Projects for Beginning Woodwork and Mechanical Drawing

By Ira S. Griffith

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PROJECTS FOR BEGINNING WOODWORK AND MECHANICAL DRAWING

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PREFACE.

"Projects for Beginning Woodwork and Mechanical Drawing" is composed of woodworking projects that have proven of exceptional service in introducing the subject matter of woodworking in a systematic manner.

The aim thruout has been to provide successful rather than unique projects. For this reason a number of familiar projects will be found included. Some of these are already in print. Having been in use quite generally before they appeared in print, they may be considered as common heritage, and having proven themselves of exceptional worth, they are here repeated.

A few projects, notably the china wall rack, stool, picture frame and pedestal, are original only in that the dimensions or construction is modified. The first is after a design by John D. Adams, the others after models in use in the schools of Cleveland, Ohio.

The working drawings of these projects have been planned with special reference to the gradual introduction of the conventions of mechanical drawing. The simpler conventions are in keeping with the present trend in the practice of the best drafting rooms. The indefinite length of blocking-out line as used in these plates is a device intended to keep ever before the beginner the draftsman's method of attack. Experience has shown this to be a most effective way to discourage line drawing from point to point.

All of the projects for mechanical drawing here given are completely solved. Experience has shown that it is possible for a boy to make a very excellent copy of a drawing without fully under-

standing its meaning. The making of stock bills assists greatly in forcing the boy to interpret his drawing. In addition to this, however, it is advisable to give the pupils some work in problems that are unsolved. *Problems in Mechanical Drawing* by Charles A. Bennett[1] is especially designed to meet this need, and the problems of Groups I-IV in his book have been used by the author in connection with plates of Groups VII and VIII with very great success. While not directly connected with the woodwork, they form a most effective method of reviewing the principles of drawing given in connection with the plates of Groups I-VI.

The directions under "Notes on Drawing" and "Notes on Woodworking Projects" are for the pupils' use. They are not intended in any way to take the place of a careful demonstration, but are offered merely as guide posts to aid the beginner in his efforts to recall the order of procedure as given in the demonstration. When he has become accustomed to working in a logical manner there is no longer any necessity for definite directions in note form, hence the meagerness of the notes for the later groups.

While the projects and notes of the book are arranged especially for use with the courses outlined and discussed in *Correlated Courses in Woodwork and Mechanical Drawing* by the author, there is nothing in the form of the plates themselves to prevent their being used with any course in beginning woodwork.

May, 1912. —IRA S. GRIFFITH.

[1] Another book by the same author entitled *Grammar Grade Problems in Mechanical Drawing*, has been announced as in preparation. This will probably meet the needs still better.

LIST OF PLATES.

PRINCIPLES AND SEQUENCE.

DRAWING

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Group II.

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Squaring up stock surfaced on two sides to thickness

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Group VII.

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The fine lines of indefinite length represent the blocking-out lines. These are made by pressing very lightly on the pencil—just enough to make them visible. The heavier lines, representing the border line and the outlines of the object, are made by going over the drawing a second time and pressing rather heavily on the pencil as it moves along over the blocking-out line bounding the object.

All drawing sheets are to have cutting lines, border lines, the name of the object, the scale, and the name of the owner of the drawing. The name of the object drawn and the name of the owner are to be printed in letters 3/16″ high. The scale will be in letters ⅛″ high. Place them as shown in Fig. 1.

Paper for Groups VII and VIII will be 12″ by 18″. All other drawings will be on paper 9″ by 12″. The oblong made by the cutting lines on the larger paper will be 11″ by 17″; on the smaller paper it will be 8″ by 11″. On either large or small paper the border line will be within the cutting line 1″ on the left side and ½″ on the other three sides.

Introductory Sheet—Plate 50.

1. Place the paper and fasten it to the board.
2. Lay off the cutting and border lines as follows: Lay the scale vertically on the paper and place short light lines at the following divisions —0″, ½″, 7½″ and 8″. Thru these points draw light blocking-out lines entirely across the paper.
3. Now lay the scale horizontally and place short, light lines at the following divisions, beginning at the left,—0″, 1″, 11½″ and 12″. With the triangle and T-square draw light vertical blocking-out lines thru these points across the

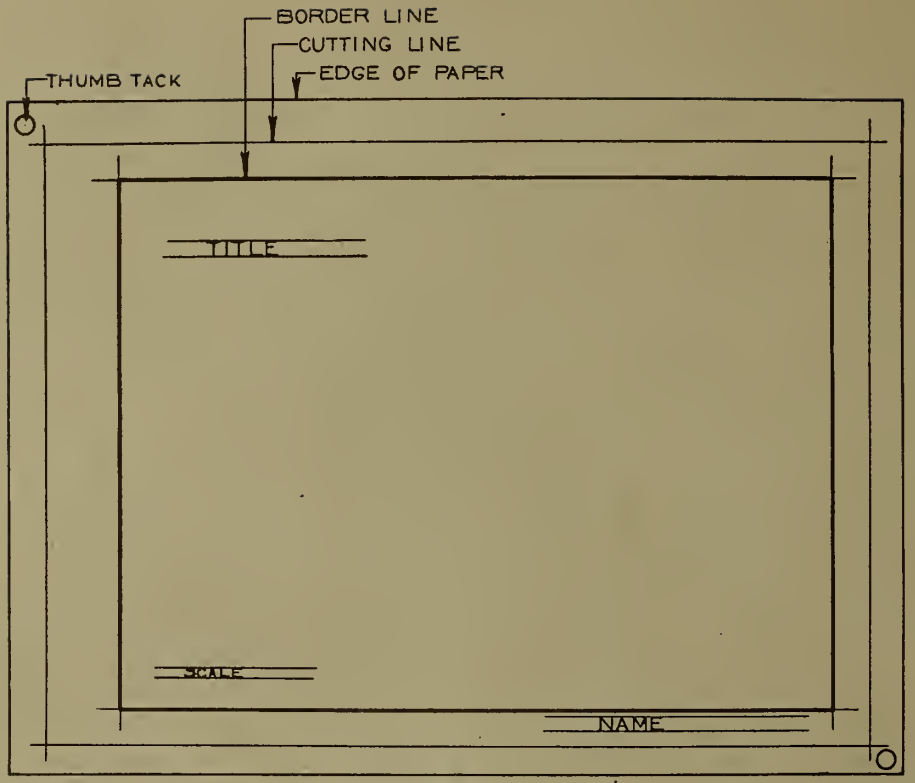

BORDER LINE
CUTTING LINE
EDGE OF PAPER
THUMB TACK
TITLE
SCALE
NAME

FIG. 1

paper. These lines give border and cutting lines, and there remains only the going over the border line a second time with pressure on the pencil to make it "stand out," Fig. 1.

4. Block out the guide lines for the letters and figures—very light lines of indefinite length. Each little square is to be $\frac{1}{8}''$, making the letters $\frac{3}{8}''$ high.

5. Draw the angles. Draw a light line for a base line. Drop the T-square below this a little in making the angles. Why?

6. Make the final letters and figures. All figures and letters hereafter will be either $\frac{3}{16}''$ or $\frac{1}{8}''$ high and drawn between two lightly made lines of indefinite length. Make these lines $\frac{3}{16}''$ apart and $\frac{1}{8}''$ as shown. You are supposed to have learned the proportions of the letters by this time so you need not draw any vertical blocking lines as you did on the first set.

7. Print your name in its proper place. See Fig. 1.

GROUP I.

Cutting Board—Plate 1.

Draw to a scale $\frac{1}{2}'' = 1''$.

1. Put on the cutting and border lines as described for the Introductory Sheet.

2. Find the approximate location of the views. Do not place your drawing in a corner but in the middle of the paper and a little below center.

3. Place your scale vertically and make short, light lines that will locate the bottoms and tops of the front and top views. Thru these points draw light lines almost all the distance between the border lines.

4. Place the scale horizontally and locate the vertical lines that belong to both front and side views. With triangle and T-square draw light lines of indefinite length thru these points. Make these lines long enough to cross both front and top view.

5. Go over the outline a second time with pressure on the pencil—horizontal lines first.

6. Put on dimension lines.

7. Put on lettering, Fig. 1, and figures.

GROUP II.

Counting Board—Plate 2.
Coat and Hat Rack—Plate 3.
Key-rack—Plate 4.

Scale ½″ = 1″.

1. Draw cutting and border lines.

2. Locate the views and then block out the horizontal and vertical lines of the outlines. Make certain these lines are sufficiently long.

3. Locate and block out the horizontal and vertical lines of the chamfer; next, the oblique or slanting lines at the corners.

4. Locate and block out the lines that locate screw hooks or holes.

5. Make heavy the outline. If you have trouble in keeping the light blocking lines separated in your mind, you may make the outlines heavy immediately after blocking out the chamfers.

6. Put on the dimension lines.

7. Put on the lettering and figures.

Geometric Sheet—Plate 51.

1. Lay out cutting and border lines.

2. Divide your space within the border into four equal parts.

3. Locate the center of each of these parts.

4. Thru these centers draw light horizontal lines and on these construct the different figures as shown.

The diameter of the circles in which the hexagon and six-point star are made is 3″. The octagon is built in a 3″ square. The ellipse has a major axis of 3½″ and a minor axis of 3″. For the constructions, see Appendix III, Sec. 5 of *Essentials of Woodworking*.

GROUP III.

Ring-toss—Plate 5.
Spool Holder—Plate 6.
Game Board—Plate 7.
Laundry Register—Plate 8.

Scale for each project ½″ = 1″.

Proceed in the same order as in Group II. The smaller circles will demand careful handling of the compass.

GROUP IV.

Sleeve Board—Plate 9.
Bread Board—Plate 10.

Scale for each project ½″ = 1″.

1. Locate and draw a light line of indefinite length for center line.

2. On this line measure off the extreme length of the board, also, on the bread board, the thickness of the cross-section.

3. Set the compass for a radius of an end and describe an arc somewhat greater than a semi-circle. In a similar manner describe the arc of the circle at the other extremity.

4. Draw the tangents connecting these circles at the top and bottom. On the bread board, project these tangent lines over into the field of the cross-section. On the sleeve board project vertical tangents at each extremity down into the field of its cross-section.

5. Using the same centers as above, shorten the radius as specified on the drawings and put on the inner lines of the front view.

6. Locate and complete the cross-sections, putting on their curves.

7. Make heavy the outlines and border.

8. Put on the dimension lines.

9. Cross-hatch the sections.

10. Put on the figures and lettering.

Cake Board—Plate 11.

1. Locate and draw the two center lines.

2. Set the compass and draw the circles.

3. Project tangents from these into the field of the cross-section.
4. Complete the cross-section outline.
5. Make heavy the outlines.
6. Put on dimension lines.
7. Cross-hatch the section.
8. Put on the figures and lettering.

Scouring Board—Plate 12.

1. Locate and draw the major and the minor axes.
2. By means of the trammel method (See *Notes on Woodworking Projects.* Directions for Scouring Board, paragraph 3, page 26) plot the curve and trace it.
3. Trace the inner curve.
4. Project tangents to the field of the cross-section.
5. Complete the cross-section outline.
6. Make heavy all outlines.
7. Put on dimension lines.
8. Cross-hatch the section.
9. Put on figures and lettering.

Coat Hanger—Plate 13.

1. Locate and draw the blocking-out line for the base line.
2. Locate the center line and at the same time locate the other vertical blocking-out lines as shown on the drawing. Draw these lines.
3. From the base line measure up on these vertical lines as indicated on the drawing. Sketch the curves thru the points so located. Sketch the curve which parallels the top curve.
4. Project the tangent to the top and bottom curves over into the field of the cross-section.
5. Complete the cross-section outline.
6. Make heavy all outlines.
7. Put on dimension lines.
8. Cross-hatch the section.
9. Put on figures and lettering.

GROUP V.

Scale—From this on the student will determine the scale to be used. The scale should be as large as can be used with the paper provided. Make the drawing either 1″=1″, or ½″=1″, or ¼″=1″, or ⅛″=1″.

In this and the succeeding groups only a few projects need directions for procedure. All of them are begun either with a base line, as in the cutting board, or with a center line or center lines. Some of them have both base line and center line, being builded partly from one and partly from the other. In almost every case it is clear which is to be drawn first—base line or center line.

Occasionally it is not possible to tell dimensions on one view in any other way than by projecting lines from corresponding parts in another view. If you fail to find dimensions you think you need, look to the other view and you will find that by drawing that view first you will be able to get the necessary dimensions in the second view by projection.

Nail Box—Plate 14.

Knife Polishing Box—Plate 15.

It will be necessary to work up the two views of this project together, getting some of the lines in one view by projecting from the other view.

Knife and Fork Box—Plate 16.

Bird Box—Plate 17.

The end view will have to be drawn first, and then, with horizontal lines, projected into the side view. Draw the base line entirely across for the two views, of course.

Broom Holder—Plate 18.

Read directions for Knife Polishing Box.

Bench-hook—Plate 19.

GROUP VI.

Teapot Blocks—Plate 20.
Thermometer Back—Plate 21.
Calendar Mount—Plate 22.
Card Holder—Plate 23.
Bill File—Plate 24.
Handkerchief Box—Plate 25.
Glove Box—Plate 26.

1. On the sketch paper provided you, make carefully at least four modifications or designs of the project assigned your class.

2. On a second sheet provided you, place three of these outlines selected by yourself and instructor.

3. On another sketch paper make at least four modifications or designs for decorating one of the three outlines above.

4. On paper provided place three of these decorative forms selected by yourself and instructor.

5. Make a full-size pattern, putting in the outline and design for decoration selected by yourself and instructor, also a working drawing if needed.

GROUP VII.

Work from base line, and center line also should there be any.

Groove Joint—Plate 27.
Book-rack—Plates 28 and 49.
Necktie Rack—Plates 29 and 48.
Magazine Rack—Plate 30.
Footstool—Plate 31.

The end view will have to have some of its lines projected into the other view in order to determine some of the measurements in that view.

Paper and Magazine Wall Rack—Plate 32.
Wall Shelf—Plate 33.
Table or Desk Shelves—Plate 34.
Taboret—Plate 35.

1. Locate and block out center line of the two views.

2. With the forty-five degree triangle block out the lines for the view of the top.

3. Draw the vertical diagonal of the top view.

4. Measure to either side of this vertical diagonal one-half the width of the leg and block vertical lines. Repeat horizontally, on the center line.

5. Block off the corners of the top view where these lines just drawn cut the sides of the square of the top.

6. On these lines build the top views of the legs.

7. Project these lines into the field of the front view and complete the front view.

8. Make heavy the outlines.

9. Put on dimension lines and figures and lettering.

Stool—Plates 36 and 47.

GROUP VIII.

Cross-lap Joint—Plate 37.

Book Trough—Plate 38.

None of the vertical measurements of the front view can be determined by looking at that view therefore it will be necessary to block out the view of the end of the trough first and project these points into the field of the front view.

Electric Cluster—Plate 39.

Electric Table or Desk Light—Plate 40.

Calendar Mount or Memo Board—Plate 41.

Hall Rack or Mirror Frame—Plate 42.

Picture-frame—Plate 43.

Taboret—Plate 44.

1. Locate and block out a square for the top. On this square construct the octagon.

2. Horizontally and vertically thru the center of the octagon, block out center lines. On either side of these center lines block out lines a distance equal to one-half the width of the legs.

STOCK BILL

(Form)

NAME_____ ARTICLE_____

GRADE_____ KIND OF WOOD_____

Finished Sizes				Cutting Sizes			
Pieces	Thickness	Width	Length	Pieces	Thickness	Width	Length
1	⅜	3	5½	1	⅜	3¼	6
1	½	1½	4½	1	½	1¾	5
2	½	1½	9	2	½	1¾	9½
1	½	5½	12	1	½	5¾	12½

3. Where these lines cut the sides of the octagon, block out the views of the tops of the legs.

4. Project these lines into the field of the front view and complete that view.

5. Make heavy the outlines.

6. Put on the dimension lines and figures and lettering.

China Wall Rack—Plate 45.

Pedestal—Plate 46.

1. Locate and draw the center line.

2. Block out the front and top views together as the placing of the dimensions necessitate, projecting from one view into the other.

3. The octagonal top is built in a square.

Curves that have no definite radius marked on the drawing are to be made freehand.

Stock Bill

Instructions:

Work from your own drawing. In this way you can assist in checking it for errors. All projects in Groups I-IV will be made of white pine or yellow poplar; those in Groups VII-VIII of chestnut.

Stock bills are not needed for articles composed of one piece of material only.

Finished sizes are the sizes to which the pieces are to be planed. Your drawing will tell you these sizes. Pieces of irregular shape are to be figured at their widest and longest dimensions.

Cutting sizes are obtained from the finished sizes by adding ¼″ to the width and ½″ to the length. Cutting sizes are the sizes to which you work in sawing out the stock preparatory to planing it.

All stock will be mill-planed on two surfaces to the correct thicknesses except that for the ring toss, spool holder, game board, and laundry register. Thickness of mill-planed stock will be the same whether for finished sizes or cutting sizes. On rough stock, or stock that has not been mill-planed, if the finished size is ¾″ thick the cutting size will be 1″ thick.

(Form, reverse side of a Stock Bill)

ESTIMATE OF COST OF MATERIAL

2	square feet of ¾ inch stock @ 7c	$ .14
3/10	square ft. of ⅜ inch stock @ 5c	.02
4	1 inch, No. 10, flat head, bright screws @ ¼c	.01
5	square feet of finish @ 1c	.05
		$ .22

Sometimes it is possible to save material by combining two irregular pieces, Fig. 2. The finished stock sizes will indicate the number of pieces while the cutting size will indicate the size of the single piece from which they are to be cut.

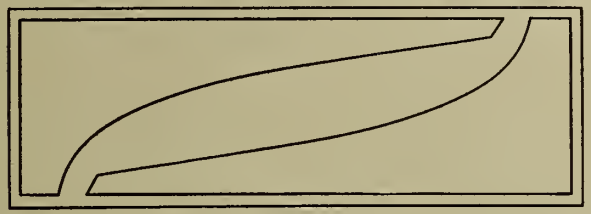


FIG. 2

Remember that length always means "along the grain of the wood," and that a piece may be wider than long. Under the word "Pieces" put the number of pieces that are of the same size.

ESTIMATE OF COST OF MATERIAL

Instructions:

Base your lumber estimate on the cutting sizes. All prices of lumber in your price list are per square foot, therefore, your stock should be figured by surface measure, only width, length and number of pieces being considered.

Fractions of an inch and fractions of a cent are not considered. If the fraction is ½ or over, use the next higher whole number; thus, 2½ or 2¾ becomes 3. If the fraction is less than ½ drop it; thus, 2¼ becomes 2.

In figuring, find the number of square inches in all pieces that are the same in price per foot. Reduce this to square feet by dividing by 144. Reduce it decimally and do not carry the result beyond tenth's place. Dispose of any fractional figures beyond tenths as directed above. Always write your decimal in a fractional form in the bill—otherwise a decimal point might be overlooked and the result be greatly changed. In the form above .3 is written 3/10, you will note.

In figuring finish, both surfaces of the stock are to be covered so that the easiest way to find the number of square feet of finish is simply to double the number of square feet of lumber. Edges are not considered. Only Groups VI, VII, and VIII have finish applied.

PRICE LIST FOR 19—-19—

LUMBER.

Chestnut, 1st grade, clear, kiln dried,
S-2-S to ⅜", per square foot.....
S-2-S to ¾", per square foot.....
S-2-S to 1", per square foot.....
White Pine or Yellow Poplar, 1st grade, clear, kiln dried.....
S-2-S to ⅜", per square foot.....
S-2-S to ½", per square foot.....
S-2-S to ¾", per square foot.....
Rough, 1", per square foot.....

HARDWARE.

Screws,
¾" No. 10 flat head, bright, each.....
1" No. 10 flat head, bright, each.....
1¼" No. 10 flat head, bright, each.....
1½" No. 10 flat head, bright, each.....
2½" No. 10 flat head, bright, each.....
3" No. 10 flat head, bright, each.....
⅝" No. 10 round head, blued, each.....
¾" No. 10 round head, blued, each.....
1½" No. 10 round head, blued, each.....

Nails,

1¼″ No. 17 wire brads (used in Groups V and VI), enough for nailing one box.....

1½″ No. 15 wire finishing nails (used in Groups VII and VIII), enough nails for nailing one project .....

Miscellaneous:

No. 81, ¾″ brass shoulder hooks for key-rack, each.....

No. 81, 1″ brass shoulder hooks for china wall rack, each.....

2½″ black Japanned wire coat hooks, each.....

No. 6 wire hook for coat hanger.....

No. 1214½ brass screw eye and No. 1614 hook (calendar mount) per pair.....

Fixtures for electric lights and hooks for hall mirror are to be purchased by the individual—prices and tastes vary so greatly.

WOOD FINISH.

Stain, filler, shellac and wax or filler, shellac and wax or stain and wax, per square foot of surface

GROUP I.

Squaring up Stock that has been Mill-planed on Two Surfaces to the Desired Thickness.

No definite dimensions required, but to be square and as large as the stock given will allow. The fewer the shavings taken off and the desired result attained, the better workman you will be considered.

Stock Provided:

One piece, 6″ by 12″, mill-planed, or S-2-S, to ¾″.

Directions:

Show your piece to your instructor after each step taken.

1. Select and mark face side.
2. Plane a face edge (a) square to the face side and (b) straight as to length. (Two tests) Mark face edge properly.
3. Plane a face edge (a) square to the face side, (b) parallel to the face edge, and therefore straight. (Two tests) Use sliding try-square test for width, not gage.
4. Plane one end (a) square to face side and (b) to the face edge. (Two tests)
5. Plane second end similarly.

GROUP II.

Squaring up Stock that has been Mill-planed on Two Surfaces to the Desired Thickness.

Definite Dimensions.

Stock Provided:

Stock will be ¼″ wider and ½″ longer than the finished sizes, but S-2-S to thickness. Dowel stock for pegs will be provided ready to be sawed into lengths.

Directions:

Show your piece to your instructor after each step.

1. Select and plane smooth a face side. (One test.) Mark it.

2. Select and plane a face edge. (Two tests.) Mark it.

3. Gage for width. Keep the gage head against the face edge.

4. Plane second edge to the gage line and square. Test for squareness.

5. Plane one end square. (Two tests.)

6. Measure off length from this end.

7. Score knife lines around at point just located. Keep the beam of the try-square against one or the other of the faces in so doing.

8. With back-saw cut off surplus stock. Saw carefully parallel to the knife line and about 1/32″ or 1/16″ in the waste.

9. Plane to the knife lines.

10. With rule and knife divide the width into the required number of parts, and mark.

11. Gage very light lines the full length of the piece thru these marks—or mark, in the case of the key-rack and hat-rack. Keep the head of the gage against the face edge.

12. Lay a rule along a line so made and mark off the hole centers.

13. With try-square and knife score light lines thru these points and across the piece. (This step may be omitted on the key-rack and hat-rack.)

14. With a point of the dividers, if no awl is provided, mark the places at which the holes are to be bored. (On the hat-rack and key-rack also mark the places into which the hooks are to be inserted, but be careful not to bore holes there.)

15. Bore the holes.

16. Smooth the knife and gage marks from the surface.

17. Lay out and work the chamfer.

18. Put the numbers on the counting board. Make three pegs. Put the hooks on the hat-rack and key-rack.

GROUP III.

Stock Provided:

Stock provided will be ¼″ wider, ½″ longer than finished size and will be in the rough, 1″ thick.

Dowel stock will be provided for pegs.

Directions:

Show the piece to your instructor after each of the steps the numbers of which are in parentheses.

(1). True and smooth a broad surface. Put on a face mark.

2. Prepare a face edge. Put on a face mark.

3. Gage to required width from face edge and plane to the gage line.

(4). Gage to required thickness on both edges from face side. Plane to the gage lines.

5. Square one end from the face side and face edge.

(6). Measure the required length and score knife lines about the second end. Saw in the waste and plane to the knife lines.

(7). By means of rule, knife, try-square and gage lay out the location of the holes, knifing across the grain and gaging along the grain, as was done in the previous group. Make these lines lightly and watch your drawing that no mistakes occur. Mark centers with awl or divider point.

(8). Bore the holes.

(9). Smooth the knife and gage marks from the broad surface.

(10). Lay out and work the chamfer.

(11). Make the pegs.

(12). Sandpaper.

(13). Glue pegs where so specified on drawing, and test for plumbness.

GROUP IV.

Stock Provided:

Stock provided hereafter will be mill-planed on two surfaces to the required thicknesses, but must be cut out by the pupil.

Directions for Getting out Stock:

1. Never cut a large board until you have first looked over the small pieces in the scrap box to see if your piece can be cut from one of these. They are the same quality of stock, only smaller.

2. No piece, once having been sawed out, is to be put back or disposed of without the instructor's permission.

3. Cut the stock ¼″ wider and ½″ longer than the drawing calls for the finished piece. Where the piece is irregular in shape cut for the widest part and longest part unless it is possible to economise. REMEMBER that length always means along the grain.

4. Lay off with pencil using square and straight-edge. Thumb-gage if the edge is fairly straight.

5. Rip-saw first to the cross line then crosscut to ripped line, leaving on the board all but just what you need.

Directions for Bread and Sleeve Board:

Show the piece to your instructor after each step.

1. Smooth both broad surfaces.

2. Lay off a center line down the middle of the board using a straight-edge and light penciled line.

3. On this line measure off the extreme length.

4. Set the dividers to the radius called for; set one point of the dividers on one of the points which indicates the length of the board and the other point of the dividers back on the line. Draw the circle a little more than half.

5. Lay off the circle at the second end similarly.

6. With a straight-edge and light penciled line connect these two circles with their tangents. Be sure the lines are tangent. Draw these tangents the full length of the board so as to indicate later the point at which to start ripping.

7. Rip-saw parallel to these tangents and ⅛″ in the waste.

8. With the turning saw cut the curves keep-

ing parallel to the line and at right angles to the surface and outside the line.

9. Plane to the tangent lines, testing with try-square.

10. Pare to within 1/32″ of the curved line, using chisel and chisel board. Keep the edge square across. Test with try-square. Carpenters sometimes use the plane here instead of the chisel.

11. Spokeshave to the curved lines and plane to the straight lines, testing with try-square.

12. Pencil gage for ⅛″ curve. See Sec. 60, *Essentials of Woodworking.*

13. Spokeshave the edge rounding.

14. Sandpaper the curve as shown in Sec. 60.

15. Remove pencil marks with eraser then sandpaper the broad surfaces.

Directions for Scouring Board:

1. Smooth the broad surfaces.

2. With straight-edge and pencil, lay off the major axis. At right angles to this lay off the minor axis.

3. Measure and mark off on a piece of paper two points a distance apart equal to one-half the major axis. From one of these points measure in the same direction along the paper's edge a distance equal to one-half the minor axis. Keeping this last point always on the major axis and the adjacent point always on the minor axis, plot the curve. Trace the curve. Also see *Essentials of Woodworking* Appendix III, Sec. 5.

4. With the turning-saw, cut out the form, keeping away from the line ⅛″ and sawing square across the board.

5. Pare the waste away to within 1/32″ of the line. Place the piece on the chisel board so as not to cut into the bench.

6. Cut to the line with the spokeshave. Test for squareness of the edge with try-square.

7. Pencil-gage ⅛″ curve as in Sec. 60, *Essentials of Woodworking.*

8. Spokeshave the edge rounding.

9. Sandpaper the edge, Sec. 60.

10. Remove the pencil marks from the broad surfaces with an eraser, and then sandpaper.

Directions for Coat Hanger:

1. Select and plane smooth a face side.
2. Select and plane straight and square a face edge.
3. Smooth the second broad surface.
4. Plane one end square.
5. Measure the length, and score knife lines around this second end.
6. Saw off the waste, and plane to the knife lines.
7. Measure along the face edge, and square light pencil lines across the face side as indicated in the drawing.
8. Measure along the lines from the face edge, and locate the points needed in plotting the curves, and trace carefully the curves freehand.
9. With the turning-saw, cut the curves, keeping parallel to the lines and ⅛″ in the waste. Keep the blade at right angles to the surface.
10. Pare to within 1/32″ of the line and finish to the line, using the spokeshave. Use the try-square test frequently for edge. The chisel board should be used so as not to injure the bench-top.
11. The upper edge is to be made rounding. Pencil-gage for ⅛″ curve as in Sec. 60, *Essentials of Woodworking*.
12. Spokeshave this edge rounding, Sec. 60.
13. Bore the hole for the hook.
14. Remove all pencil marks with an eraser, then sandpaper.

Directions for Cake Board:

1. Smooth both broad surfaces.
2. Locate the center of the block by drawing the diagonals and describe the circle wanted.
3. With the turning-saw, cut the curve, keeping parallel to the line and ⅛″ in the waste. Keep the blade at right angles to the surface of the board.
4. Pare to within 1/32″ of the line, and finish the edge square to the surface with the spoke-

shave. Use the chisel board so as not to mark the bench-top.

5. Pencil-gage the ⅛″ rounded edge, *Essentials of Woodworking*, Sec. 60.

6. Spokeshave the edge rounding.

7. Remove the pencil marks with an eraser, then sandpaper.

GROUP V.

Duplicate Parts.

Fastening with Nails and Screws.

1. Using your stock bill of cutting sizes, get out all your pieces. Use small pieces wherever possible. If you find that several boys must wait while you are cutting your stock, get out only enough pieces to allow you to start planing, and return later for the rest.

2. Remove the mill-marks from both broad surfaces. Surface truing is not necessary, for the construction of the boxes permits the "nailing out" of any slight irregularities. If a board is badly cupped it should not be used for the thickness for which it was originally intended.

3. Select and mark the face sides of all pieces that are to be of similar width.

4. Plane a face edge on each of these.

5. Gage their widths.

6. Plane their second edges.

7. Plane one end of each piece square.

8. Place those that are to be of equal length on the bench side by side, even the ends that were planed, and measure off the length on one piece.

9. Score knife line across all the face edges at this point.

10. Separate the pieces and carry these lines across the face side of each piece, square to the face edges.

11. Finish these second ends in the usual manner.

If these like pieces are any of them under size thru faulty work, reset the gage and regage all of them to the same width as the smallest part of

the poor piece. If it was the length of one of them that was wrong, place them again on the bench, face edges up, and re-mark them, and then re-work them to this shorter length.

12. In a similar manner work up other pieces having similar widths or lengths, then work up the single pieces.

Take note to see whether any of these latter pieces are affected by changed dimensions on previous pieces. If they are, follow the new dimensions as obtained from the pieces already worked. For illustration, if the two sides of a box have been shortened thru poor work a middle partition running parallel with them, and the bottom dimension parallel to these sides, will have to be shortened accordingly. Do not change any parts, however, that are not so affected—the width of the bottom, for instance.

13. Test all the parts by placing them in position or along side corresponding parts.

14. Sandpaper all the parts except those parts that go together to form a joint.

15. Fasten the parts. On boxes fasten the sides or the ends to the partition. Fasten the ends to the sides or the sides to the ends. Place the bottom last.

In fastening the bottom, place and nail one edge of the bottom to a side of the box. Next make even the end of the bottom and one end of the box, and nail this. If the end of the bottom board and the end of the box do not "line up" move the unfastened side of the box until they are even. Fasten the other side and end and set the nails. If the bottom projects any, plane it off and sandpaper the outside of the box.

Fastening with Screws:

1. Square up the different parts as described above.

2. Bore the holes in the parts thru which the screws are to be first put. Countersink these holes.

3. Place the upper piece on the lower and mark thru the holes already bored with brad-awl or a divider point. Insert the screws. As this is soft wood no boring need be done in the second piece. If you have trouble holding the parts together place the pieces in the vise and insert one screw at a time.

GROUP VI.

DESIGN: STRUCTURAL, DECORATIVE.

Directions:

1. Work up the various parts. The method to be used will depend upon the design of the structure. If the outline is based upon a square or oblong, square up the parts in the usual manner, and put in the modifications afterward. For illustration, the octagon is based upon the square. Work the part to a square, therefore, and afterward lay out for the corners.

If the part is circular, no edges or ends are squared up, but the curve is laid out immediately and worked.

If the outline of the part is irregular in shape, it will be necessary to make a full-sized templet or pattern in paper and by laying this on the wood and marking around it, get the shape. Here a center line will be used.

None of the suggestions given require any new methods tho they may require, and are intended to require a little thought as to which of the methods previously used they demand for their solution.

2. Sandpaper the parts and put them together.
3. If nails are used set the heads slightly and cover them.
4. Apply the design.
5. Outline the design as instructed.
6. Apply the stains.
7. Apply the wax for polishing.
8. Apply a second coat of wax.

GROUP VII AND GROUP VIII.

GROOVE JOINT. CROSS-LAP JOINT.

Directions:

1. Using the cutting sizes of your stock bill, get out all your stock. If you should find that several boys are waiting while you cut your stock, take only enough to get your work started, and return later for the rest.

2. Work up like parts, planning the work so as to insure accuracy and save time. If you have forgotten how to work duplicate parts, reread directions for Group VI.

Be sure to remove the mill-marks before laying out any joints.

Do not put on any chamfers until the joints have been laid out.

3. Lay out the joints. See *Essentials of Woodworking*, Secs. 62, 77.

4. Work the joints. See *Essentials of Woodworking*, Secs. 78, 79, 80, 81.

5. On the groove joint projects, sandpaper the parts and put on the filler. Clean off the filler, put the parts together and, after the filler has dried over night, shellac, and then wax.

6. On the cross-lap projects, glue and clamp the joints. Glue up your joints as they are ready, so as to have them dry when they are needed later. When this glue has hardened over night take off the clamps, clean up the wood with sandpaper, and put on the finish.

Directions for Finish:

1. Apply the filler. See *Essentials of Woodworking*, Sec. 151.

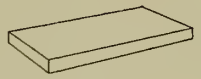
Be sure to get it cleaned off and out of the corners while it is soft. Allow the filler to stand over night after being rubbed.

2. Sandpaper the filler with fine paper held on the finger tips. Apply a very thin coat of shellac and allow this to dry over night. See *Essentials of Woodworking*, Sec. 149.

3. Sandpaper this shellac lightly with fine paper held on the finger tips. Apply a coat of wax. *Essentials of Woodworking*, Sec. 153. If a decorative design in spirit stains has been used, omit the shellac coat and apply two coats of wax. Stain for decorative design is to be applied after sandpapering the wood and before applying the filler.

Note: Oil finish will not stick to glue spots. Neither will glue stick to an oiled surface.

CUTTING BOARD



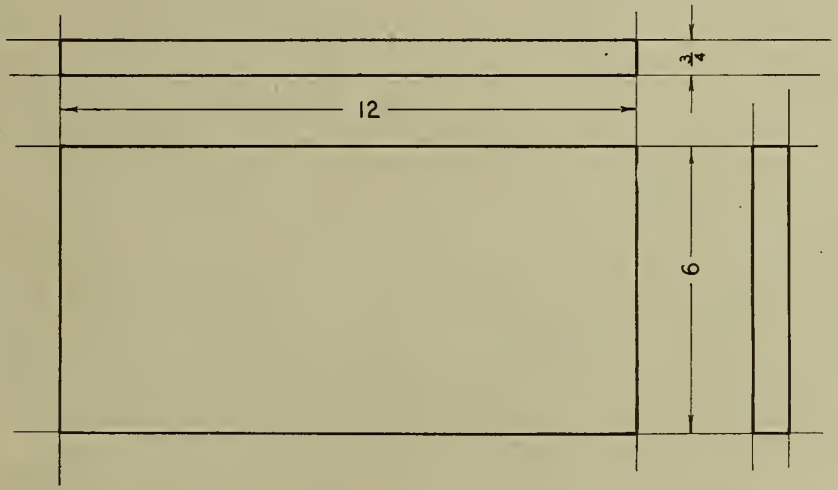
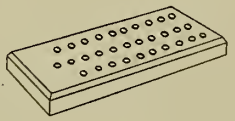
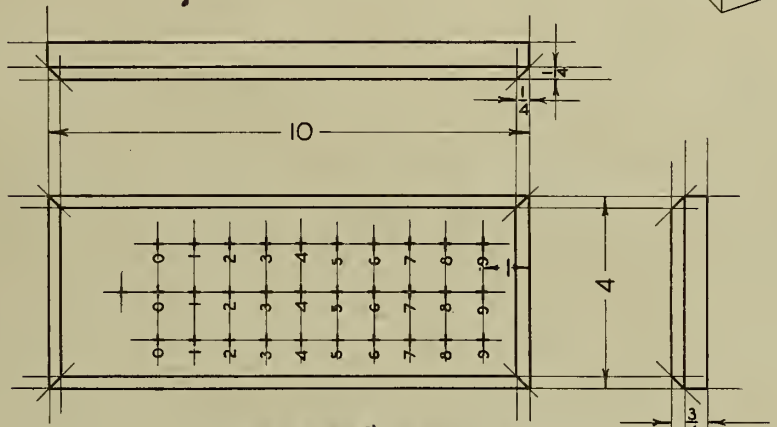


Plate 1.

COUNTING BOARD





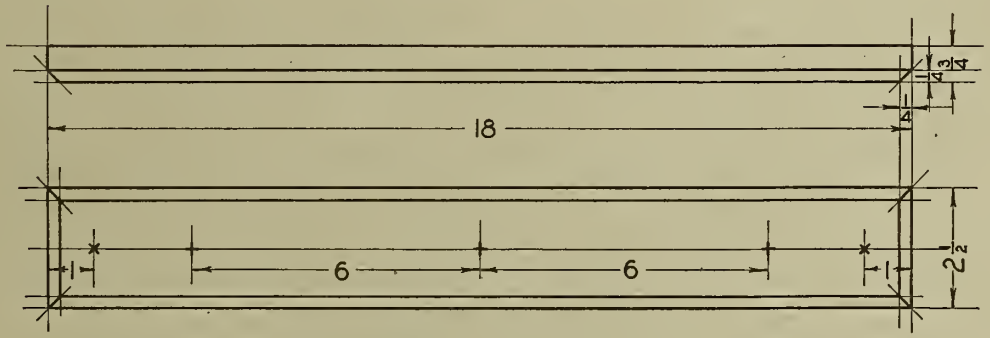
THRU BORE $\frac{3}{8}$" HOLES AT +

FROM $\frac{3}{8}$" DOWEL STOCK SAW 3 PIECES EACH $1\frac{1}{4}$" LONG

POINT THE ENDS $\frac{1}{16}$" EACH

PLATE 2.

COAT AND HAT RACK

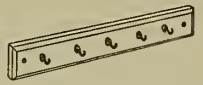


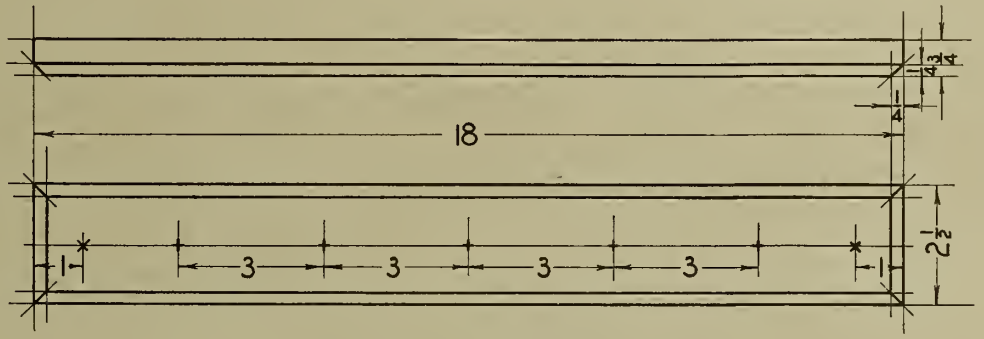
3/16" HOLES FOR SCREWS AT X

2 1/2" WIRE COAT HOOKS AT +

PLATE 3.

KEY RACK



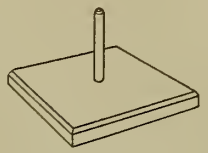


3/16" HOLES FOR SCREWS AT X

3/4" BRASS CUP HOOKS AT +

PLATE 4.

RING TOSS



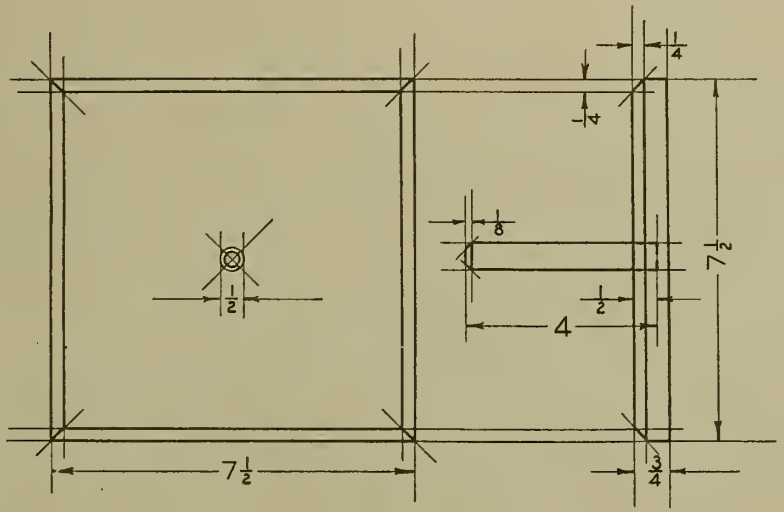
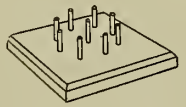


Plate 5.

SPOOL HOLDER



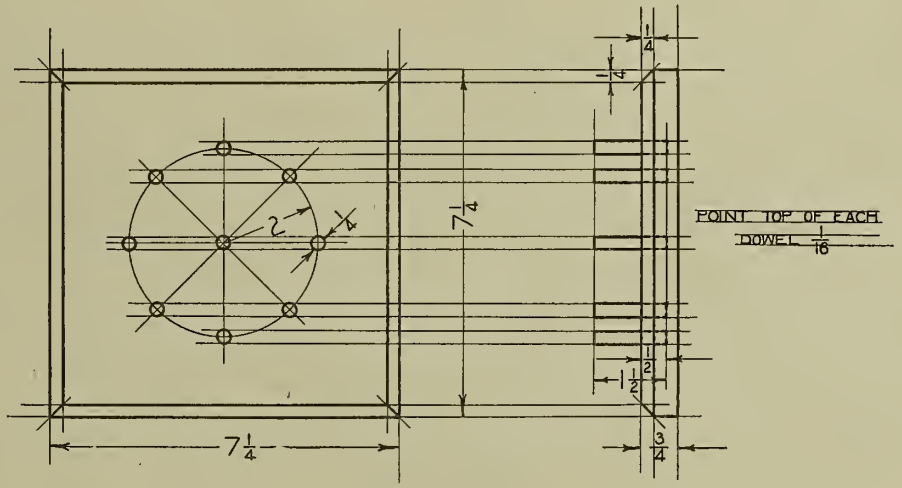
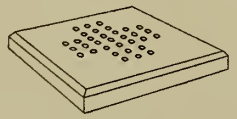
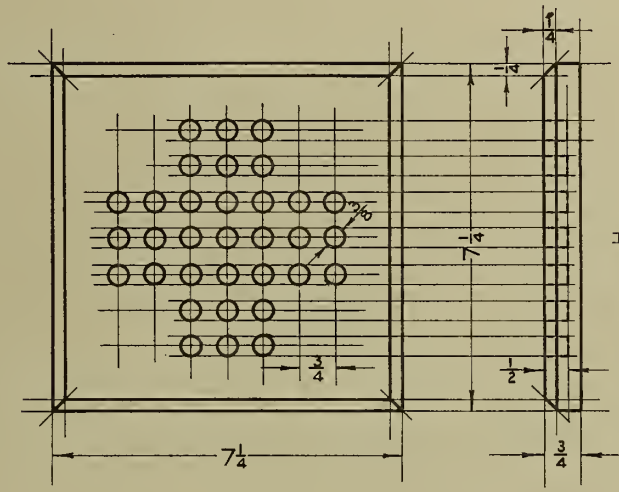
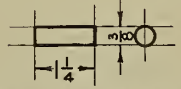


PLATE 6.

GAME BOARD





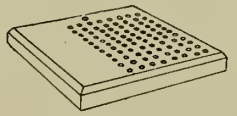


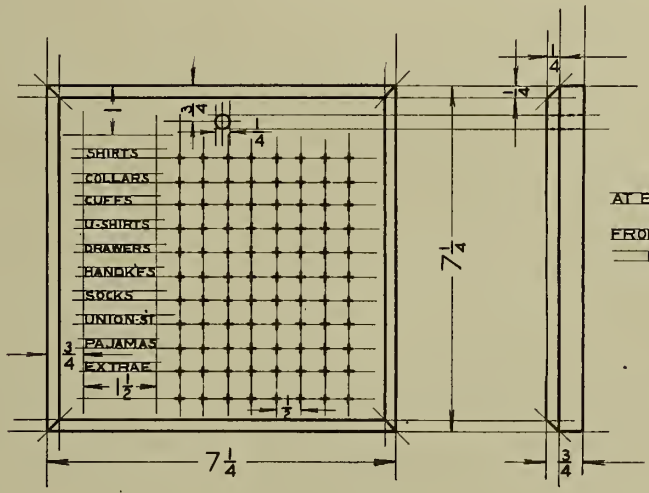
FROM $\frac{3}{8}$" DOWEL STOCK MAKE 32 PEGS POINT ENDS $\frac{1}{16}$ EACH

SOLITAIRE — PLACE ALL PEGS IN THE BOARD — JUMP PEGS ONE OVER ANOTHER ALONG STRAIGHT LINES, HORIZONTALLY, VERTICALLY OR DIAGONALLY — PLAN THE PLAYS SO THAT THE FINAL PEG TO BE REMOVED WILL LAND JUMPER IN CENTRAL HOLE.

PLATE 7.

LAUNDRY REGISTER





AT EACH + BORE A $\frac{3}{16}$" HOLE $\frac{1}{2}$" DEEP

FROM $\frac{3}{16}$" DOWEL STOCK SAW 10 PEGS 1" LONG
POINT THE ENDS $\frac{1}{16}$"

SLEEVE BOARD

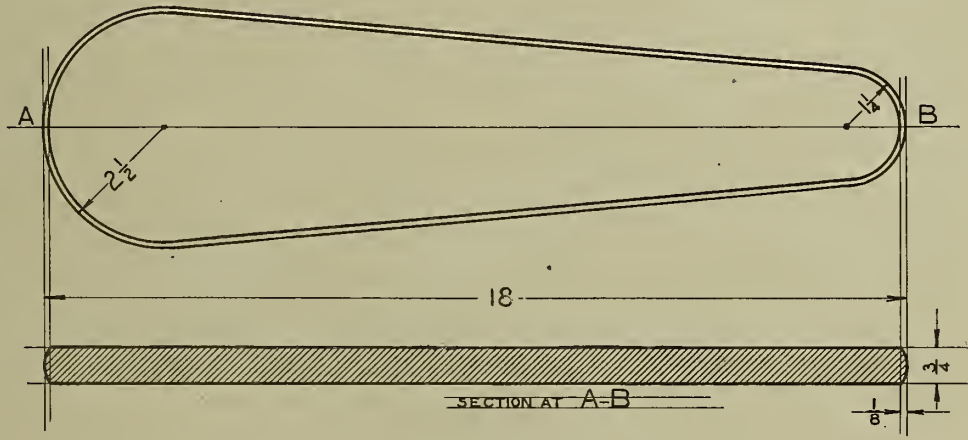


Plate 9.

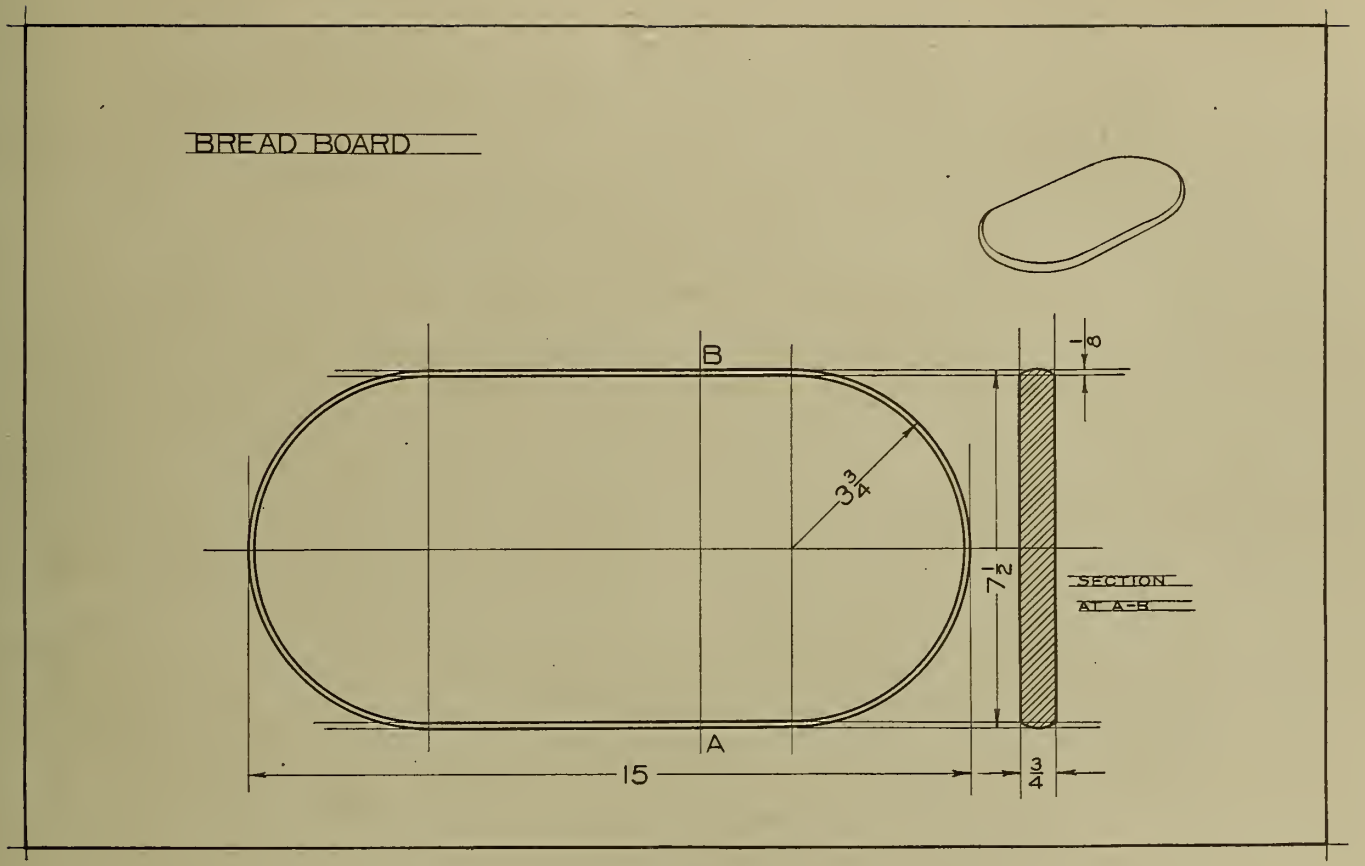


Plate 10.

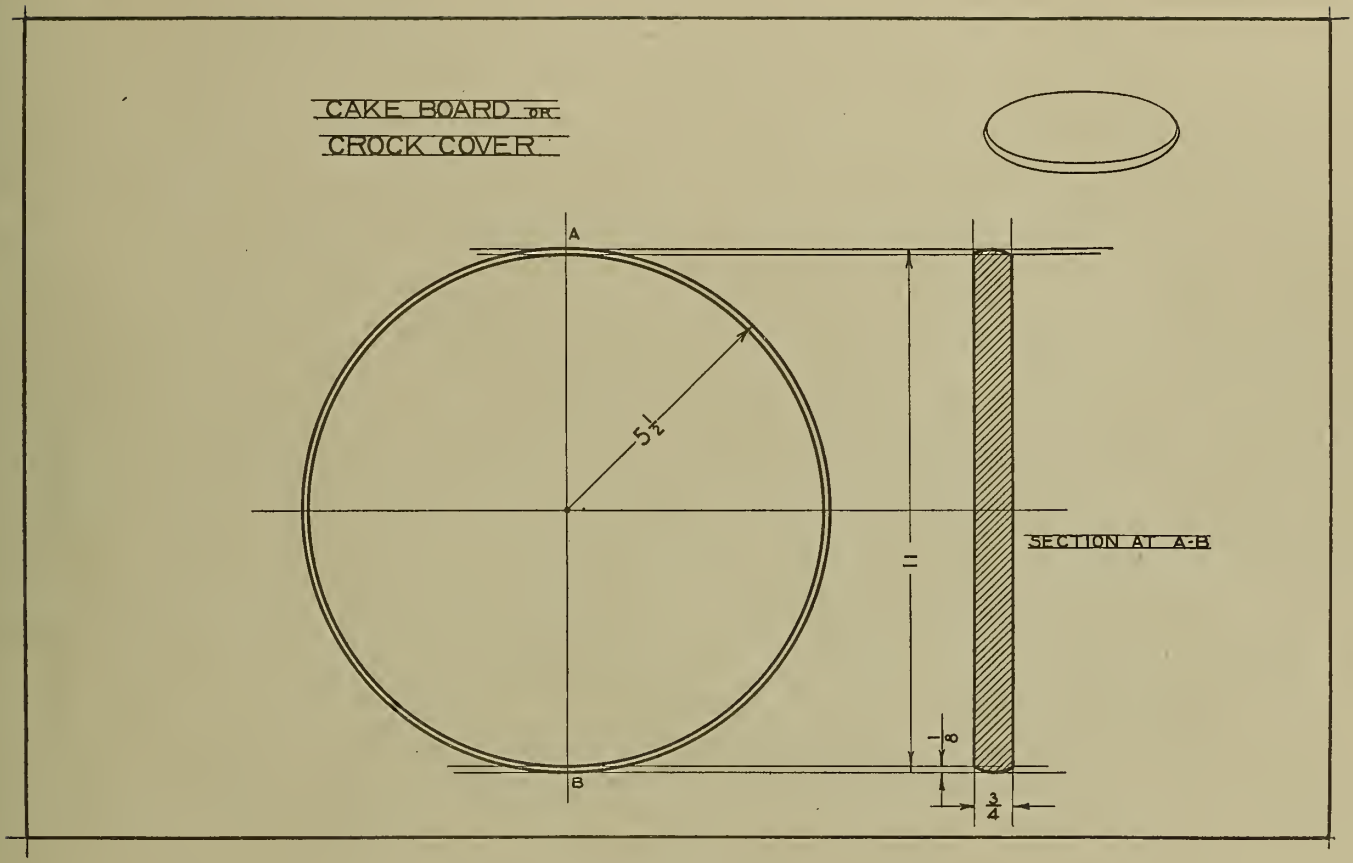


Plate 11.

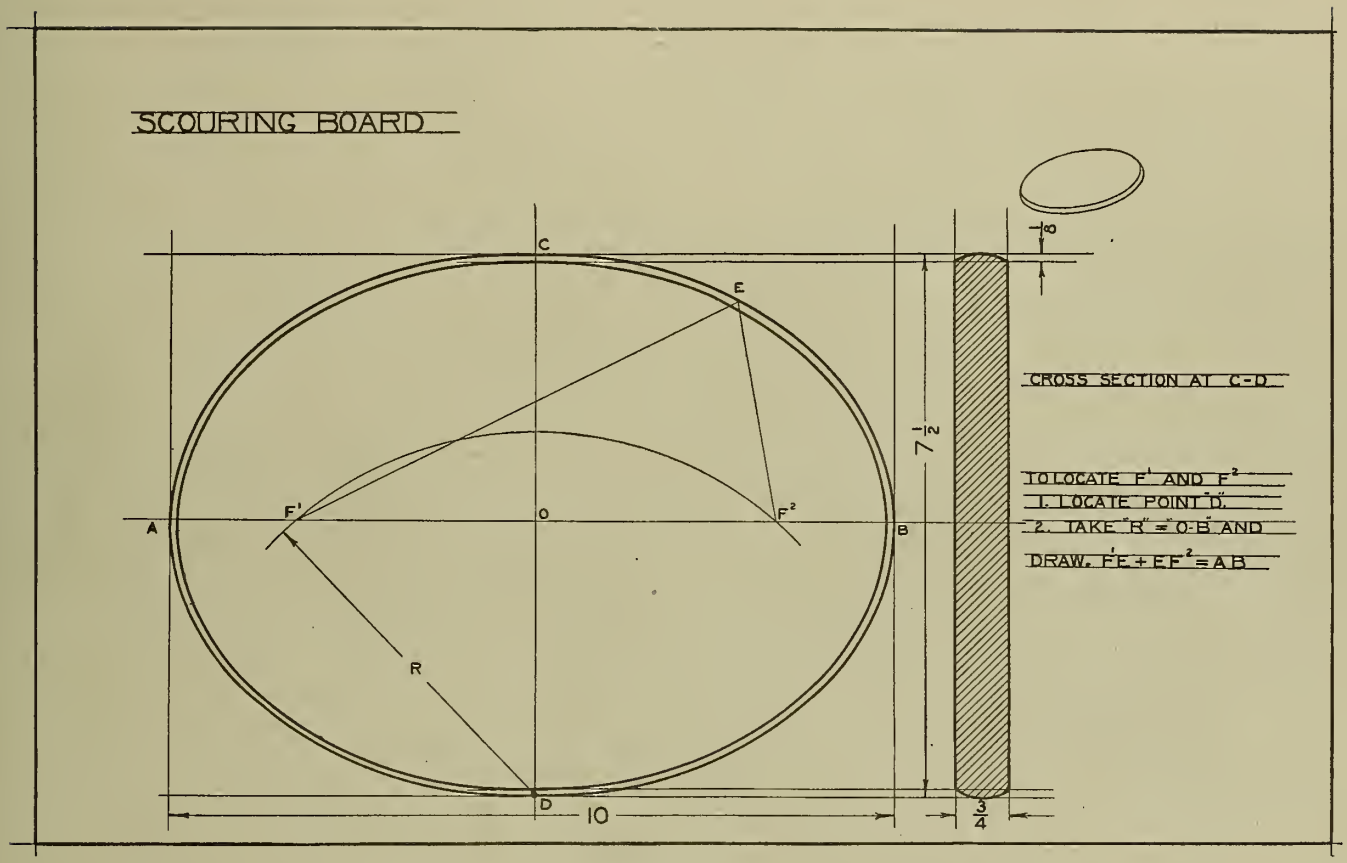
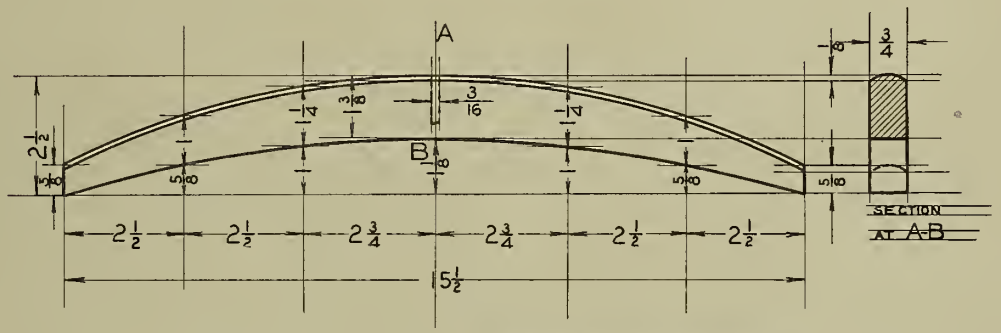

SCOURING BOARD
C
E
F'
O
F²
A
B
D
R
10
7 1/2
1/8
3/4
CROSS SECTION AT C-D
TO LOCATE F' AND F²
1. LOCATE POINT "D".
2. TAKE "R" = "O-B" AND
DRAW. F'E + EF² = AB

Plate 12.

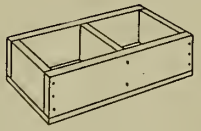
COAT HANGER



SWEEP ARCS = $16\frac{7}{8}$" AND $27\frac{1}{8}$"

PLATE 13.

NAIL BOX



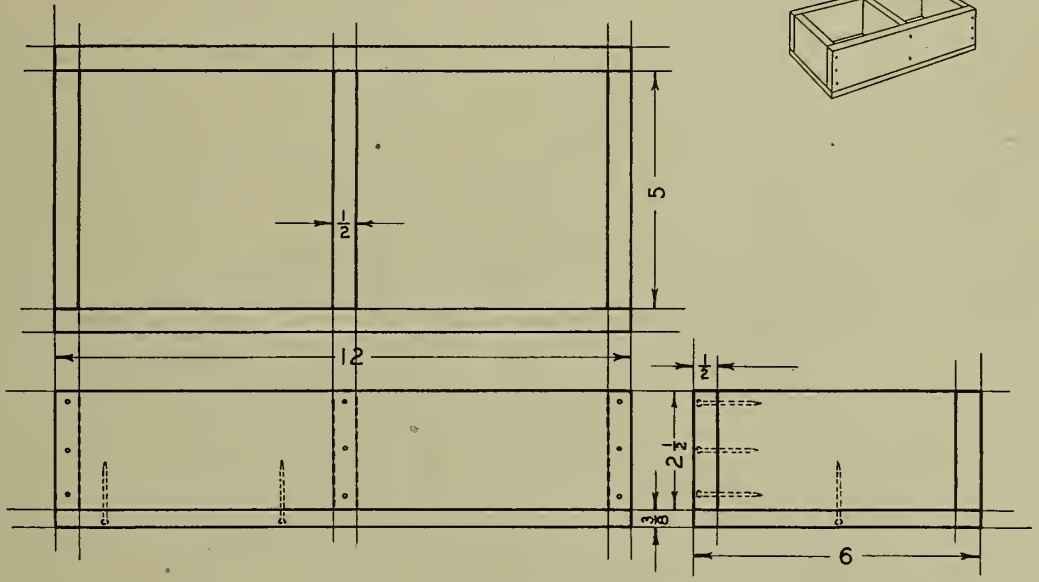
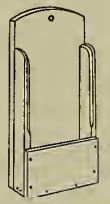


Plate 14.

KNIFE POLISHING BOX



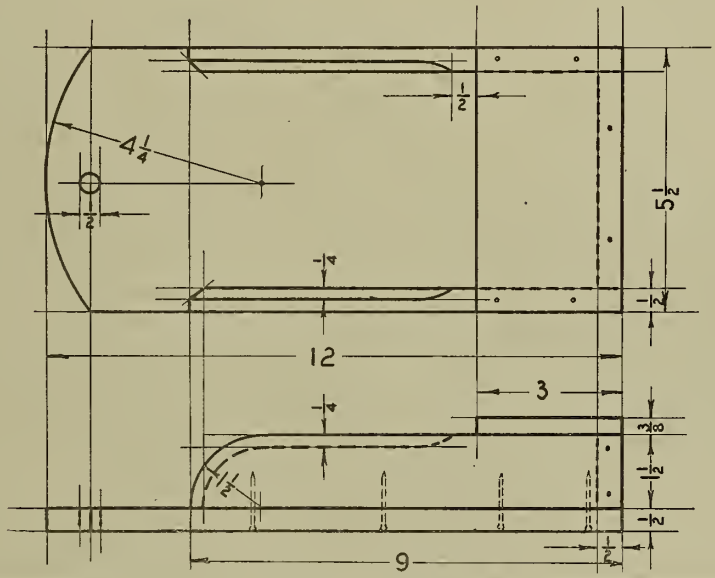
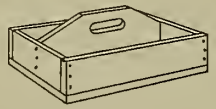


PLATE 15.

KNIFE AND FORK BOX



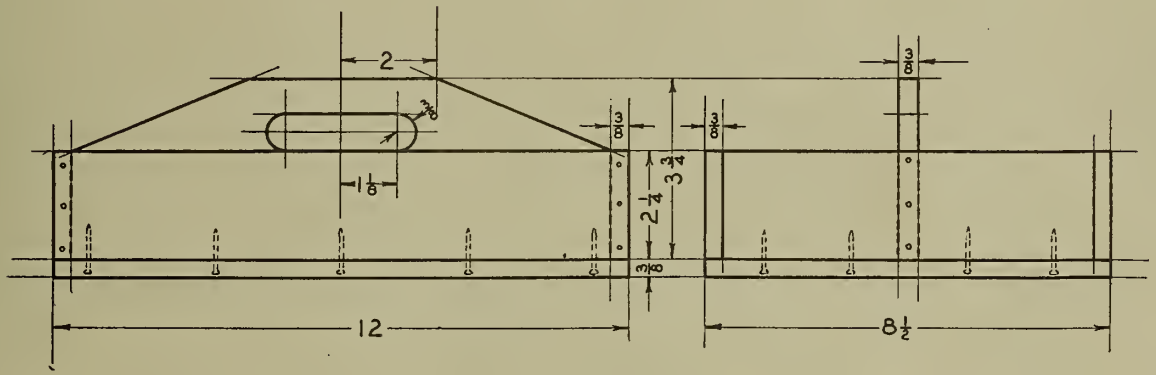
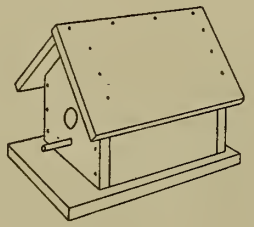


Plate 16.

BIRD HOUSE



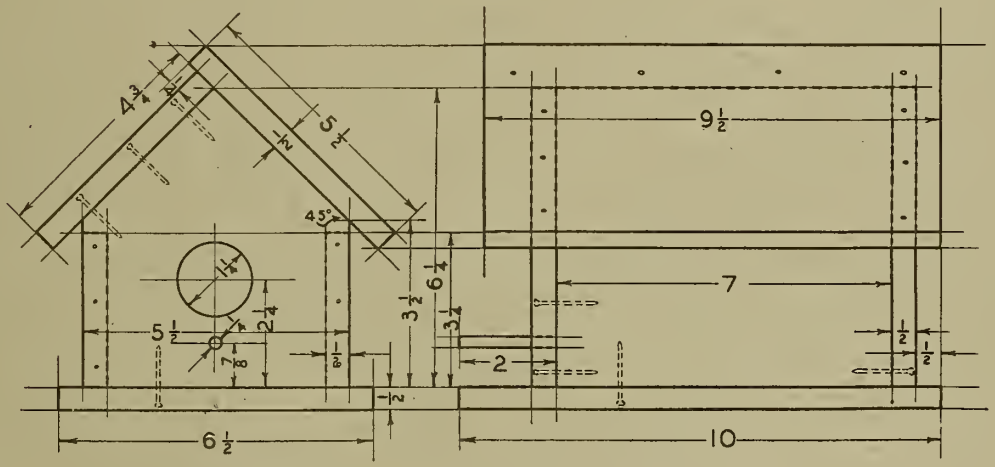
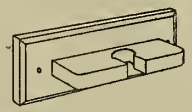


PLATE 17.

BROOM HOLDER



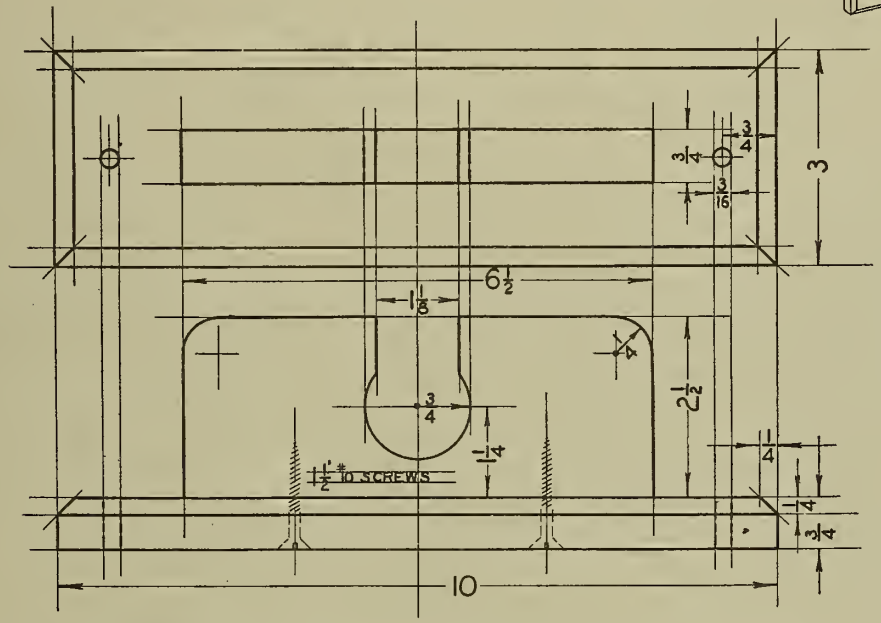


Plate 18.

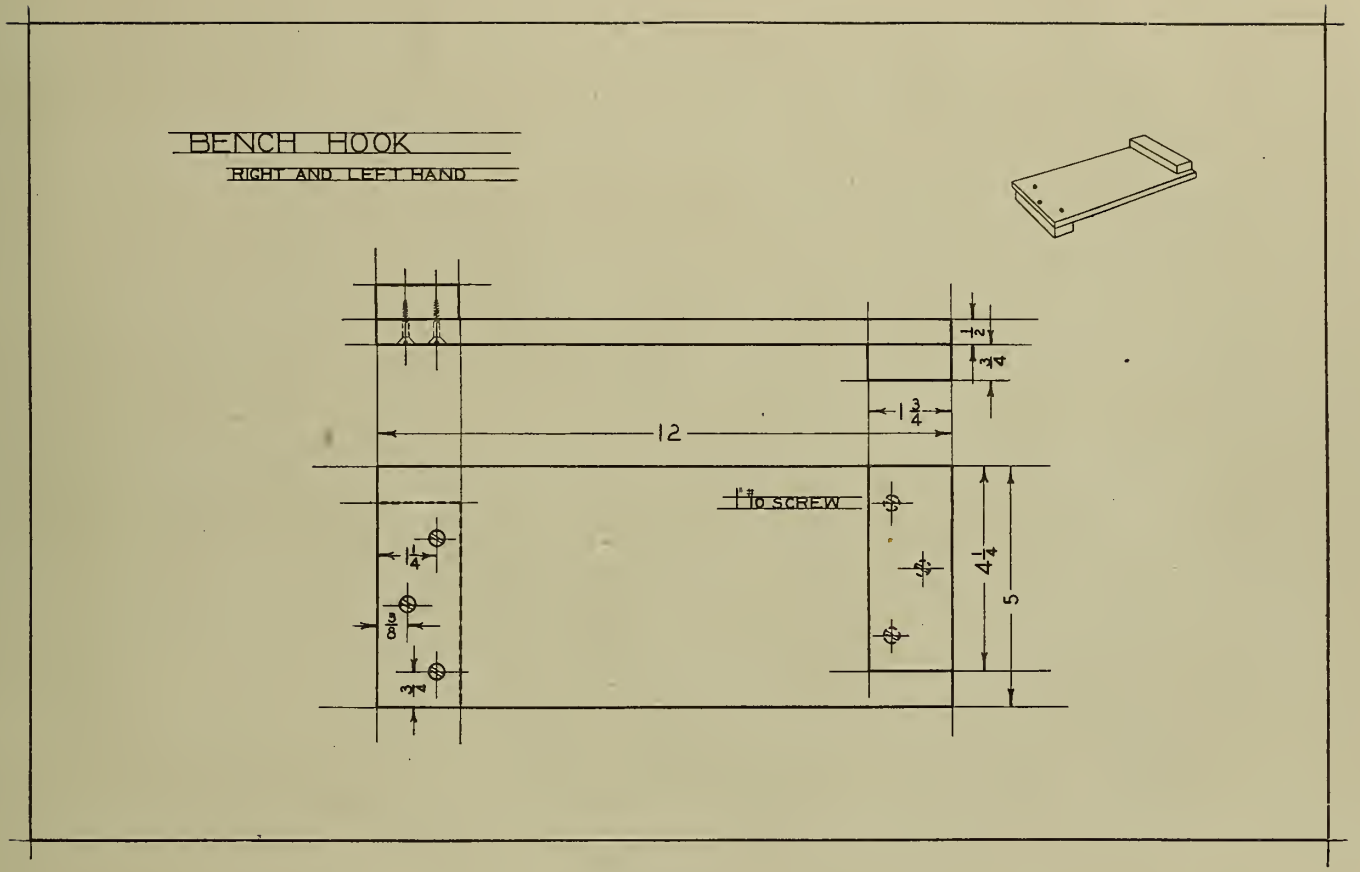

BENCH HOOK
RIGHT AND LEFT HAND
12
1 3/4
1/2
3/4
#10 SCREW
4 1/4
5
1/4
3/8
3/4

Plate 19.

TEAPOT BLOCKS (BLANK MODEL — TO BE MODIFIED)

SUGGESTIONS

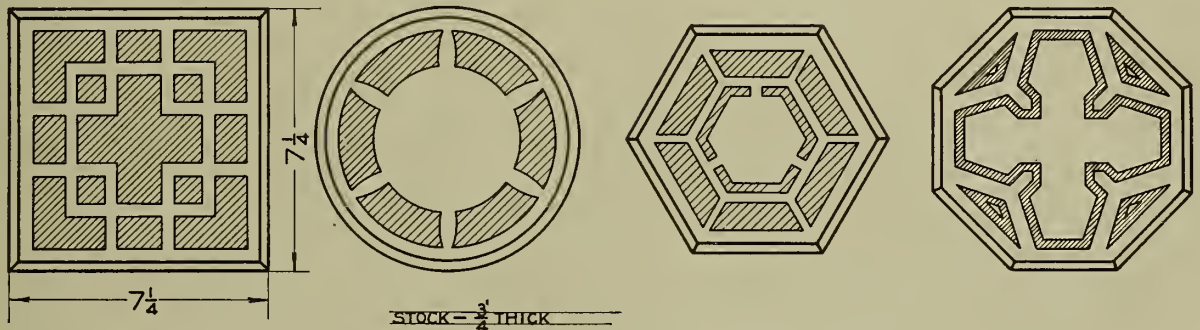


Plate 20.

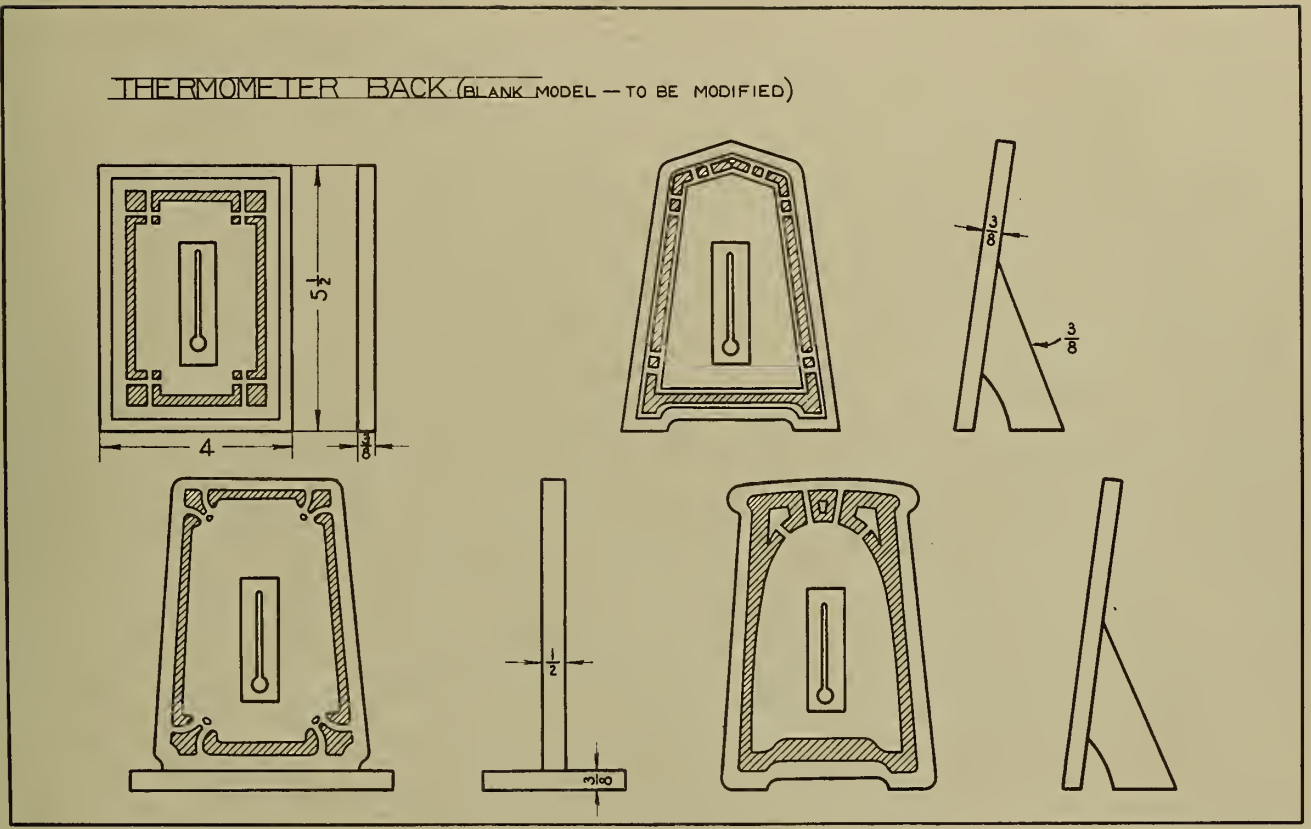
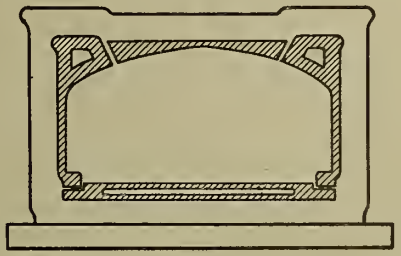
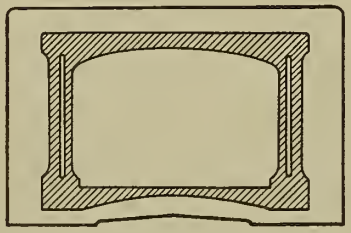
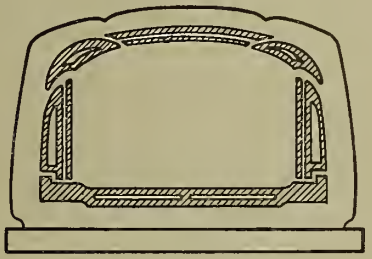

THERMOMETER BACK (BLANK MODEL — TO BE MODIFIED)
5½
4
3/8
3/8
3/8
1/2
3/16

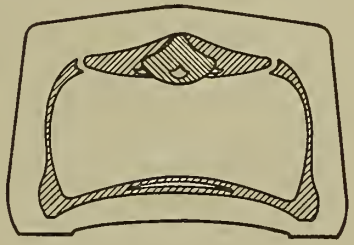
PLATE 21.

CALENDAR MOUNT (BLANK MODEL—TO BE MODIFIED)





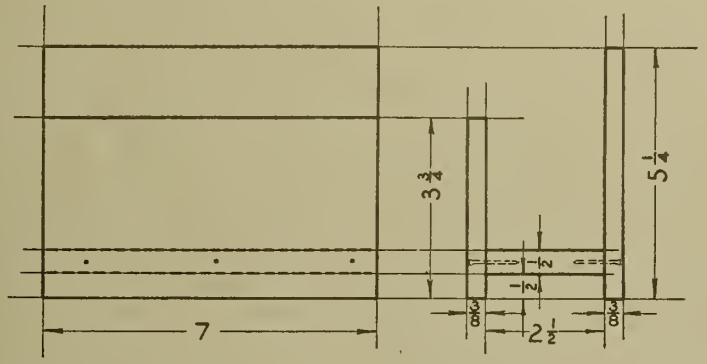


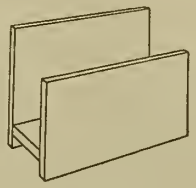


DESIGNED BY GORDON KELLAR

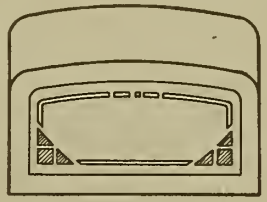
PLATE 22.

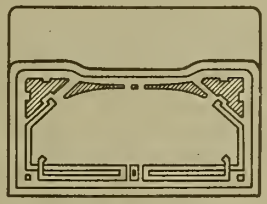
CARD HOLDER (BLANK MODEL—TO BE MODIFIED)

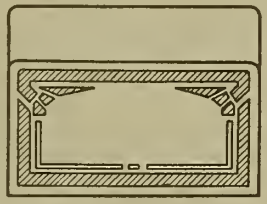




SUGGESTIONS







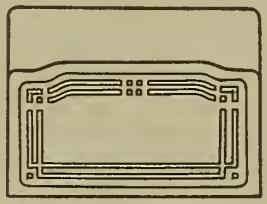
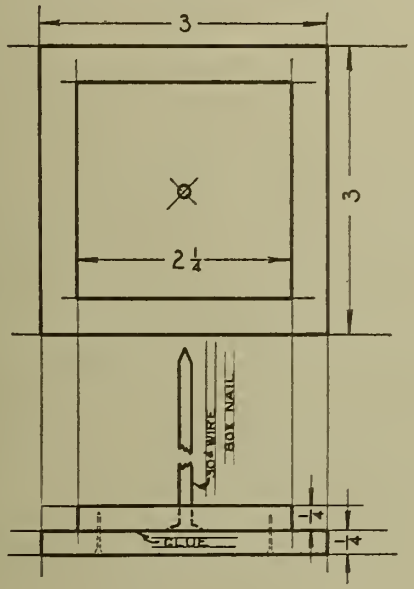
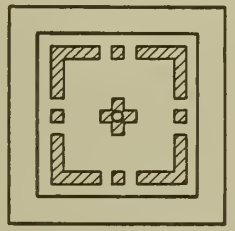


Plate 23.

BILL FILE (BLANK MODEL — TO BE MODIFIED)





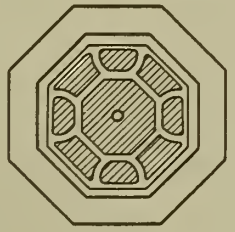
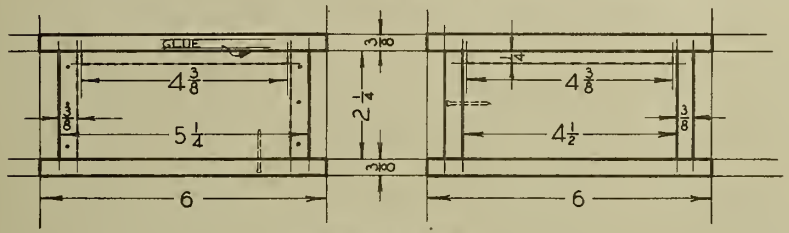
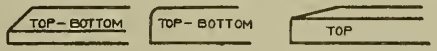


PLATE 24.

HANDKERCHIEF BOX (BLANK MODEL—TO BE MODIFIED)



MODIFIED EDGES



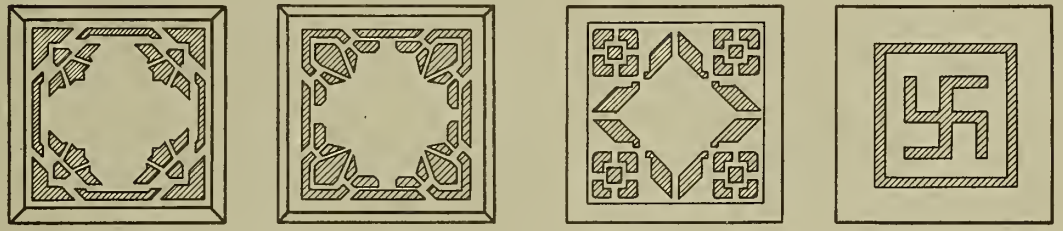


PLATE 25.

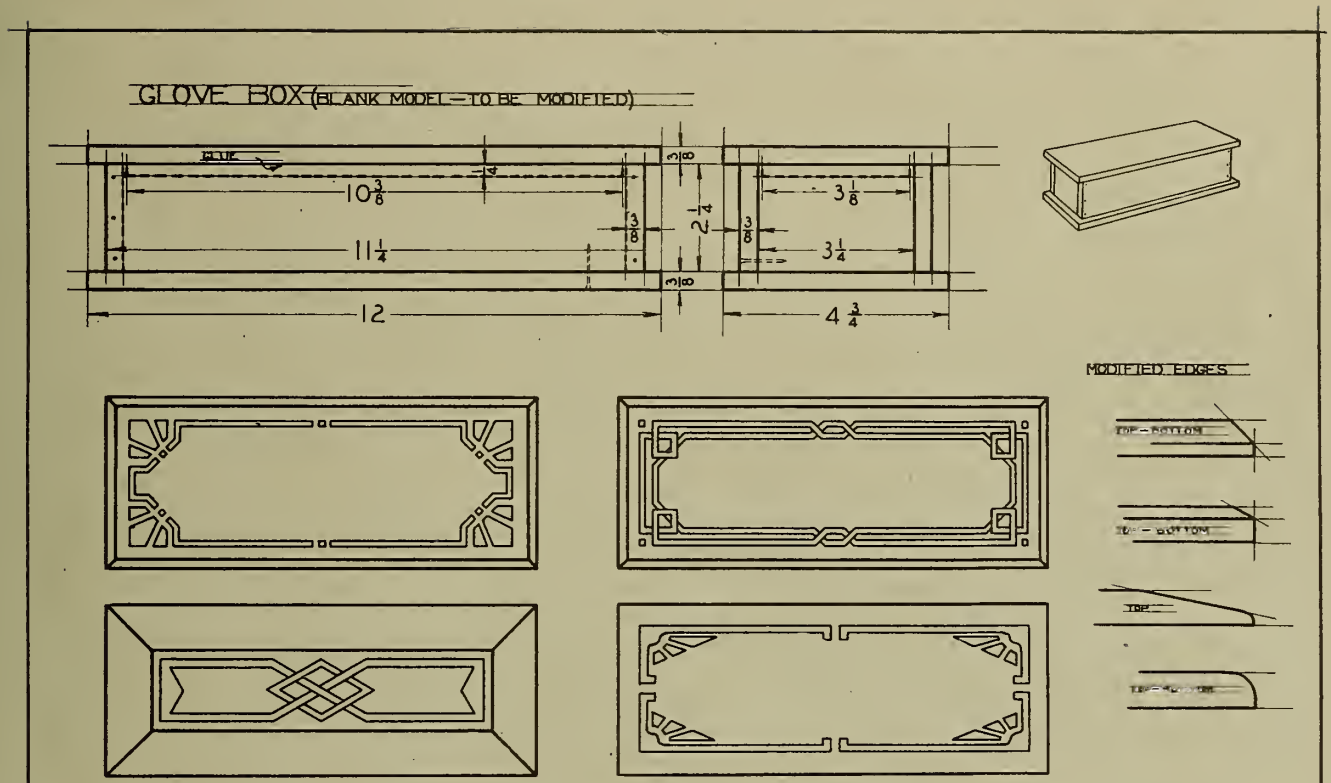

GLOVE BOX (BLANK MODEL — TO BE MODIFIED)
GLUE
10 3/8
11 1/4
12
2 1/4
3/8
3/8
3/8
3/8
3 1/8
3 1/4
4 3/4
MODIFIED EDGES
TOP

PLATE 26.

GROOVE JOINT (PREPARATORY TO GROUP VII)

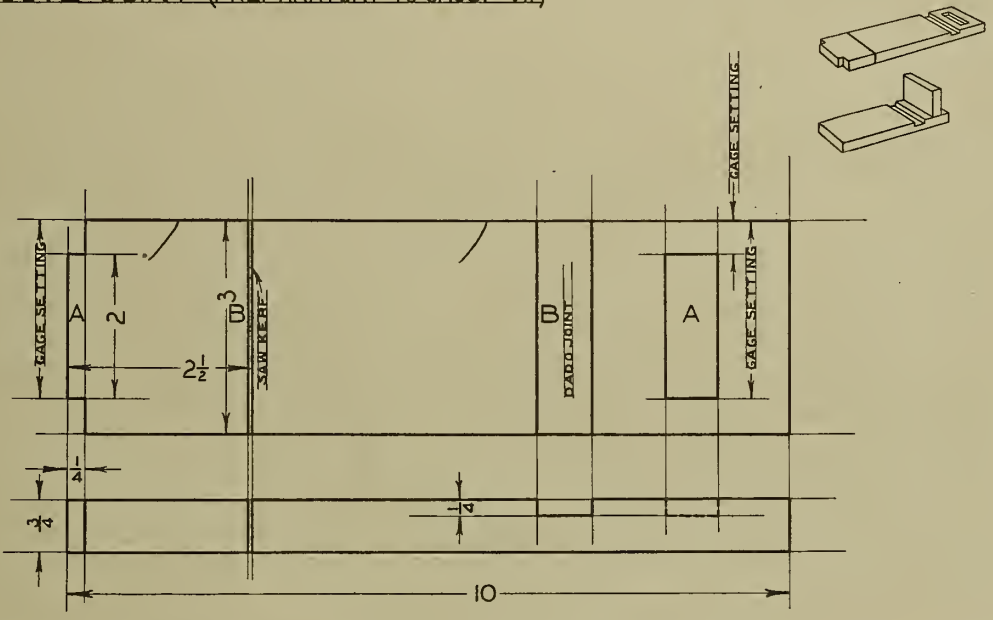
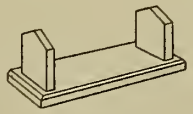


PLATE 27.

BOOK RACK



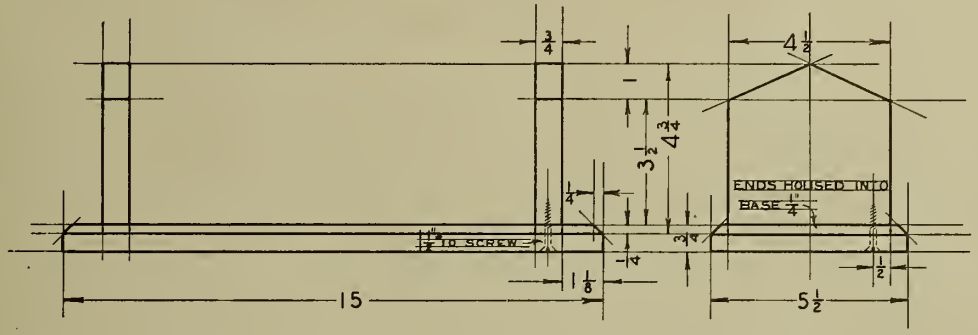


PLATE 28.

NECKTIE RACK

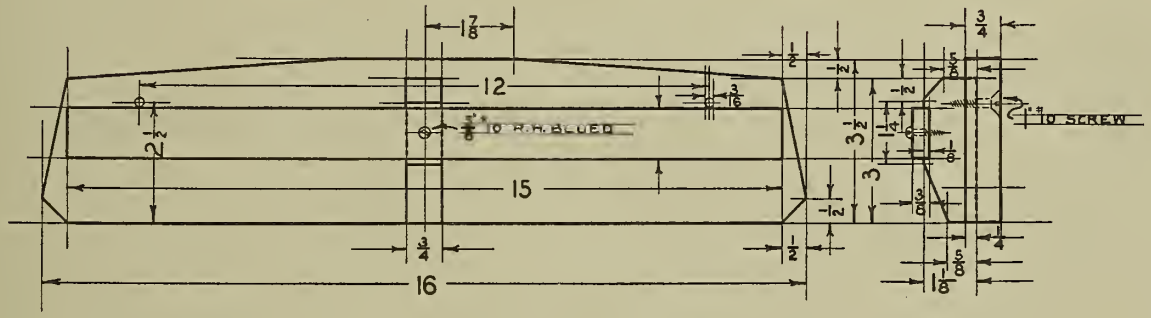
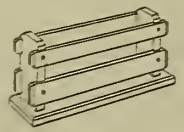


Plate 29.

MAGAZINE RACK



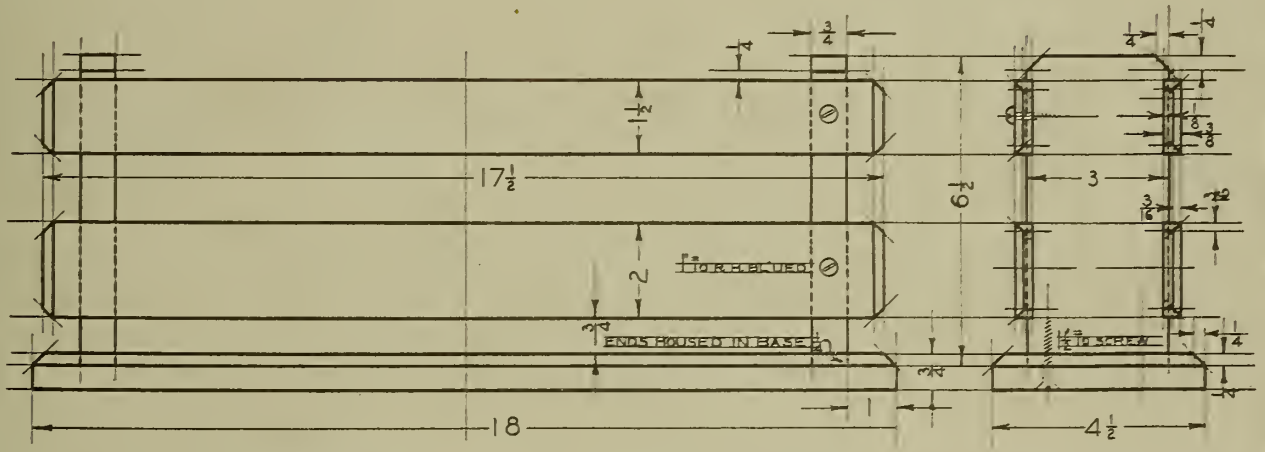
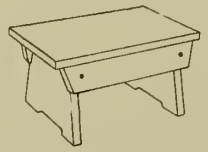


PLATE 30.

FOOT STOOL



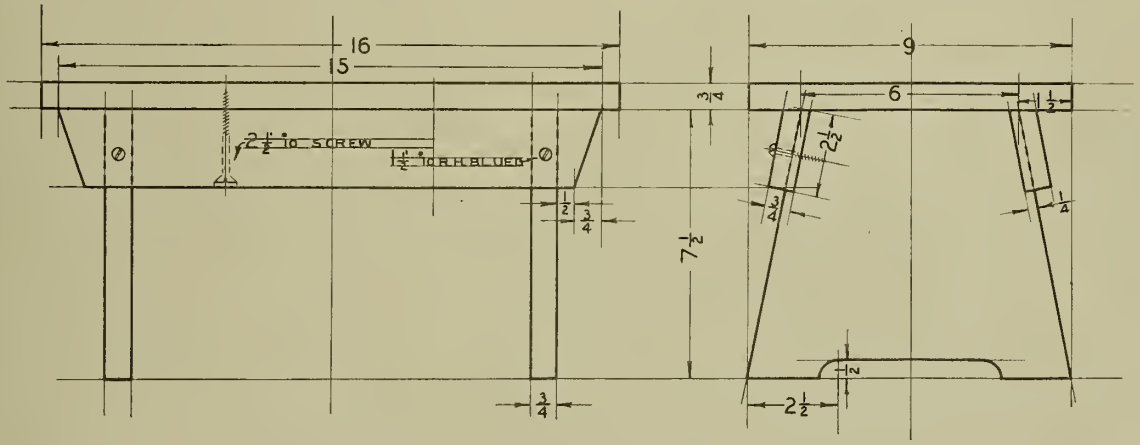
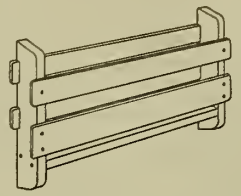


PLATE 31.

PAPER OR MAGAZINE WALL RACK



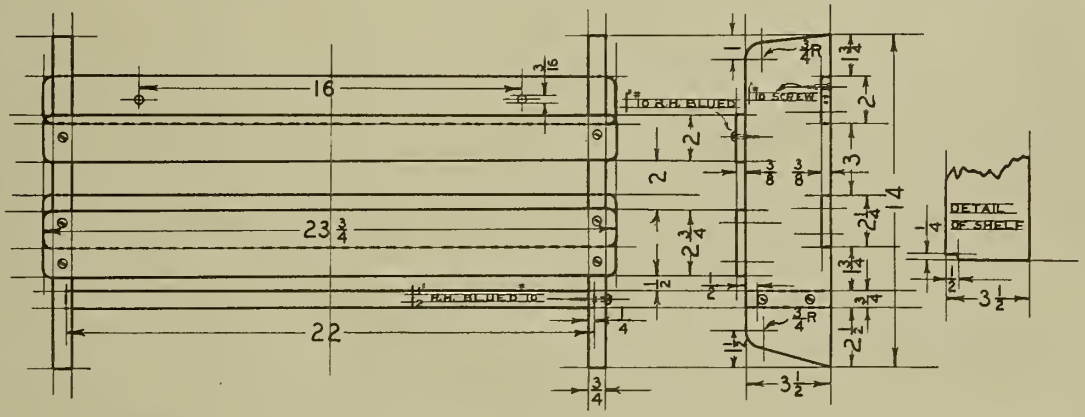


PLATE 32.

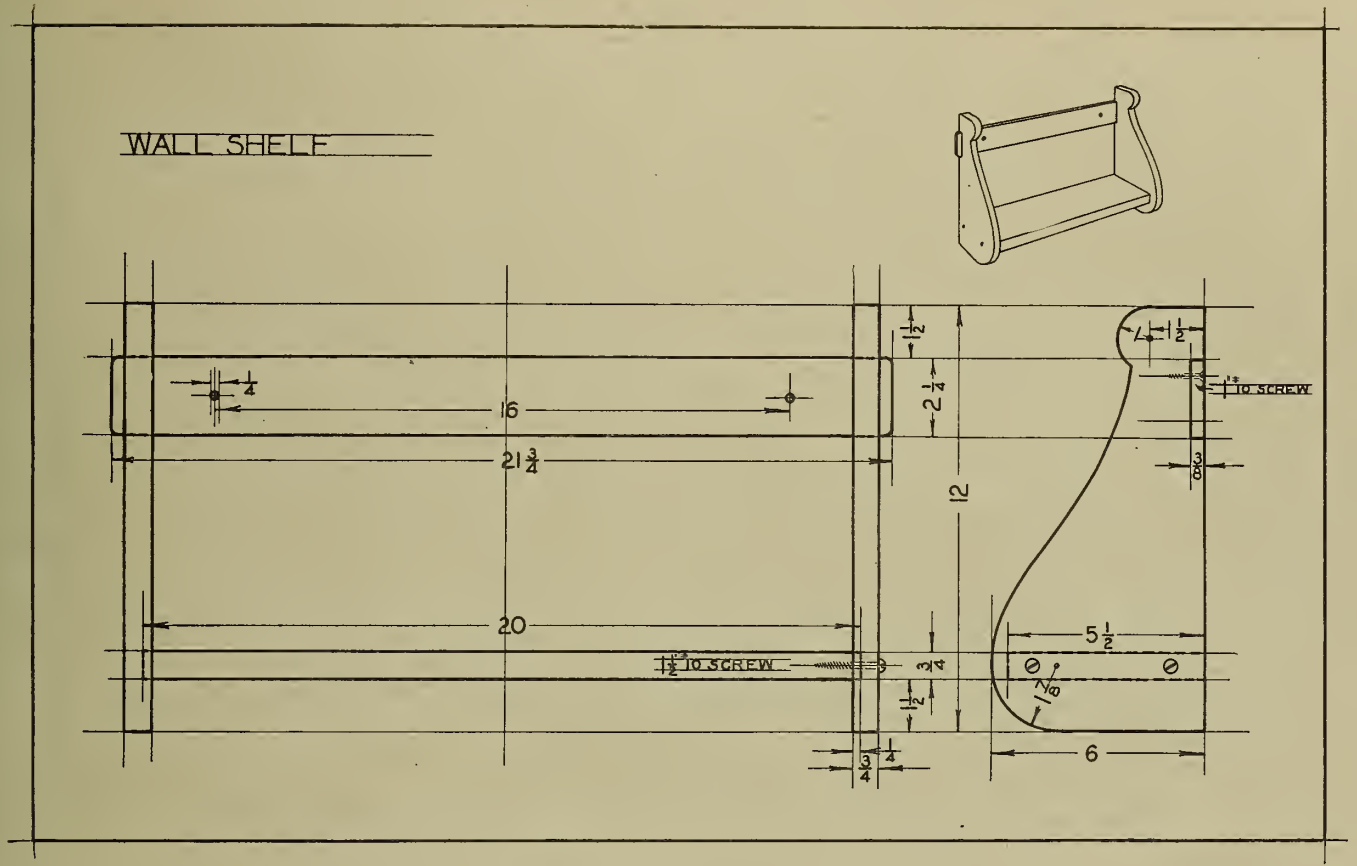
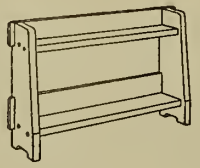


PLATE 33.

TABLE OR DESK SHELVES



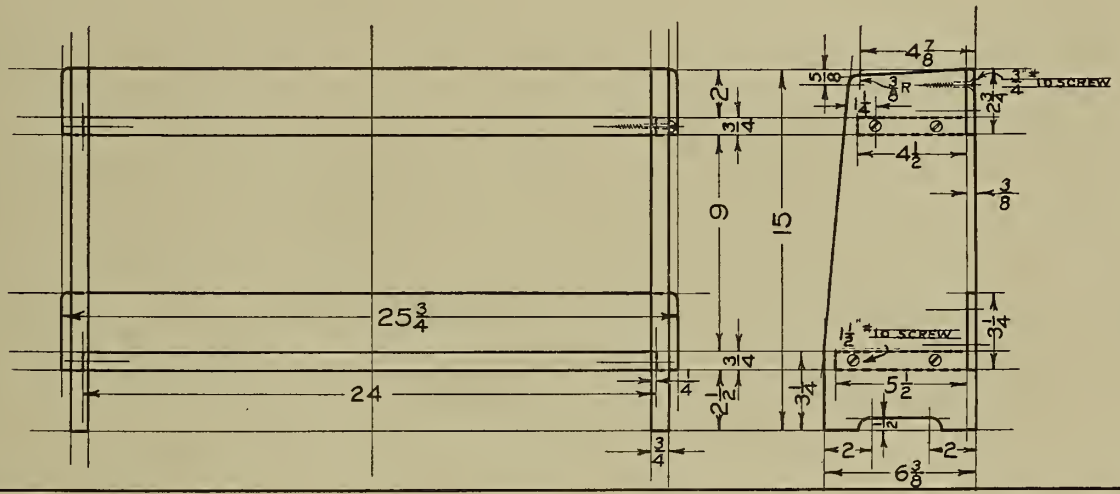
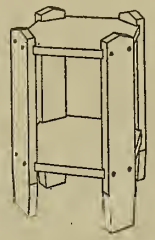


PLATE 34.

TABORET



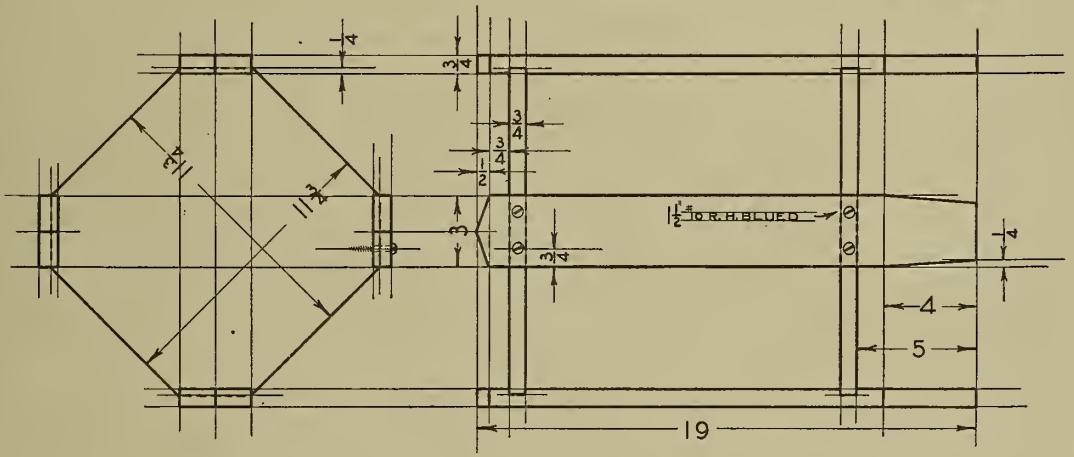


Plate 35.

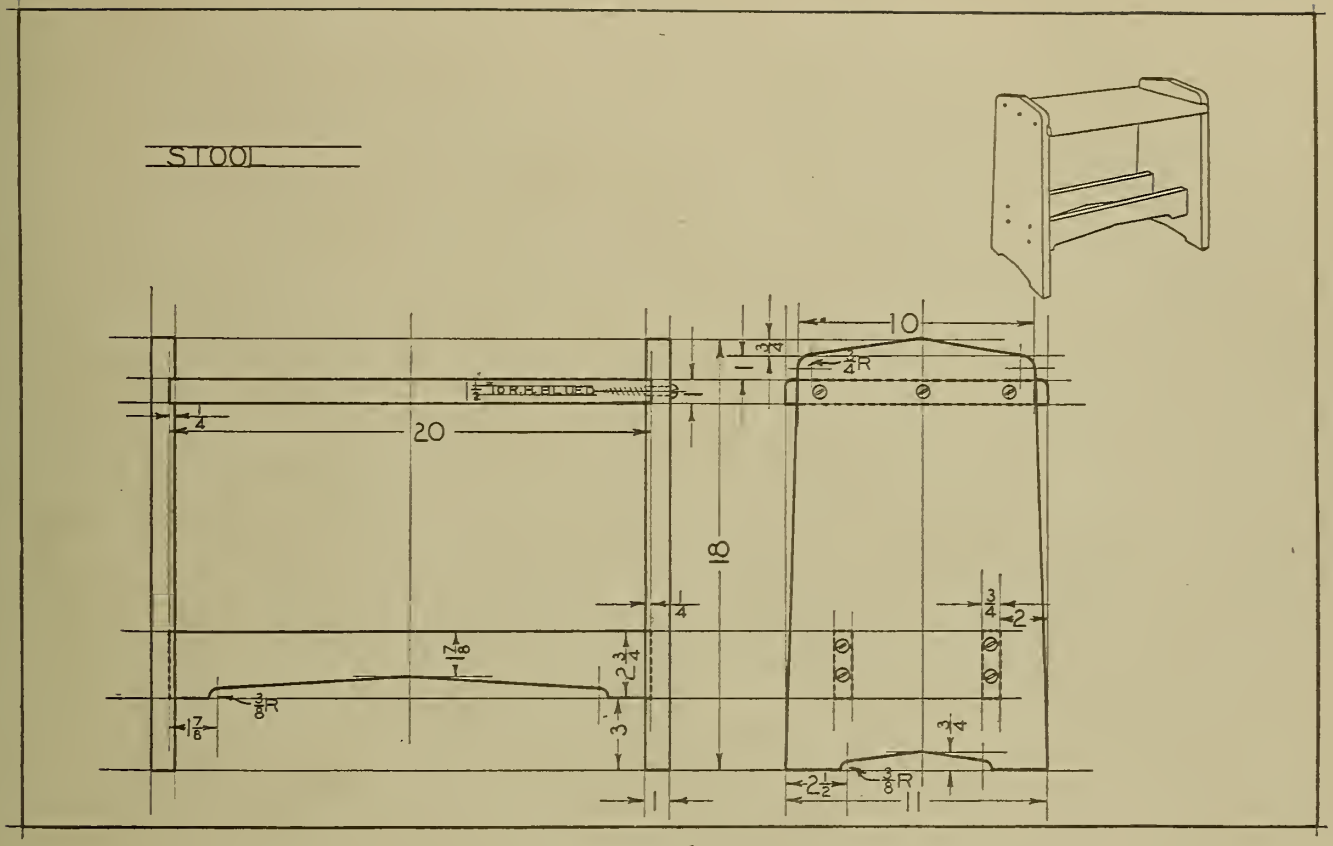
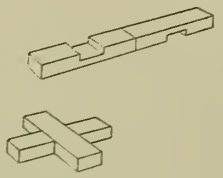
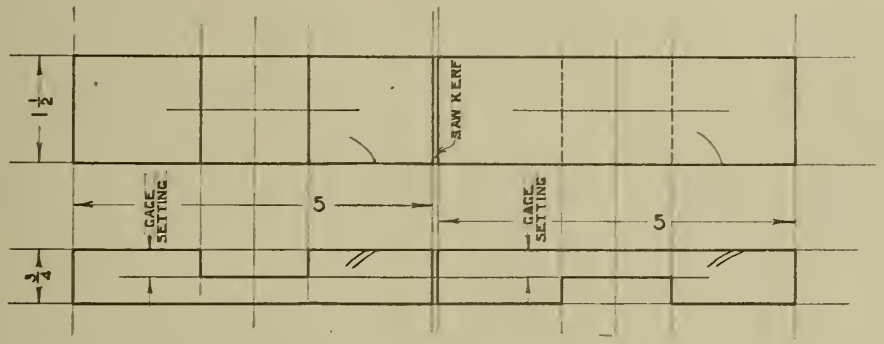


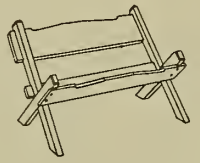
PLATE 36.

CROSS-LAP JOINT (PREPARATORY TO GROUP VII)





BOOK TROUGH



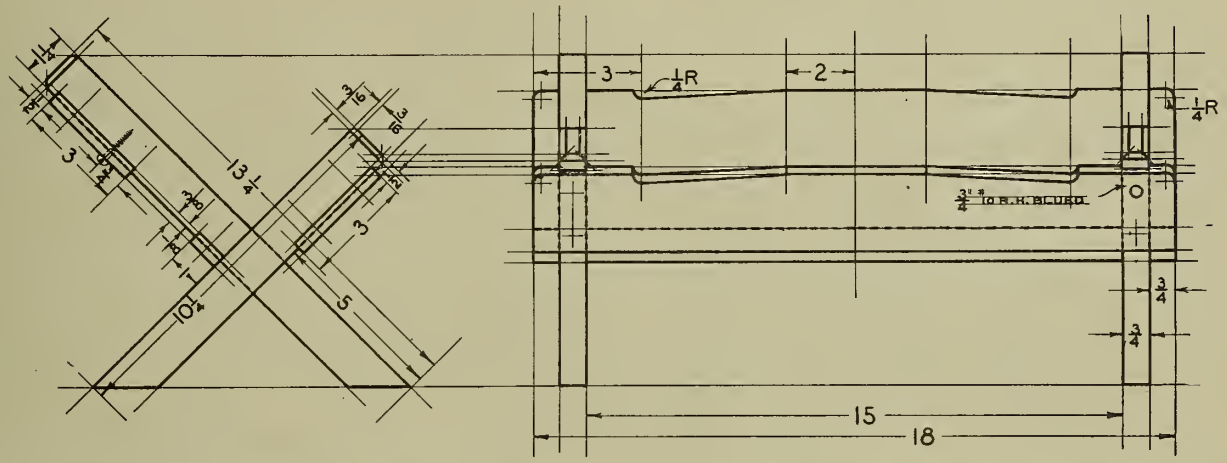


PLATE 38.

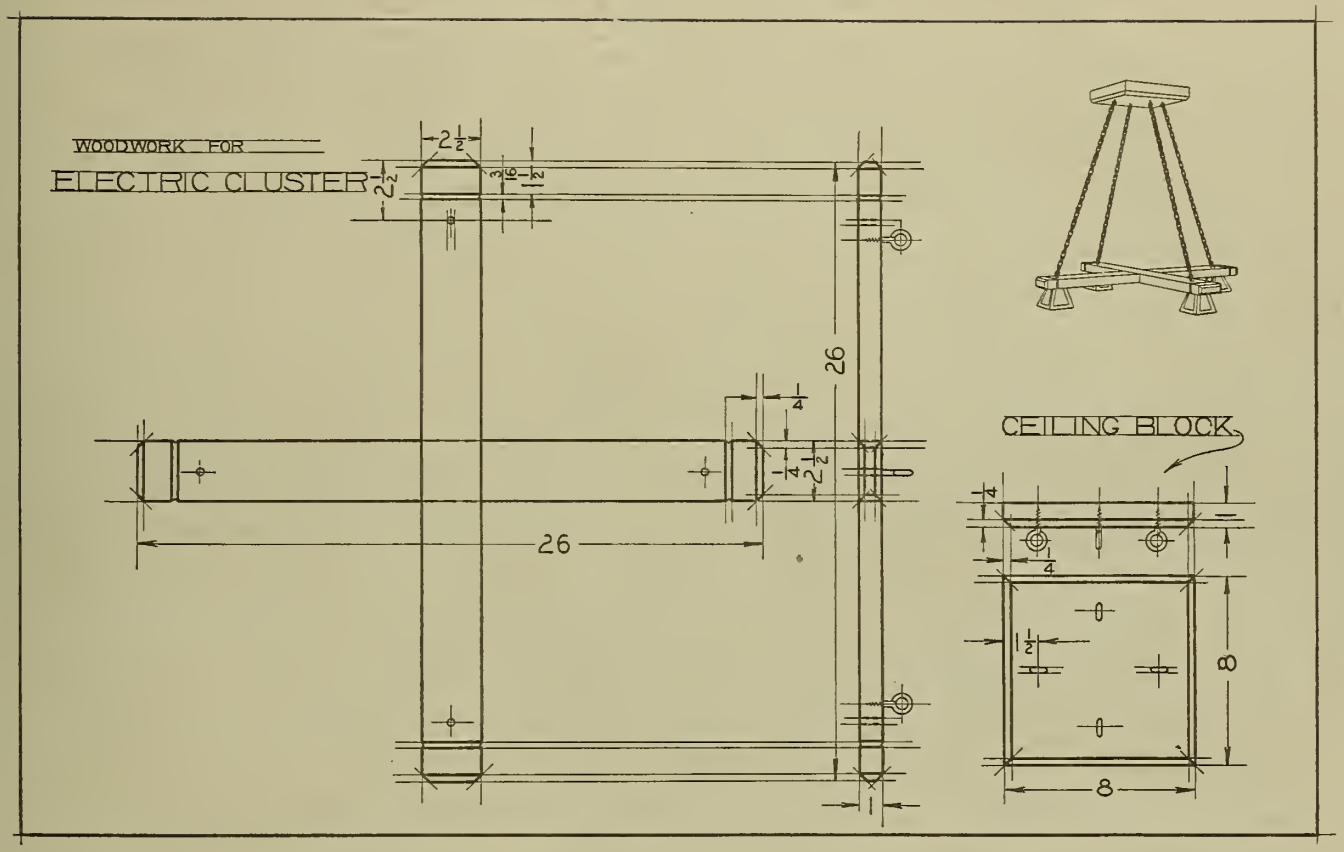
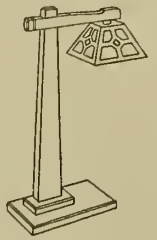

WOODWORK FOR
ELECTRIC CLUSTER
2½
2½
3/16
1½
26
4
¼
2½
26
CEILING BLOCK
¼
¼
1½
8
8

PLATE 39.

ELECTRIC TABLE OR DESK LIGHT



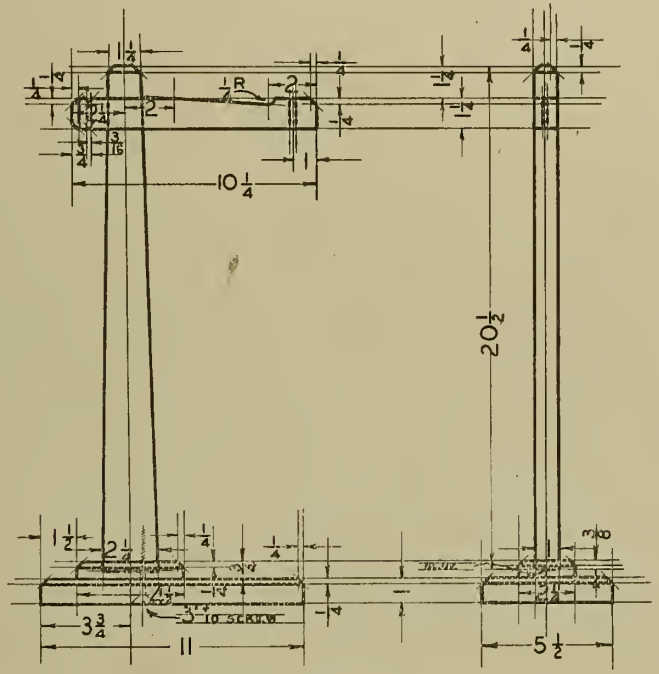
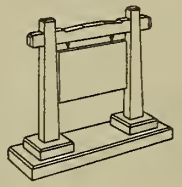


PLATE 40.

CALENDAR MOUNT OR MEMO BOARD



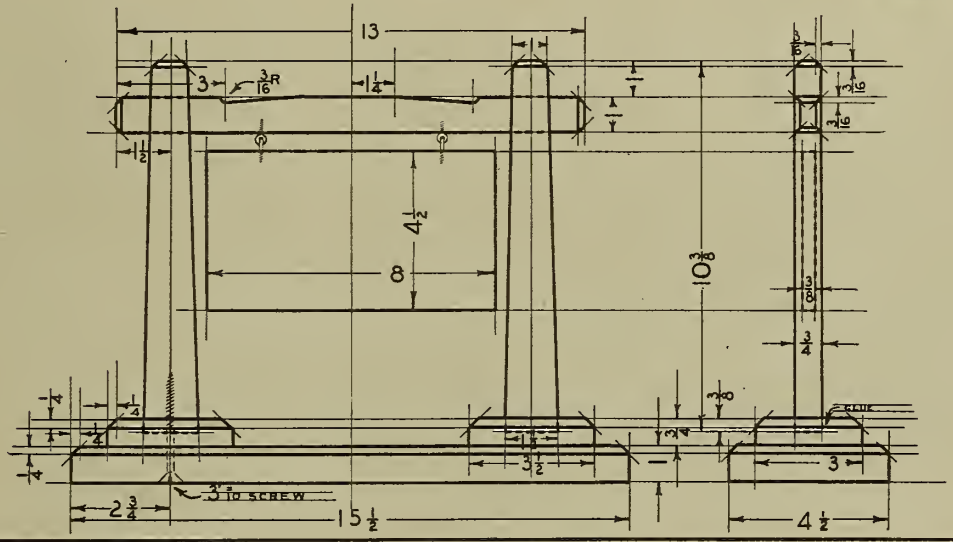


PLATE 41.

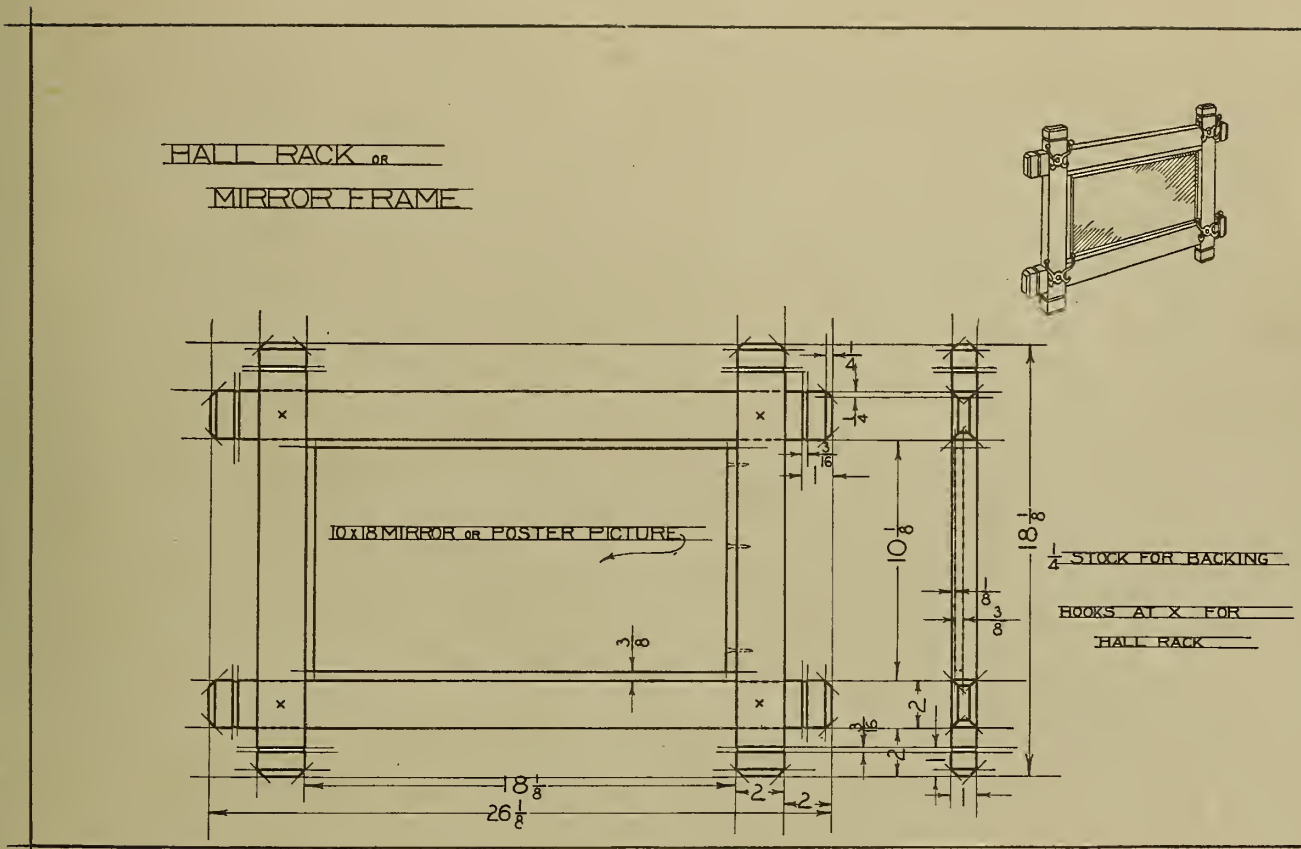
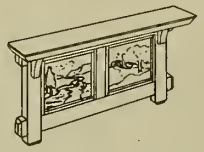

HALL RACK OR
MIRROR FRAME
10 x 18 MIRROR OR POSTER PICTURE
1/4 STOCK FOR BACKING
HOOKS AT X FOR
HALL RACK
18 1/8
10 1/8
26 1/8
2
3/8
3/16
1/4

PLATE 42.

PICTURE FRAME



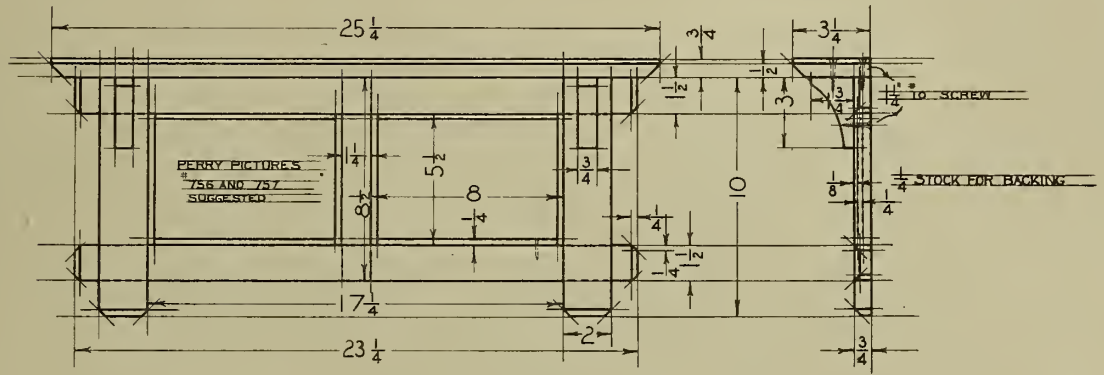


PLATE 43.

TABORET

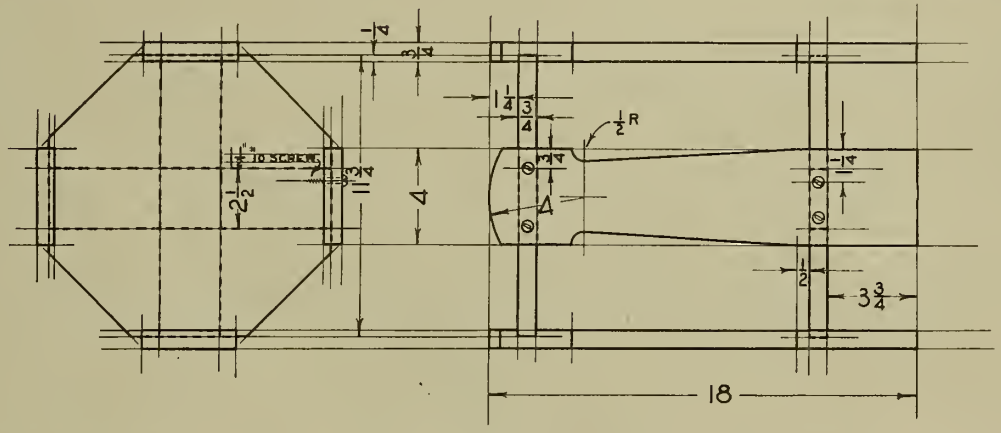


PLATE 44.

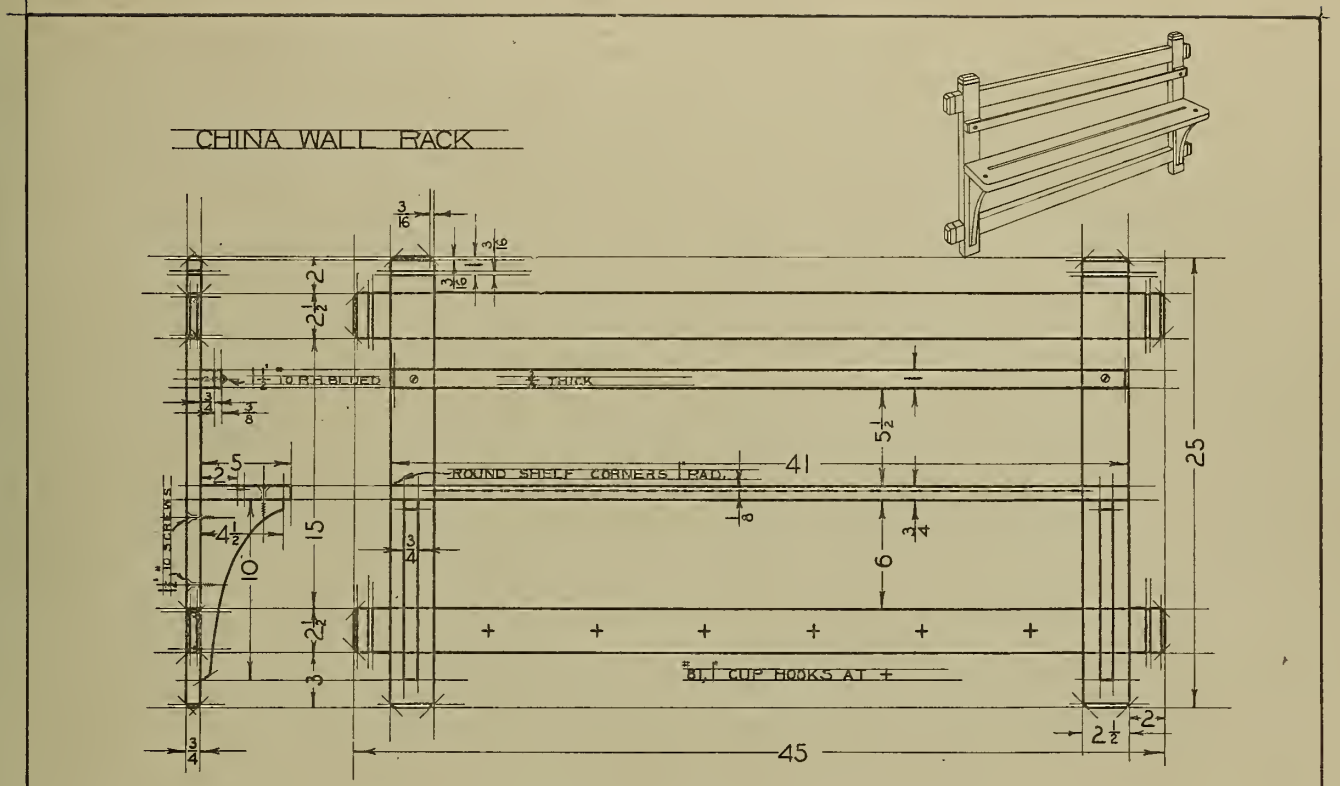

CHINA WALL RACK
ROUND SHELF CORNERS RAD. ½
41
45
25
15
10
6
#81 CUP HOOKS AT +

Plate 45.

PEDESTAL

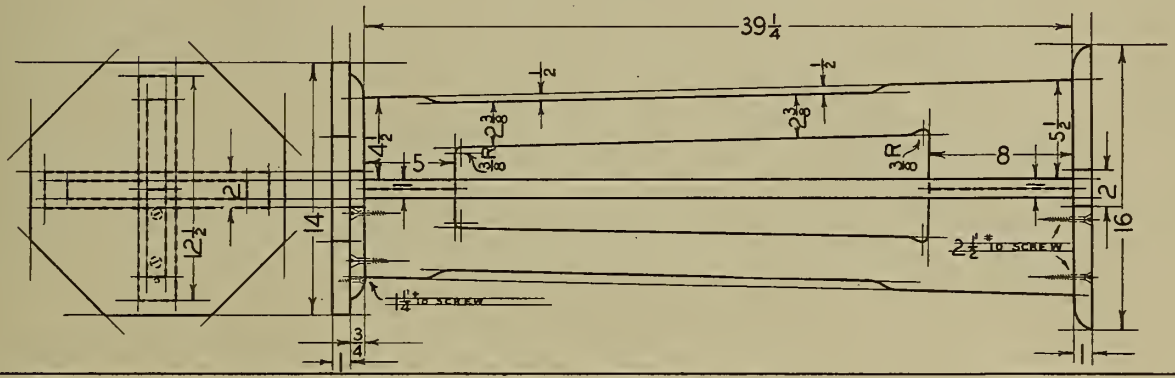


Plate 46.

SUGGESTIVE TREATMENTS FOR STOOL

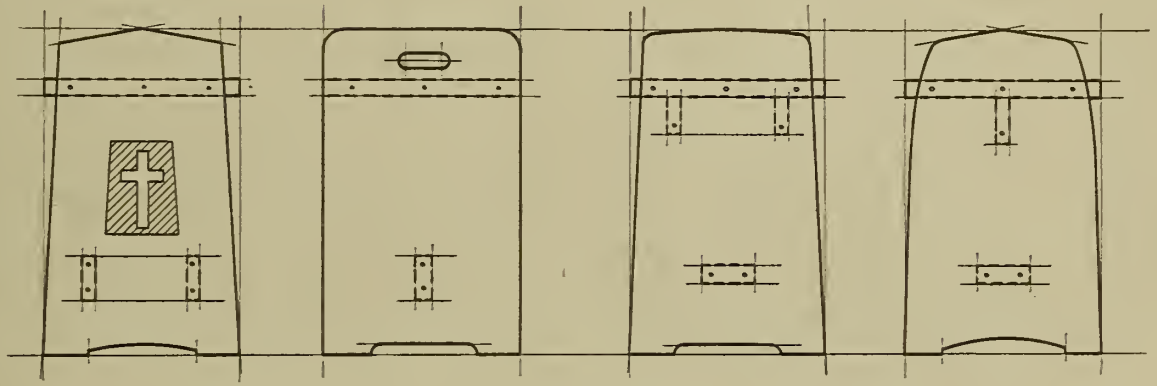


Plate 47.

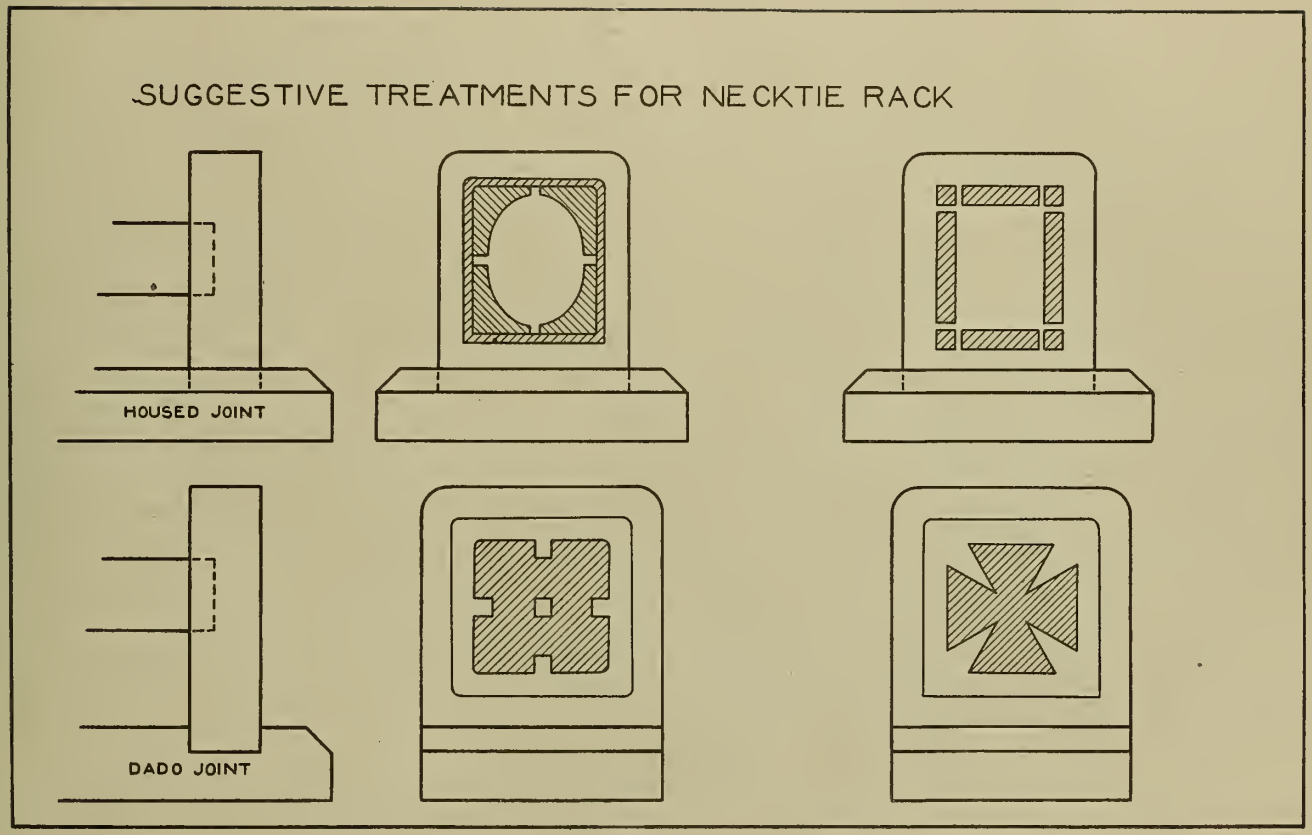

SUGGESTIVE TREATMENTS FOR NECKTIE RACK
HOUSED JOINT
DADO JOINT

Plate 48.

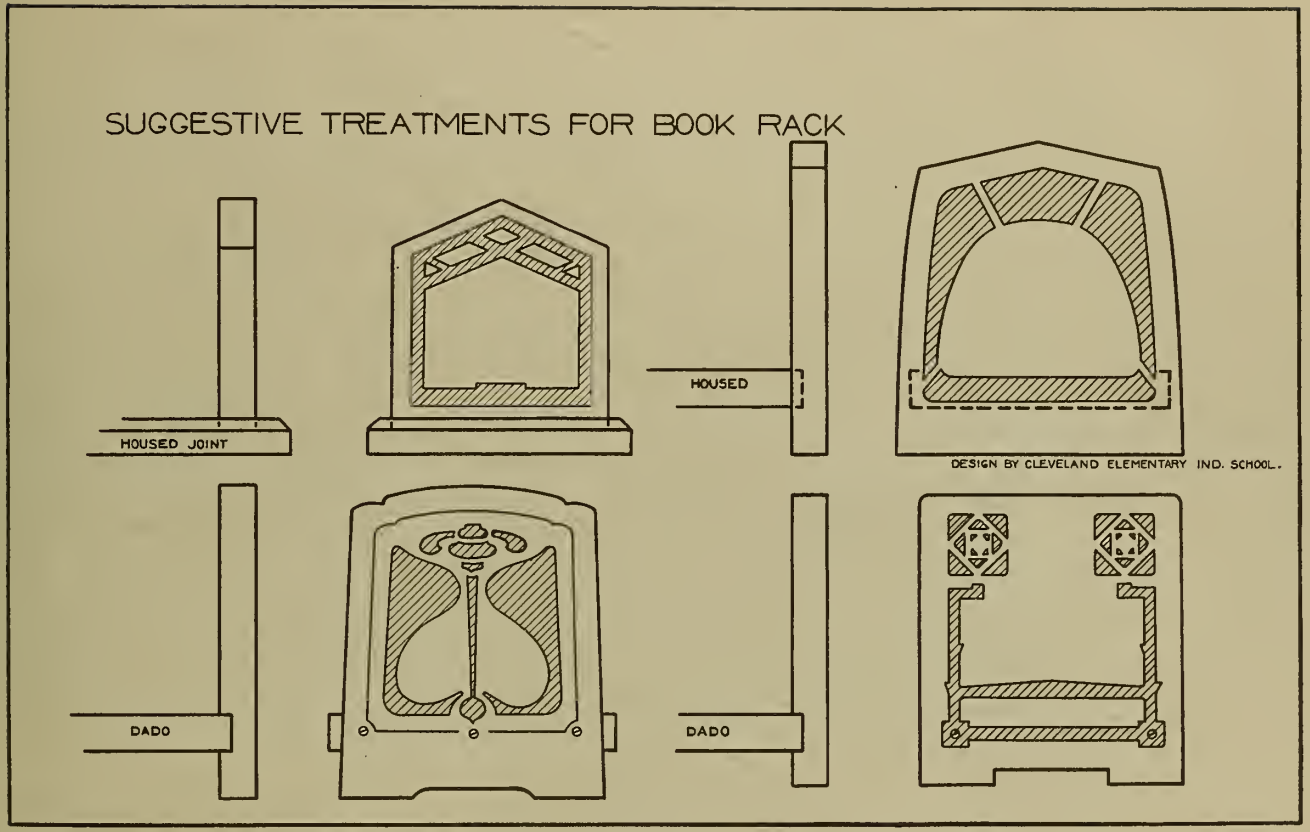

SUGGESTIVE TREATMENTS FOR BOOK RACK
HOUSED JOINT
HOUSED
DESIGN BY CLEVELAND ELEMENTARY IND. SCHOOL.
DADO
DADO

PLATE 49.

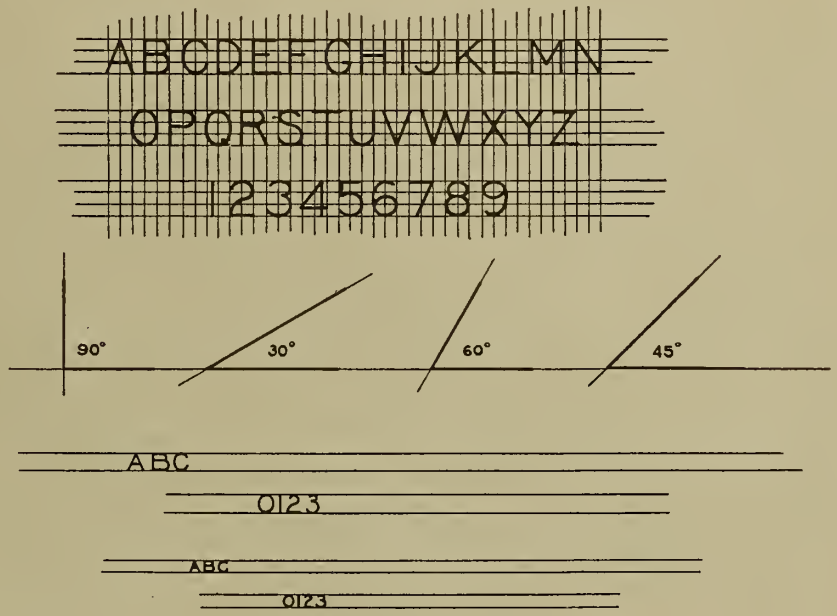

ABCDEFGHIJKLMN
OPQRSTUVWXYZ
1234567890
90°
30°
60°
45°
ABC
0123
ABC
0123

Plate 50.

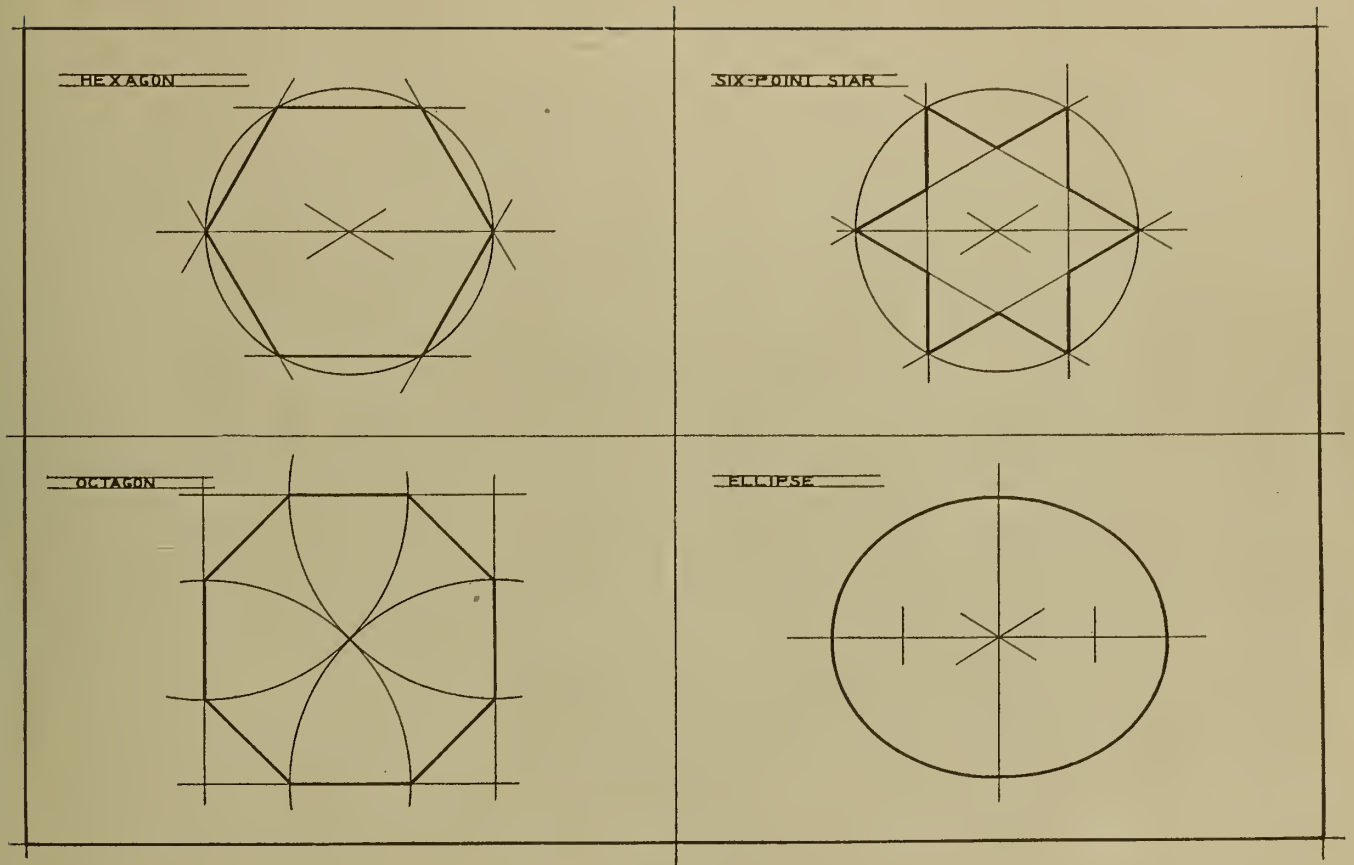


PLATE 51.

THE WOODWORKING SERIES

By [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

PUBLISHED BY

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