With specially ground cutters, the unlimited field taxes the inventive ingenuity of the craftsman, in figuring out new ways and means to put the machine to work. No longer need the craftsman confine his decorations to plain unadorned mouldings, if he is the proud possessor of a modern drill press.

For the making of mouldings such as shown, a gauge board is necessary, detailed sketches of which are given. With its adjustable stops it may be varied for length of cut. With its mitre gauge, the angle of the cut may be adjusted to suit the pattern. Its construction permits it to be used frontwise or sidewise on the table, so that cuts may be run lengthwise or crosswise on the moulding.

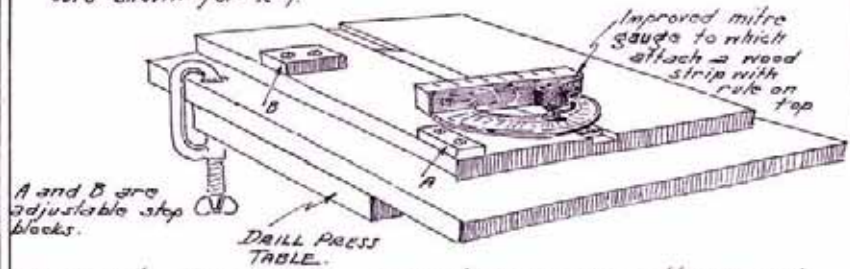
Figures 3, 4 and 5 show moulding cut on flat strips of wood. Figures 1 and 2 show effects gained by previously shaping the wood to the form of a moulding and then carving or routing, so that the cutting is done on curved surfaces. The sketches have been made as self explanatory as possible so descriptions would be unnecessary in the text.

Once understood and undertaken, the urge to experiment and to design one's own mouldings becomes overwhelming, and you will join the ranks of modern drill press carvers.

By grinding routers R-8 and R-9 on the end to a concave shape, which will give a button-like effect, many more interesting possibilities are opened up for experimentation. The combination of a curved cutter working on a curved surface gives interesting effects. Again, if the R-9 router has a small $\frac{1}{8}$ " wide groove ground in the end about $\frac{1}{8}$ " from its outside edges, a rosette cutter will result. This again adds to our possibilities and combinations. There are thousands of mouldings which are at the craftsman's command through the medium of the drill press and router cutters.



R-7 R-7 Ground
 Either of these shaped router bits may be used in making the cuts shown for R-7.



To operate, lay moulding against gauge, run cutter down to desired depth, lock, and move moulding across under cutter. For cuts running lengthwise, clamp 90° from above, turn gauge 90° from above. Use rule to gauge distance of or between cuts.

THE ACCESSORIES

IN ALL woodworking plants, no matter how finely they are equipped, there are many special parts, forms, jigs, etc., that are indispensable. Half of the battle of making fine things is in the preparation. You would not begin painting a house with the idea of hanging on with one hand while painting with the other. You get a ladder, box or what not to serve the purpose. So it is with accessories.

The accessories shown on the opposite page are almost vital necessities in doing fine work, and as labor savers, only those who have used them will appreciate them. Before attempting the making of any of the articles shown in this book we strongly advise the making of these accessories.

Table Extension for Bench Saw

As an addition to the bench saw, the table extension will demonstrate its value almost immediately. The sketch shows so clearly its manner of construction and installation, that explanations are almost unnecessary. Strips of hard wood may be substituted for the channel iron specified, while $\frac{3}{4}$ " panel board may be used in place of laminated stock shown, if desired. Level it up with the surface of the table.

Likewise the mitre-gauge extension. It helps hold long stock, and at the same time lends itself to more accurate cutting. It helps, after putting on a stock block, in duplicating long lengths.

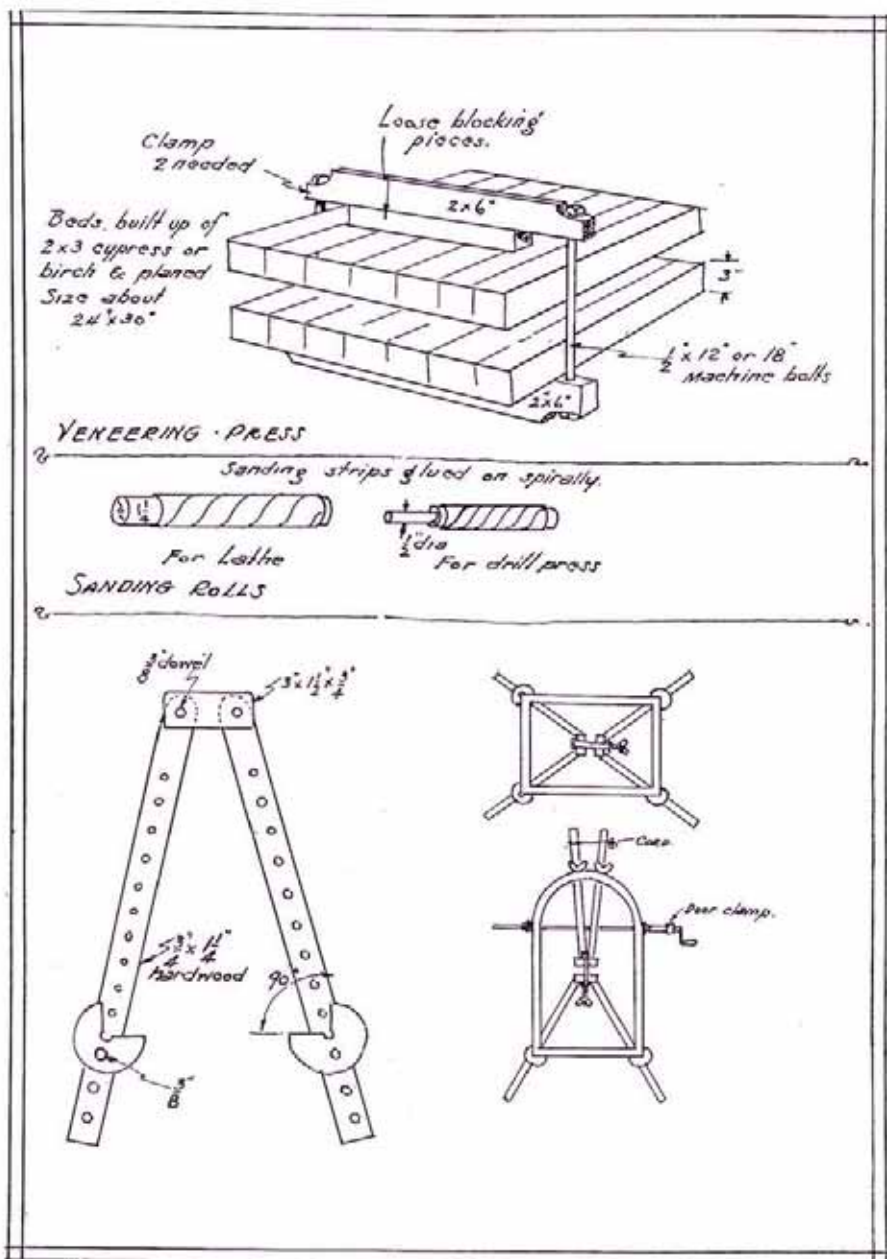
Circle Cutting Jig

The circle cutting jig for the bandsaw will demonstrate its usefulness at once. It will save the labor used to make it, many times over, since there are so many times a true circle is wanted, and it takes less time to set the jig than it does to mark out a circle and saw it out rough and ready, and it adds the advantage of duplicating circles indefinitely.

Sandpaper Rolls

The sandpaper rolls for the lathe are so vital, that our own workshop is equipped with sizes ranging from $\frac{1}{4}$ " to 1" diameter for the drill press, from $\frac{3}{4}$ " to 3" (by $\frac{1}{4}$ " size) for the lathe, carried in two grades of sandpaper. One soon becomes so expert in their use, and such fine smooth-flowing curves develop on the stock under

their magic, that it is a pleasure to use them. In addition, purchase or rig up a face plate for the lathe or on a separate stand, with a table at 90° with its face, for squaring up ends, mitres and a long list of other places.



Supporting Long Stock

There are numerous ways in which long stock may be supported while under work on the saw, shaper or jointer, and one of these conveniences is sketched on the opposite page. The main thing is to get a roller, adjustable as to height, which may be placed where convenient while working. Its construction and use are so obvious, that nothing need be said about them.

Cutting of Forms

In the making of forms always remember that any irregularities which appear on the shape, from which you are going to develop other work, will show up on the finished job. Make your forms and jigs as if they were the finished article, and keep them for next time. It happens often, that a slight alteration in one existing jig, will save several hours' labor in making another. A workman whose shop is full of forms and jigs is invariably a good operator.

Making Turning Templates

In making turnings, and especially a number of duplicate turnings, one of the most convenient things one can have is a turning template. Take a strip of wood about as wide as your turning is in diameter. Joint one edge true, and using this edge as a centre line, mark off accurately your shoulders along this edge. Then trace or draw the shape of the turning on the face of the strip. Measure and mark on the strip each diameter you will need for calipering. You now have a guide for the turning under your eyes at all times. It eliminates constant reference to the drawing. A strip of hardwood, faced on one side with white celluloid is ideal as it can be used again by erasing pencil marks.

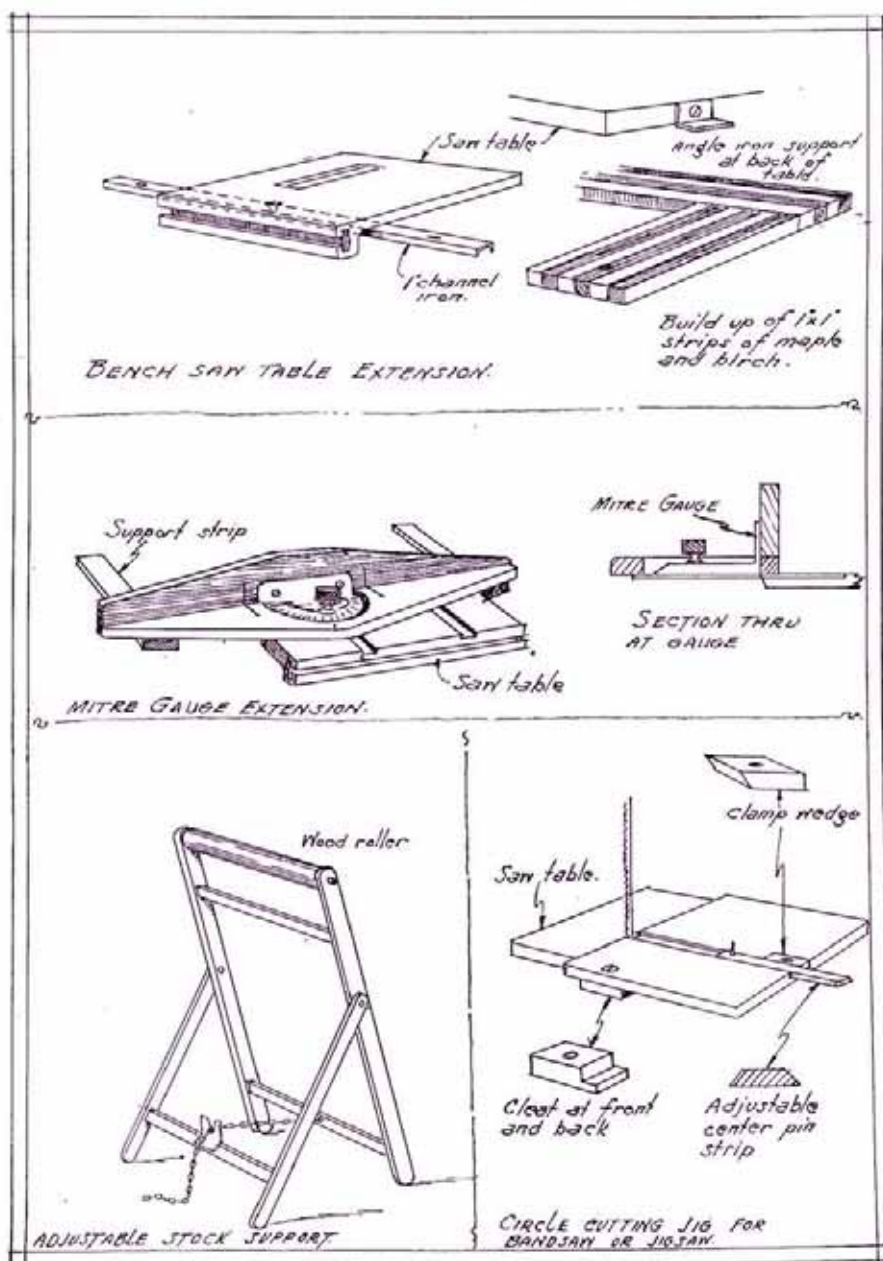
Glueing or Veneering Press

The glueing or veneering press is an item which many long for, but few obtain. The simple press illustrated is identical with the one in our shop, and on which all veneer work or flat glueing called for in the making of the various projects, was accomplished.

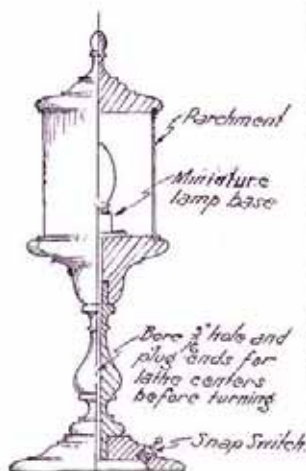
Frame Clamping Jig

The frame clamping jigs illustrated have been in continuous use in our workshop for a long time. The writer remembers seeing a similar pair in his grandfather's shop many years ago. Self aligning and so universally useful in the clamping of door frames, box

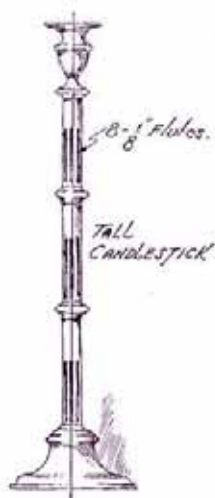
frames and boxes, picture frames, etc. It would be hard to get along without them. Frames, other than square are readily handled through a little manipulation as illustrated. Make two sets while you are about it, a small pair about a foot long, and another about



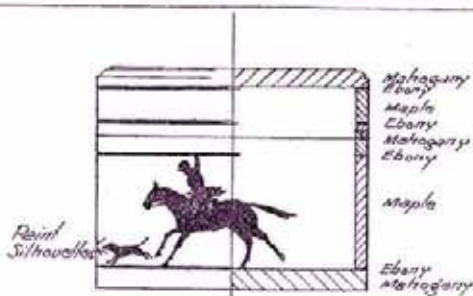
three feet long. You will not regret it later. On the various accessories illustrated and described, only general information as to size and dimensions are given. They may be varied to suit your needs. A lot of the pleasure of having one's own workshop is in the working out of one's own problems.



BOUDOIR LAMP OR
TORCHIERE.

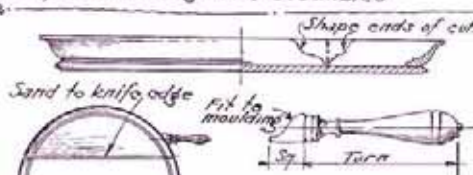


TALL
CANDLESTICK



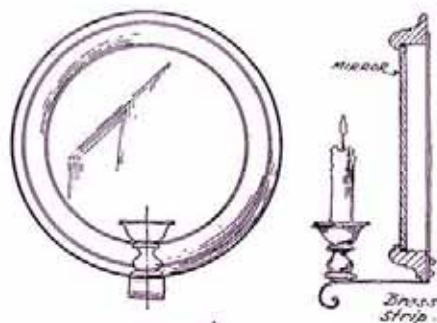
POWDER OR JEWEL BOX

Turn inside of top & box separately on face plate. Fit together, place between lathe centers and finish turning while assembled.



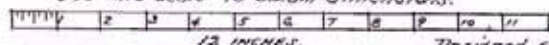
CRUMB TRAY & SCOOPER

Turn as a dish, in one piece. Saw apart, attach handles to each piece as shown.



CANDLE SCONCE.

Use this scale to obtain dimensions.



12 INCHES.

Designed & drawn by Lester A. Burton.

FOR ordinary workshop use, common woods can be divided into two classes, soft and hard. They are classified below.

If the furniture or other articles you make are to be satisfactory, it is imperative that the wood used be thoroughly dried out, otherwise warping, checking, or shrinking may damage your work. When ordering lumber specify kiln-dried or else be prepared to give it time to dry out before using. Warping is caused by uneven shrinkage and usually occurs across the grain, curling the edges up. Splitting or checking is due to the fact that evaporation of water at that section of the wood is more rapid than at the others. As unfinished wood is more easily affected by climatic changes, it should be painted as soon as possible.

HARD WOODS

Chestnut

Light in weight, of average strength, hardness and elasticity. Once quite plentiful from Maine to Michigan and South to Alabama, but blights in recent years have reduced the supply considerably, especially on the East Coast. Chestnut is sawed, planed, turned and shaped easily, although it splits readily and warps quite badly.

Maple

Found in New England and the Great Lakes region. It is very hard, strong and elastic, but rather difficult to work as it splits badly when nailed, warps easily. Its close, crooked grain takes an excellent finish. Used for carving, tool handles and similar work where hardness is essential.

Oak

Used extensively for furniture and cabinet work. It is heavy, strong, hard and elastic. Very durable but warps and checks considerably.

Ash

Resembles oak somewhat, although ash is coarser grained and less attractive, but easier to work. Used for all kinds of furniture. Straight grained, heavy, hard, strong, stiff and tough, but becomes brittle with age.

Black Walnut

Because of its beautiful chocolate brown color, walnut is in popular demand for furniture, but rapidly becoming scarce. It is heavy, hard, strong, coarse grained and easily worked. Gun stocks are made of walnut almost exclusively.

Birch

This wood is hard, tough, straight of grain and able to stand wear and tear. Widely used in cabinet making and for various kinds of furniture. An excellent wood for lathe turning.

Mahogany

There are several varieties of mahogany, chief of which are Central American, African, Mexican and Philippine. They vary considerably in color, hardness and ease of working. Usual color is rich red. Very desirable if kept dry. Glues exceptionally well.

SOFT WOODS

Poplar

An excellent wood to work. Light, soft and stiff but not strong. Its fine texture and exceptional working qualities make it very desirable for furniture.

Gum

Except for one quality sweet gum would be one of the most useful woods. It has an even texture, is comparatively easy to work, takes a beautiful finish, is an ideal wood for carving, and with a little care can be nailed well. It has a beautiful chocolate hue varied by uneven deposits of coloring matter. But it twists and warps more than any other common wood, although it is excellent for small articles of household use.

Cypress

A soft, easily worked wood that does not warp easily, but is likely to contain many fine checks. Nails well and is very durable. Color is reddish brown. It makes beautiful furniture.

Redwood

Southern Oregon and Northern California furnish the redwood which often grows to ten or fifteen feet in diameter. An excellent wood to work. Its color is red, turning to brown as it seasons. It is soft yet brittle, warps and shrinks very little and is very durable. Curly specimens are used with excellent effect in cabinet work.

White Spruce

Soft, of medium elasticity and strength. Its color is light yellow. Splits readily, is easy to work and fairly durable. Being very resonant it is used extensively for sounding boards of pianos and other musical instruments.

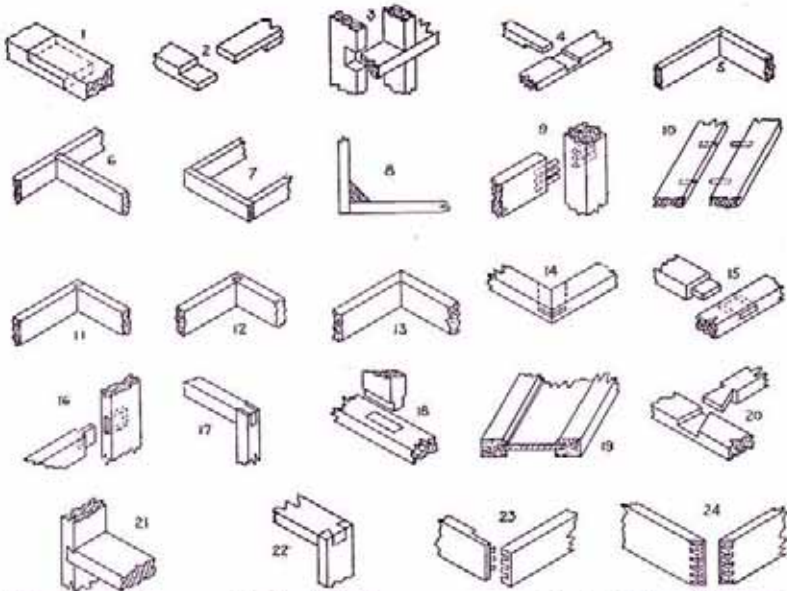
Basswood

A light, straight-grained wood which warps very little, is easily worked and nails well. Fairly durable but weak. Picture frames and mouldings are usually made from basswood.

White Pine

A very light wood of average strength and durability. It is used in large quantities for various carpentry purposes. Grain is straight and it is easily worked.

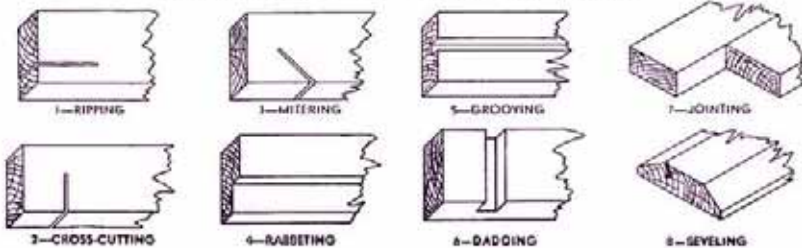
HOW JOINTS ARE MADE



- | | | |
|---------------------------------|-------------------------------------|--|
| 1. Spliced or Halved Joint | 9. Dowel Butt Joint | 17. End Mortise and Tenon Joint |
| 2. End Lap or Halved Joint | 10. Edge to Edge Dowel Joint | 18. Stub Mortise and Tenon Joint |
| 3. Cross Lap Joint | 11. End Dado or Box Joint | 19. Panel Construction |
| 4. Middle Lap Joint | 12. Dado Tongue and Rabbet Joint | 20. Half Lap Dovetail Joint |
| 5. Rabbet Joint | 13. Mitre Joint | 21. Half Dovetail Dado Joint |
| 6. Dado Joint | 14. Mitre with Spline | 22. Through Single Dovetail Joint |
| 7. Butt Joint | 15. Through Mortise and Tenon Joint | 23. Multiple End Dovetail Joint |
| 8. Glued and Blocked Butt Joint | 16. Blind Mortise and Tenon Joint | 24. Blind Mitre or Secret Dovetail Joint |

Even though you fasten with nail or screw, reinforce every joint with Le Page's Glue

Explanation of Common Terms



"A craftsman is known by the joints he makes." Not only do carefully made joints enhance the appearance of a piece of furniture, but they also contribute largely to its strength and durability.

It is not our purpose here to describe all joints nor to tell how to construct them. However the reader will find that the joints shown here cover all of the important ones used in cabinet work. A

little time spent in studying the joints of high class furniture will be productive of many ideas.

No. 1. Spliced or Halved Joint—used where the ends of two pieces are to be joined together in a continuous line to obtain extra length.

No. 2. End Lap or Halved Joint—used where the end of one piece joins the end of another at an angle. Often used on window screens, frames, small doors or panel type of construction. Instead of being cut square across the joint can be made with a mitre on one side. In this case it is called an "End Lap Mitre Joint."

No. 3. Cross Lap Joint—used where two pieces having square edges intersect each other as in the case of making pigeon holes, divisions on an umbrella stand or the cross bars of a taboret, etc.

No. 4. Middle Lap Joint—used to connect two members at some intersecting point in the form of the letter T. Note: All of the four above joints are of the half lap group and are made in much the same way, that is, cutting away half of the wood on both members, making the top and bottom surfaces flush (even).

No. 5. Rabbet Joint—used extensively in drawer and cabinet construction where a plain butt joint would be objectionable on account of the end grains showing.

No. 6. Dado Joint—used in the back construction of drawers, the joining of the shelves to the sides, for book shelves, etc.

No. 7. Butt Joint—used a great deal in box construction. This joint is often simply nailed together.

No. 8. Glued and Blocked Butt Joint—used extensively in cabinet work. The strength depends on the quality of the glued joint and the reinforced blocking.

No. 9. Dowel Butt Joint—used in cabinet work in place of the mortise and tenon joint wherever the leg and rail type of construction is used.

No. 10. Edge to Edge Dowel Joint—used for joining together various boards as in the case of wide table tops, panels, etc. The dowels help to line up the one surface of all the different boards joined in this way.

Note: Dowel joints are simple and quick to make. Care must be exercised to accurately locate all holes and to bore them straight. Dowel pins must fit these holes. These joints are glued together.

No. 11. End Dado or Box Joint—(Sometimes called dado and rabbet joint) used in box construction.

No. 12. Dado Tongue and Rabbet Joint—used in drawer construction. This type shows very little end grain and has a good glueing area.

No. 13. Mitre Joint—used extensively in picture frame construction or running mouldings. A true mitre is cut at 45° . This joint, however, may be made at any angle.

No. 14. Mitre with Spline—used for the stronger and better type of mitre construction. The grain of the spline must run at right angles to the mitre cut.

No. 15. Through Mortise and Tenon Joint—used for all forms of frame or panel construction as in doors, blinds, screens, etc. The hole portion is known as the mortise and the other part fitting into it as the tenon.

No. 16. Blind Mortise and Tenon Joint—used extensively in all forms of leg and rail construction where the end of the tenon, as in the case of the through mortise and tenon joint, would be objectionable.

No. 17. End Mortise and Tenon Joint—a simplified type of mortise and tenon joint. Used for the making of screens, frames, etc.

No. 18. Stub Mortise and Tenon Joint—differs from the blind mortise and tenon joints in that the joint is made with a short tenon. Is used more extensively in carpentry work.

No. 19. Panel Construction—grooves are cut in the edges to receive the panels. This form has its value in allowing for expansion and contraction of the panel.

No. 20. Half Lap Dovetail Joint—used in place of the middle lap joint where there is to be a pulling strain on one member.

No. 21. Half Dovetail Dado Joint—a good joint, but difficult to make it fit well on wide surfaces—used in place of simple dado joint.

No. 22. Through Single Dovetail Joint—used in place of the end mitre and tenon joint.

No. 23. Multiple End Dovetail Joint—used extensively in drawer construction.

No. 24. Blind Mitre or Secret Dovetail Joint—a very difficult joint to make and used very little. For fine box construction. No joints show except the mitre cut.

GLUES AND THEIR USES

by the courtesy of LePage's

THE woodworker is concerned with three kinds of glue—animal, fish and casein. Animal glue, commonly known as "hot glue" is obtained from the hides, skin, bones and sinews of cattle. Fish glue, which we know as a ready-to-use, prepared liquid glue is made from the skin and bones, heads and tails of fish. Casein glue, ordinarily called waterproof glue, is made from the curd of milk.

Good Joints Essential

No great skill is needed in using glue but there are a few important directions to follow regardless of what kind of glue you use.

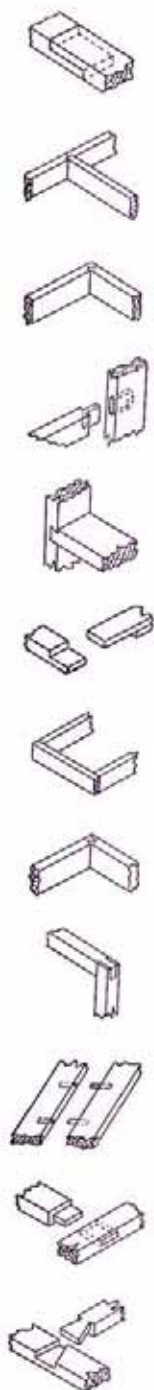
The most vital point is that the two pieces of wood to be joined together must make a perfect contact. The wood must be dry and free from grease, and the glue must be of the proper consistency and be spread in a warm room free from draughts. Use enough glue, do not starve the joints. The two pieces to be joined must be held together under pressure, while the glue sets. Always make a trial fitting without glue and mark the various pieces as they are to be put together as No. 1 and No. 1, No. 2 and No. 2, etc. Clean off the excess glue by throwing fine sawdust over that glue that has been squeezed out of the joint. This will facilitate its removal with a chisel.

Glue Holds More Than Wood

If two pieces of wood are properly glued together, the glue will hold better than the wood itself. The illustration, on opposite page, clearly proves this.

No one kind of glue, whether animal, fish or casein, is the best for all uses. For average use, however, Le Page's Liquid Glue is highly recommended. It requires no soaking, heating or mixing to certain proportions. It is fool proof. It has the advantage of setting slowly, giving the worker ample time to arrange and rearrange the clamps, or to square up the different parts being glued. For many needs, the slow set is indispensable.

EVEN THOUGH YOU FASTEN WITH NAIL OR SCREW



USE OF CASEIN GLUE

by the courtesy of LePage's

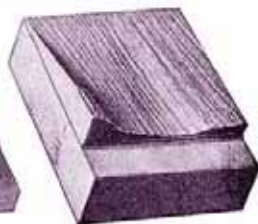
CASEIN GLUE, commonly known as "Waterproof glue," has made great gains in popularity in the past few years. The main feature is its moisture resisting power. It will withstand the action of moisture, humidity, extreme heat and climatic changes to a surprising degree. For high grade work such as veneering and wood-jointing on furniture, cabinets and pianos, patterns, radios, aeroplanes, gunstocks, model boats and model locomotives, outdoor furniture, canoes and boats it proves a most dependable adhesive. As a rule, when other glues do not hold LePage's Casein Glue does the trick.

For the home craftsman, this glue is of special value inasmuch as it requires no heating and is practically odorless. It is mixed with an equal part of water and stirred, no heating is necessary. In a few minutes you will have a smooth creamy "dough" ready for use. Only sufficient glue should be made for one day's use. Owing to the moisture-resisting qualities of the glue, the moisture will solidify over night, it then is unfit for use and should be thrown away.

The main constituent of this glue is casein, a by-product of cow's milk which is the dried curd.



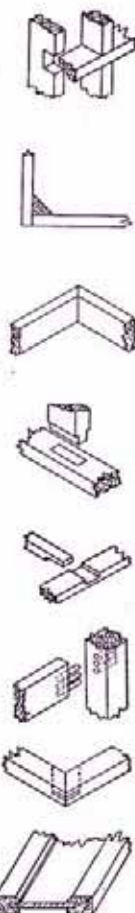
LePage's Held
Under 10,955 Pounds Pressure



The first illustration above shows the side view of one of the blocks of wood used in testing the strength of LePage's. The thin straight line indicates the lepage joint. The irregular line indicates the line along which the wood finally gave way, leaving the lepage joint unbroken.

Under a pressure of 10,955 pounds, the block was finally broken. Note from the surface of the two halves that it was the wood itself which gave way under the strain and not the LePage's.

REINFORCE EVERY JOINT WITH LePAGE'S GLUE



GENERAL FINISHING DIRECTIONS

THE matter of finishing is so vast a subject that only a brief sketchy outline may be given in the space allotted. The matter is so important, however, that a thorough study should be made of the information following.

Since all of us cannot provide ourselves with accurate scales and measuring instruments, some substitute must be made. For this purpose, one of the triple measuring spoons, $\frac{1}{4}$, $\frac{1}{2}$ and teaspoon which are made for cooking purposes makes an ideal substitute. Likewise a graduated quart measure should be gotten. We can afford that, metal or glass, preferably the latter. Get a blank notebook in which to keep records, and don't trust your memory. It fails at the wrong time.

In commercial finishing water stain is in general considered to give the best results, with oil stain second. Very little acid or spirit penetrating stain is used, since the time factor of control varies so greatly in each piece or parts of each piece being finished. Uniformity of color and delayed action of coloring is of prime importance to good uniform finishing. Aniline dyes, soluble in water, form the basic element in most water and a lot of oil stain with coal tar products running a close second.

For those who can obtain the necessary ingredients, below are listed several of the most useful water stains. They may be strengthened or diluted as personal requirements dictate, by adding more water or less water to the base formula. The color may be varied somewhat by a slight change in proportions, too, but care should be taken in doing this.

Antique Mahogany

Mahogany Brown Powder.....	2	oz.
Mahogany Red Powder.....	1	oz.
Potassium Bichromate.....	$\frac{1}{2}$	oz.
Water.....	1	gal.

This formula produces a dark cherry mahogany, which may be lightened by diluting to one-half strength.

Standard Reddish Brown Mahogany

Bichromate of Potash.....	2	oz.
Lye (Household).....	$\frac{1}{8}$	oz.
Brown Mahogany Powder.....	$3\frac{3}{4}$	oz.
Scarlet Stain Powder.....	$\frac{3}{8}$	oz.
Nigrosine Black.....	$\frac{1}{8}$	oz.
Water.....	$1\frac{1}{2}$	gal.

Give good coat this stain. When dry sand with 4/0 paper. Color filler with Van Dyke Brown and Burnt Sienna (ground in oil colors). Sand and wash coat with orange shellac. Varnish and rub with pumice stone and water.

Standard Brown Mahogany

Bichromate of Potash	1/8 oz.
Mahogany Brown St. Powder.....	2 oz.
Mahogany Red St. Powder.....	1/2 oz.
Walnut Crystals	1 dram
Water	2 1/2 qts.

Give good coat stain; sand lightly. Wash coat with a solution of half-and-half white and orange shellac. Color filler with Van Dyke Brown (ground in oil color). Shellac again, sand and apply varnish. Rub down with pumice stone and water.

Another Brown Mahogany

Mahogany Brown	1 3/4 oz.
Nigrosine, Jet Black.....	3/4 oz.
Picric Acid	20 grains
Water	1 gal.

Apply and work as above, same filler, shellac and treatment.

Standard Walnut (soft woods)

Ground Walnut Crystals.....	10 oz.
Bichromate of Potash.....	1/4 oz.
Water	1 gal.

Standard Walnut (hard wood)

Ground Walnut Crystals.....	12 oz.
Carbonate of Soda (dry).....	1/2 oz.
Water	1 gal.

Stain and sand with 4/0 paper. Color filler with Van Dyke Brown (ground in oil color) shellac lightly (half-and-half white and orange), sand and varnish. Rub down with pumice stone and water.

Since none of the projects shown are adaptable to oak, space not permitting; the matter of finishing oak has not been taken up. It is hoped, that in a later volume, some oak pieces may be used in which case, water stains and formulas will be described.

Oil stains or acid stains for oak are applied and treated much the same as for mahogany or walnut. Instead of varnish, wax is used much as a final coating on oak and walnut, and some mahogany. The finish up to and including the final shellacking before varnishing is the same, then wax is applied. Do NOT under any circumstances, apply wax on varnish. It will soften the varnish and

in time ruin it beyond redemption. Wax may be used as a polish on lacquer, however, with no effect on the lacquer.

The foregoing formulas are, in their essentials, the stains used in most of the furniture factories. Many variations of them have been worked out by expert finishers, but they vary only in a few respects. Many ingredients, unavailable to the non-professional finisher, have been added as personal requisites of individuals.

If you prefer to buy your stain all made up in preference to compounding it yourself we suggest that you use oil stain. Its drying is much slower than acid stains and is therefore under control at all times. It has an advantage, also, in that it may be used to color the filler which is used over it. It does not raise the grain as water stains do, and for the average novice, is recommended as the ideal medium with which to work.

Special finishes, as applicable to some of the projects, are described in the text on that particular project to which it applies.

Any varnish referred to is meant as dull rubbing varnish.

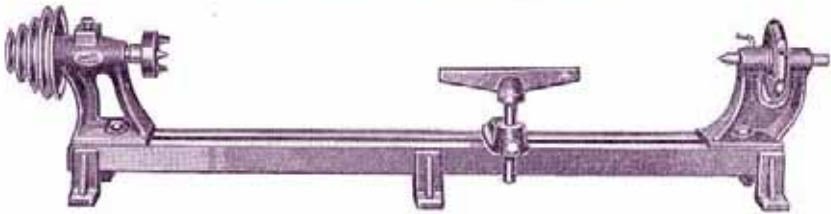
Wash coat shellac is five pound commercial shellac, diluted four to one with alcohol.

Sand bare wood, just before applying any stain, with 2/0 sandpaper. Use 4/0 for sanding shellac coats. Fine steel wool may be used on shellac, but care must be taken to get all dust and particles off before applying any additional shellac or varnish.

Make absolutely certain that all traces of glue and grease stains are removed before applying any stains; and be certain there are no water marks or wet spots on any surface before applying any oil stain or filler.

The biggest factor in finishing is the treatment of the wood before finishing. You cannot get a smooth finish on rough wood that has not been properly prepared. An extra hour with sandpaper on the bare wood will save hours on the finish and possibly grief in the end. The success and good appearance of a project lies in the finish and more than half of the finish lies in the preparation. Don't depend on the finish to cover up defects. Instead of covering them up, it will show them up.

STANDARD 4-SPEED LATHE



FOR complete lathe information refer to the article on Heavy Duty 4-Speed Lathe. All general information is applicable to both machines.

The lathe shown above has bronze bushed bearings with a large oil reservoir between them. A novel feature is the placing of the ball-thrust bearing inside the head casting. There it revolves with the spindle in a bath of oil, fully protected from dust and dirt.

Similarly to the Heavy Duty Lathe this one is driven by 4-step cone pulleys providing speeds of approximately 750, 1350, 2200 and 4000 R. P. M. without altering the belt tension. It may be driven from above, below or behind.

Use of Accessories

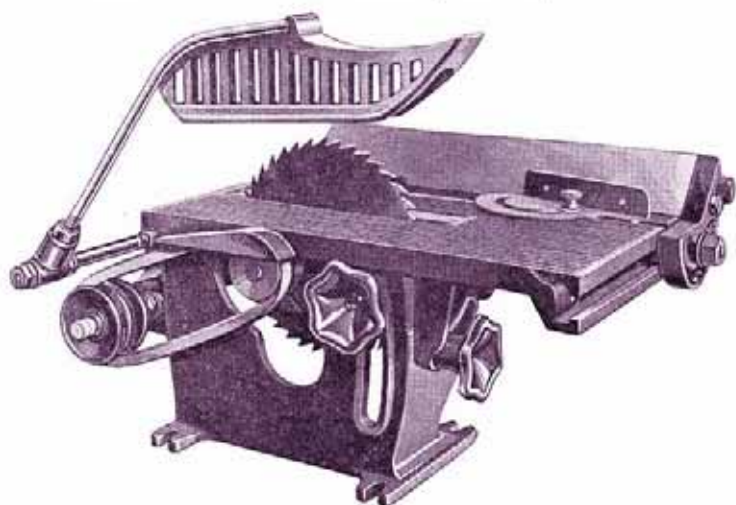
Several accessories such as face plates, adapter for holding sanding drum, wire polishing and grinding wheels, sanding discs and drill chucks may be used to advantage on both the heavy and standard lathes. Face plates and sanding discs attach directly to the lathe spindle while the other accessories are attached to the adapter which, in turn, is attached to the spindle.

Safety Precautions

Keep sleeves and neckties away from moving parts. Always go over all adjustments carefully before starting lathe. Revolve work by hand before starting motor to make sure there is sufficient clearance between work and tool rest. In sanding, hold sandpaper firmly, and in back of the revolving stock (to prevent fingers being drawn between tool rest and work). Always hold chisels firmly.

THE 7" BENCH SAW

THE 7" Bench Saw embodies several features which are departures from the usual. The unique arrangement for raising and lowering the saw, and the simple yet positive tilting of the table to any angle from 90° to 45° with the saw, are very much worth while.



Assembly Notes

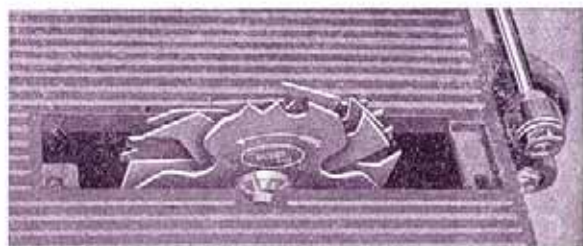
In setting up the saw, remove the wood insert in the table, place the saw on the spindle with the teeth pointing toward you at the top of the saw. Loosen the hand nut which clamps the saw spindle arm, then raise the saw to its fullest height: lower it as far as possible, to see that it clears all parts of the table and base properly. Replace the wood insert. The idler pulley is next put on and with the belt running from the inside groove to the pulley on the saw spindle, move the idler pulley just far enough away from the saw to make the belt assume an almost straight line, on the upper stretch. Any tighter than this only puts added wear on the parts of the machine. By placing and holding a piece of wood against the front of the saw, see if you can make the belt slip by grasping the lower stretch and pulling to the rear. You will at once appreciate the power that is transmitted by a "V" Belt of this size. The guard and its mounting are now put on, taking the caution to see that the saw clears the table on both sides. Test the squareness of the table with the saw, and adjust, if necessary, through the medium of the stop screw under the left front side of the table. When finally correct lock the stop screw in this position. In like manner with a 45 degree angle, test the extreme tilted position of the table, and with the stop screw

under the right front side of the table correct this adjustment and lock the stop screw. At any time the table may be set to either of these extremes quickly and positively. The speed of the saw should be about 3500 R. P. M. while in operation on sawing, dadoing or sanding.

Operation

While the machine is primarily what its name implies, a Bench Saw for ripping boards lengthwise or parallel with the grain, for cross cutting, or at an angle across the grain, there are many other possibilities in it. With the substitution of a dado head, a wide addition is made to the field of usefulness. A dado head consists of two outside saws or cutters, with teeth of such form that it will cut with or across the grain, and a number of inside or chipping cutters. The outside cutters may be used singly or together, but the inside cutters are never used alone, always having the outside saws with them. The saws and cutters are placed on the spindle similarly to the saw, with the teeth of the inside cutters staggered with respect to the teeth of the outside ones. This balances the load on the spindle and is productive of smoother operation. If a cut is more than $\frac{1}{2}$ " wide and $\frac{1}{2}$ " deep, it is advisable to make the depth in two cuts. With one adjustment, run the cut through all the lumber that requires it, readjust and again go through the lot. Likewise, if the width of the cut is of such dimension that an accurate width cannot be secured with one cut, make a little over half the width, or a little over one-third, then readjust the fence and repeat. Remember, you are not concerned as much with production as with accuracy.

Keep the grease cups full of grease and give them a half turn about every few hours of operation. Grease and oil are cheaper than repair parts. A good workman is known by the condition of his tools and the quality of his work. Keep your saws free from rust and well sharpened. Take your time, and make sure of your adjustment before going ahead. Poor care



and improperly adjusted machines only result in poor quality work. Among the projects shown will be found suggested accessories which you can make for the bench saw, which will widen its field of usefulness. You will immediately appreciate the value of them.

By all means provide yourself with them, and enjoy their convenience. The sketches, with notes are mostly self-explanatory, so space to describe them in detail need not be taken.

Use of Sanding Disc

The 6" metal plate with sanding (abrasive) disc attached directly to it is mounted on saw spindle, with the saw blade and strips in table removed. No nut is used on spindle, the sanding plate being screwed directly to it. This provides an excellent power sander for smoothing or rounding off the ends of work as well as for sanding small pieces. For work too large for the disc sander use the belt sander. In operating the disc hold wood against that half of sander nearest you. In this position the motion of the disc has a tendency to hold the wood against the table, and better work results.

To replace worn out abrasive discs quickly, use good quick-setting cement. Split the paper backing of disc with thumb nail and tear off old disc, leaving a layer or two of paper if possible. New disc can be attached and work resumed in a very short time.

Surface Grinding

Another suggested use of this novel saw is in the nature of a surface grinder. The No. 930, $\frac{1}{2}$ " x 4" grinding wheel, is mounted on the saw spindle instead of the saw blade. By lowering the head to a point where the grinding surface of the wheel extends very slightly above the table level and passing the work back and forth, holding it flat on the table, results can be obtained almost equal to a good surface grinding job.

In this operation it is very essential that the grinding edge of the wheel be parallel to the table top to grind a true surface. Incidentally this is an excellent arrangement for grinding bevel-edged tools as the table serves as a rest for the tool. Another use is for grinding skates, the blade being ground by passing it over the wheel at exactly right angles.

General Directions

If a great deal of angle cutting is to be done, that is, if the angle of the saw is to be changed often, it is well for the operator to equip himself with a 45° and a 90° angle square to facilitate rapid alignment of saw in correct position.

Do not put any belt dressing or compound on belt. Keep it clean, removing oil or grease when necessary with a gasoline dampened cloth. In setting up saw or dado be sure that it will turn toward you with teeth pointing in the same direction.

Do not attempt to saw very small pieces with the circular saw—use the jig saw or band saw instead.

Keep saws sharp. There is less danger of personal injury with sharp tools and cutters.

Always keep fingers as far away from saw as possible. In ripping place the thumbs on the end of work nearest you, fingers on the side, and feed gradually. Use a notched stick for pushing narrow pieces past saw.

After starting a cut do not stop until cut is completed. Never attempt to remove partly sawed stock while saw is in motion. Small pieces of wood left on table after sawing should be knocked off with a piece of wood—do not attempt to remove them with fingers while saw is moving.

If the saw blade "wobbles" it is not necessarily defective. Saws that run out of true when turned slowly by hand will usually run absolutely true when turning at the correct speed of 3500 R. P. M. If yours apparently runs "out" make this test. Run it at operating speed and see if it is not true. If it continues to "wobble" at maximum speed it is possible that the blade is bent or the spindle defective. The saw has a spindle with shoulder turned from one piece of steel and no flanges should be used on it. No washer is necessary between saw blade and lock nut as the direction of rotation has a tendency to tighten the nut.

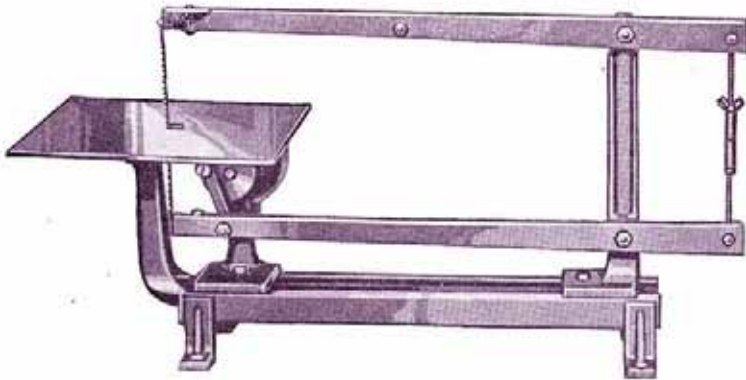
Utmost in protection is assured the operator by the guard supplied. It is advisable to keep it in place at all times. Even when the saw is not in use, if left exposed there is a possibility of the operator's being scratched when reaching over the blade.

TYPE NJS JIG SAW

NOTHING can take the place of a jig saw in the home workshop. It is a complete creative machine in itself, capable of sawing out innumerable articles of intrinsic beauty and symmetry from wood, Bakelite, brass, copper, pewter, tin and untempered steel.

The extent of uses for this most efficient machine are governed almost entirely by the ability and experience of the operator. Many use it for cutting out toys, book-ends, door stops, etc., for the kiddies, others for intricate fret work, such as reproductions of historic clocks and cathedrals while others use it commercially for silhouetting window cut-out displays and raised letters for the artistic, attractive signs which are coming into such popular use for tea rooms, antique shops, etc., where something unique and unusual is desired for display and advertising.

This jig saw has been greatly improved by using a heavy, bronze-bushed drag link and fitting it for the "V" Belt drive. It operates so quietly that one does not need a basement or attic workshop for this machine. It can be used in the kitchen without disturbing anyone.



How to Assemble

The head stock, back stand and bracket for table are all assembled on the bed according to the sketches, leaving the clamping bolts loose. It will be noted that the stand for table slides between the rails of the base and is held in position by the same bolt that secures the head stock.

The arms are next put in place on the right side of the back stand. Note that side brace extends from arm to left side of back stand. Now attach drag link to lower arm, using long bolt and fasten other end of link with short bolt to driving disc. With this done, see that lower arm is in line with base. It should be exactly in line. If it is out loosen drive pulley and slide shaft through until arm aligns with base. After this is done the bolt in the lower arm should be made to line up with the driving head shaft, by changing position of head stock on bed. Then tighten pulley on shaft and revolve assembly eliminating binding, if any, by shifting position of head stock. Do not assume that driving disc should bear against headstock. There should be about $\frac{1}{4}$ " of exposed shaft at this end. Then tighten head stock and back stand on base. Next align upper arm with lower arm. About midway of the upper arm is a bolt holding brace. Loosen this bolt, change arm to correct position and tighten bolt. The table is put on last and saw blade inserted. All saw blades should be operated with teeth pointing down. Shift position of table and bracket until saw travels practically in the centre of hole in table.

The best driving speed for this Jig Saw is 450 to 500 R. P. M. This speed is obtained by running belt from the 1 $\frac{1}{4}$ " "V" pulley on countershaft or motor shaft to the regular pulley on head stock assuming the shaft is turning at about 1750 R. P. M. On 25-cycle motors and others having slower speeds, the 1 $\frac{3}{4}$ " "V" pulley may be used on countershaft.

Before starting Jig Saw, oil every bearing carefully. There are two holes in back stand for lubricating arm bolts, two in the head stock under the table for driving shaft, and two in the drag link. Drag link bearings should be oiled every few hours of operation, the others not as frequently. A drop of oil should occasionally be put on eye-bolt on back end of arms and also on clips at ends of upper and lower arms where saws are held.

Tilting Table

The Type NJS Jig Saw is provided with tilting table, angle from zero to forty-five degrees. This is of great assistance in doing relief and overlay work, as well as for inlaying. Jig Saw Cut Out Book gives detailed explanation of these operations.

On the underside of the table is a hardened steel adjusting screw, the head of which should be adjusted in a position directly behind the saw and lightly in contact with the back of it.

A correct adjustment here will eliminate rocking of the blade due to the slight arc traveled by the arms.



Bellows Keep Lines Clear

This unique device, composed of a steel diaphragm, moulded rubber disc and steel arm provides a simple, effective method of keeping the work clear of saw dust in following, or sawing to, a line. No power is required to operate it as the arm motion provides the necessary action. It should be attached under the bolt holding the saw clip, or under the jig saw arm. After bolting in position bend the bellows arm so that the air stream will be directed on the cutting line of the saw.

Sanding With the Jig Saw

By wrapping a narrow strip of sandpaper around a jig saw blade, spirally, light sanding of edges of fret work is accomplished.

Fret Saw Adapters

The mechanical drawing shows position for attaching adapters. On loosening the knurled nut that clamps the blade, you will note that the bolt has a hole drilled through the centre of the diameter. The fret saw blades are inserted through this hole part way before knurled nut is tightened. After tightening this nut, make certain that adapter does not bind. The section that holds the blade should rock freely in the other section, as binding here will break saws.

The adapters may be used with all models of "Driver" Jig Saws, and hold the small, pinless blades used in fret saw work. To attach these adapters, simply remove the metal clips from ends of arms and bolt in place according to sketch.

General Information

If kept properly lubricated and adjusted, this jig saw will give years of satisfactory service. It should be inspected periodically for alignment and to see that all bolts, set screws, etc., are tight.

The belt requires no dressing, but should be kept dry and as free from oil as possible. Should it become oily, wash with gasoline. Beeswax rubbed on the saw blade occasionally improves the action and is used by most professionals in jig saw work.

No attempt has been made to provide a device for guiding the work on the table due to the fact that the need for a guide is very rare, most jig saw work requiring a flat, clear table. A milled guide slit interferes with free movement of small designs and has other disadvantages.

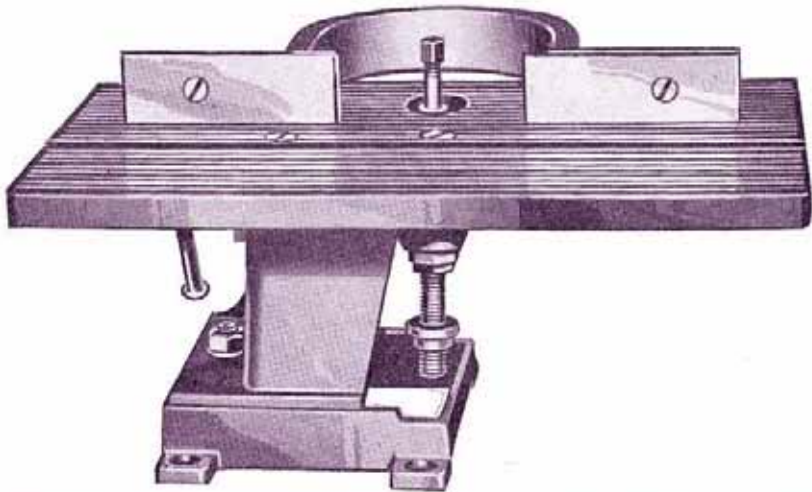
If you wish a guide to cut absolutely straight lines, simply clamp a strip of wood to the table top with small C clamps.

SPINDLE SHAPER

THIS machine is a unique creative machine in itself. The high-speed vertical shaper is indispensable in planing mills, furniture factories, carpenter shops, etc.

For the home craftsman it serves many different purposes—enabling him to cut almost innumerable kinds of mouldings, put fancy edges on table tops, cabinet panels, etc. The cutters which are supplied can be used singly or in combination as two can be mounted together. Further varied cuts are obtained by simply tilting, raising or lowering the head stock to expose the cutters at various angles and heights.

An advantage of this type shaper is that by removing the guard and guides the interior edges of work such as small picture frames and panels may be done very easily. This operation is not possible with other types which employ large cutter heads with removable blades. Provision is also made for dadoing or grooving, and for raising panels with this machine. Head stock is inverted and these accessories attached to end of spindle $\frac{1}{2}$ " in diameter.



Without doubt, the shaper shown here is the safest to operate. The small cutters and effective guards practically eliminate the hazards ordinarily associated with high speed shapers.

Shapes and styles of cutters available are shown.

Assembly

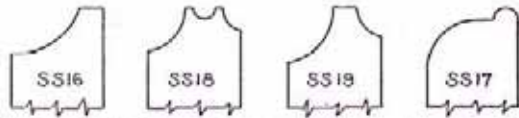
Sub-base is set on base as in diagram and bolted in place. Ball-bearings are used because of the high speed, to minimize friction and wear and to insure precision work over a long period of time.

In case you have any difficulty deciding what is the correct adjustment, it is better to leave bearings slightly loose than too tight. After adjusting, set up cone lock screws or nut as the case may be so that cone will be securely locked. Finally, space drive pulley evenly between forks of head stock and tighten lock screws securely.

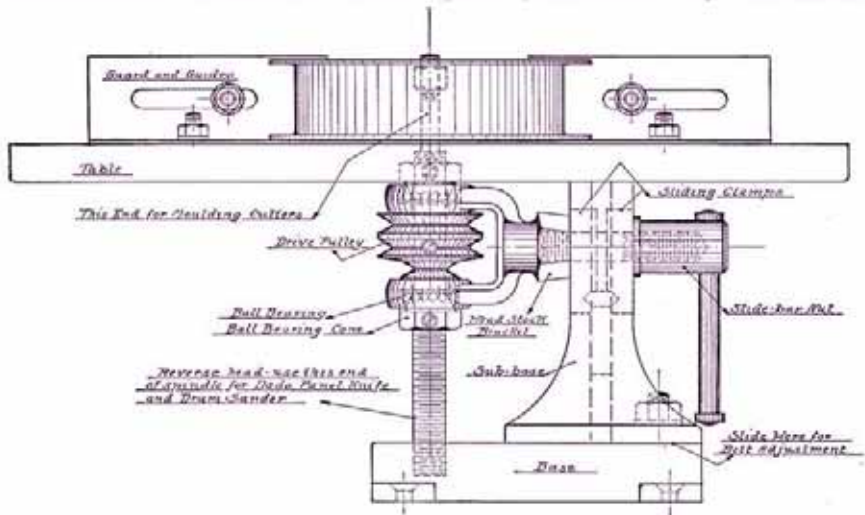
Next fasten the head stock assembly in place as the sketch indicates, with clamps and slide bar nut. The table should be attached next and then the guides. Transmission is by means of a single round belt for carving while the double drive is used with dado and panel knife.

Operating Speed

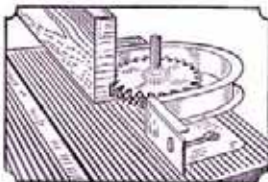
Best operating speed for cutters is between 7,500 and 10,000 R. P. M. For dado and panel knife 3500 R. P. M. The higher speed is obtained by belting from the 2 15/16" pulley (953) on the countershaft to the small groove on spindle shaper pulley with countershaft turning at double speed (3500 R. P. M.) To double



These large cutters are available for the spindle shaper, are 1 11/16" in diameter, and are attached to the 1/2" end of the spindle.



speed of countershaft use a pulley on motor shaft twice the diameter of corresponding pulley on countershaft. For correct dadoing speed run double drive belt from double 1 3/4" pulley (LJ-354) on counter-

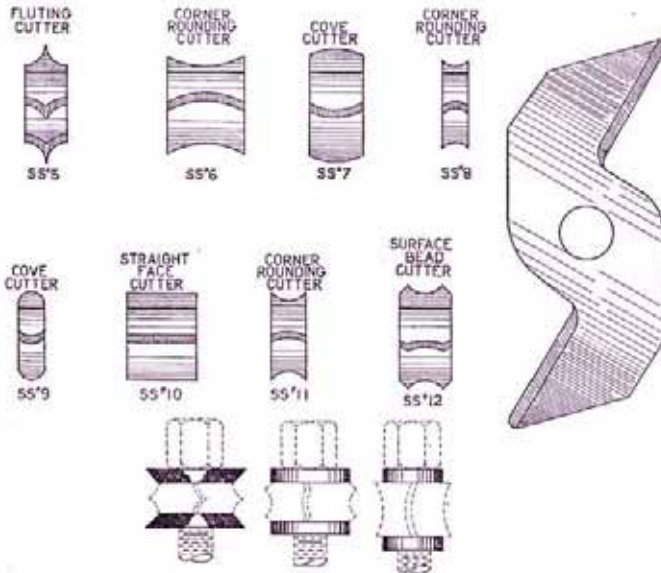


Horizontal dadoing and grooving, promoting greater accuracy, done on the shaper. Other dadoing on the bench saw.

shaft to large grooves of spindle shaper pulley. With the countershaft speed at 3500 R. P. M. the machine speed will be the same which is correct. You will notice that belt is required to run from a vertical position on countershaft to a pulley mounted on shaper head. With countershaft turning toward you belt should run over top of countershaft pulley and from there around shaper pulley from the right side to the left and back under the countershaft to be coupled. This will give you the correct direction of rotation. It will be noted that sub-base slides on base permitting easy, quick belt adjustment.

Mounting Cutters, Dado, etc.

When the shaper is assembled and located in front of counter-shaft the guides and spindle will be on the left side of the table. Looking from this position all cutters, dado and panel knife should turn **clockwise**, i. e., in the same direction as the hands of a clock move. In this way all cutting edges engage the work as it is passed through from the front of the table toward the back. Cutters are so placed that the edge furthest away from the center cuts first, beveled edge follows.



Adjusting the Guides

The secret of fast, accurate and uniform work is an efficient system of guides. Those furnished on this shaper fill every need of the home craftsman. The guard with sliding guides advances and recedes as required to restrict depth of cut and is adjustable two ways, covering all cutters used, leaving just enough exposed to do the cutting. A set of guide washers and depth collars is indispensable when operating without guard and guides, as in carving the interior edges of ovals, etc., as in small picture frames and panel work. Used above and below the cutter they prevent cutters from cutting too deep. Size of depth washers used should correspond in diameter to the smallest diameter of the cutter to be used. The disc guard supplied with this set should always be used with dado and panel knife being placed under lock nut next to dado saw or panel knife with bevel part down to allow working clearance.

Lubrication

If carefully greased when assembled the ball bearings can be operated for a considerable length of time without lubricating as the felt washers prevent leakage. However, it is a good idea to inspect bearings every few months to see that they have sufficient lubrication.

Sharpening Cutters

These cutters are made from highest grade tool steel, ground to mechanical precision and carefully tempered. Naturally they should be kept sharp to assure good work.

Cutters should be sharpened on an oil stone with flat edge of the cutter next to stone. This preserves the bevels. Very little steel needs to be removed, but it is important that the same amount be taken from each of the three flutes to maintain uniformity. Do not attempt to grind or file along the curved surfaces, as this will change the contour of the cutter.

Things to Remember

Never attempt to change position of guide, guard or slides while spindle is revolving.

In shaping across the grain, as with the ends of strips, keep hands as far as possible from cutters.

Do not try to cut too deep with panel knife. The duty of this knife is to shave off a shallow cut, not to take the place of dado for rabbeting, etc.

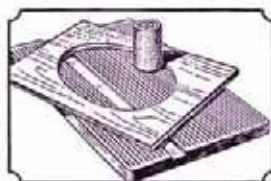
If the first cut is ever rough, rippled or irregular, put the work through a second time to smooth it.

When only one cutter is used all of the depth collars and washers (SS-14) should be placed on spindle to take up space between the upper cone and the beginning of the threads. If these are not sufficient, use any washer of small outside diameter with 5/16" hole.

If driving spindle comes in contact with table at side of hole when in vertical position, the table should be moved slightly. This is accomplished by loosening both screws in table top and shifting as required.

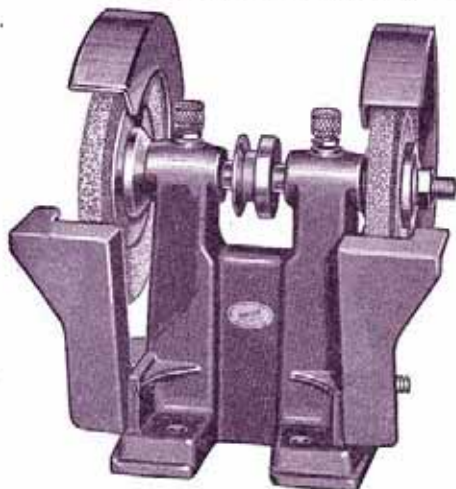
The set of four new cutters is attached to the opposite end of the spindle from the smaller cutters. No depth washers are furnished for this type cutter, the proper depth of cut being governed by the position of the guard and guides.

If head fits too close to rear of hole in table add an extra washer.



Using drum sander on shaper assures accurate, close work.

BENCH GRINDER AND POLISHING HEAD



THERE are so many uses for the Bench Grinder and Polishing Head that either one or the other is a shop necessity. With 4" or 6" wheels permanently mounted in a convenient and accessible position, chisels, gouges, plane bits and all cutting tools may be kept in the proper condition for accurate and clean work. In connection with the jointer, the drill press, the shaper and the router, and the lathe it is indispensable. While the Pol-

ishing Head (No. 94-A) is adaptable to buffing, polishing, drilling and grinding of a lighter nature, it is built strong enough to give satisfactory service if lubrication is properly taken care of.

The heavy duty type Bench Grinder, with its grinding rests so arranged that either 4" or 6" diameter wheels of different widths may be used is adaptable to practically all types of grinding usually required in the home workshop. Conveniently adjustable and adequate wheel guards protect the eyes and face to a great extent from flying metal and particles of dust. The heavy bronze bushed bearings with the grease cup lubricant reservoirs make it a very sturdy accessory.

The bench grinder may be driven from above, below or behind, thus adapting itself readily to particular shop conditions. Sufficient clearance between bearings is allowed to accommodate a flat belt transmission if that is desired.

The utility of these two tools is greatly extended by their accessories. Cloth buff wheels are used for polishing nickel, brass, copper and similar metal. Wire scratch wheels remove dust, paint and other coatings from all metallic surfaces. Sanding disc and drum are used to shape wood as well as to smooth it. Also for sanding floors and similar surfaces to remove water stains and similar discoloration.

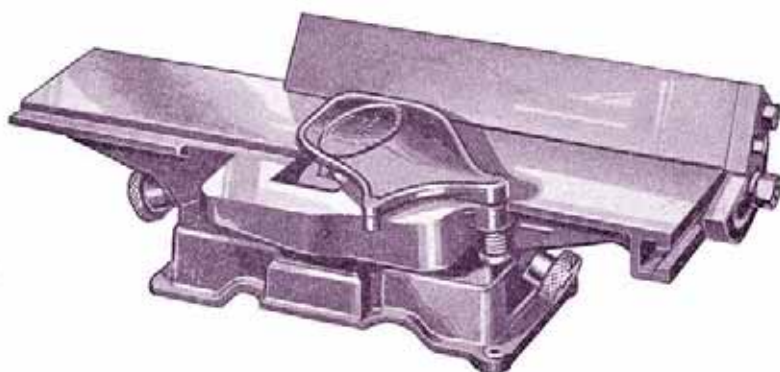
Due to their simplicity no special instructions as to assembly, adjustment or



maintenance are necessary. Lubrication should, of course, be taken care of periodically.

May be run at any speed up to 3500 R. P. M. The smaller diameter wheels require a higher spindle speed than the large wheels to obtain an equal peripheral speed at the grinding surface.

4" PLANER OR JOINTER



MOST of the description of this machine is the same as that for the 4" Heavy Duty Planer covered in the previous article. Reference should be made to it for full information. Only the points of difference will be covered here.

The planer, Type TP-14, has bronze bearings with oil reservoirs and felt wicks in each bearing box to distribute the oil to the bearings as required. It is possible to use this planer for many months without any attention to lubrication.

Assembling

If the planer is purchased in parts the first step in assembly is to bolt the sub-base on the base. Be sure to remove any dirt or paint from the surfaces where the tables slide on the sub-base so they will fit together accurately. Now slip a bearing over each end of the cutter-head shaft and put the assembly in place on the sub-base, and insert bolts through the hole in the base. Revolve the head slowly in the bearings. While tightening bolts tap the bearings slightly in the event there is a slight binding. Place pulley on the cutter-head shaft and belt to the motor. Run for short periods at first until bearings become "broken in."

The front and rear table are next assembled on the base—the table with the rabbeting ledge is considered the back table while

the one with the rabbeting arm is the front. In bolting the tables to the sub-base a strong tension washer is provided so that tables may be readily adjusted by means of the hand wheel.

Adjusting the Knives

Assembly of the knives and cutter-head is shown in drawing of the Timken Bearing Planer. As correct performance of the planer depends on accurate setting of the knives, too much care cannot be given to their alignment.

The knives are adjusted to be in an exact plane with rear table, using a metal straight edge or rule. The straight-edge should touch the knife along its entire length as the straight-edge is moved from one side of the table to the other. After adjusting the three blades go back and very carefully tighten up the bolts in the chip breakers so that there is no possibility of the knives getting out of alignment. Any waves in the wood planed or uneven cutting are caused by improper alignment of the knives or by feeding the work too fast.

When assembly of the planer is completed, fill the bearings with a good grade of medium motor oil. The bronze bearings will then require no further attention for an indefinite length of time. Properly lubricated in the beginning, sufficient lubrication is provided for service equivalent to 24 hours per day continuous operation for a period of 12 months.

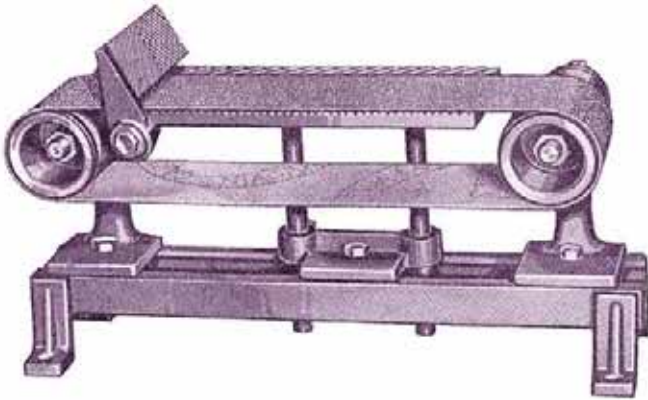
Operating Speed

Due to the precision balancing of the cutter-head and the specially designed bronze bearings, this planer may be operated at somewhat higher speed than the average. A speed of between 4000 and 5000 R. P. M. is recommended and this means from 12,000 to 15,000 cuts per minute and assures perfect work.

With a 1750 R. P. M. motor the 1 $\frac{3}{4}$ " diameter pulley is used on the planer with the 4" pulley on the motor shaft or countershaft.

For information on operation and other data, read the article describing the heavy duty jointer.

BELT SANDER



MUCH of the tedious sanding, formerly done by hand, is performed very efficiently by this machine. The wide endless belt which is a high grade fabric-backed abrasive, travels over two rubber faced pulleys quickly reducing or smoothing wood, fibre, bakelite and metal. The object to be sanded is held on belt over table for flat or bevel sanding while the section where belt travels over rollers is used for sanding curves, contours and irregular shaped objects. The wide, flat surface provided by the belt sander makes it ideal for sharpening tools of all kinds as it grinds the entire surface at one time and does not overheat the work. Two grades of abrasive belts are available. The table, which is ground flat, preserves flat surfaces on the work sanded. The fence can be adjusted to various angles and enables the operator to sand the same angle consistently on any number of pieces.

How to Assemble

In assembling, first attach rubber-faced pulleys to driving heads, then mount heads on base, leaving them slightly loose for final adjustment. Do not tighten spindle nuts as far as they will go on pulley—tighten only until width of pulley is same as abrasive belt. Put abrasive belt in place taking care that it will travel in the right direction. Arrow on inside of belt indicates correct direction. Then see if both pulleys are equal distance from the heads so that belt will run evenly. They can be moved in and out by loosening the drive pulley set screw and sliding the spindle through. With this done put table in place. If you attach casting that clamps to bed on uprights first it will be easy to set table in proper place. Table should be located half way between both rubber pulleys.

Now line up abrasive belt as nearly as possible, but do not get it too tight. It should be possible to move lower part of belt up and down at least one-half inch. Belt machine to countershaft according to diagram, oil all bearings and start. If belt shows a tendency to travel to one side and rub against the table uprights or fence, tap the driving head lightly, twisting it slightly to one side. It may take a little time to get the correct belt adjustment at first, but once it is right it seldom requires further alignment. Tighten driving heads down securely after belt is adjusted. A guide, for maintaining different angles, is provided which is easily adjustable to any position desired and can then be locked in place.

Operating Speed

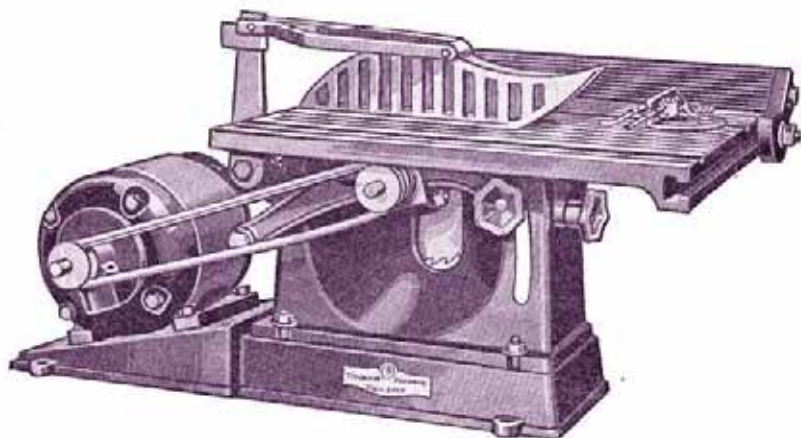
For light sanding a speed of 1750 R. P. M. is very effective, while for heavier work or where fastest cutting is desired, 3500 R. P. M. will prove best. At 3500, of course, lubrication should be more carefully watched.

If the sanding you are doing is for a natural wood finished surface, the work should always be sanded **with the grain**, not across it, as cross-grain sanding leaves lines very difficult to remove. The coarse belt is used for fast cutting and the fine one for finishing off. Either can be used for sharpening tools.

The table is shown in normal operating position. If you find in sanding at this position more stock is removed at ends of work than in centre, raise table until this condition is overcome. It may be necessary to move one or both driving heads a bit closer together or farther apart to alter belt tension.

Although it is not imperative to follow this method, it is advisable that driving be done over both pulleys to divide the load. In use the belt sander requires considerable power and equalizing the load greatly improves the operation.

HEAVY DUTY 8" BENCH SAW



THIS saw, as shown, is a self contained unit, motor and machine being mounted on a heavy base. This feature makes it readily portable and handy to move about the workshop.

It is much heavier and larger than the 7" Saw, throughout. Instead of ball bearings, it has Timken Tapered Roller Bearings, the table is larger (17" x 13½"), is 27" long and 15" high, overall. Its 8" blade cuts up to 2¼". As shown, it is driven by a ½ H. P. Repulsion Induction motor of 3450 R. P. M., which is advised for this capacity saw. It takes a 5½" diameter dado.

Table and Arbor Control

Controlling the movement of saw arbor up and down and the tilting of the table are done by means of conveniently located hand wheels beneath the table. With the motor attached to the base the arbor may be moved to either limit without changing the belt tension.

To tilt the table simply loosen the hand wheel at table quadrant. With the table tilted the splitter and guard retain their former position and work very effectively.

Lubricating

There is very little to get out of order or require attention on the saw other than occasional lubrication. To do this remove the saw blade, loosen the clamping bolt that holds the bearing assembly in place, and slide the assembly out from the drive pulley side. This will expose a hole in the centre of the bearing housing which should be filled with vaseline or other light grease. Lubrication is necessary only about once a year.

Should any end play develop in bearings this can be taken up by removing the bearing cap and tightening the bearing lock nut. After tightening nut, tap each end of the spindle lightly with a soft hammer or block of wood.

Do not set bearings too tight.

Care and Operation

The correct operating speed for this saw is about 3500 R. P. M. Using a $\frac{1}{2}$ H. P. Repulsion Induction motor of 3450 R. P. M., two pulleys of the same diameter should be used on motor shaft and saw spindle, the ones recommended being the $2\frac{1}{2}$ " diameter. If a 1750 R. P. M. motor is used the 4" diameter pulley should be used on the motor shaft with the $2\frac{1}{2}$ " on the saw spindle. The use of the 3450 R. P. M. $\frac{1}{2}$ H. P. motor is strongly recommended for this saw as the additional power is of great value especially when continuous heavy work is encountered.

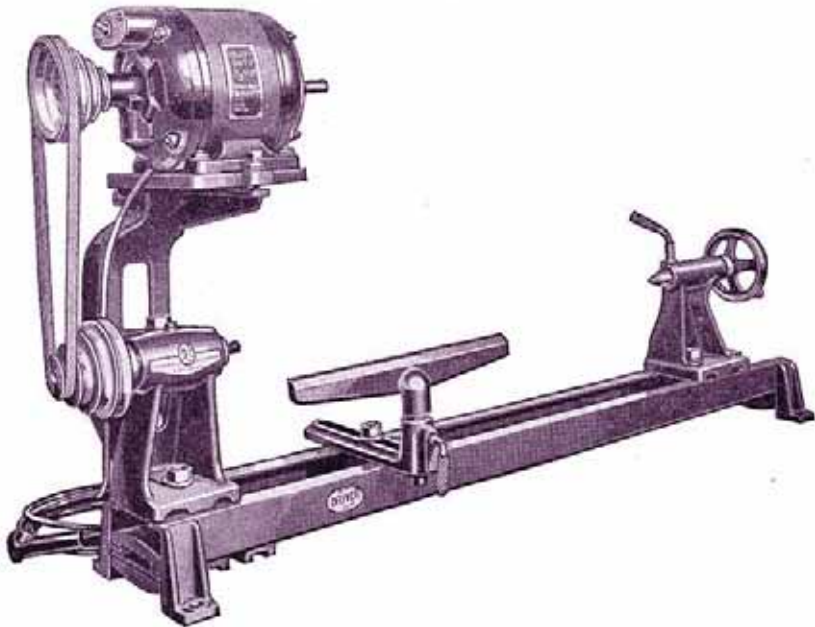
The type of work possible with this saw parallels very closely that of the 7" saw except for the generally increased capacity of the 8" saw, and for that reason are not covered in this article. Reference to the 7" Bench Saw will explain the use of various accessories.

Cutting Wheel for Sawing Metal

An 8" Abrasive Cutting Wheel $\frac{3}{32}$ " thick, for cutting unhardened steel, iron, copper, brass, fibre, aluminum in rods, sheets or tubes is available for use on the 8" Heavy Duty Bench Saw. It is mounted on the spindle in place of the saw blade and operated at the same speed. A wood guard, easily cut to shape with the band saw and dadoed out on the under side should be used in place of the standard metal guard, to give the operator full protection from flying bits of metal and abrasive.

This abrasive wheel cuts very rapidly and accurately leaving little or no burr. An advantage over metal cutting saw blades is that it requires no sharpening.

HEAVY DUTY 4-SPEED LATHE



THE type of lathe illustrated here is well adapted to either home or shop use. An unusual feature is the motor bracket which provides a self-contained unit with vertical drive. The motor is attached to a hinged base which is easily raised or lowered for belt tension by means of a set-screw at the front. If the motor bracket is not desired, this lathe may be driven equally well from behind or below. The 29" "V" belt is standard although other lengths may be used for different installation requirements. Four step cone pulleys provide a positive yet very flexible drive, and an unusually helpful range of speeds, a choice of 750, 1350, 2200 and 4000 R. P. M.

The motor should be attached and transmission so arranged that the lathe spindle turns **toward** the operator. If it does not, the correct rotation may be secured by turning the motor end for end or reversing its direction of rotation.

The drawing shows the details of the headstock. The construction of this particular head is commendable in that the bearings (Timken Tapered Roller Bearings) are adjustable to almost any wear that may ever develop, without altering the alignment of the spindle. A large oil reservoir holds sufficient lubricant for many months of service, without attention. If end play develops in the spindle it can be taken up by removing the bearing cap and tighten-

ing the inside lock nut. After adjusting, tap both ends of spindle lightly with a soft hammer or block of wood to free bearings.

Bed May Be Extended

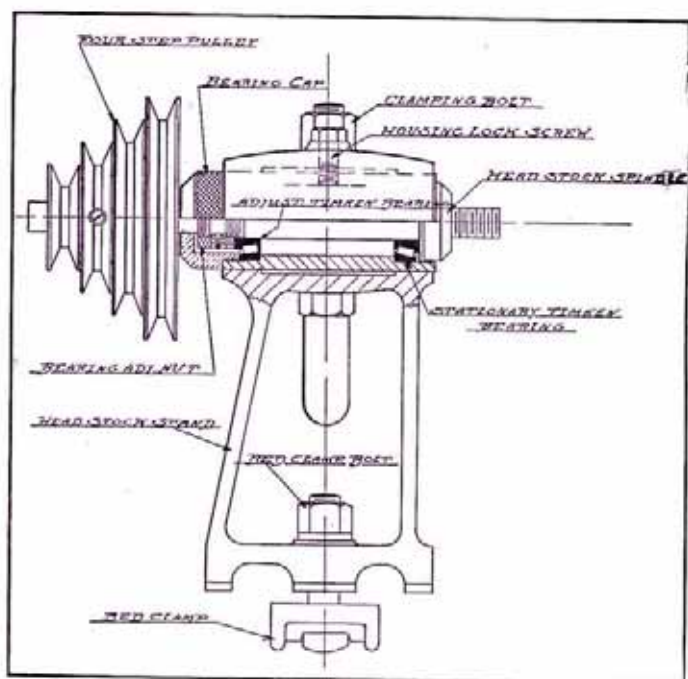
The normal bed length is 42 inches. This may be doubled, for extra long turnings such as newel posts and pillars, by adding an extra section of bed. This gives a distance between centres of about six feet.

Carving Work Between Centres

With the double end shaft motor mounted on the bracket, the flexible shaft may be driven from the opposite end providing the operator a convenient source of power for working on turnings between the lathe centres. Fluting, reeding, carving and beading may all be done from this set-up.

Face Plate Work

Face plate work differs from spindle turning in that the work is held by the live centre only, the tail stock does not come into play. For this operation the tool rest is swung around and used at right angles to the bed, parallel to the work. Bases for lamps and candlesticks, knobs and bowls are all products of face plate turning.



If the work to be turned is small, screw it to the small face plate, using the wood screw centre. Fasten larger pieces with three short screws to the large face plate. It is well, before starting to turn square work, to saw off the corners with the jig saw or bench saw. If convenient, it is advisable to saw the stock out as near round as possible with the jig saw. This will save considerable time.

With the work attached, the face plate should be screwed to head stock spindle in place of the regular dog. Then swing tool rest around at right angles to bed and move up to within about $\frac{1}{8}$ " of the work, parallel to it. Top of tool rest should be slightly above centre of work.

If it is necessary to cut clear through the work, place a piece of thin wood between the stock and face plate.

First cut edge off to diameter and then square off face, remembering not to carry chisel beyond centre of revolving stock as there the direction is reversed and your chisel will be thrown up. Start at the centre and work toward the edge. Speed for face plate should be ordinarily about 1350 R. P. M.

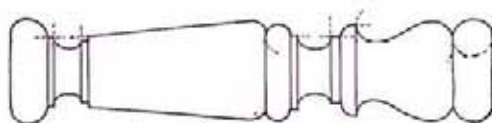
For use of accessories, see description of Standard 4-Speed Lathe.

How To Turn

In wood turning there are certain peculiarities or niceties that have to be observed, so that the finished turning has an appearance of refinement about it. Except in specific instances, which were pointed out in the description of details on the various projects described, all flat shoulders or surfaces should be parallel to the centre line. All curves meeting such flat surfaces, such as beads or coves, should meet at right angles to that surface. Where two curves meet they should be tangent to each other to produce a flowing curve. These are the fundamentals of good design. A beautiful turning is a hard thing to design and still harder to execute, if these principles are ignored. As stated before, there are exceptions to these fundamentals which will be pointed out later. To better illustrate the point, two turnings are shown and there is no better way of grasping the principles than by making the two turnings out of some scrap wood and comparing them "in the flesh."

The same dimensions are given for both turnings but the execution is different. By means of the light lines, the angles and curves are analyzed showing conclusively why one turning has a

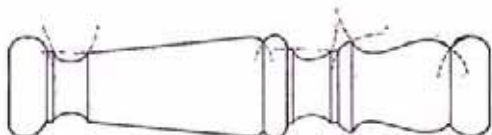
snap and refinement about it while the other has that "kitchen chair leg" look about it. Study the turnings carefully.



A well turned piece.

Paring and Scraping

Two methods of turning are used, the paring and the scraping. The



A less attractive turning.

former is the harder to acquire and, after the turning and sanding is done, produces a turning no better than the scraping method. Factory operators, and plenty of good ones, use the scraping method and produce beautiful work. The turning itself may be only roughly done, and the finishing touch done with sandpaper. This produces speed of operation which the paring method cannot hope to equal. In commercial automatics a combination of paring and scraping is used, and the sanding machine depended upon to clean up the work. On such accurate work as pattern making the scraping method is used. If satisfactory for that, it is ideal for the amateur. And there is very little danger of the chisel slipping and ruining the work, not to mention valuable lumber.

Use of Chisels

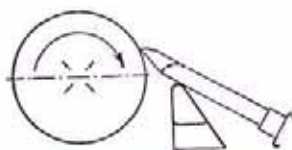
In getting square or hexagon stock cylindrical a large gouge chisel is used. This is called the "roughing" process. Hold it lightly yet firmly, against the tool rest with the curved portion of the chisel down as shown in accompanying sketch. Rolling the chisel slightly on its side will often improve the cutting.

With the stock rounded out, next mark it off for cutting the various shoulders, "V's" and beads. At all times you will need a pair of outside calipers handy to check diameters as you proceed. Constant measuring is necessary for uniform work. **Always caliper with lathe stopped.**

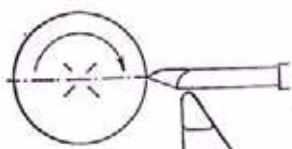


(Top) Gouge Chisel.
(Centre) Skew Chisel.
(Bottom) Spear Point Chisel.

There are several "special" turning tools which may be described to good advantage and are usually found among the commercial operators' tools. One is the beading tool, which is a chisel ground to a reverse of the round point, and which, when presented to the turn-



Correct position for holding chisel.



Incorrect position.

ing produces a perfectly shaped bead. Various sizes of these are handy additions to the tool equipment, likewise the cove chisel, just the opposite of the beading tool. Several sizes of these, with their accurately rounded ends, will produce a perfectly shaped "cove" or hollow. The addition of several widths of flat chisels, $\frac{1}{8}$ ", $\frac{1}{4}$ ", $\frac{1}{2}$ " and 1", is advisable since there are a lot of places where they may be used to advantage. To the craftsman who does a lot of turned work and who takes pride in the "snap" in his turnings, these special tools will be welcome.

In the sketch on turnings, all the fundamental "cuts" and quite a few of the "special" cuts are illustrated and analyzed for the benefit of the new woodturner. Study the sketch carefully and apply the principles, then note the improvement in your turnings.

In addition, provide yourself with several length of straight-edges, faced with white celluloid, if you can obtain them. Sand the surface of the celluloid with fine sand paper, and pencil marks stand out wonderfully against it. Such a template strip is described among the "accessories." Once you use this method of transferring the turning from the drawing to the wood, it becomes the natural procedure.

Half, or Split Turnings

In making half or split turnings, glue the two necessary thickness of wood together, with a thickness of wrapping paper between them. When centring in the lathe, be careful that the teeth of the lathe dog does not come in this joint, and don't put too much pressure on the tail centre. After turning, the two halves may be readily split with a putty knife or thin chisel and the paper planed or sanded off. On heavy turnings additional strength and safety may be had by screwing the two halves together, close to head and tail stock beyond points to be turned.

SANDING ATTACHMENT FOR HEAVY LATHE

WITH the few extra parts shown in the illustration the lathe is quickly converted into an excellent sanding machine. Provision is made for sanding all angles by means of the tilting table, and compounds are made possible with the mitre gauge ordinarily used on the 8" Bench Saw.

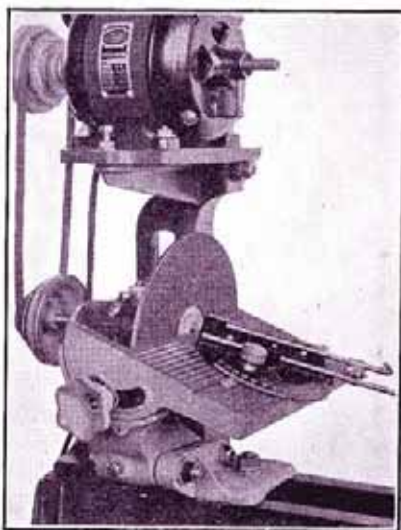
This set-up provides great power, and the abrasive disc cuts very rapidly. Joints can be worked to very close fits with the sander, as very little wood can be removed at a time.

Work should be applied to the abrasive disc on the side nearest the operator; otherwise the abrasive disc will have a tendency to raise the work off the table.

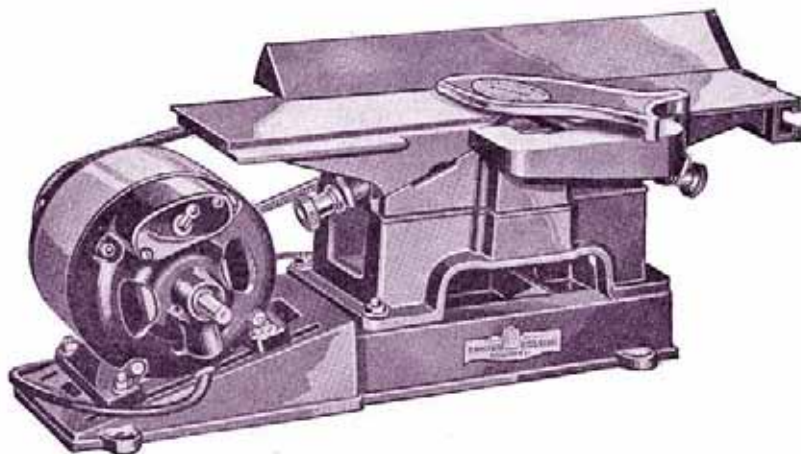
The table is locked securely in position with the hand wheel. Top of table is ground flat for accurate work.

Safety Precautions

Keep sleeves and neckties away from moving parts. Always go over all adjustments carefully before starting lathe. Revolve work by hand before starting motor to make sure there is sufficient clearance between work and tool rest. In sanding, hold sandpaper firmly, and in back of the revolving stock (to prevent fingers being drawn between tool rest and work). Always hold chisels firmly.



4" HEAVY DUTY PLANER, OR JOINTER



THE planer, or jointer, is used for "dressing" lumber, or smoothing it as it comes from the mill or yard: also for beveling or chamfering edges, truing up edges of boards and cutting rabbets.

The finest thing that can be said of any jointer is that it planes an absolutely true surface which requires little or no sanding, over a long period of years.

In the selection of a planer or jointer, there are several questions the machine should answer to your complete satisfaction. Here they are.

1. Are the tables readily adjustable?
2. Does it have a "safety head"?
3. Will the bearings assure indefinite accuracy?
4. Are adjustments made easily?
5. Does the fence tilt both ways?
6. Has it a rabbeting ledge?
7. Is the safety guard so good you will have no desire to take it off?

In the planer above, every one of these questions is answered. As an example, it is equipped with Timken Tapered Roller Bearings which will operate indefinitely without appreciable wear. If they ever do develop "play" they can be easily adjusted to correct clearance without replacing bushings or any other bearing parts.

Care and Operation

Before starting the planer see that all bolts and nuts are tight, that the cutterhead revolves freely, and the belt is not too tight. Table adjusting support nuts (shown in assembly drawing) should not be too tight as they must permit sliding of the tables when raised or lowered.

If motor is mounted on unit base the 34" "V" Belt is used. If driven from countershaft, other lengths may be used according to the set-up desired or amount of space available for installation. In every instance run the belt as loose as possible without slipping. With the belt too tight, power is wasted and efficiency reduced. A 4" pulley gives the correct operating speed of about 4000 R. P. M. when a 1750 R. P. M. motor is used. Power required for the planer, $\frac{1}{4}$, $\frac{1}{3}$ or $\frac{1}{2}$ H. P. If 3450 R. P. M. $\frac{1}{2}$ H. P. motor is used, the 4" pulley on the motor should be changed to the 2 $\frac{1}{2}$ " diameter (V).

Checking the Adjustment of Knives

The three cutter head knives must be in exactly the same position with respect to the tables. If one is higher than the others, it will do most of the cutting, leaving the surface covered with knife cuts or ripples.

To get knives correctly adjusted lay a straight edge (steel rule) lengthwise of the rear table at one side. Then rotate the head by hand until the edge of the knife barely touches the straight-edge. Then move the straight-edge to the opposite side of the table and

raise or lower that end of the knife until it touches the straight-edge the same as the other end did. It is assumed that the knife lock screws have been loosened slightly. When you get this adjustment re-check the other end to see that it didn't move, then set the knife lock screws tight. Proceed with the other two knives in like manner, without changing the position of the table. It will take a little time to get the knife adjustment perfect but it will be well worth the time spent, as the adjustment will not ordinarily need to be disturbed for a long time. Be sure to tighten all lock screws securely after adjustment. Go around the head two or three times to make sure you didn't miss any.

Sharpening the Knives

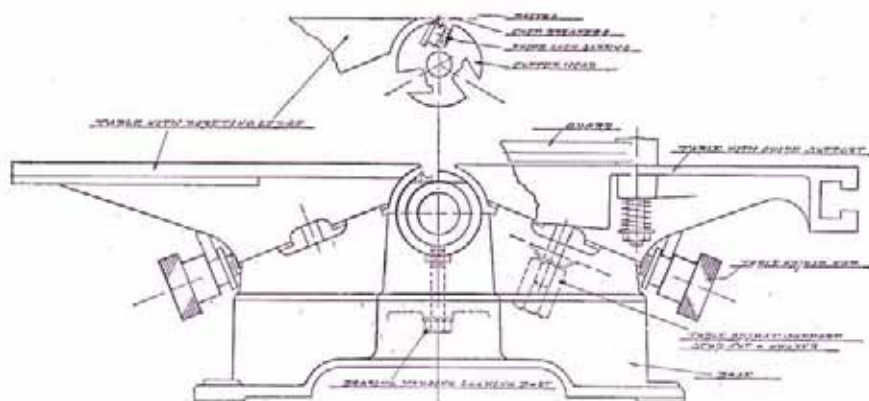
Unless the knives have been damaged by coming in contact with nails or similar hard objects it will not be necessary to remove them from the head for sharpening. They can be sharpened by dropping the rear table to a lower position and, with a flat oil stone, honing the edges. A circular motion of the hand is used. A stone of the "Hard Arkansas" type will give a razor-like edge that will stand up very well.

Position of Tables

For general work keep the front table about 1/32" below the rear table. For a final cut the front table can be raised slightly, making a lighter cut. By taking the cut slowly a very smooth, even surface will result. This is of particular value to the "Home Craftsman," since he is interested in quality rather than quantity of work. Forcing work at the jointer does not pay as it will be necessary to do additional sanding to get a satisfactory surface.

Fence Easily Adjusted

The position of the fence should be checked closely before planing to avoid ruining valuable lumber and wasting time. To set



the fence correctly at any desired angle, loosen the lock-nut just enough to allow tilting, then with the bottom edge held firmly against the table, tilt it to the desired angle and lock it there.

Planing Flat Surfaces

To plane or joint flat surfaces, run the wood through with the grain of the wood running from the top rear end to the bottom front end whenever possible. To joint the edges of a board, set the fence exactly 90° for a square edge and in running the stock through pay particular attention to holding it against the fence. Jointing at an angle requires the same procedure. One of the projects illustrates this principle. In planing thin stock of any kind it is well to use a pusher block, that is a block about 2" x 3" x 5" long with a strip across one end to catch the end of the stock. This will keep the fingers well away from the cutter-head. Stock shorter than 4" long should not be surfaced on the jointer — use a belt sander instead.

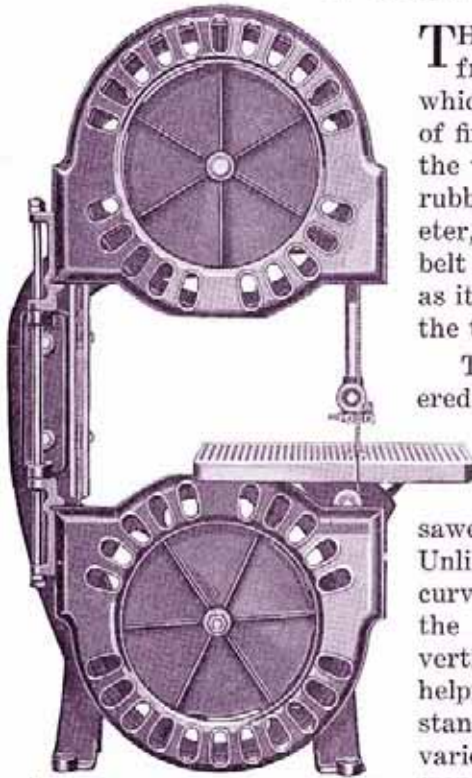
Rabbeting

In the absence of a shaper or drill press rabbets may be cut on the jointer as a special shelf or ledge is provided especially for this purpose at the left edge of the rear table. To set up for a rabbet, the distance between the ledge and where the fence is set will determine the width of the rabbet. The depth is gotten by lowering the front table. Don't try to make it all in one cut, as much more accurate work can be done by taking it by degrees. By manipulation of the fence in connection with the rabbet ledge, and by ranging the width and depth of cuts, picture frame mouldings may easily be made. It will follow, of course, that only flat cuts can be made.

Care of Bearings

This planer is equipped with Timken Tapered Roller Bearings which require little attention other than occasional greasing. About every six months remove the bearing caps, fill them with a light grease and replace. Screwing the caps on will force the grease into the bearings. If, after years of use, the bearings are at all loose the play can be readily taken up without disturbing the alignment of the head. To do this remove the bearing cup and tighten the lock nut if bearings are too loose or loosen the nut if they are too tight. After changing the adjustment, tap both ends of the shaft lightly with a soft hammer or block of wood to free the bearings. **Do not operate them too tight.** They should turn freely without being loose.

12" BAND SAW



THE band saw derives its name from the shape of its blade which is an endless band or strip of fine steel with teeth cut in it all the way around. This travels over rubber faced pulleys, 12" in diameter, as an ordinary endless flat belt travels over its pulleys, cutting as it passes through a small slot in the table.

The band saw has uses not covered by circular, scroll or jig saws.

In the first place, it cuts much thicker stock, wood up to 6 inches thick being sawed with perfect ease and safety. Unlike the circular saw, all sorts of curves and angles may be cut since the blade is narrow and travels vertically. Its capacity is especially helpful in production work. For instance in cutting silhouettes and various novelties from plywood many pieces can be clamped or

nailed together, with the marked pattern on the top, and then cut out at one time thus reducing the operating time tremendously.

Cutting out small blocks, sawing pieces to length roughly, and roughing out shaped pieces and parts are uses which further add to the utility value of the band saw.

The table tilts from horizontal or right angles to the saw, through any degree to forty-five degrees, simply and effectively. Adjustable stop screws for permanently locating the table in either of the two extremes, ninety or forty-five degrees, to which the table may be quickly set, assure convenient operation.

With the acquisition or construction of the accessories described as the circle cutting jig and the re-sawing guides, the scope of the saw is greatly extended, which greatly increases the value of the tool to the craftsman.

Adjusting the Saw Blade

In changing or replacing a saw, open the guards and unscrew the tension stud on the top enough to allow the saw to be slipped

on the two wheels. Remove the headless screw in the front of the table slot to insert the saw, then replace it. Set the saw on the centre of the rim of the two wheels, and after tightening it up enough to hold it on, revolve the wheels by hand, watching the saw on the upper wheel. If it creeps toward the front, screw in the tilting stud found below the tension wheel until the saw tracks on centre. If the saw creeps toward the back of the wheel rim, unscrew the tilting stud. When adjusted so the saw will run true on the rim, lock the tilting stud securely.

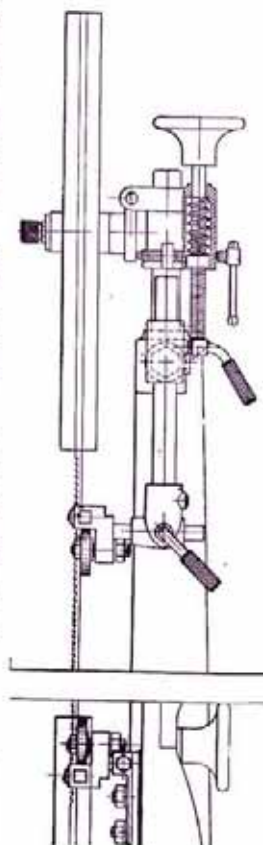
Setting the Guides

Now loosen the set screws which hold the side guides, above and below the table and pull the guides away from the saw. Then set the right-hand guide between $1/32''$ to $1/16''$ out from the bracket and lock it there. Now move the whole arm in or out, as found necessary, in the frame, until the right-hand guide just touches but does not move the saw. Lock the guide bracket in this position. Then move the left-hand guide in until it bears lightly against the other side of the saw. Now, with the saw between the square guide pins and the front edges of the pins **just even with the teeth bottom** adjust the roller disc until it just touches the back of the saw. It is set properly when the saw touches it but does not make it revolve until sawing is done. Under the pressure of sawing, the blade will be forced backward and the disc then relieves it of considerable strain.

Now repeat the adjustment described on the lower guide and the saw is ready to do business. Don't put too much tension on the saw but just enough to make the blade feel tight. Too much tension will result in saw breakage. Of course, the wider the blade the more tension that may be put on it, and the heavier the cut that may be taken.

Hints on Sawing

There are certain little tricks in the use of a band saw that make operation easier and result in cleaner looking work. Let us go over



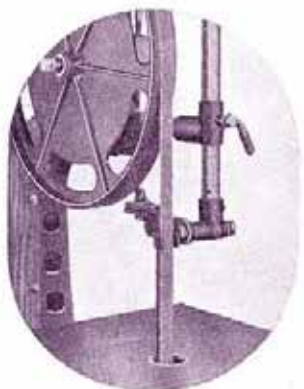
a few of these. Before starting to saw always lower the upper saw guide assembly to a point just above the wood to be sawed. To saw along a straight line, use the fingers of one hand as a guide, feeding the work with the other. Unlike a wide hand saw, the saw will not guide itself, but will creep off in the line of least resistance, so the work has to be guided continually. Don't force hard against the saw, nor try to make it perform the functions of a rip saw unless forced to do so, and then, take it easy.

Cutting Curves

To cut curves, the work must be guided differently, or it will cut first on one side of the line, then on the other, producing a ragged looking edge. When cutting around a curve which has its centre of radius nearest the frame, or to the left of the saw, hold the fingers of the left hand about where that centre is and **push lightly to the right, holding the edge of the cut against the side of the blades**, and feed the work with the right hand. This utilizes the blade as a guide and results in a very smooth cut. When the centre of radius is between the saw and the outside edge of the table, pivot the work with the right hand, pushing lightly to the left, and feed the work with the left hand. Try it out as you read this and you will more completely understand it, and then realize why band-sawing smooth flowing curves with clean edges looks so easy under the hands of a professional. When you wish to start a curve tangent to a straight line or another curve, bring the edge over the **back of the blade first**, then gradually swing around until the teeth start to cut. This is the only way to successfully accomplish the desired result. If, in a pinch, you have to saw around the outside of a curve where the width of the saw being used will not allow it to do so naturally, go around with a series of short, straight tangential cuts, and come back later to "clean up" this spot. Likewise, going around the inside of a curve, too small to take naturally, do so with short straight cuts which will widen the slot sufficiently to allow the saw to get around. If a considerable number of curves appear on the job in hand, put on a saw small enough to take them.

Making "turnings" on a band saw is something one would hardly expect, yet it can be done. First, the "turning" is sawed two ways from the "square" which will result in a "square turning." Then adjusting the table to forty-five degrees, the corners are beveled, so that the width of the "flats" on all eight sides are equal. Then, adjusting the table to $22\frac{1}{2}$ degrees, the corners are further knocked off, giving us a 16-sided "turning" which when carefully rounded

off with file and sandpaper, presents a creditable looking turning. To make square, hexagonal or octagonal turnings such as the tall candlestick pictured and described among the projects, this is the procedure to follow.



Operating Speed

The band saw may be operated direct from a 1750 R. P. M. motor or counter-shaft. With the 6½" pulley on the band-saw the 2½" diameter pulley is used on the source of power. This provides a speed of 650 R. P. M., correct for band sawing all ordinary woods. Keep wheel bearings thoroughly lubricated. Oil hardened steel guide washer bearing sufficiently often to

keep it turning. Always have guards in place when operating the band saw. Do not attempt to adjust guides or any other part while saw is in motion.

Sanding Belt a Helpful Accessory

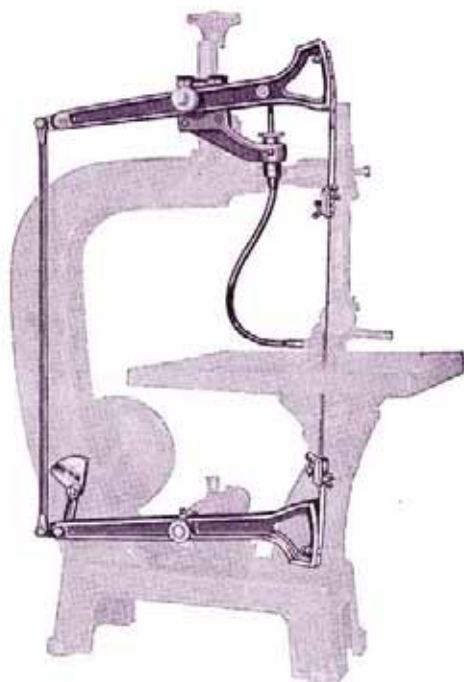
Anything that makes tedious hand sanding easier is welcomed by every craftsman. There are available for the band saw sanding belts of different grits which take the place of the band saw blade. A special guide is attached replacing the upper roller guide assembly. This guide provides a rigid backing for the saw.

This sanding belt is extremely fast-cutting; it literally eats away the wood. Hard-to-get-at corners in band sawed or jig sawed work are easily and quickly brought to a smooth surface. Long, flat surfaces may also be sanded by passing them across this speeding abrasive belt.

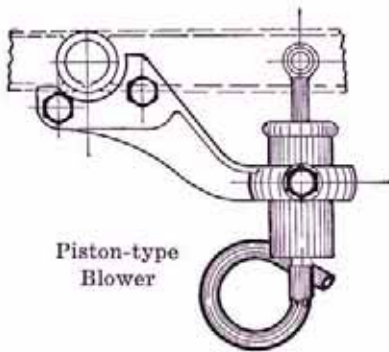
Metal cutting saws may be used. Special fine-tooth saws can be used instead of the regular band saw blades for cutting fibre, bakelite, copper, brass, aluminum and other non-ferrous metals. Do not attempt to saw cast-iron with the band saw.

THE HEAVY DUTY SUPER JIG SAW

FOR those who have a considerable amount of jigsawing to do and heavy material to cut, the Super Jig-Saw was evolved. The change from Band Saw to Jig Saw or back again is accomplished so easily that everyone possessing a modern 12" Band Saw will find the Jig-Saw attachment very helpful in sawing wood, bakelite, fibre and non-ferrous metals. Where the work is of an amount that will keep the Jig-Saw busy, an investment in an extra bandsaw frame and parts, less the wheels and guards is worth while. This makes a super Jig-Saw, at a cost below that of the bandsaw, which will stand the wear and tear of continued use.



The saw utilizes the guides and fittings of the band-saw for varying the tension of the blade, the upper and lower guide pieces are both used to hold the saw steady, and the stroke of $1\frac{3}{4}$ " on the blade makes for a good clean cut. The upper guide assembly, lowered to a position directly over the wood being sawed acts as a hold-down arm overcoming the tending of saw blades to lift the work from the table on the up stroke. Here again the easily tilted table makes itself felt in such operations as pattern making, hull construction on model boats and aeroplanes; while the steadiness of stroke and absence of vibration make it an ideal tool for use in inlaying and the making of marquetry. An ingenious feature in the Heavy Duty Jig Saw is the piston type blower. It operates from the upper arm. The cylinder is fastened stationary and the piston actuated by the arm directs a stream of air through a rubber tube to the left saw guide which is hollow. This stream of air keeps the work clear of sawdust while in operation and, incidentally, cools



the saw blade, greatly prolonging its life. The blower can be used only when the band saw is fitted up to operate as a Jig Saw. Like all reciprocating parts the piston should be frequently greased.

The operation of the Jig Saw is different from that of the bandsaw in that the blade moves up and down while the bandsaw blade moves only downward. Its neces-

sarily slower motion and the fact that it cuts only on the downward stroke make the Jig Saw a slower cutting tool than the bandsaw, but work turned out is exceptionally smooth. And then by boring a hole in the wood to be sawed through which the blade may be slipped, interior portions of a board panel may be cut out, an operation which the bandsaw cannot perform.

Special blades 14" long are used in this Jig Saw. They are plain end type. All grades from the finest fret blades to the coarse Jig Saw blades are used with excellent results.

Operates at 650 R. P. M., same speed as bandsaw, using the 2½" pulley on motor or countershaft.

THE FLEXIBLE SHAFT (TYPE BBF)

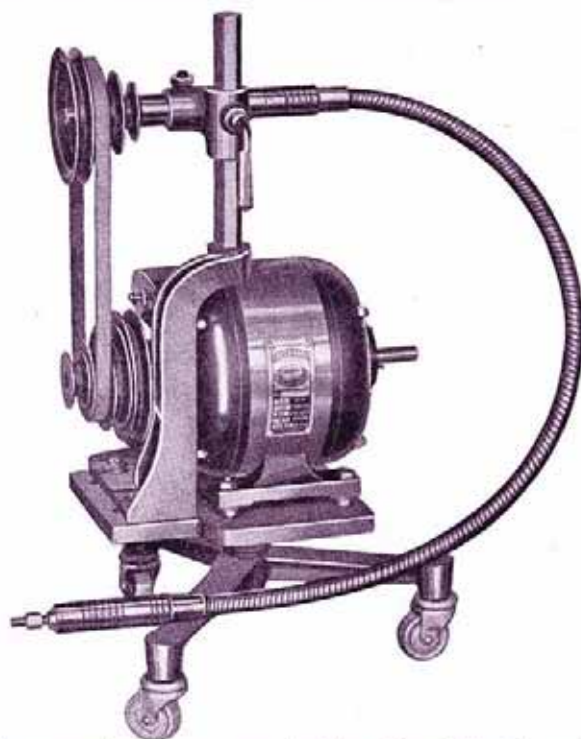
FLEXIBLE not only in name but in use. Indeed, the uses of this tool are so varied and its field so great that the space allotted to its description and uses is far too small. Hundreds of pages may be written around it, without entirely covering the full range of operations it will handle. Primarily a portable unit with a flexible cable shaft which may be taken to the job, where the job is too cumbersome or impossible to perform in any other way.

Powered with a ¼ or 1/3



H. P. motor, equipped with a drill capacity of 5/16" at the chuck, such out of the way jobs as drilling out a broken stud in the crank case of an automobile, boring a hole to mount a new light bracket or mounting on the fenders, reboring the holes of the door frame to put new screws in, boring out the dash board for mounting new accessories, are a few of the many operations it will do around the car. Then in addition, it will clean the mud from around the running gear and wheels, under the fenders, from the engine, in a way undreamed of by any

other method. Then it will clean the surface of the body and fender, after which it will polish the finish to a brilliant lustre. As long as there is a light socket within reach it will take the drudgery from the shoulders of the man who owns a car and keeps it ship-shape himself. If used for this purpose only, it is more than worth its low price. Then when the fenders lose their finish and begin to look bad, the entire finish may be easily and effectively re-



moved, leaving a surface ready for a new finish. It will buff and polish the chrome-plated or nickel parts of the car without a lot of elbow grease. And when you are finished with the car, take the outfit in the house, mount a cloth buffing wheel and with jeweler's rouge on it, watch the old silverware take on new life. No matter what you do or make around the house, there always seems to be some job that the tool is designed to fit and to do.

The motor is mounted on a small base equipped with easy running, ball-bearing casters. On the same base is mounted a jack shaft which supports the head and pulley through which the power is transmitted. A bronze bearing head transmits the full power of the motor to the shaft with no loss through improper fitting or friction.



Assembling

Follow the instruction sheet carefully in setting up the tool, paying particular attention to getting the head shaft parallel to the motor shaft. In putting the shaft and casings together, **do not use any pliers or wrench**, but screw only as tight as you can with the fingers, attach the hand piece to the shaft. Look to the pulley on the head shaft to see that it is at least $\frac{1}{8}$ " away from the bearing or head when the flexible shaft

is straight. The flexible cable tends to force out of the shaft when bent and while running, and this play is necessary to prevent the cable from binding or wearing in the sides of the casing. The entire core should be smeared liberally with Graphite Lubricant when assembled, and periodically re-lubricated. You can't overdo lubrication in this respect. In operation the shaft should turn in a counter-clockwise direction, looking at the end of the shaft. Operated in the opposite or clockwise direction, will result in the shaft or cable unscrewing itself. **Always have the hand piece in your hand when starting the motor**, and avoid getting the hand piece too close to the head of the jackshaft; the cable has a tendency to twist on itself and become damaged. Do not use a circular saw over 2" in diameter, and remember, that, while the shaft is flexible, bending it in too small an arc causes considerable friction in the casing, resulting in a great loss of power. No bend under 6" should be attempted. For connecting the shaft directly to the motor, a coupling or adapter BBF-7 is available, but since this only gives one operating speed, its use is not general when the jackshaft is available. Other uses for this coupling will be mentioned further on.

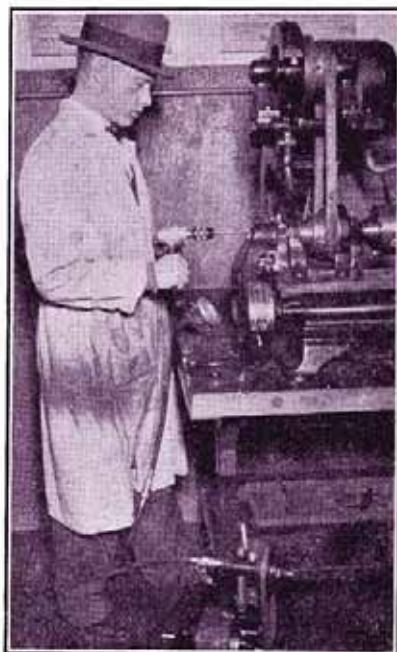
Drilling

Adapter FS-405 is screwed on the hand piece spindle and the $\frac{5}{16}$ " chuck is used on the adapter. Since the shaft is not designed to carry a load heavier than this, the use of the $\frac{1}{2}$ " chuck is not recommended. When drilling, and as the drill breaks through, ease up on the pressure, since a series of jerky strains is transmitted

to the shaft, which might prove disastrous if repeated. Drilling should be done at about motor speed, 1750 R. P. M. or less.

Fluting and Reeding

These two operations should be done with the highest speed of the shaft available. If considerable of this work is done, a jack shaft should be mounted in a convenient place on the bench where it may receive power from the countershaft running at 3500 R.P.M., speeds up to 8000 R.P.M. are available. For fluting turnings between centres of the lathe, the combination tool rest is mounted in the tool rest brackets at the back of the lathe, and the flexible shaft hand piece clamped in the fluting attachment. With the tool rest adjusted parallel to the top surface of the work and the desired cutter on the hand piece spindle, the operation is easily carried out, leaving a finished cut of professional nicety. Of course, if a high speed drill press is available, and you have built the accessory described as the dividing head, the job can be more easily handled there. Shaped turnings may be fluted only on the shaper with a shaped form on the base of the dividing head to guide the dividing head and turning properly. (See dividing head for details.)



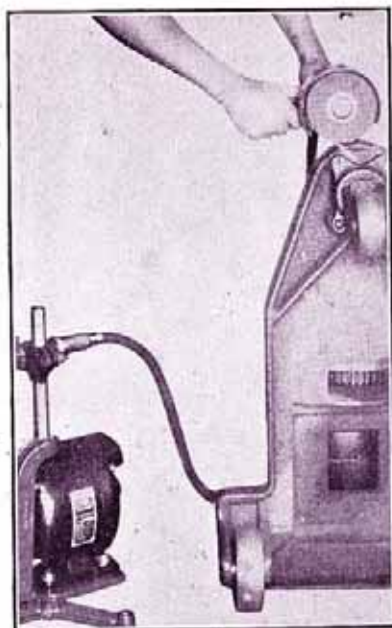
Grinding

For quickly smoothing the edges of large and cumbersome castings, and other places or pieces which may not readily be taken to the bench grinder, the portable flexible shaft fills a very definite need. The wheel guard BBF-6 should be attached to the hand piece



Improved Motor Coupling Eliminates Vibration.

before performing this operation. 1750 R. P. M. is the speed recommended for grinding operations, with wheels no larger than 4" in diameter in use. Wheels are mounted by means of the FS-405 adapter.



Sanding

When the fenders or body of the car have been dented and straightened, the sanding drum and sanding disc fill the need for a power tool to prepare the surface for new finish. Quickly attached through the medium of the adapter FS-405 (without flange) either may be used effectively. The disc is screwed to the adapter and includes in its scope such operations as removing old paint from floors, furniture, cars, and facing all flat surfaces. The carborundum faced paper may be quickly peeled off and a new piece applied through the use of Quick Setting Cement.

For curved surfaces, the sanding drum comes in with its easily replaceable abrasive sleeve. It is one of the handiest accessories of the tool. Unscrew the nut at the outer end of the adapter (FS-405) and, slipping the drum on, replace the nut. Screwing it up tight, expands the rubber sleeve which forms the drum, holding the abrasive sleeve firm. Simply unscrewing the nut a little allows the abrasive sleeve, which comes in two grades, to be slipped off and a new one put on.

Cleaning and Polishing

For effectively cleaning and polishing not only automobiles but other lacquer coated surfaces, the flexible shaft, when used with a special auto cleaner available, is in a class by itself. The cleaner is applied with a soft cloth, by hand, and polished with a sheepskin pad, while still wet. A speed of 1200 R. P. M. for this operation should not be exceeded, and slower speeds are recommended. Never use the shaft and cleaner on varnished surfaces, likewise wax, since its action and heat generated tends to soften the varnish. Two or three applications may be necessary on extremely dull surfaces, but if there is any finish at all left on the surface you want to polish, this outfit will polish it.

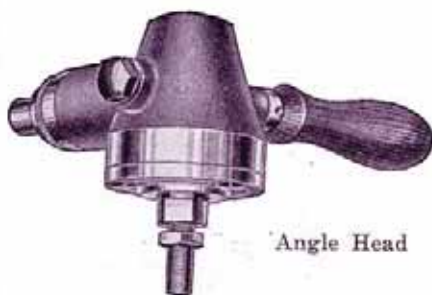
In the home, the housewife or maid may use it to good advantage in waxing or polishing floors. As stated before, **don't use it on varnished furniture.**

Flexible Shaft Has Limitations

While flexible shafts are used in a great many instances for transmitting power on machinery, etc., to eliminate expensive bevel gearing or worm gears, the use of this shaft is not recommended for that purpose. Each application of a flexible shaft to power transmission presents a different problem and special shafting should be designed for each particular job.

Shaft May Be Doubled

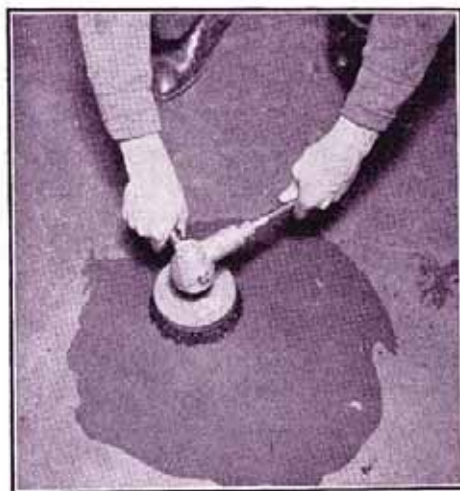
The length of the shaft may be doubled by putting two sections together, but more than this is inadvisable as this throws a strain on the ferrules greater than they were designed to stand.



Angle Head

The Angle Head as shown in use in the photo below, permits the tools to operate at right angles to the shaft itself, and thus eliminates sharp bends and allows operation in very close places. It also reduces the speed of the shaft one-third, giving increased power to the tool.

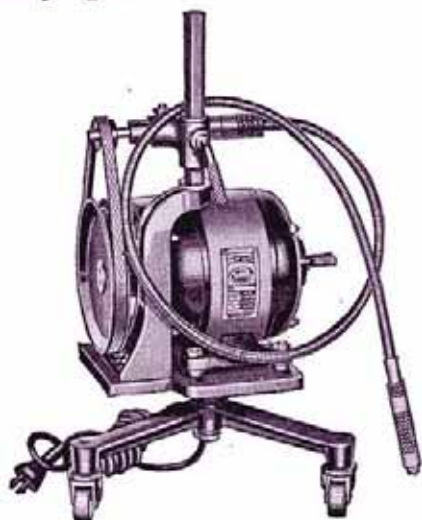
With the addition of an angle head for the shaft, more convenience in operating under difficult circumstances is obtained. This head is equipped with the finest SKF ball bearings obtainable and transmits power with an ease and quietness which is gratifying.



To Get Utmost Service Observe These Rules

Always operate shaft as nearly straight as possible. Acute bends shorten the life of core and casing. Do not use drills larger than $\frac{1}{4}$ " in metal. When grinding always use guard. Oil hand piece frequently with a good grade of motor oil. Saws, larger than two inches in diameter, should

never be used. Keep core smeared with good Graphite Lubricant. Never operate shaft at speeds under 1750 R. P. M. unless load is very light.



HIGH SPEED SHAFT (TYPE CF)

WHILE it is possible to do a fair job of carving, fluting or reeding with the Type BBF outfit, nothing like the results obtained with the High Speed Shaft are possible.

With speeds up to 12,000 R. P. M. available, such operations as carving are a pleasure. The shapes take form rapidly under the magic action of the variously shaped cutters and bits supplied. The entire attention may be centred on the form or shape desired, since the high speed makes the handling so comparatively easy that even a novice can do a fairly creditable job of carving on his first attempt. For routing out surfaces for inlaying, etc., the work is made so easy that anyone can handle the shaft.

Let it be noted that this high speed shaft in no way is intended to replace the heavier BBF Shaft. It will not transmit the same power nor handle as heavy a load. It should never be run, under use, at slower speeds than 5000, and the highest speeds available are best. While carving, 9000 R. P. M. is the lowest speed recommended.

The outfit is designed to be equipped with the 1/3 H. P. 1750 R. P. M. or the 1/2 H. P. 3450 R. P. M. motor. With the 1750 R. P. M. motor the 6 1/2" "V" pulley is used on the motor shaft with the 1 1/4" pulley on the jack-shaft. The 3450 R. P. M. motor requires the standard four-step pulleys.

All the routing cutters and small shaping cutters may be used with adapter spindle DP-120 fitted to the chuck. The dovetail cutters may be used in carving operations for putting cuts in leaves and similar ornaments. The shaft, with fluting or beading cutters, operates so easily that mechanical means of guidance are almost unnecessary. Guiding by the hand alone, against an edge of the work will suffice in a good many cases. Care must be taken

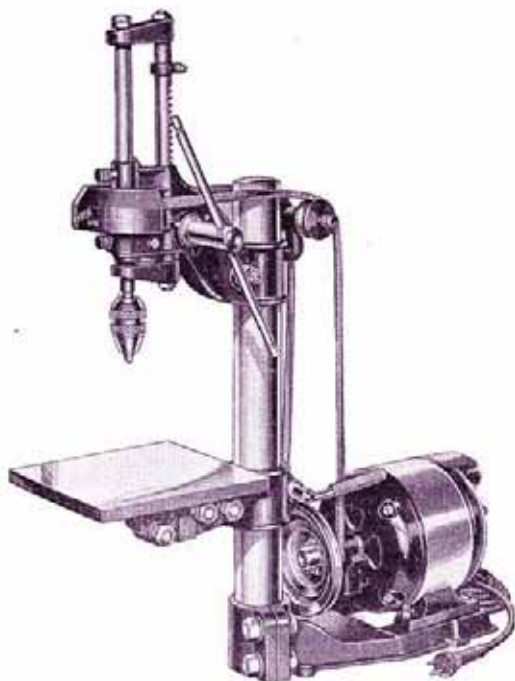
to keep the shaft spindle at right angles to the direction of cutting or a ragged edge will result. One soon gets the "knack" of handling it and doing nice work. The hardest thing is to stop playing with it, since its operation is so fascinating that one can spend an entire evening just "practicing" to see what it will do.

Grinding Dies

A set of small carborundum grinding stones of various shapes is available for very fine grinding. These stones are attached directly to the hand-piece which is made as a collet chuck. Precision work is assured by these stones traveling at high speed.



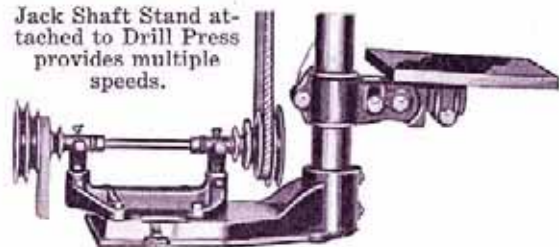
THE DRILL PRESS



WHILE at one time the users of a drill press were restricted to drilling this modern machine is easily adapted to a multitude of uses formerly unrealized. By simply changing attachments, many operations such as carving, routing, shaping, dovetailing, sanding, mortising, boring and countersinking are accomplished fully as efficiently and satisfactorily as drilling.

To perform all these operations properly a drill press must be extremely flexible in that it should operate in a wide range of speeds. For instance, drilling requires a slow spindle speed, while routing, shaping and mortising need high speeds of about 5000 or 6000 R. P. M. for perfect, smooth work. The bearings must be capable of enduring this high speed without overheating or suffering abnormal wear. Vibration, also must be kept at a minimum.

Jack Shaft Stand attached to Drill Press provides multiple speeds.



Drilling and Boring

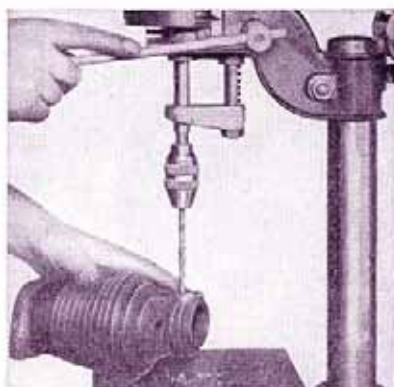
Two chucks are provided for holding drills, the standard $\frac{1}{2}$ " capacity chuck and the Jacobs Key Chuck. The former is satisfactory for all average

work, the latter is available for extremely accurate drilling. Both hold all round shank drills up to $\frac{1}{2}$ " in diameter. Boring tools of larger diameter may also be used provided their shanks are not over $\frac{1}{2}$ " in diameter.

For accurate drilling or boring it is essential to have the table correctly aligned. To get it square with the spindle insert a bent wire in the chuck and extending to the table. Then, revolving the spindle by hand the point of the wire will enable you quickly to "square" the table with the spindle. By providing yourself with one of the squared up table vises with machined surfaces, work is firmly held in various positions on the table or over one edge where the work is too large. Several small metal clamps are such useful additions as to be almost necessities. With them angular boring is simplified by clamping the work to the table and tilting the table. With various sized blocks or strips clamped to the table, duplicate parts may be easily handled.

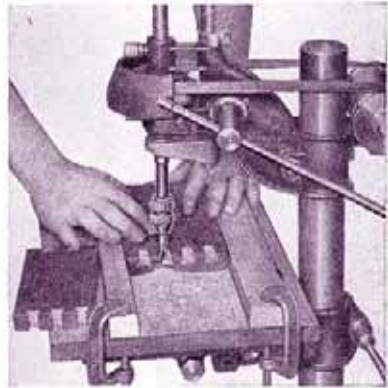
Making Dovetail Joints

In using the machine in the cutting of dovetails, a wooden table is placed on the regular table. On this guide strips may be nailed or clamped. The distance between cuts is $\frac{13}{16}$ " for the $\frac{1}{2}$ " cutter and $\frac{9}{16}$ " for the $\frac{3}{8}$ " cutter. $\frac{7}{16}$ " for the $\frac{1}{4}$ " cutter. The female part of the work is laid flat on the table, between guide strips. By providing yourself with strips of the thickness suited to the cutter being used and of a quantity equal to the number of cuts being made, accurate spacing is made easy. As shown in the accompanying photo the work



Drilling a cast-iron cylinder. All metals as well as wood are drilled quickly and accurately.

plus the necessary strips are placed between the guides and the cut run to the desired length, against a stop strip. Then remove one strip, make another cut, and so on. In machining the male part of the work, the table is swung to one side and the guides reset for alignment. With the addition of an L-shaped clamp board, to which the work is clamped in an upright position, the work is handled again with the help of the guide strips and auxiliary spaces. Neat looking and extremely substantial drawer and box construction is thus assured the craftsman. Properly handled, work on a par with the most expensive dovetailing machines may be turned out, although not as fast, since commercial machines are multiple spindle, almost automatic affairs. The principle used, however, is exactly identical.



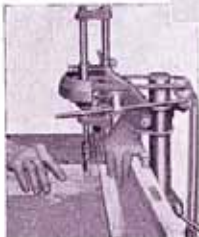
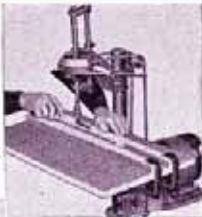
Dovetail joints so difficult to make by hand are formed easily and quickly with special cutters in drill press.

Carving and Recessing

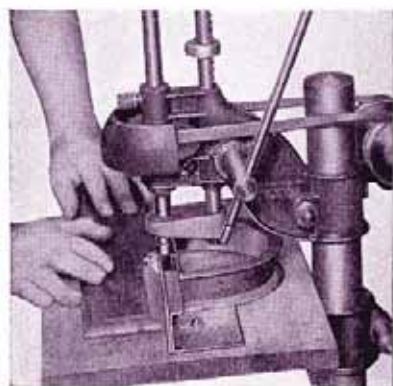
In operating the drill press as a recessing or carving machine, a different procedure is followed than on any other machine. Provide yourself with a wood table to be clamped to the machine table. With the selected cutter in the chuck, run it down and locate the exact spot where it touches this table. In the dead centre of this spot put a No. 10 wood screw, then cut off the head, leaving about $\frac{1}{8}$ " projecting.

Photo at side shows mortise being cut with router.

Lower shows tenon being cut with router.



Now on some $\frac{3}{16}$ " or $\frac{1}{4}$ " plywood lay out the design of the work. From scrap $\frac{1}{4}$ " stock very carefully bandsaw or jig saw the various parts of the design and after filing or sanding the edges smooth, nail and glue them in their proper places on the form board. Then in several parts of the design drive some brads through the form board. Cut them off to about $\frac{1}{8}$ " long and file the points sharp. Stock to be machined or cut is pressed down on these points, the form with the sawed pattern is placed with pattern side down over the guide pin on the table, and the



Drill Press carving moulding edge with motor mounted on base or run from countershaft.

advantage comes through the saving of the forms, for subsequent duplication of some highly desirable project. Follow this operation through in the making of the chair, desk and mirror shown earlier in this book, and realize the workmanship of which you are capable, with the help of a modern drill press.

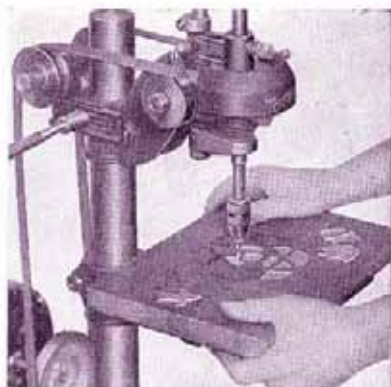
cutter run down to the desired depth and locked. Then by moving the form around and against the guide pin, the recessing or carving is duplicated any number of times on as many pieces as desired. See the template for carving on page 32. The care and neatness with which you make your form will show itself in the finished work. The surprising thing about the operation is that it takes less time to make the form and then do your work, than it does to laboriously cut the work out by hand, and then patch it up afterward. An added

Mortise and Tenon Joints

The cuts for this joint are accurately and easily made with the drill press. The photos illustrate both cuts in the making. For cutting a mortise, the inlay routers are used, the size depending on the size mortise to be made. Using the wood table in place over the regular table, two strips of wood are clamped to the table with ordinary C clamps, just far enough apart to permit the piece to be mortised to slide through between them. The piece is then slid in place under the router and the spindle lowered until it cuts about $\frac{1}{4}$ " deep. Lock the rack in position and advance stock to length of cut desired. Run machine at maximum speed for this operation.

Repeating the cutting operation will give the required depth. Do not attempt to complete a deep mortise in one cut.

For the tenon make a saw cut



Shows router removing stock to uniform depth for inlaying. Far superior to hand work.

to the depth required and rout out wood from saw cut to end of piece. Round off the edges to fit the mortise with the belt sander.

Inlaying In Wood

The use of Inlay designs and borders offers the home craftsman untold possibilities. New adaptations, new articles to make, together with new beauty and value will assure you far greater satisfaction in woodworking than you ever thought possible. For those who wish to realize profit on their work inlaying will open the door to innumerable possibilities as it takes furniture and novelties out of the realm of the ordinary "unpainted" variety into a class of work representing many times greater value.

Inlaying, while it can be done by hand, is more easily and quickly done with the Drill Press. After selecting a particular design or border lay it on the piece of furniture or wood novelty in the position it is to be used and mark its outline carefully with a knife blade. Then place work on drill press table and lower feed rack with router turning at maximum speed until correct depth of cut is attained. (Average thickness of these designs is 1/28".) Then lock rack in place and move work about on table until space for inlay is routed out. If design has square corners finish the corners with a sharp knife.

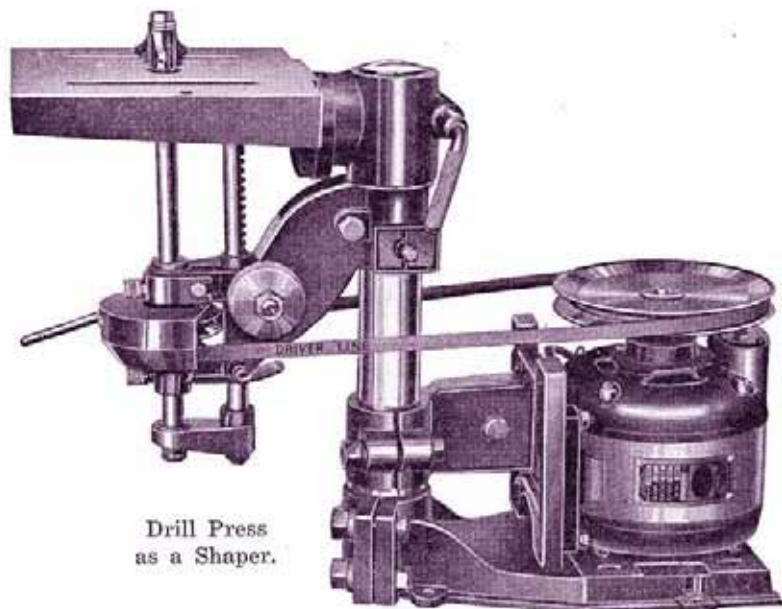
Designs are available with either a paper or a linen backing, and although they are alike in every respect as far as the design itself is concerned, their treatment is different. Paper backed inlays should be inserted with the paper on the top, the paper is then sanded off. Cloth-backed inlays should be inserted with the cloth down. Coat the design and the routed area with glue and set the design in position. Place several thicknesses of newspaper or corrugated cardboard over the inlay, then clamp a flat board over the newspaper. For long borders and large designs it is advisable to use plenty of clamps or weight to hold designs in place until dry. Let dry over night.

CONVERTING THE DRILL PRESS INTO A SHAPER

WITH a few changes in the position of various parts the drill press is converted into a highly efficient shaper. The set-up shown here has the motor mounted on the column behind the head eliminating the jack shaft and pulleys. This provides a positive direct drive. By mounting the 6½" pulley on the 1750 R. P. M. motor, or the 4-step pulley on the 3450 R. P. M. motor proper speeds

for shaping, routing and carving are readily attained. Belt to the small groove of the head stock pulley.

To convert the drill press, remove the head stock, jack shaft assembly and table. The head is then inverted and slipped back over the column. The table with bracket is then slid over the column.



Drill Press
as a Shaper.

If the drill press table has no hole in the centre, it will be necessary to make one to permit the spindle to extend through. This set-up requires the 39" belt.

For a motor mounting there is a new type base and bracket, or the old type drill press table can be used as a motor base by drilling holes in it and mounting the motor in place. The table and bracket are then swung around to the rear as in illustration, and the table tilted to put the motor in a position with shafts vertical. This requires a 39" "V" belt. With this, or the foregoing set-up the use of a plain (or sleeve) bearing motor will be satisfactory for ordinary use; but if in continual use, a Timken bearing motor should be used to carry the end thrust.

Also, if this set-up is to be used constantly it may be advisable to use the drill press head in its normal position and invert the driving spindle and rear (geared) spindle. This will bring the head bearings nearer the work and prevent vibration when shaping very hard stock.

Straight Shaping

For straight shaping; that is, straight-edged work of all kinds, the guide (SS-4) is used, screwed down to the table and adjusted for width of cut. The depth of cut is regulated by raising or lowering the rack assembly and secured in place with the lock lever.

Irregular Surfacing

For irregular or curved work a collar is used on the spindle above or below the cutter as the need will indicate. This collar will restrict the depth of cut, the difference in diameter between the collar and cutter being the depth of cut obtained. It is also well to note that the diameter of the collar also fixes the smallest sized radius into which it is possible to work with that particular collar. To illustrate, it is impossible with a $1\frac{1}{4}$ " diameter collar to run into a corner where a $\frac{1}{2}$ " radius is required. In doing curved work one of two things is necessary. First a form on which the shape or curve is carefully worked out to which the stock, roughly sawed to shape is screwed or clamped. An illustration of this method is clearly shown on the drop leaf table. Second, the shaper work plan where the work is sawed and sanded to the exact shape desired exclusive of what moulding is to be used. Then the work is itself the form and bears against the depth collar.

Where the size of the cutter at base will not give the desired depth with the standard molded type cutter, a form is necessary. To illustrate—suppose we have a cutter $1\frac{3}{4}$ " in diameter and a collar 1" in diameter. The difference is $\frac{3}{4}$ " or $\frac{3}{8}$ " in depth of cut. We need $\frac{1}{4}$ ", so a form is made by following the shape of the work but allowing the form to project $\frac{1}{8}$ " beyond the work. On a 4" round lid, for instance, the form would be a circle $4\frac{1}{4}$ " in diameter. For accurate duplication of parts the form method is the only safe and sure way.

Surface Shaping

With the various shaped routers, moulded cuts may be made **in the surface of a panel**. Raised and inset panel effects are easily formed without the need of a lot of framing work.

Fret Work and Grill Work

If a jig saw is lacking, suitable fret and grill work may be done with the drill press and routing cutters. Plywood panels, large enough for china closet doors are routed out (clear through) with this set up. This is very fascinating work and produces excellent results.

Making Jigs

For accurate machining or routing of various types of work, jigs or forms are necessary particularly in duplicating pieces. Rather than attempting to describe an unlimited assortment of such jigs, some of the most commonly used ones are described in the various projects, showing how they are fitted to the operation. This is more practical since it includes actual operation as well as construction guidance. Once a jig or form is made, preserve it as it often can be used again to good advantage.

Dovetail Joints

This subject is covered more in detail on another page under Drill Press. With a fairly simple jig, the cutting of an accurate dovetail joint is simplified and the time consumed is cut from hours to minutes. Since the different sized dovetail cutters require different spacing a "comb" or guide piece is essential for each size used. This comb can be filed from a piece of metal about 1/16" thick.

Grinding Cutters to Shape

Since there are so many shapes of cutters necessary to the successful construction of correctly beautiful furniture, and it is prohibitive to carry an adequate line of such cutters, a few words on grinding them is appropriate. Various widths of straight face cutters are available and from these we can grind any special shape necessary. Some of the projects are purposely designed to call for special cutters which will have to be ground "on the job."

In grinding a 1 $\frac{3}{4}$ " cutter the clearance angle or "rake" of the cutting edge should be not less than three degrees nor more than five degrees. The first thing to do is to make a template of the exact shape of the moulding, of brass, tin, zinc or cold-rolled steel, their desirability being in the order named. Very carefully file it to shape, reserve of the actual moulding.

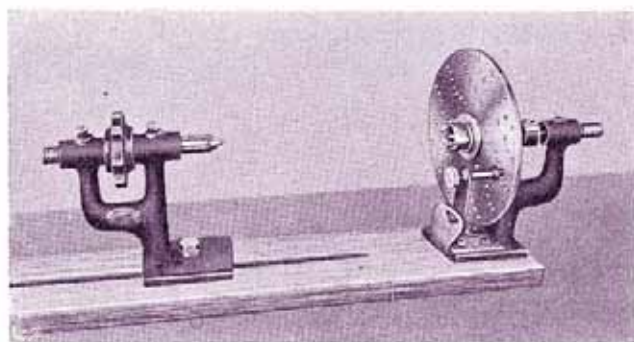
The straight sides are the gauge points or edges. Lay this on one of the wings of the cutter. With a pencil work the outline on this surface. With a grinding wheel dresser of some sort, round off the edge of a $\frac{1}{2}$ " grinding wheel, any diameter, and start grinding in the hollow or "cove." Observe the angle at which the original edge was ground and try to maintain it. Check constantly with the template until it is exactly the same shape.

Grind the other wings in exactly the same manner. With a small pencil type oil stone, sharpen the edges to remove the "wire edge" and the cutter is ready to use. A skilled shaper operator takes great

pride in the cutters he makes, and takes good care of them. Take your time, grinding a little at a time and when you get near the pencil lines go still more slowly as metal once ground away cannot be replaced. Work with goggles or glasses of some sort, or hang a piece of glass over the grinder to protect the eyes, as the hardened steel will make the sparks fly.

Since the construction of jigs or forms for doing router carving is explained in detail under the Console Mirror, Telephone Cabinet and the Chair, as well as the carved mouldings, no space need be taken on that subject here. This field is so vast and full of possibilities that special volumes on inlaying and carving are almost indispensable.

Dividing Head for Fluting and Reeding



Another item of equipment not often found in a home craftsman's realm is the dividing head. Almost indispensable in a factory, it is surprising that so few take the

trouble to provide themselves with one. The commercial varieties are, of course, expensive, but a simple form, as illustrated, will more than demonstrate its usefulness, once you have added it to your accessories. Used in connection with the flexible shaft, shaper or drill press, in putting flutes or beads on turnings, accurate spacing may be easily obtained without the necessity of measuring and laying out each individual piece to be machined. In use the turning is held between the centres and presented to the cutter. After one cut is finished it is simple to pull back the stud enough to release the head, turn it to the next hole and make the next cut, and so on.

HELPFUL SHOP HINTS

Crosscut saws are used for cutting across the grain. The rip (coarse tooth) is for sawing with the grain.

Before feeding work to the saw, planer or shaper, be sure it is free from nails, tacks or other metallic substance.

Do not expect satisfactory results from dull saws, planer knives and shaper cutters. The saw should be reset and filed or replaced with a new one. Planer knives and shaper cutters can be sharpened as good as new with an oil stone.

Keep your bench top clear as possible from extra pulleys, small tools and accessories. They can be kept in a tool box, in the bench drawers or hung on a tool rack.

Remove mill marks from lumber by planing or sanding.

If your shop is at all damp all exposed metal of your tools should be kept covered with a light film of oil to avoid rusting. This is very important as rust often accumulates over night and rusty tools are practically useless.

In driving nails or corrugated fasteners always put something heavy or solid behind or under the work to brace it.

When nailing do not attempt to drive the nail flush with the hammer as it is apt to leave a hammer mark on the wood. Use a nail set for the last one or two blows.

If pulleys loosen on shafts, either file a flat place on the shaft where the screw hits or better locate the pulley and then drill a shallow hole in the shaft for the pulley screw to rest in.

Care of rubber-and-fabric "V" belts. Under no circumstances should belt dressings or compounds be applied to these belts. They operate best dry under all conditions. Any oil or grease that gets on belts should immediately be removed with a cloth dampened with gasoline. "V" belts should not be run crossed.

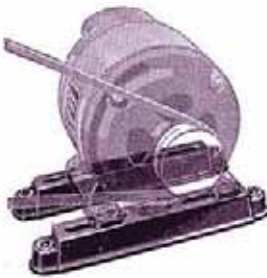


If a circular saw blade wobbles when the machine is revolved slowly by hand do not assume that the blade is defective. On attaining its correct peripheral speed it will undoubtedly be perfectly true.

Care of Hairon Belting. Exhaustive testing over a long period of time with every known kind of dressing and compounds have convinced us that hairon belting should be run dry—just as you get it. While neatsfoot oil undoubtedly preserves the leather it leads to slipping when belt becomes warm. Compounds of rosin reduce slipping under certain circumstances but shorten the life of the belt.

If bearings overheat. Bronze-bushed shaft hanger bearings cannot be recommended too highly as they reduce friction materially and last indefinitely if kept properly oiled. Little, if any, difficulty

will be experienced with the bronze bearing overheating. If your shop has the plain iron bearings and, when well oiled, they have a tendency to become hot, it is apparent that they are binding through faulty alignment. You can correct this by means of the two rocker



set screws and the swivel yoke. Loosen and move them until perfect alignment is obtained. Running belts too tight will also cause bearings to overheat. Only sufficient tension on belts should be maintained to prevent slipping. Beyond that point loss of power, overheating and undue wear result.

Motor Adjusting Rails

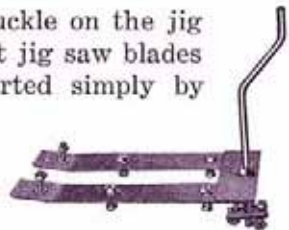
Motor rails fastened permanently to the bench permit easy adjustment of belt tension. Motor slides in grooves backward or forward. Rails will fit any make of motor.

For edge doweling in lathe. Insert polishing spindle (No. 941) in head stock with the half inch diameter toward the tail stock. Mount drill chuck on this end. Then take an old style bench saw table, cut off the uprights and mount on bed. This table serves as an excellent platform in doweling. It is adjustable up and down and in and out, providing always a rest that assures uniform work.

Clamping the ball bearing hand piece of the flexible shaft in a vise to use attachments rigid is not advisable as the tension is likely to damage the ball bearings, cones or cups.

When turning long pieces in the lathe a brace should be set up from the centre of lathe bed or bench to brace the work on two sides and keep it from "whipping" and vibrating. It should not bind the work but leave it barely clear.

It is not necessary to loosen the turnbuckle on the jig saw every time a blade is changed. As most jig saw blades are of uniform length, they can be inserted simply by hooking the blade in the lower arm clip and then depressing the upper arm slightly with one hand while the blade is inserted with the other.



Adjustable Motor Mounting

For convenience in making belt adjustments, this spring motor mounting was developed. A turn of the crank lowers or raises the motor.

A very small thin file will come in handy for smoothing off and evening up fret and jig saw designs.

Using the 4" or 6" saws or dado portably on the flexible shaft is not advised under any circumstances and should not be attempted.

Always grasp the flexible shaft before turning on the power and do not lay it down until power is shut off.

If a machine develops an unusual noise stop it immediately and inspect carefully to find the cause.

Never attempt to operate machines unless they are securely bolted or screwed down to the bench.

CHART SHOWING SPEEDS AND PULLEYS FOR POWER TOOLS

	TYPE OF BELT DRIVE USED	PULLEY USED ON COUNTER-SHAFT OR MOTOR	PULLEY ON MACHINE	R.P.M.	R.P.M.	R.P.M.
				1750 R.P.M. 60-CYCLE MOTOR	1450 R.P.M. 25-CYCLE MOTOR	3600 R.P.M. 60-CYCLE MOTOR
LATHE (Improved Type)	Round Belt "V" Belt "V" Belt	LJ354 PV175 PV4	953 PV3 PV4	1000 1000 4000-765	835 835 3700-635	
JIG SAW	Round Belt "V" Belt	J75 PV125	953 PV3	550 730	450 600	
PLANER (Old Type)	Round Belt "V" Belt	953 PV400	J75 PV175	5200 4000	4350 3700	
PLANER (New Type)	"V" Belt	PV400	PV175	4000	3700	
BENCH SAW (Old Type)	"V" Belt	PV250	PV125	3500	2900	
BENCH SAW (New Type)	"V" Belt	PV250	To Small Step on B6. From Large Step of B6 to PV175 on spindle.	3300	2750	
BELT SANDER	Round Belt	LJ354	LJ354	1750	1450	
POLISHING HEAD	Round Belt "V" Belt	LJ354 PV175	LJ354 PV175	1750 1750	1450 1450	
BENCH GRINDER	"V" Belt	PV175	PV175	1750	1450	
SPINDLE SHAPER	Round Belt	L352	Small Step	5200	4350	
DRILL PRESS	"V" Belt	PV4	Small Step Large Step	3100-1350 2300-1000	2550-1100 1900-850	
BAND SAW	"V" Belt	PV250 PV4	BN18 BN18	650 1075	550 890	
JIG SAW ATTACHMENT FOR BAND SAW	"V" Belt	PV250 PV4	PV65 PV65	650 1075	550 890	
FLEXIBLE SHAFT	"V" Belt	PV423 PV4	PV423 PV4	5000-600 4000-765	4200-500 3700-635	9550-1200 8200-1575
HEAVY DUTY LATHE	"V" Belt	PV4	PV4	4000-765	3700-635	8200-1575
HEAVY DUTY PLANER	"V" Belt	PV400	PV175	4000	3700	
HEAVY DUTY BENCH SAW	"V" Belt	PV400 PV250	PV250 PV250	3500 1750	2900 1450	3750 3600

Guards should be kept in place even when machines are not running as it is possible to scratch oneself on saw blades.

Troughs for removing sawdust can be made very readily and will prove worth while in keeping the bench clean. Some are made of drain pipe and have a small suction fan driven from the counter-shaft or motor.



Jack Shaft Stand provides multiple speeds.

For Increasing and Reducing Speeds

A handy jack shaft stand increases or reduces speeds. Especially useful for increasing the drill press speed for shaping and routing. Bolt holes are placed identically with those of the motor so that it may be used on the same base if desired.

VENEERS AVAILABLE

MANY home craftsmen never attempt to veneer because they think it is too difficult. However, it is not nearly so difficult as one might imagine. With a workable press such as the one described elsewhere in this book, very fine work can be done with very little experience. The use of veneers at home has shown rapid growth in the past few years, due undoubtedly to a large number of craftsmen trying it and finding the results very gratifying.

Those experienced in furniture will invariably prefer veneered to solid stock, as there is much less cracking, checking and warping with veneered stock. One thing for the amateur to remember is that it is necessary to veneer both sides of the stock. Also, the veneer should not be applied directly to the base. In three-ply veneer stock the face and backing veneers are laid at right angles to the grain of the core. In five-ply veneer a crosslay veneer (usually poplar or gum) is glued both sides and laid at right angles to the core (one piece, each side) and on these the face and backing veneers are laid with the grain parallel to the core or at right angles to the crosslay veneer. Seven-ply veneer stock is usually made up by taking three pieces of $\frac{1}{4}$ " core stock glued together to form the core on which regular veneer is laid to form three- or five-ply stock. This form is usually used when building curved plywood.

SAMPLE SET SELECTED VENEERS (WORKABLE SIZE)

15 Rare Woods, 8" or 9" Square (1/28" Thick)—Price \$2.25 (Postpaid)

Per Sq. Ft.	Set Includes	Per Sq. Ft.
(.16)	Lacewood	(.11)
(.21)	Brazilian Rosewood	(.18)
(.21)	East Indian Rosewood	(.18)
(.08)	American Walnut	(.16)
(.07)	African Mahogany	(.24)
(.10)	Oriental Walnut	(.09)
(.18)	Padouk	(.10)
	(.17) Bird's Eye Maple	

This assortment is sold only as a complete set.

Any of these veneers can be obtained direct from the Educational Dept., Walker-Turner Co., Inc., Plainfield, N. J., by the square foot. Figures in parentheses are prices per square foot. All veneers will be shipped in lengths of not over 36 inches. Transportation is prepaid only on the samples, not paid when bought by the foot. Due to the expensive, special packing required, orders for less than ten (10) square feet of veneers cannot be filled.

THE HOME CRAFTSMAN MAGAZINE



WORKING with tools at home is becoming such an extensive and popular hobby or pastime that this magazine has been developed exclusively for the field.

Each issue carries articles and projects especially selected for home craftsmen, regardless of what make equipment they use. Everything possible is done from editorial and creative standpoints to offer only material that is practical and usable. Theories are avoided. Each article of furniture, and all novelties are completely made and finished in a typical workshop, using the best known power and hand tools. In this way, the disappointment of "paper planned" projects is avoided. Furthermore, any question that you might have regarding articles described in

the Home Craftsman or any project of your own will be gladly answered personally by one of our competent designers.

The Home Craftsman may be purchased where you obtained this Handbook. Single copies 10 cents. Also by subscription \$1.00 for 10 issues. Address Dept. H, The Home Craftsman, Plainfield, N. J.

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