ADVANCED

HANDICRAFT 4-H CLUB WORK

By P. G. Lundin

MICHIGAN STATE COLLEGE
COOPERATIVE EXTENSION SERVICE

EAST LANSING
REQUIREMENTS FOR CLUB

1. Handicraft club members one year's work may select:
   a. One article listed for
   b. Build, repair, or re
   c. Refinish at least one
   d. Redecorate one or t
   e. Paint at least one b

2. Handicraft club members make two of the arti
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   d. Redecorate one or t
   e. Paint at least one b

3. Each handicraft club mem

OTHER

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ADVANCED
HANDICRAFT CLUB WORK

P. G. LUNDIN
Assistant State Club Leader

REQUIREMENTS FOR ADVANCED HANDICRAFT CLUB WORK

1. Handicraft club members must be between the ages of 12 and 20 years, inclusive. Third-year members must be 12 years old by January 1.

2. Handicraft club members enrolling for the third year's work must make three of the articles listed for the third year's work. Handicraft club members enrolling for the fourth year's work must make two of the articles listed for the fourth year's work. Handicraft club members enrolling for the fifth, sixth, or seventh year's work may select one of the following:
   a. One article listed for this group.
   b. Build, repair, or remodel something for the home or farm.
   c. Refinish at least one piece of furniture.
   d. Redecorate one or more rooms of the home.
   e. Paint at least one building or a farm machine.

3. Each handicraft club member must exhibit his work and report at a club, community, district or county exhibit.

OTHER CRAFTS

Interest in other types of craftwork has increased during the last few years. New materials are coming on the market which can be used in handicraft projects.

In addition to the regular wood work, much has, and can be done with archery, ceramics, leather, metal and plastics. Working with these materials will add interest and variety to the craft program.
Projects of this type may be substituted for the regular wood work. It is recommended that not more than half of the necessary articles be made from these newer materials.

**Power Machinery**

Power machinery, mitre saws and other cabinetmakers’ tools may be used in making advanced articles.

Note: Club members need not necessarily make articles listed in this bulletin nor according to the exact specifications shown in drawings. With the permission of the extension agent or local leader, the club member may make articles from plans obtained elsewhere, but the articles selected must compare in difficulty of construction with those articles listed in the bulletin for the year’s work in which he is enrolled.

**PURPOSES OF 4-H HANDICRAFT CLUB WORK**

Handicraft work offers boys excellent opportunities to learn the fundamentals of wood working. It includes not only construction work, but also the study of native trees, wood identification, selection and care of tools, reading and drawing of plans, preparing and applying simple finishes, and many other phases of the work. The practice and knowledge gained from completing satisfactorily the handicraft project will not necessarily make carpenters of the boys who finish, but it should equip those boys with the ability to plan and make many of their own articles.

Advanced members will develop a keener appreciation for better finishes and furniture. The knowledge of woods, types of construction and manner of finishing will mean more as a result of handicraft club work.

The handicraft club does more than just teach the fundamentals of successful manual training or carpentry. The social club meetings offer opportunity for associations with other members. Members learn to conduct club meetings, and to follow some definite plan and an outlined program for each of the 4-H handicraft club meetings. Handicraft club work develops rural leadership, emphasizes the importance of organization and cooperation and promotes a four-fold development of head, heart, hands, and health.

In the subject matter presented only a general working knowledge is given. For a more detailed study, students should obtain some of the bulletins listed in the back of this bulletin.

Organize the club during the year the club is organized mail the extension agent. Clubs should plan their work so that it may be completed by the middle of the year.

**HOW TO BE A CRAFTSMAN**

Craftsmanship is the know ledge that comes from the skillful use of the hands. Old carpenters have their “tricks” with their trade that are handed down from day to day. They come from contact with the tools. In a short time you will learn to make a smooth cut, yet when you try to quickly make a smooth cut will result. With any tool, as wood that has been sanded.

The first thing any worker learns that if he were asked which he would rather have, is to examine the board again. The other factor in craftsmanship is the ability to handle tools delicately and to make an object out of wood. One step in a successful project is to learn by trial and error. No book could tell a carpenter’s trade. They have notes on the keyboard to produce. Most of the drawings in the bulletin for the year’s work in which he is enrolled.
In the subject matter presented in this bulletin it is intended to give only a general working knowledge of the different topics discussed. For a more detailed study of any one subject the club member should obtain some of the bulletins, pamphlets, and reference articles listed in the back of this bulletin.

Organize the club during October or November. As soon as the club is organized mail the enrollment blank to your county extension agent. Clubs should plan their work so that all project requirements may be completed by the middle of March or the first part of April.

**HOW TO BECOME SKILLFUL**

Craftsmanship is the knowledge of the use of tools and the skillful use of the hands. Old carpenters and cabinetmakers have more "tricks" with their trade than anyone could possibly teach, and no two workmen's tricks are the same. These "tricks" are part of the day's work. They come from cut and try, or the trial and error method. In a short time you will learn several things about tools and wood.

When you begin to plane a piece of white pine, you will discover shortly that to attempt to push the tool against the grain will not make a smooth cut, yet when you push the plane with the grain, a smooth cut will result. With a sharp plane the cut is almost as smooth as wood that has been sandpapered.

The first thing any worker with wood does, before he touches his tool to a piece, is to examine the grain. He does it so automatically that if he were asked which way the grain "ran" he would have to examine the board again. There is no way of learning such facts except by practice.

The other factor in craftsmanship is skill with the hands. To become a skillful workman in wood requires practice. First, you learn to handle tools delicately and firmly as a pianist learns to strike the notes on the keyboard to produce precisely the effect he wishes. The other is to learn by trial and error the better ways of doing every single thing. No book could possibly teach you all the "tricks" of the carpenter's trade. They have to be learned at the bench. No one can make an object out of wood without a definite plan. Therefore, it is important that you have a plan of some kind as a guide for your work. One step in a successful plan is to have a working drawing.

Most of the drawings in this bulletin are drawn to show the front, side, and top views. Measurements are given in each drawing, and
it is necessary to study all three views in order to obtain all dimensions. Each drawing is a suggestive plan for some definite article, but the specifications and designs may be changed to fit the individual conditions.

**SELECTION AND CARE OF TOOLS**

Many handicraft clubs, through the interest aroused by this project, have acquired complete sets of tools, and there are countless numbers of boys who are building their private tool collections.

Tools, as well as other farm implements, should be selected carefully. It is never true economy to buy cheap tools, because they usually will be found wanting in quality and temper. These defects will be noticed only after use, and if the tools are of standard grade a satisfactory adjustment will be made upon complaint to the dealer. Having once purchased a set of good tools, one should take the best possible care of them.

In the first place, it is important to have a clean, dry place for tools and, after using, to return them to their proper place. The tools may be kept in a cabinet over the bench or in the drawers of the bench itself. In either case it will be found easier to put the tools back in their places if a picture or silhouette drawing of each tool is placed on the rack behind it so that at a glance one can see where the tool belongs.

In case some of the tools necessary to do the required work herein outlined are not available to all, the club members who have them should make arrangements with the other boys to let them use theirs. In case none of the boys has the tools, the club, as such, may purchase them.

A thin coat of oil should be used on tools to prevent rusting. If tools become rusty the rust should be removed by rubbing with pulverized pumice stone such as is sold at all drug stores for rubbing down fine finishes. They should then be thoroughly oiled.

All tools bearing an edge should be kept well-sharpened because it will be found that much time and energy is wasted in using a dull tool, and the quality of the work is also impaired.

Care should be taken that the edges of plane bits and chisels are not needlessly dulled by contact with metal or dirty surfaces. In using old lumber, care should always be taken to remove all grit and dirt possible by using a stiff wire brush. Never use the plane after sandpaper has been applied because the fine particles will dull the plane bit.

**SELECTION**

Many American woods are not special properties which make attacks. Heartwood, the darker part of the tree, is always more colored lumber cut from the outer part, is well adapted for use where conditions exist, such as fences, gardens, exposed to moisture or comes into used under exposure frequently to make it more durable. All lumber trees contains a large amount of to advantage in construction of a soned, which means removing excess is used it will shrink and may finishing and decorating of articles to a very large extent on the use.

**PLYWOOD**

Plywood is a modern term and not receive serious consideration aeroplanes, boats and other light weight. Plywood comes in two.

In the thinner plywood the core and the back, while in some of the three plies they may run at right diagonally or both. The sheets of in thickness from 1/64 to 1/4 in strength for its weight, plywood types of construction offers a facture of such items as panels, generally obtainable at all plani used to good advantage for many. Most of them will take a very o

**L**

Pine, cypress, basswood or a paint or enamel finish is to b
SELECTION OF THE WOOD

Many American woods are naturally durable; that is, they possess special properties which make them resistant to decay and insect attacks. Heartwood, the darker colored lumber cut from the inner part of the tree, is always more durable than sapwood, the lighter colored lumber cut from the outer part of the tree. Heartwood, therefore, is well adapted for use where decay or insect-producing conditions exist, such as fences, garden furniture or wherever wood is exposed to moisture or comes in contact with the ground. Lumber used under exposure frequently is treated with chemicals which help to make it more durable. All lumber that comes from seed-propagated trees contains a large amount of moisture. In order to use this lumber to advantage in construction of articles, it is necessary that it be seasoned, which means removing excess moisture. If unseasoned lumber is used it will shrink and may warp and twist. Good workmanship, finishing and decorating of articles made from lumber is dependent to a very large extent on the use of properly seasoned lumber.

PLYWOODS

Plywood is a modern term describing an old product which did not receive serious consideration until its use in the construction of aeroplanes, boats and other large articles needing strength with very light weight. Plywood comes in many plies, varying from 3 to 11. In the thinner plywood the core is usually at right angles to the face and the back, while in some of the plywood where we have more than three plies they may run at right angles to the core or they may run diagonally or both. The sheets of veneer used in making plywood vary in thickness from 1/64 to 1/4 inch. In addition to possessing great strength for its weight, plywood is non-splittable, and in the thinner types of construction offers a brasing effect when used in the manufacture of such items as panels. Plywood in the cheaper varieties is generally obtainable at all planing mills or lumber yards and may be used to good advantage for many of our standard handicraft articles. Most of them will take a very effective finish.

LUMBER

Pine, cypress, basswood or any of the softwoods may be used for exercises where great strength is not necessary. In most cases where a paint or enamel finish is to be applied, softwood or a cheap hard-
wood is satisfactory. Many of the smaller articles can be made from reclaimed lumber, scrap lumber or veneered panels. For the more advanced exercises, especially in the furniture class, members should purchase the very best lumber available—maple, beech, oak, cherry, gum, birch, walnut, and other native furniture woods, that will answer the purpose. Many lumber yards have western and even tropical woods at reasonable prices.

Members living in northern Michigan may utilize their native woods. Sawmill scraps may be used to make appropriate rustic articles.

**Grading Lumber**

It is necessary to have lumber graded to insure a uniform product, no matter where it is purchased. Yard lumber (softwood) less than 6 inches in thickness is used for general building purposes and is divided into two main divisions: select lumber and common lumber. The select lumber is divided into four grades—

Grade A, virtually free from defects,

Grade B allows a few small defects or blemishes,

Grade C allows a limited number of small defects or blemishes that may be covered by painting, and

Grade D, many defects or blemishes but which do not detract from a finished (painted) surface. The common grade comes from the coarse part of the tree and will have defects such as cracks, knots and other blemishes. Common lumber is classified as follows:

No. 1. Sound and tight types knotted in stock, size of defects and blemishes limited. May be considered water-tight lumber.

No. 2. Allows large and coarse defects. May be considered grain-tight lumber.

No. 3. Allows larger and coarser defects than No. 2 and occasional knotholes.

No. 4. Low quality lumber allowing the coarser defects such as decay and holes.

No. 5. Must hold together under ordinary handling.

**Cost of Materials**

It may be of interest to 4-H club members to know how to prepare a lumber order and to calculate the number of board feet in various sized boards. Three dimensions are needed for a piece of wood. The thickness of the piece is given as a figure, width by the second, and height by the third dimension. For example, 1 inch x 12 inches x 12 inches or 12 x 1 x 1.

The rule for finding the number of board feet is as follows: Multiply the thickness by the length in feet and divide by 12.

**Example: How many board feet in a piece of wood — 6 inches wide and 2 inches thick?**

\[
\frac{2 \times 6 \times 12}{12} = 12
\]

In ordering lumber the kind should be specified, the number of pieces and the three dimensions given, and so forth.
various sized boards. Three dimensions are necessary in describing a piece of wood. The thickness of the board is expressed by the first figure, width by the second, and length by the third. A board foot is 1 inch x 12 inches x 12 inches or its equivalent.

The rule for finding the number of board feet in a piece of lumber is as follows: Multiply the thickness in inches by the width in inches by the length in feet and divide by 12.

Example: How many board feet in a piece of lumber 2 inches thick, 6 inches wide and 12 feet long?

\[
\frac{2 \times 6 \times 12}{12} = 12 \text{ feet}
\]

In ordering lumber the kind should be specified, followed by the number of pieces and the three dimensions. For example:

White Pine

1 piece — 2" x 4" x 10' — Read: 2 inches by 4 inches by 10 feet.
12 pieces — 1" x 6" x 16' — Read: 1 inch by 6 inches by 16 feet.

Convenient Lumber Table Showing the Number of Feet Board Measure.

<table>
<thead>
<tr>
<th>Size in Inches</th>
<th>10</th>
<th>12</th>
<th>14</th>
<th>16</th>
<th>18</th>
<th>20</th>
<th>22</th>
<th>24</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 x 2....</td>
<td>1-2/3</td>
<td>2</td>
<td>2-1/3</td>
<td>2-2/3</td>
<td>3</td>
<td>3-1/3</td>
<td>3-2/3</td>
<td>4</td>
</tr>
<tr>
<td>1 x 3....</td>
<td>2-1/3</td>
<td>3</td>
<td>3-1/3</td>
<td>4</td>
<td>4-1/2</td>
<td>5</td>
<td>5-1/2</td>
<td>6</td>
</tr>
<tr>
<td>1 x 4....</td>
<td>3-1/3</td>
<td>4</td>
<td>4-3/3</td>
<td>5</td>
<td>5-1/3</td>
<td>6</td>
<td>6-2/3</td>
<td>7</td>
</tr>
<tr>
<td>1 x 5....</td>
<td>4-1/6</td>
<td>5</td>
<td>5-3/6</td>
<td>6-2/3</td>
<td>7-1/2</td>
<td>8-1/3</td>
<td>9-1/6</td>
<td>10</td>
</tr>
<tr>
<td>1 x 6....</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>10</td>
<td>11</td>
<td>12</td>
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<tr>
<td>1 x 7....</td>
<td>5-5/6</td>
<td>7</td>
<td>8-1/6</td>
<td>9-1/3</td>
<td>10-1/2</td>
<td>11-2/3</td>
<td>12-5/6</td>
<td>14</td>
</tr>
<tr>
<td>1 x 8....</td>
<td>6-2/3</td>
<td>8</td>
<td>9-3/4</td>
<td>10-2/3</td>
<td>12</td>
<td>13-1/3</td>
<td>14-3/4</td>
<td>16</td>
</tr>
<tr>
<td>1 x 9....</td>
<td>7-1/2</td>
<td>9</td>
<td>10-1/2</td>
<td>11-3/4</td>
<td>13</td>
<td>15-1/2</td>
<td>16-3/4</td>
<td>18</td>
</tr>
<tr>
<td>1 x 10.....</td>
<td>8-1/3</td>
<td>10</td>
<td>11-3/3</td>
<td>13-1/3</td>
<td>15</td>
<td>16-2/3</td>
<td>18-1/3</td>
<td>20</td>
</tr>
<tr>
<td>1 x 11.....</td>
<td>9</td>
<td>12</td>
<td>14</td>
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<td>18</td>
<td>20-2/3</td>
<td>22-1/3</td>
<td>24</td>
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<tr>
<td>1 x 13.....</td>
<td>10-1/2</td>
<td>16</td>
<td>18-3/4</td>
<td>21-1/2</td>
<td>24</td>
<td>26-2/3</td>
<td>29-1/3</td>
<td>32</td>
</tr>
<tr>
<td>1 x 14.....</td>
<td>11-2/3</td>
<td>18</td>
<td>21-1/2</td>
<td>24-2/3</td>
<td>27</td>
<td>30</td>
<td>33</td>
<td>36</td>
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<td>1 x 15.....</td>
<td>12-1/3</td>
<td>20</td>
<td>23-1/2</td>
<td>26-1/3</td>
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<td>32</td>
<td>35</td>
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<td>1 x 16.....</td>
<td>13-1/3</td>
<td>22</td>
<td>25-1/2</td>
<td>28-2/3</td>
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<td>40</td>
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<td>1 x 17.....</td>
<td>14-1/3</td>
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<td>27-1/3</td>
<td>30-2/3</td>
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<td>1 x 18.....</td>
<td>15-1/3</td>
<td>26</td>
<td>29-1/3</td>
<td>32-2/3</td>
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<td>38</td>
<td>41</td>
<td>44</td>
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<tr>
<td>1 x 19.....</td>
<td>16-1/3</td>
<td>28</td>
<td>31-1/3</td>
<td>34-2/3</td>
<td>37</td>
<td>40</td>
<td>43</td>
<td>46</td>
</tr>
<tr>
<td>1 x 20.....</td>
<td>17-1/3</td>
<td>30</td>
<td>33-1/3</td>
<td>36-2/3</td>
<td>39</td>
<td>42</td>
<td>45</td>
<td>48</td>
</tr>
</tbody>
</table>

| 1-1/4 x 4....  | 4-1/6 | 5 | 6-1/6 | 7-1/2 | 8-1/3 | 9-1/6 | 10 | 11 |
| 1-1/4 x 5....  | 5-1/6 | 6 | 7-1/2 | 8-3/4 | 10 | 11-1/4 | 12-1/3 | 14-1/3 |
| 1-1/4 x 6....  | 6-1/8 | 7-1/2 | 8-3/4 | 10 | 11-1/4 | 12-1/3 | 14-1/3 | 16-1/3 |
| 1-1/4 x 7....  | 7-1/2 | 9 | 10-1/2 | 11-3/4 | 13 | 14-1/3 | 16-1/3 | 18-1/3 |
| 1-1/4 x 8....  | 8-1/2 | 10 | 12-3/4 | 14-3/4 | 16 | 18-2/3 | 20-2/3 | 22 |
| 1-1/4 x 9....  | 9-1/2 | 12 | 14-3/4 | 16-3/4 | 18 | 20-2/3 | 22-2/3 | 24-1/2 |
| 1-1/4 x 10.... | 10-1/2 | 14 | 16-3/4 | 18-3/4 | 20 | 22-2/3 | 24-2/3 | 26-2/3 |
| 1-1/4 x 14.... | 14-1/2 | 22 | 24-3/4 | 26-3/4 | 28 | 30-2/3 | 32-2/3 | 34-2/3 |
| 1-1/4 x 16.... | 16-1/2 | 26 | 28-3/4 | 30-3/4 | 32 | 34-2/3 | 36-2/3 | 38-2/3 |
| 1-1/4 x 17.... | 17-1/2 | 28 | 30-3/4 | 32-3/4 | 34 | 36-2/3 | 38-2/3 | 40-2/3 |
| 1-1/4 x 18.... | 18-1/2 | 30 | 32-3/4 | 34-3/4 | 36 | 38-2/3 | 40-2/3 | 42-2/3 |
| 1-1/4 x 19.... | 19-1/2 | 32 | 34-3/4 | 36-3/4 | 38 | 40-2/3 | 42-2/3 | 44-2/3 |
| 1-1/4 x 20.... | 20-1/2 | 34 | 36-3/4 | 38-3/4 | 40 | 42-2/3 | 44-2/3 | 46-2/3 |
THIRD YEAR DRAWINGS

Auto creeper
Bird feeder
Chickadee house
Chickens
Clothes hanger
Clothes rack
Cupboard
Curtain, poles and bracket
Dairy barn desk
Dressing bench
Folding screen
Footstool
Knife and fork tray
Lunch box shelf
Magazine rack
Nail box
Pant hangers
Pedestal
Radiator cover
Refreshment stand
Rustic gate
Stilts
Taboret
Tool box
Wagon jack
Wall lamp
Wall shelf
Waste paper basket
Window seat

FOURTH YEAR DRAWINGS

Barn medicine desk
Bookcase
Bow end lamp
Bookrack
Bow and Arrow
Candle holder
Combination table and cupboard
Game table
Hot lunch cupboard
Kitchen helps
Kitchen wagon
Lawn chairs
Mallet
Martin house
Modern end table
Porch swing
Sewing cabinet
Step ladder
Tool chest
Umbrella stand
Vanity bench
Wheeled lawn table
Window seat

FIFTH, SIXTH, AND SEVENTH YEAR DRAWINGS

Bed in cabinet
Bow and Arrow
Breakfast nook
Cabinet bed
Cedar chest
Chair
Chair lamp
Dog house
Dressing table
End table
Fences
Helmet lamp
Hog house
Kitchen table
Library table
Modern desk
Piano bench
Radio end table
Round top table
Self feeder
Sewing cabinet
Spinet desk
Studio couch
Telephone stand
Work bench
Writing desk

CONSTRUCTION

The first step in construction is to have dimensions specified in the drawings ready know the six steps involved. These steps are mentioned briefly in bulletin 11A and 11B.

1. Plane working face.
2. Square working edge.
3. Square working end.
4. Reduce to correct length.
5. Reduce to right width.
6. Reduce to right thickness.

SANDPAPER

When the woodworker is sure any more cutting with edged tools is necessary, sandpaper to finish a piece of wood by the sandpaper will dull it should be treated as a tool, while just as carefully. Sandpaper is made of grains of sand used on the surface to 3. The finer grades, 3/0 to 6 surfaces in finishing. The grades at 00 and then range as follows:

- Commercial packages of sandpaper come by 11 inches.

How to Use

For the first sanding of a piece but it is seldom necessary to us leave deep scratches that require finer paper to remove. If sandpaper follow the exact shape of the surf or near an edge the paper will "sharp lines, making them rounded", it will be noticed that m done by the spot upon which one
CONSTRUCTION

The first step in construction is to square stock according to the dimensions specified in the drawing. Advanced members should already know the six steps involved.

These steps are mentioned briefly, but for further details consult bulletins 11A and 11B.

1. Plane working face.
2. Square working edge.
3. Square working end.
4. Reduce to correct length.
5. Reduce to right width.
6. Reduce to right thickness.

SANDPAPERING

When the woodworker is sure that it will not be necessary to do any more cutting with edged tools and not until then may be used sandpaper to finish a piece of work. The grit left in the pores of the wood by the sandpaper will dull the tools. When sandpaper is used it should be treated as a tool, which it really is, and should be handled just as carefully. Sandpaper is numbered according to the size of the grains of sand used on the surface. The numbers range from 000000 to 3. The finer grades, 3/0 to 6/0, are used only in rubbing down surfaces in finishing. The grades used for rougher work usually start at 00 and then range as follows: 0, ½, 1, 1½, 2, 2½ and 3. Commercial packages of sandpaper contain one ream, each sheet 9 inches by 11 inches.

How to Use Sandpaper

For the first sanding of a piece of lumber coarse sandpaper is used, but it is seldom necessary to use numbers 2½ and 3 because they leave deep scratches that require considerable sandpapering with a finer paper to remove. If sandpaper is held under the hand it will follow the exact shape of the surface. If one attempts to sandpaper on or near an edge the paper will “drag” the corners and spoil the neat sharp lines, making them rounding. If the surface of the paper is examined, it will be noticed that most, if not all, of the cutting has been done by the spot upon which one’s fingers rested. This means a waste
of paper and time, as well as resulting in a poor piece of work to overcome all of those difficulties. The sanding block may be used to good advantage. A convenient size for a sanding block is $3\frac{3}{4}$ inches by $5\frac{1}{2}$ inches, a form which can be made to fit the convenience of the club member. A large sheet of sandpaper is cut into four equal pieces and drawn over the edges of the block. The face of the block over which the paper is drawn should be perfectly straight, flat, and smooth, so that every part of the paper will contact the surface of the wood. Sandpaper thus held will not follow the small depressions in the surface but will cut only on the high spots, gradually bringing them level. The paper cannot "drag" the edges because it is held up by the block. In fact, the block gives added control of the cutting of the sandpaper and makes it an efficient tool. The paper, however, should not be tacked to the block for it is necessary to renew it often and tacking takes too much time and may crack or spoil the block. In general, sandpapering should be done parallel to the grain of the wood. Careless cross-grain strokes with the paper will cause scratches that show plainly when the wood is finished and the better the finish, the more they show. A tendency of the beginner is to stand at one side of the piece to be sanded and pass the paper across the back in a moon-shaped curve. Such sanding produces a scratched surface. The sandpaper should always be pushed straight forward and pulled straight back. Much more might be said about sandpapering, but if these suggestions are followed, better work will be produced.

More elaborate blocks for holding the paper are often made and many other devices are often used, but a little experience will serve to call attention to the foregoing facts as well as to suggest additional ones.

**BIRD HOUSES**

Birds not only make the world happier by their songs, but they also consume vast hordes of insects every year. These insects if unchecked would destroy all growing things. The onward march of civilization has destroyed many of the natural habitats of our birds. Handicraft members can do a constructive piece of conservation by building homes and sheltering nests and also feeding stations for our feathered friends. A well-built bird house should be durable, rainproof, cool and readily accessible for cleaning. Original ideas and designs may be used to add beauty to the house. Wood is the best building material for bird houses. A wood that is easily worked may be used. Sawmill waste (re- cheap and satisfactory material unless a rustic finish is desired. Green are generally preferred. placed in exposed places should be avoided.

Entrance holes for bird houses should be placed at the top of the box. Perches at the entrance should be provided to protect them from enemies than a requirement.

**Dimensions of nesting boxes for various species**

<table>
<thead>
<tr>
<th>Species</th>
<th>Floor of cavity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bluebirds</td>
<td>5 x 5</td>
</tr>
<tr>
<td>Robin</td>
<td>6 x 8</td>
</tr>
<tr>
<td>Chickadees</td>
<td>4 x 4</td>
</tr>
<tr>
<td>Titmouse</td>
<td>4 x 4</td>
</tr>
<tr>
<td>Nuthatches</td>
<td>4 x 4</td>
</tr>
<tr>
<td>House wren</td>
<td>4 x 4</td>
</tr>
<tr>
<td>Bewick wren</td>
<td>4 x 4</td>
</tr>
<tr>
<td>Carolina wren</td>
<td>4 x 4</td>
</tr>
<tr>
<td>Violet-green swallow</td>
<td>5 x 5</td>
</tr>
<tr>
<td>Tree swallow</td>
<td>5 x 5</td>
</tr>
<tr>
<td>Barn swallow</td>
<td>6 x 6</td>
</tr>
<tr>
<td>Purple martin</td>
<td>6 x 6</td>
</tr>
<tr>
<td>Song sparrow</td>
<td>6 x 6</td>
</tr>
<tr>
<td>House finch</td>
<td>6 x 6</td>
</tr>
<tr>
<td>Starling</td>
<td>6 x 6</td>
</tr>
<tr>
<td>Phoebe</td>
<td>6 x 6</td>
</tr>
<tr>
<td>Crested flycatcher</td>
<td>6 x 6</td>
</tr>
<tr>
<td>Flicker</td>
<td>7 x 7</td>
</tr>
<tr>
<td>Golden-fronted woodpecker</td>
<td>6 x 6</td>
</tr>
<tr>
<td>Red-headed woodpecker</td>
<td>6 x 6</td>
</tr>
<tr>
<td>Downy woodpecker</td>
<td>4 x 4</td>
</tr>
<tr>
<td>Hairy woodpecker</td>
<td>8 x 8</td>
</tr>
<tr>
<td>Screech owl</td>
<td>8 x 8</td>
</tr>
<tr>
<td>Saw-whet owl</td>
<td>6 x 6</td>
</tr>
<tr>
<td>Barn owl</td>
<td>10 x 18</td>
</tr>
<tr>
<td>Sparrow hawk</td>
<td>8 x 8</td>
</tr>
<tr>
<td>Wood duck</td>
<td>10 x 18</td>
</tr>
</tbody>
</table>

(*) One or more sides open.
houses. A wood that is easily worked, such as cypress, pine, or poplar may be used. Sawmill waste (rough slabs with the bark on) furnishes cheap and satisfactory material for rustic houses. Paint may be used unless a rustic finish is desired. Modest tones as brown, gray, or dull green are generally preferred. Martin houses and others that are placed in exposed places should be painted white to reflect the heat.

Entrance holes for bird houses in most cases are placed near the top of the box. Perches at the entrance seem more of an assistance to enemies than a requirement for the occupants.

### Dimensions of nesting boxes for various species of regular box-inhabiting birds and the height at which they should be placed above the ground.

<table>
<thead>
<tr>
<th>Species</th>
<th>Floor of cavity</th>
<th>Depth of cavity</th>
<th>Entrance above floor</th>
<th>Diameter of entrance</th>
<th>Height above ground</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Inches</td>
<td>Inches</td>
<td>Inches</td>
<td>Inches</td>
<td>Feet</td>
</tr>
<tr>
<td>Bluebirds</td>
<td>5 x 5</td>
<td>8</td>
<td>6</td>
<td>1½</td>
<td>5-10</td>
</tr>
<tr>
<td>Robin</td>
<td>6 x 8</td>
<td>8</td>
<td>(1)</td>
<td>(1)</td>
<td>6-15</td>
</tr>
<tr>
<td>Chickadees</td>
<td>4 x 4</td>
<td>8-10</td>
<td>6-8</td>
<td>1¼</td>
<td>6-15</td>
</tr>
<tr>
<td>Titmice</td>
<td>4 x 4</td>
<td>8-10</td>
<td>6-8</td>
<td>1¼</td>
<td>6-15</td>
</tr>
<tr>
<td>Nuthatches</td>
<td>4 x 4</td>
<td>8-10</td>
<td>6-8</td>
<td>1¼</td>
<td>12-20</td>
</tr>
<tr>
<td>House wren</td>
<td>4 x 4</td>
<td>6-8</td>
<td>1-6</td>
<td>¾</td>
<td>6-10</td>
</tr>
<tr>
<td>Bewick wren</td>
<td>4 x 4</td>
<td>6-8</td>
<td>1-6</td>
<td>1</td>
<td>6-10</td>
</tr>
<tr>
<td>Carolina wren</td>
<td>4 x 4</td>
<td>6-8</td>
<td>1-6</td>
<td>1¼</td>
<td>6-10</td>
</tr>
<tr>
<td>Violet-green swallow</td>
<td>5 x 5</td>
<td>6</td>
<td>1-5</td>
<td>1½</td>
<td>10-15</td>
</tr>
<tr>
<td>Tree swallow</td>
<td>5 x 5</td>
<td>6</td>
<td>1-5</td>
<td>1½</td>
<td>10-15</td>
</tr>
<tr>
<td>Barn swallow</td>
<td>6 x 6</td>
<td>6</td>
<td>(2)</td>
<td>(2)</td>
<td>8-12</td>
</tr>
<tr>
<td>Purple martin</td>
<td>6 x 6</td>
<td>6</td>
<td>1</td>
<td>2½</td>
<td>15-20</td>
</tr>
<tr>
<td>Song sparrow</td>
<td>6 x 6</td>
<td>6</td>
<td>(1)</td>
<td>(1)</td>
<td>1-3</td>
</tr>
<tr>
<td>House finch</td>
<td>6 x 6</td>
<td>6</td>
<td>4</td>
<td>2</td>
<td>8-12</td>
</tr>
<tr>
<td>Sterling</td>
<td>6 x 6</td>
<td>16-18</td>
<td>14-16</td>
<td>2</td>
<td>10-25</td>
</tr>
<tr>
<td>Phoebe</td>
<td>6 x 6</td>
<td>6</td>
<td>(1)</td>
<td>(1)</td>
<td>8-12</td>
</tr>
<tr>
<td>Crested flycatcher</td>
<td>6 x 6</td>
<td>8-10</td>
<td>6-8</td>
<td>2</td>
<td>8-20</td>
</tr>
<tr>
<td>Flicker</td>
<td>7 x 7</td>
<td>16-18</td>
<td>14-16</td>
<td>2½</td>
<td>6-20</td>
</tr>
<tr>
<td>Golden-fronted woodpecker</td>
<td>6 x 6</td>
<td>12-15</td>
<td>9-12</td>
<td>2½</td>
<td>12-20</td>
</tr>
<tr>
<td>Red-headed woodpecker</td>
<td>6 x 6</td>
<td>12-15</td>
<td>9-12</td>
<td>2</td>
<td>12-20</td>
</tr>
<tr>
<td>Downy woodpecker</td>
<td>4 x 4</td>
<td>8-10</td>
<td>6-8</td>
<td>1¼</td>
<td>6-20</td>
</tr>
<tr>
<td>Hairy woodpecker</td>
<td>6 x 6</td>
<td>12-15</td>
<td>9-12</td>
<td>1½</td>
<td>12-20</td>
</tr>
<tr>
<td>Screech owl</td>
<td>8 x 8</td>
<td>12-15</td>
<td>9-12</td>
<td>3</td>
<td>10-30</td>
</tr>
<tr>
<td>Saw-whet owl</td>
<td>6 x 6</td>
<td>10-12</td>
<td>8-10</td>
<td>2½</td>
<td>12-20</td>
</tr>
<tr>
<td>Barn owl</td>
<td>10 x 18</td>
<td>15-18</td>
<td>4</td>
<td>6</td>
<td>12-18</td>
</tr>
<tr>
<td>Sparrow hawk</td>
<td>8 x 8</td>
<td>12-15</td>
<td>9-12</td>
<td>3</td>
<td>10-30</td>
</tr>
<tr>
<td>Wood duck</td>
<td>10 x 18</td>
<td>10-15</td>
<td>3</td>
<td>6</td>
<td>4-20</td>
</tr>
</tbody>
</table>

(1) One or more sides open. (2) All sides open.
WOOD FASTENERS

Proper assembly of the articles is an important part of the handicraft member’s work. Nails, screws, glue, and dowels all have their proper places in the assembly of articles. Consider your problem and select the wood fastener most suitable to your needs.

Nails

Common nails and brads are designated by the penny system. This originated in England, and two explanations are offered—one that a 6-penny or 10-penny nail, etc., sold for 6 cents or 10 cents, etc., the other that 1,000 6-penny nails weighed 6 pounds. A symbol for “penny” is the letter D. The length of the nails up through 10-penny may be determined by dividing the penny by 4 and adding one-half. For example, length of an 8-penny nail is \( \frac{8}{4} \) inches = \( \frac{2}{4} \) plus the one-half will equal \( \frac{5}{4} \) inches. The length of a nail, whenever possible, should be at least three times the thickness to be fastened. Nails are sold by the pound or in quantity lots by the keg, containing 100 pounds of nails.

Common Nails

Common nails all have flat heads. They are made of wire and may be purchased in any size from 2-penny to 60-penny. Nails of this type are in more general use than any other type. They are generally used for such purposes as nailing, sheathing, fencing, barn floors.

Box Nails

Box nails are slightly smaller in diameter than a common nail, hence can be used advantageously in lumber which splits easily. They may be procured in any size from 2-penny to 40-penny. The 6- and the 8-penny are the more commonly used.

Finishing Nails

Finishing nails are used in places where the head of the nail should not show. They are usually sunk or set in the wood and the holes filled with putty or plastic wood. They are used extensively for interior finishing and cabinet work. The sizes vary from 2-penny to 20-penny.

Screws

Screws, next to nails, are the most useful in woodwork. The setting of screws produces a much stronger joint. There are the flat-head and the round-head, the former being used when a flat surface is desired. One advantage of screws over nails is that they are free from injurious substances which may cause out danger to health. Zinc, rusting. This type would be used for putting on shingles.

There are two general types of screws—wood screws and sheet-metal screws. Wood screws are the flat-head and the round-head, although the latter is the more generally used for the same purpose. Sheet-metal screws vary from 2- to 60-penny, although the most commonly used are the 4-penny to 20-penny. They may be procured in any size from 2-penny to a 6-penny, 4-penny to 20-penny.

Barbed nails are sometimes used for greater security. They are sometimes used for greater security. They are made of rust-resistant materials and are blue. Barbed nails have a barb on the end of the shank to prevent the nail from pulling out of the wood. Special nails are available for the correct size and finish of nails commonly used.
Common Brads

These nails have a small head similar to finishing nails and are often used for the same purpose. They may be purchased in sizes from 2- to 60-penny, although they are often specified according to their length in inches.

Shingle Nails

Nails for putting on shingles may be procured in sizes from 3-penny to a 6-penny, 4-penny being one of the more common.

Hinge Nails

There are two general types of hinge nails; namely, the oval-head and the flat cornersunk head. They may be procured in sizes of 4-penny to 20-penny. They may also be smooth or barbed, zinc-coated or blue. Barbed nails have a greater grip and holding power and are sometimes used for greater strength. Blue nails are treated so as to be free from injurious substances and may be held in the mouth without danger to health. Zinc-coating tends to prevent the nail from rusting. This type would be preferred in roofing work.

Screws

Screws, next to nails, are the most common fasteners used in woodwork. The setting of screws requires more time and labor, but produces a much stronger joint. The two common types of wood screws are the flat-head and the round-head. Use a flat-head screw where a flat surface is desired. On exposed surfaces a round-head screw presents a neater appearance. To fasten two pieces of wood together with screws, (1) Drill the first hole large enough to allow the shank of the screw to slide in easily; (2) Drill the second hole slightly smaller than the diameter of center portion of the screw. The second hole is sometimes omitted in very soft wood. For flat-head screws, use a countersink and ream the first hole deep enough to permit the head of the screw to drop down flush with the top of the wood. Soap or oil on the threads of the screw will make the screw easier to drive, especially in hardwood.
Corrugated Fasteners

The wiggle nail or corrugated fastener is a little device that may be used for tightening loose joints or cracks. It is commonly used in fastening window frames, screen doors, and in joining boards together. It is a nail which has much strength for holding two surfaces together side by side.

The wiggle nail is made with plain edges for hardwood and saw edges for soft woods and may be obtained in different sizes.

Glue

*I may not smell so very sweet
Nor be a thing of beauty
But most things would be incomplete
Unless I did my duty.*

Glue, like nails or screws, is a fastener, but where the nail or screw fastens at only one point, glue properly used holds over the entire surface of the joint, and it may be actually stronger than the piece of the wood to which it is applied. Glue suitable for handicraft work is usually sold by hardware stores, paint stores and even lumber yards and may be selected for the individual need. Many times, mucilage, paste or cement is used for gluing wood, but this is not recommended because it will not make a strong permanent joint. Following is a brief description of the different types of glue marketed:

Animal or hard glue is sold in sheets and ground form, in bulk or package. Most of the ground glue is made for the use of painters as wall sizing and is called sizing glue. This is not suitable for gluing wood. Animal glue must be soaked in cold water, then heated to about 150°F. and applied hot to the surface of the wood. The wood is warmed to avoid chilling and setting of the glue before pressure is applied. A good grade of animal glue if used with care will make a joint stronger than the wood. It is not waterproof.

Casein, a dry, powdered glue is now sold in ½-, 1- pound and larger packages. It is quickly made into liquid glue by mixing with cold water, following directions given on the package. This type of glue is especially suited to home craft work because no heat is required in mixing or applying. The glue may be used for indoor or outdoor purposes. This type of glue is quick setting and water-resistant.

Liquid glue is sold in liquid form ready for use. Its strength is not equal to the other types described, but is usually satisfactory for soft wood. It is not waterproof.
 Courtesy of Stanley Rule and Level Plant, New Britain, Conn., U. S. A.
SUGGESTIONS FOR MAKING

The surface to be glued together must be clean and free from dust. Make sure of this by holding the joint together and looking at both surfaces. Do not use too much glue, as this will cause weak joints. In repairing furniture, always paint the surface of the wood. Apply a thin coat of glue to the joint. Strong glue joints can be made by using clamps if possible and maintaining the pressure. The pressure should not be too great or the wood will be damaged.

The most important things to check before applying the glue are (1) to see that the parts to be glued fit properly and will quickly go together without binding the wood. If the parts do not fit, cut or plane them so that the glue will penetrate easily. (2) To prove the accuracy of the joint, the work should be clamped together tightly. (3) Apply the glue to the joint before applying the glue, (4) Allow 24 to 48 hours for the excess glue to cure. (5) Put the pieces together and will quickly go together with strong glue joints so that the glue will penetrate.

Do

Dowels are round wooden pegs that are usually grooved. They are usually made in diameters from % inch to % inch. Dowels are cut a trifle shorter than the wood into which they are set, and are chamfered to prevent binding when put in place.

To prove the accuracy of the joint, the work should be clamped together tightly. If the dowel holes are not in alignment, one or both holes, cut flush, and

TIPS ON SUCCESS

Dowels should be absolutely flush with the wood into which they are set.
SUGGESTIONS FOR MAKING STRONG GLUE JOINTS

The surface to be glued together should be smooth and even. Make sure of this by holding the joint up to the light before gluing. Dowel or mortise and tenon joints must be tight fitting. Regardless of how much glue is applied, a weak bond will result from loose fitting joints. In repairing furniture, always scrape any old glue from the surface of the wood. Apply a thin even film of glue to both sides of the joint. Strong glue joints cannot be made without pressure. Use clamps if possible and maintain pressure from one to four hours. The pressure should not be so great as to distort the joint or to crush the wood. If clamps are not available apply weight.

The most important things to consider in applying glue are (1) Be sure the parts to be glued fit properly, (2) Clean the parts thoroughly before applying the glue, (3) Apply a thin even coat of glue, (4) Clamp together tightly, (5) Allow 24 to 48 hours for the glue to set, (6) Remove the excess glue by scraping and sanding. Glue is one of the secrets for producing good work. Before using hot glue be sure to have everything in readiness. Have the work and clamps handily arranged for quick use. Put the pieces together that are to be glued. See that they fit and will quickly go together when the glue is applied. Warm the joints so that the glue will penetrate the wood.

Dowels

Dowels are round wooden pegs that may be plain, fluted or spiral grooved. They are usually made of maple or birch and may be purchased in diameters from \( \frac{3}{8} \) inch to \( 1\frac{1}{4} \) inches in any length desired.

Dowels are cut a trifle shorter than the sum of the depth of the two holes into which they are set. Commercial dowel pins are slightly chamfered to prevent binding when they are forced into place.

To prove the accuracy of the location and boring of the dowel holes, the work should be clamped together without glue for a trial. If the dowel holes are not in alignment, a dowel should be glued into one or both holes, cut flush, and new holes rebored.

TIPS ON SUCCESSFUL DOWELING

Dowels Must Be Dry

Dowels should be absolutely dry. If possible they should be drier than the wood into which they are driven. Dowels should be kept
in a warm place for a few days and should not be used until the moisture absorbed has been removed. Then the dowel will swell somewhat, producing an exceedingly tight joint.

**Bits and Boring**

Experience has proved that best results in boring are obtained by using brad bits instead of twist drills. It has been demonstrated that it is absolutely impossible to bore the same size hole even with the same bit in a soft and hard textured piece of wood. Care should be taken in having the exact-sized bit.

**Length of Dowels**

Always use dowels with a length as great as the work will stand. Before a dowel joint will come apart the dowel must loosen in the hole. Therefore, the deeper the hole is bored and the greater the contact with the glue, the tighter the dowel will hold. The use of longer dowels of small diameter is recommended over shorter dowels with greater diameter.

**Hot Glue Must Be Used**

If this work is done by hand, a workman will sometimes daub glue into a dozen or more holes at once and then drive the dowels. This is not advisable for good glue joints positively cannot be made with cold glue. It takes but a few seconds for glue to cool so some of these joints are certain to be defective.

**WEAVING**

Handicraft members will find weaving work very fascinating. Catalogs and books of instructions may be obtained from several commercial concerns who manufacture weaving material. Hongkong grass, fiber cord, braiding material and even wool twine may be used as weaving materials. Hongkong grass and the fiber cord will probably be the most satisfactory. Both of these are strong, durable, and come in continuous lengths. Both the grass and the fiber cord may be purchased in the natural color or in colors to suit the individual's taste. Both the grass and the fiber cord have a texture and color that resembles rush. About 1 ¼ to 1 ½ pounds of grass or fiber cord will be necessary for the average project. Sometimes it will be necessary to make it more pliable. This may be achieved by wrapping it in a damp cloth before use. In making the tops for food Warmers, the core frame for the more common design may be helpful in obtaining...
necessary for the average seat. The amount of cord necessary will depend upon the size of the seat and how tight the weaving is made. Sometimes it will be necessary to dampen the grass in order to make it more pliable. This may be done by dipping the grass in water and then wrapping it in a damp cloth. The material should not be soaked. In making the tops for footstools, benches and chairs, substantial twine should be used. The corners should be a trifle above the connecting frame for the more common types of stools. The following directions may be helpful in obtaining the best results.
**Square Seats**

Mark the four corners of the seat, 1, 2, 3 and 4. Mark the rails A, B, C and D, as shown in the cut. Start at corner No. 1. A strand of the cord or grass is then laid over rail A with the short end turned down on the inside. Draw the strand over the top of rail A, then under it and up on the inside, then over the top of rail B, then under it and then up on the inside. Pull the strand across the frame to the top of rail C at corner No. 2. Draw it over the top of the same rail, then under it and up on the inside and over the top of rail A. Pull directly across the frame to the top of rail D at corner No. 3. The operations at corner No. 3 and No. 4 are identical to those of No. 1 and 2. Repeat these until the seat is completed.

It is necessary to make a tight weave by drawing up well on the corners and pushing the strands close together on the rails and at the diagonals to make the weaving compact. In using the Hongkong grass and some of the finer materials for weaving, it may be tied together by using a "figure 8" knot on the strand that runs parallel to the rails of the chair. These knots will later be covered by the other strands. In using the fiber cord it is well to cut the under-side. It may be tied to the under-side of the rail that is being put in may be tied to the under-side of the rail.

**Rectangular Seats**

As in weaving the square seat, the first process is repeated at all corners until the openings are filled. In a rectangular seat the spaces on the short rails will be filled with more rows on the long rails. From this point weave over and under a long rail into the center and over and under the opposite long rail. Repeat this operation until the center is filled and the seat is finished.
cord it is well to cut the uneven end off so that it is hidden on the under-side. It may be tacked with a very small brad or nail to the under-side of the rail. The old end and the end of the new piece that is being put in may be tacked together to form a more even joint.

**Rectangular Seats**

As in weaving the square seat, the first process is repeated at all corners until the openings are filled. In a rectangular seat the spaces on the short rails will be filled with more rows on the long rails. From this point weave over and under a long rail into the center and over and under the opposite long rail. Repeat this operation until the center is filled and the seat is finished.
Irregular Seats

Irregular seats are those which are wider across the front rail than across the back rail. Measure the back width. Center this same distance on the front rail as marked with chalk or pencil. This will leave a short distance near each front post that must be filled before the seat can be woven like a square one. Fill in the two front corners up to the mark by using the same method as used in weaving a square seat, except that each time the weaving is done around the two front posts. It will be repeated twice around each post instead of only once. When the ropes of grass or fiber cord have filled this extra space, the weaving proceeds as for a square seat. The diagonal lines may be slightly apart in the center as in the rectangular seat. The extra space is then filled in as it is on the rectangular frame.

Packing the Seat

As the work progresses it becomes necessary to fill the space between the layers of cord. Use enough padding to give the seat a plump, rounded contour. Paper is commonly used for making a firm seat. Cornstalks, cotton or wool padding, corrugated paper and other items may be used as packing material. When the wrapping and the filling are completed on the frame, the top may be finished. In the paper cord the seat should be given a coat of glue sizing and a coat or two of shellac, or clear varnish may be used. The grass will need no sizing. The shellac or varnish will aid in keeping a perfectly smooth surface, and it is a protection against moisture. If color is desired a coat of stain may be applied before using the shellac, especially if the seat is to be made of the same color or tint as the frame of the stool or chair. It is suggested that the stain be tested on the bottom side in order to get the desired shade.

ARCHERY

By A. O. Haugen

Most boys and girls are attracted by the sight of a bow and arrow. You, too, can make a bow and arrows from materials listed below. Your 4-H Club agent has a copy of the booklet “The Flat Bow by Hunt and Metz.” Complete instructions and drawings will give details on construction. If you have a man in your community who shoots or makes bows you should get acquainted with him. He may be interested in helping you and your group.

SOME RULES OF SAFETY

Never point a drawn bow
Never shoot in the direction
Never shoot straight up
Never draw the string back
Never release the bow

SUGGESTIONS

Always unstring your bow
Always keep arrows

MATERIALS (Bows and Arrows)
1 piece lemonwood or h
6 Arrow shafts (Birch or
6 plastic nocks
6 steel arrow points
18 cut turkey feathers
1 oz. ball No. 10 or No.
Beginners especially, are likely to make bows and arrows that are too heavy to pull properly. It is not the weight of the bow, but how you shoot it that counts. Be sure to make the bow and arrows to fit yourself and you will shoot much straighter. Recommended bow weights and arrows lengths for the average sized girl or boy are as follows:

**GIRLS**

<table>
<thead>
<tr>
<th>Age</th>
<th>Pull</th>
<th>Probable arrow length</th>
</tr>
</thead>
<tbody>
<tr>
<td>11 - 15 years</td>
<td>15 - 20 lbs.</td>
<td>22&quot; - 23&quot;</td>
</tr>
<tr>
<td>16 - 20 years</td>
<td>20 - 25 lbs.</td>
<td>24&quot; - 26&quot;</td>
</tr>
</tbody>
</table>

**BOYS**

<table>
<thead>
<tr>
<th>Age</th>
<th>Pull</th>
<th>Probable arrow length</th>
</tr>
</thead>
<tbody>
<tr>
<td>11 - 15 years</td>
<td>20 - 30 lbs.</td>
<td>24&quot; - 26&quot;</td>
</tr>
<tr>
<td>16 - 20 years</td>
<td>30 - 40 lbs.</td>
<td>26&quot; - 27&quot;</td>
</tr>
</tbody>
</table>

A bow which is about as long as you are tall will fit you best and should last a long time if carefully made and properly used.

**SOME RULES OF SAFETY**

Never point a drawn bow at anyone. Never shoot in the direction of another person, as stray arrows may cause serious injury. A bow is like a gun, in that it must be properly used. Never shoot straight up into the air. Never draw the string back without an arrow on the string. This is to prevent drawing the string back too far, which usually results in a broken bow. Never release the bow string without an arrow on it. This is a sure way to break your bow.

**SUGGESTIONS**

Always unstring your bow and hang it from a peg when not in use. Always keep arrows standing on end when not in use and they will stay straighter longer.

**MATERIALS (Bows and Arrows)**

- 1 piece lemonwood or hickory 1¼" x 1¾" x 72"
- 6 Arrow shafts (Birch or Port Oxford Cedar) 5/16" x 28"
- 6 plastic nocks
- 6 steel arrow points
- 18 cut turkey feathers 2½" - 3" long
- 1 oz. ball No. 10 or No. 12 Barbours Linen Thread
Cross Bars—3 pieces 1½" x 2" x 19"
Slats (short)—11 pieces ½" x 1¼" x 4" CASTE

See drawing.

Sides—2 pieces ½" x 5" x 20"
Back, Bottom and Front—1 piece ⅞" x 4" x 9¼"

BRACKET AND POL

Doubt

Brackets—2 pieces ⅘" x 7" x 13"
Turned Ends—2 pieces ⅞" x 2¼"

Sing

Brackets—2 pieces ⅞" x 4⅛" x 9¾"
Turned End—3" x 3" x 6"

DAI

Sides—2 pieces 13/16" x 9½" x 20"
Bottom—1 piece 9/16" x 18" x 21½
Cover—1 piece 13/16" x 18" x 20"
Back—1 piece 13/16" x 9½" x 11½
Front—1 piece 13/16" x 3¼" x 20"

Sides and Sections—
1 piece ½" x 2¼" x 4'-2"
Strap handle may be used or X

CARPE

Sides—2 pieces ½" x 9" x 2'-6"
Ends—2 pieces ½" x 10" x 12"
THIRD YEAR EXERCISES

AUTO REPAIR CART
Cross Bars—3 pieces 1½” x 2” x 19¼”
Slats (long) —2 pieces ½” x 1¼” x 36”
Slats (short)—11 pieces ½” x 1¼” x 29”
Head Rest—1 piece ¾” x 6” x 6”
4 Casters 1”

See drawing.

BLUEBIRD HOUSE

Sides—2 pieces ½” x 5” x 20”
Back, Bottom and Front—
1 piece ¾” x 4” x 34”
Roof—1 piece ½” x 7” x 8”
Perch—1 dowel ¾” dia. x 3½”

CHICKADEE HOUSE

Sides—2 pieces ½” x 5” x 20”
Back, Bottom and Front—
1 piece ¾” x 4” x 34”
Roof—1 piece ½” x 7” x 8”
Perch—1 dowel ¾” dia. x 3½”

BRACKET AND POLES FOR OVERDRAPED CURTAINS

DOUBLE CURTAIN STYLE
Brackets—2 pieces ½” x 7” x 13”
Bar—1 pole ¾” diameter
Turned Ends—2 pieces 2½” x 2½” x 6”

SINGLE CURTAIN STYLE
Brackets—2 pieces ½” x 4½” x 9¼”
Turned End—3” x 3” x 6”
Pole same as above.

DAIRY BARN DESK

Sides—2 pieces 13/16” x 9½” x 20”
Bottom—1 piece 9/16” x 18” x 21 5/16”
Cover—1 piece 13/16” x 18” x 20”
Back—1 piece 13/16” x 9½” x 118”
Front—1 piece 13/16” x 3¼” x 20”

Top—1 piece 13/16” x 4” x 20”
Cover Cleat—2 pieces 13/16” x 1¼” x 15”
Cover Edging—1 piece ¾” x 1¼” x 20”
For cover and bottom veneer may be
used if boards are not glued.

NAIL BOX

Sides and Sections—
1 piece ¾” x 2¼” x 4’-2”
Bottom—
1 piece ¾” x 7½” x 9¼”
Strap handle may be used or X piece made higher and handle cut into top.

CARPENTER’S TOOL BOX

Sides—2 pieces ¾” x 9” x 2’-6”
Ends—2 pieces ¾” x 10” x 12”
Bottom—1 piece ¾” x 6½” x 2’-6”
Handle—1 dowel 1½” diameter 2’-6”
AUTO REPAIR CART
CUT AWAY OPPOSITE CORNER FOR VENTILATION

CHICKADEE HOUSE

FRONT VIEW

SIDE VIEW

FASTEN BOTTOM WITH 3/8" NO. 6 SCREWS
DOUBLE CURTAIN STYLE

FOR SINGLE CURTAINS

BRACKET & POLES FOR OVERDRAPE CURTAINS
DAIRY BARN DESK DETAILS
Nail Box
NAIL HANDLE IN PLACE

CARPENTER'S TOOL BOX

END BOARD

SIDE BOARD

BOTTOM BOARD
DRESSING BENCH

Top—1 piece 1" x 11¾" x 20⅞"  
Legs—2 pieces 1" x 13¼" x 14¼"

Brace—1 piece 1" x 2½" x 18½"  
Wedges—2 pieces 1" x 13" x 3"

FOOT STOOL

Top—1 piece 1" x 11¾" x 16"  
Bottom—1 piece 1" x 11¾" x 16"

Plywood (See Dwg.)— 
1 piece ½" x 9¾" x 14"

Leg—4 pieces 1½" x 3" x 5"  
Upholstering material— 
14 F. H. screws—1½" long

FOLDING SCREEN

Upright—6 pieces 1" x 3¼" x 53"  
Tops—3 pieces 1" x 4¾" x 14"  
Braces—6 pieces 1" x 3" x 14"

3 panels—3½" or 3¾" x 13" x 31"  
3 panels—3½" or 3¾" x 13" x 14"  
6 2½" x 1" hinges

REFRESHMENT STAND

Legs—4 pieces 3¾" x 2¼" x 38"  
Tray—2 pieces plywood— 
½" x 13½" x 20½"

Tray Edging—½" x 1" x 13′-0"  
Handle—1 piece 3/4" x 4½" x 17"

Leg Braces—1 piece 3½" x 32" long  
dowel rod— 
2½" x 1¼" hinges with removable pin— 
4—No. 12 1½" R. H. screws— 
4—½" x 1" steel pins

KNIFE AND FORK TRAY

Ends—2 pieces 7/16" x 3" x 7"  
Bottom—1 piece 7/16" x 5½" x 12"

Sides—2 pieces 7/16" x 3¾" x 12"  
Center—1 piece 7/16" x 4½" x 11¾"

MAGAZINE RACK

Veneer: 
Center—1 piece ½" or ¾" x 15" x 17½"—solid

Ends—2 pieces ½" or ¾" x 10" x 15"  
Bottom—1 piece ½" or 1" x 8" x 15"

PEDESTAL

Top and Bottom— 
2 pieces ¾" x 9" x 9"  
2 pieces ¾" x 12" x 12"

Leg Squares— 
4 pieces ¾" x 2½" x 2½"

Upright may be solid or of 4 boards overlapped.

Upright— 
1 piece 4" x 4" x 25"  
or 
4 pieces ¾" x 4" x 25"

RADIATOR COVER

Top—1 piece ¾" x 13¼" x 30"  
Ends—2 pieces ½" x 11¾" x 31¾"

Back—1 sheet galvanized iron 36" x 27"
DRESSING BENCH

FOOT STOOL

PEGs MAY BE
FAKED AS SHOWN.
PICES ARE NAILED
AND GLUED IN PLACE.
**Top View**

**End View**

**Side View**

**Assembly**

**Center Board**

**End Board**

**Side Board**

**Bottom Board**

**Knife and Fork Tray**
See drawing.

Shelves—2 pieces $\frac{3}{4}'' \times 11\frac{1}{2}'' \times 11\frac{1}{2}''$
Legs—4 pieces $\frac{3}{4}'' \times 3'' \times 19''$

WAS

Sides—6 pieces $\frac{1}{2}'' \times 5\frac{1}{2}'' \times 15''$
Bottom—1 piece $\frac{3}{4}'' \times 7'' \times 7''$

Sides—2 pieces $\frac{3}{4}'' \times 7\frac{1}{2}'' \times 31''$
Back—1 piece $\frac{3}{4}'' \times 17\frac{3}{4}'' \times 23''$
Bottom Shelf—1 piece $\frac{3}{4}'' \times 6\frac{1}{2}''$

Drawer:
Front—1 piece $\frac{3}{4}'' \times 24'' \times 17\frac{3}{4}''$
Sides—2 pieces $\frac{3}{4}'' \times 24'' \times 6''$
1 drawer pull

Base—$\frac{3}{4}'' \times 5'' \times 11''$
$\frac{1}{4}'' \times \frac{3}{4}'' \times 30''$ wrought iron

Lifting Leg—1 piece $2'' \times 4''$ x
Supporting—
2 pieces $1'' \times 4'' \times 2'4''$
1 piece $2'' \times 4'' \times 12''$

POU

Box—4 pieces $\frac{3}{4}'' \times 11\frac{1}{2}'' \times 14$
Perch—4 pieces $\frac{3}{4}'' \times 2'' \times 24$
Braces—2 pieces $\frac{3}{4}'' \times 24'' \times \frac{3}{4}$
Braces—2 pieces $\frac{3}{4}'' \times 1\frac{3}{4}'' \times 1$

White pine

Sides—2 pieces $1'' \times 1\frac{1}{2}''$ x
Top and Bottom—
2 pieces $1'' \times 1'' \times 26\frac{3}{4}''$
Back—1 piece $\frac{3}{4}'' \times 26\frac{3}{4}'' \times$
Rests—2 pieces $\frac{3}{4}'' \times 1'' \times$
RUSTIC GATE

TABORET
Shelves—2 pieces ¾" x 11¾" x 11¾"
Legs—4 pieces ¾" x 3" x 19"

16 No. 6 R. H. blued screws 1¾"

WASTE PAPER BASKET
Sides—6 pieces ¾" x 5¾" x 15"
Bottom—1 piece ¾" x 7" x 7"

18 No. 3 screws R. H. ¾"

WALL SHELVES
Sides—2 pieces ¾" x 7¾" x 31"
Back—1 piece ¾" x 17½" x 23"
Bottom Shelf—1 piece ¾" x 6¾" x 17½"

Drawer:
Front—1 piece ¾" x 2½" x 17½"
Sides—2 pieces ¾" x 2¼" x 6"
1 drawer pull

Middle Shelf—1 piece ¾" x 5¾" x 17¼"
Top Shelf—1 piece ¾" x 4½" x 17¼"

Back—1 piece ¾" x 2¼" x 17"
Bottom—
1 piece ¼" plywood x 5¼" x 16½"

WALL LAMPS
Base—¾" x 5" x 11"
¾" x ¾" x 30" wrought iron

Electric light socket, cord and plug.

WAGON JACK
Lifting Leg—1 piece 2" x 4" x 5½-4"
Supporting—
2 pieces 1" x 4" x 2½-4"
1 piece 2" x 4" x 12"

Handle—1 piece 2" x 4" x 2½-2"

1 ¾" strap hinge (heavy)
1 ½" bolt 4" long
4 flathead screws

POULTRY WATER HEATER
Box—4 pieces ¾" x 11½" x 14½"
Perch—4 pieces ¾" x 2" x 24"
Braces—2 pieces ¾" x 24" x 24"
Braces—2 pieces ¾" x 1½" x 11"

Galvanized sheet iron for 6" x 6" x 6"
pan with flange.
Electric bulb, connections and rubber cable.

BULLETIN RACK
White pine for frame work and veneer for back.

Sides—2 pieces 1" x 1½" x 36½"
Top and Bottom—
2 pieces 1" x 1" x 26½"
Back—1 piece ¾" x 26½" x 36½"
Rests—2 pieces ¾" x 1" x 26"

Braces—
3 pieces ½" x ¾" x 24½"
2 pieces ¼" x 3" x 24½"
2 pieces ½" x 2" x 24½"
Slides—6 pieces ¾" x 1" x 1½"
RUSTIC GATE

VIEW OF LATCH

VIEW OF HINGE
TABORET
WASTE PAPER BASKET

TOP VIEW

SIDE VIEW

USE 18-8" #3 BLUED R.H. SCREWS
WAGON JACK

![Diagram of a wagon jack with dimensions and labels.](image-url)

- **Dimensions:**
  - Base: 2.0" x 2.0"
  - Handle: 5.0" x 5.0"
  - Cylinder of hinged piece:
    - Set in handle.

- **Material:**
  - All wood 3/4" in thickness / 3/8" planed.

- **Instructions:**
  - Score and draw lines from 2.0" stock.
**LUNCH BOX SHELF**

White pine, basswood or poplar.

Sides—2 pieces $\frac{3}{4}'' \times 9'' \times 28''$
Shelves—12 pieces $\frac{3}{4}'' \times 9'' \times 60''$

**PORTABLE CLOTHES RACK**

Uprights—
- 4 casters
- 2 shelf brackets
- 10 screw hooks

**CUPBOARD FOR DRINKING CUPS**

White pine, poplar, basswood or veneer.

Top and Bottom—
- 1 piece $\frac{3}{4}'' \times 3\frac{3}{4}'' \times 36''$
- 1 piece $\frac{3}{4}'' \times 5\frac{3}{4}'' \times 30''$

Sides—2 pieces $\frac{3}{4}'' \times 9'' \times 30''$

Back—1 piece $\frac{3}{4}'' \times 30'' \times 36''$ veneer

Front—2 pieces $\frac{3}{4}'' \times 3\frac{3}{4}'' \times 30''$

Doors—2 pieces $\frac{3}{4}'' \times 12'' \times 26''$

Supports—5 pieces $\frac{3}{4}'' \times 2'' \times 35''$

Hinges, small screw hooks
LUNCH BOX SHELF

PORTABLE CLOTHES RACK
Shelves—3 pieces ¾" x 16" x 80½"  
Braces—3 pieces ¾" x 16" x 20½"

Top—1 piece ¾" x 8½" x 54½"  
Ends—2 pieces ¾" x 8½" x 36½"  
Uprights—2 pieces ¾" x 8½" x 36

Small Shelves—
6 pieces ¾" x 8½" x 8½"


Sides—4 pieces ¾" x 2½" x 51"  
Sides—4 pieces ¾" x 1¼" x 46"

Large Stilts—2 pieces 1½" x 1½" x
Small Stilts—2 pieces 1¼" x 1¼" x

Cl
Top—1 piece ½" x 14½" x 20½"  
Bottom—1 piece ½" x 11½" x 17½  
Front and Back—
2 pieces ½" x 20½" x 28½"  
Sides—2 pieces ½" x 13½" x 28½

Sides—2 pieces ½" x 8½" x 13½"  
Bottom—1 piece ½" x 12½" x 17½  
Top—1 piece ½" x 13½" x 15½  
Wings—2 pieces ½" x 5½" x 24½"  
Brace—1 piece ½" x ¼" x 12½"  
Pole Anchor—2 pieces 1½" x 2½ x

Sides—2 pieces ¾" x 7½" x 10½  
Back—2 pieces ¾" x 3½" x 14½
WINDOW SEAT

Shelves—3 pieces $\frac{3}{4}'' \times 16'' \times 80\frac{1}{2}''$
Braces—3 pieces $\frac{3}{4}'' \times 16'' \times 20\frac{1}{4}''$
Back—1 piece $\frac{3}{4}'' \times 21\frac{1}{2}'' \times 80\frac{1}{2}''$
Cleats—4 pieces $\frac{3}{4}'' \times 1\frac{1}{2}'' \times 16''$
Footing—3 pieces $\frac{3}{4}'' \times 1\frac{1}{2}'' \times 16''$

OPEN BOOKCASE

Top—1 piece $\frac{3}{4}'' \times 8\frac{1}{2}'' \times 54\frac{1}{2}''$
Ends—2 pieces $\frac{3}{4}'' \times 8\frac{1}{2}'' \times 36\frac{1}{2}''$
Uprights—2 pieces $\frac{3}{4}'' \times 8\frac{1}{2}'' \times 36\frac{1}{2}''$
Small Shelves—
6 pieces $\frac{3}{4}'' \times 8\frac{1}{4}'' \times 8\frac{1}{4}''$
Large Shelves—
2 pieces $\frac{3}{4}'' \times 8\frac{1}{2}'' \times 34\frac{1}{2}''$
Brace—1 piece $\frac{3}{4}'' \times 8\frac{1}{2}'' \times 22\frac{1}{2}''$
Angle irons or corner braces.

BOOK SHELVES

Sides—4 pieces $\frac{3}{4}'' \times 2\frac{1}{2}'' \times 51''$
Sides—4 pieces $\frac{3}{4}'' \times 1\frac{1}{2}'' \times 46''$
Backs—5 pieces $\frac{3}{4}'' \times 3'' \times 30\frac{1}{2}''$
Shelves—5 pieces $\frac{3}{4}'' \times 9'' \times 30\frac{1}{2}''$

STILTS

Large Stilts—2 pieces $1\frac{3}{4}'' \times 1\frac{1}{2}'' \times 8'$
Small Stilts—2 pieces $1\frac{1}{2}'' \times 1\frac{1}{2}'' \times 4\frac{1}{2}''$
Iron rods or strap iron
No. 10 flathead screws 1$rac{1}{4}''$

CLOTHES HAMPER

Top—1 piece $\frac{3}{4}'' \times 14\frac{1}{2}'' \times 20\frac{1}{2}''$
Bottom—1 piece $\frac{3}{4}'' \times 11\frac{1}{2}'' \times 17\frac{1}{4}''$
Front and Back—
2 pieces $\frac{3}{4}'' \times 20\frac{1}{4}'' \times 28\frac{1}{4}''$
Sides—2 pieces $\frac{3}{4}'' \times 13\frac{3}{4}'' \times 28\frac{3}{4}''$
Brace—1 piece $\frac{3}{4}'' \times 1'' \times 20\frac{1}{2}''$
2 small hinges
12 small screws
15 feet quarter round

BIRD FEEDER

Sides—2 pieces $\frac{3}{4}'' \times 8\frac{1}{4}'' \times 13\frac{3}{4}''$
Bottom—1 piece $\frac{3}{4}'' \times 12\frac{1}{4}'' \times 17\frac{3}{4}''$
Top—1 piece $\frac{3}{4}'' \times 13'' \times 15''$
Wings—2 pieces $\frac{3}{4}'' \times 5\frac{3}{4}'' \times 24\frac{1}{4}''$
Brace—1 piece $\frac{3}{4}'' \times 1\frac{3}{4}'' \times 12\frac{3}{4}''$
Tail Parts—2 pieces $\frac{3}{4}'' \times 3\frac{3}{4}'' \times 9\frac{3}{4}''$
Tail Parts—1 piece $\frac{3}{4}'' \times 2\frac{1}{2}'' \times 9\frac{3}{4}''$
Upright—1 31'' dowel, iron bar or
2'' x 4'' x 5' or 6'
1 piece glass 6\frac{1}{2}'' x 12''

PANT HANGER

Sides—2 pieces $\frac{3}{4}'' \times 7'' \times 10''$
Back—2 pieces $\frac{3}{4}'' \times 3'' \times 14''$
Dowels—4 pieces $\frac{3}{4}''$ dia. x 16''
COMBINATION BOOK SHELF AND WINDOW SEAT

1/8" PLYWOOD SET IN FOR BACK

DETAILED JOINT FOR MIDDLE SHELF

1/2 CLEATS TO SECURE BACK AND SHELVES

SEE DETAIL

3-1/4' FOOTINGS TO RAISE OFF FLOOR

OPEN BOOKCASE

54"
ALL PIECES 
\frac{\text{1}}{\text{2}} \text{ INCH THICK} 
OR USE PLYWOOD

CLOTHES HAMPER
FOURTH BARN

Sides—3 pieces 13/16" x 9" x 29¾"
Shelves—3 pieces 9/16" x 7½" x 17½"
Top and Bottom—
  2 pieces 13/16" x 8" x 36"
Doors—2 pieces 9/16" x 11½" x 25½"

ARTICLES:

COMBINATION

Base—2 pieces 2½" x 5" x 6"
Barrel—1 piece 5" x 5" x 6"

CA

1 piece walnut 4" x 4" x 9"

TABLE AND CUPBOARD

Sides—2 pieces ¾" x 11" x 51"
Top—1 piece ¾" x 11" x 30"
Back—1 piece ¾" x 30" x 52½"
Door—1 piece ¾" x 28½" x 40"

Base for Top—
  1 piece veneer ¾" x 22" x 22"
Border—4 pieces ¾" x 4" x 22"
Squares—
  5 pieces ¾" x 12" x 14" dark
  4 pieces ¾" x 12" x 14" light

HOT Lu

Size and design may vary.

KITC

Sides—2 pieces 9/16" x 11½" x 28½"
Shelves—2 pieces 9/16" x 10" x 23½"
Top—1 piece 9/16" x 18½" x 32½"
Braces—4 pieces 9/16" x 2½" x 10½"
Braces—4 pieces 9/16" x 4" x 4"
## FOURTH YEAR EXERCISES

### BARN MEDICINE CASE

<table>
<thead>
<tr>
<th>Part</th>
<th>Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sides</td>
<td>3 pieces 13/16&quot; x 9&quot; x 29&quot;</td>
</tr>
<tr>
<td>Shelves</td>
<td>3 pieces 9/16&quot; x 7½&quot; x 17&quot;</td>
</tr>
<tr>
<td>Top and Bottom</td>
<td>2 pieces 13/16&quot; x 8&quot; x 36&quot;</td>
</tr>
<tr>
<td>Doors</td>
<td>2 pieces 9/16&quot; x 11¼&quot; x 25&quot;</td>
</tr>
<tr>
<td>Door Braces</td>
<td>2 pieces 9/16&quot; x 3½&quot; x 25½&quot;</td>
</tr>
<tr>
<td></td>
<td>1 piece 9/16&quot; x 5½&quot; x 25½&quot;</td>
</tr>
<tr>
<td>Apron</td>
<td>1 piece 9/16&quot; x 3½&quot; x 36&quot;</td>
</tr>
<tr>
<td>Back</td>
<td>1 piece veneer ½&quot; x 30&quot; x 38&quot;</td>
</tr>
<tr>
<td></td>
<td>4 hinges and 2 dozen screws</td>
</tr>
</tbody>
</table>

### ARTICLES MADE WITH LATHE

#### COMBINATION BOOK END AND LAMP

<table>
<thead>
<tr>
<th>Part</th>
<th>Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base</td>
<td>2 pieces 2⅞&quot; x 5&quot; x 6&quot;</td>
</tr>
<tr>
<td>Barrel</td>
<td>1 piece 5&quot; x 5&quot; x 6&quot;</td>
</tr>
<tr>
<td>Candle Holder</td>
<td>Base—2 pieces 1¼&quot; x 8&quot; x 8&quot;</td>
</tr>
<tr>
<td></td>
<td>1 piece walnut 4&quot; x 4&quot; x 9&quot;</td>
</tr>
</tbody>
</table>

#### TABLE AND CUPBOARD COMBINATION

<table>
<thead>
<tr>
<th>Part</th>
<th>Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sides</td>
<td>2 pieces ¾&quot; x 11&quot; x 51&quot;</td>
</tr>
<tr>
<td>Top</td>
<td>1 piece ¾&quot; x 11&quot; x 30&quot;</td>
</tr>
<tr>
<td>Back</td>
<td>1 piece ¾&quot; x 30&quot; x 52&quot;</td>
</tr>
<tr>
<td>Door</td>
<td>1 piece ¾&quot; x 28½&quot; x 40&quot;</td>
</tr>
<tr>
<td>Leg</td>
<td>1 piece ¾&quot; x 12&quot; x 30&quot;</td>
</tr>
<tr>
<td>Shelves</td>
<td>4 pieces ¾&quot; x 10&quot; x 30&quot;</td>
</tr>
<tr>
<td></td>
<td>5 hinges and screws</td>
</tr>
<tr>
<td></td>
<td>1 bullet latch</td>
</tr>
</tbody>
</table>

#### BOOK RACK

For bill of material see detailed drawing.

#### GAME TABLE

<table>
<thead>
<tr>
<th>Part</th>
<th>Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base for Top</td>
<td>(Purchased) ¾&quot; x ¾&quot; x 64&quot;</td>
</tr>
<tr>
<td>Border</td>
<td>1 piece veneer ¾&quot; x 22&quot; x 22&quot;</td>
</tr>
<tr>
<td>Squares</td>
<td>4 pieces ¾&quot; x 4&quot; x 22&quot;</td>
</tr>
<tr>
<td>Inlays</td>
<td>1 piece 2½&quot; x ¾&quot; x 72&quot; dark wood</td>
</tr>
<tr>
<td>Legs</td>
<td>4 pieces 1½&quot; x 1½&quot; x 27½&quot;</td>
</tr>
<tr>
<td>Aprons</td>
<td>4 pieces ¾&quot; x 3½&quot; x 18&quot;</td>
</tr>
<tr>
<td>Aprons</td>
<td>4 pieces ¾&quot; x 1½&quot; x 14&quot; light wood</td>
</tr>
</tbody>
</table>

#### HOT LUNCH CUPBOARD

Size and design may vary.

#### KITCHEN WAGON

<table>
<thead>
<tr>
<th>Part</th>
<th>Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sides</td>
<td>2 pieces 9/16&quot; x 11½&quot; x 28&quot;</td>
</tr>
<tr>
<td>Shelves</td>
<td>2 pieces 9/16&quot; x 10&quot; x 23&quot;</td>
</tr>
<tr>
<td>Top</td>
<td>1 piece 9/16&quot; x 18&quot; x 32&quot;</td>
</tr>
<tr>
<td>Braces</td>
<td>4 pieces 9/16&quot; x 2&quot; x 10&quot;</td>
</tr>
<tr>
<td></td>
<td>4 pieces 9/16&quot; x 4&quot; x 4&quot;</td>
</tr>
<tr>
<td>Braces</td>
<td>4 pieces 9/16&quot; x 2¾&quot; x 3&quot;</td>
</tr>
<tr>
<td>Braces</td>
<td>4 pieces 13/16&quot; x 2&quot; x 11&quot;</td>
</tr>
<tr>
<td></td>
<td>4 rubber castors, molding or quarter round for top, glass and screws.</td>
</tr>
</tbody>
</table>
TOP OF BARREL SET IN 1/3 BELOW ENDS OF STAVES
SCRATCHED LINES
FELT FACING
COMBINATION BOOK END & LAMP
SMALL BRASS NAILS
HOLE FOR LEAD WEIGHT
3 1/2"
ARTICLES MADE WITH LATHE
BOOK RACK

DETAIL OF SMALL SHELVES
Saw across grain making perfect squares.
Shift newly cut strips and glue again.

Game Table
HOT LUNCH CUPBOARD

SIX PIECES

BOTTOM

TOP

SHELVES

TOP BACK PIECE

TOP CASING

CENTER AND SIDE CASINGS

BOTTOM CLEARANCE
### KITCHEN HELPS

#### TOWEL RACK
- Frame: 2 pieces $\frac{3}{4}'' \times 1'' \times 12\frac{3}{4}''$
- Hangers: 7 pieces $\frac{3}{4}'' \times 1\frac{1}{4}'' \times 24''$
- Dowel: 1 piece $\frac{3}{4}''$ diameter, 6'' long

#### KITCHEN LADDER
- Legs: 4 pieces $\frac{3}{4}'' \times 1\frac{1}{2}'' \times 31\frac{1}{2}''$
- Top: 1 piece $\frac{3}{4}'' \times 6\frac{3}{4}'' \times 12''$
- Supports: 2 pieces $\frac{3}{4}'' \times 5'' \times 9\frac{1}{4}''$
- Folding Legs: 2 pieces $\frac{3}{4}'' \times 4'' \times 28''$
- Braces: 1 piece $\frac{3}{4}'' \times 1\frac{1}{4}'' \times 4''$;
- Braces: 4 pieces bar iron $1/16'' \times \frac{3}{4}'' \times 5''$

#### STOOL
- Legs: 4 pieces $\frac{3}{4}'' \times 1\frac{1}{4}'' \times 31\frac{1}{4}''$
- Top: 1 piece $1'' \times 1\frac{3}{4}'' \times 12''$
- Steps: 2 pieces $\frac{3}{4}'' \times 2'' \times 24''$
- Folding Legs: 2 pieces $\frac{3}{4}'' \times 4'' \times 28''$
- Braces: 1 piece $\frac{3}{4}'' \times 2'' \times 18\frac{1}{4}''$
- 2 hinges and screws

#### LAWN CHAIRS
- Back: 1 piece $\frac{3}{4}'' \times 3\frac{3}{4}'' \times 37''$
- Back: 2 pieces $\frac{3}{4}'' \times 3\frac{3}{4}'' \times 35''$
- Back: 2 pieces $\frac{3}{4}'' \times 3\frac{3}{4}'' \times 33''$
- Seat: 10 pieces $\frac{3}{4}'' \times 3\frac{3}{4}'' \times 22\frac{1}{4}''$
- Arms: 2 pieces $\frac{3}{4}'' \times 6'' \times 27''$
- Back Legs: 2 pieces $\frac{3}{4}'' \times 2'' \times 12\frac{1}{4}''$
- Arm Braces: 2 pieces $\frac{3}{4}'' \times 2\frac{1}{4}'' \times 12\frac{3}{4}''$

#### MODERN END TABLE
- Top: 1 piece $\frac{3}{4}'' \times 14'' \times 28\frac{1}{4}''$
- Shelf: 1 piece $\frac{3}{4}'' \times 14'' \times 27''$
- Ends: 2 pieces $\frac{3}{4}'' \times 14'' \times 18''$
- Drawer Frame:
  - 2 pieces $\frac{3}{4}'' \times 2'' \times 26\frac{3}{4}''$
  - 2 pieces $\frac{3}{4}'' \times 2'' \times 14''$
- Drawer: 2 pieces $\frac{3}{4}'' \times 3\frac{3}{4}'' \times 26\frac{3}{4}''$
- 8 $\frac{3}{4}'' \times 3' \ dowels$
- Handles: 2 pieces $\frac{3}{4}'' \times \frac{3}{4}'' \times 4''$
- Drawer: 2 pieces $\frac{3}{4}'' \times 3\frac{3}{4}'' \times 12\frac{3}{4}''$
- Drawer Stop: 1 piece $\frac{3}{4}'' \times 3\frac{3}{4}'' \times 26''$
- Drawer Bottom: 1 piece $\frac{3}{4}'' \times 12'' \times 26''$
- (veneer)
- Braces: 2 pieces $1\frac{1}{4}'' \times 1\frac{3}{4}'' \times 7''$ split diagonally

#### STEPLADDER
- Front Legs: 1 piece $\frac{3}{4}'' \times 3\frac{3}{4}'' \times 12\frac{3}{4}''$
- Back Legs: 2 pieces $\frac{3}{4}'' \times 2\frac{1}{4}'' \times 12\frac{3}{4}''$
- Steps: $\frac{3}{4}'' \times 4'' \times 8'\frac{3}{4}''$
- Top: 1 piece $\frac{3}{4}'' \times 5'' \times 18''$
- Back Braces: 2 pieces $\frac{3}{4}'' \times 1\frac{3}{4}'' \times 12'\frac{3}{4}''$
- 1 Iron Rod: $\frac{3}{4}'' \times 16''$

#### PORCH SWING
Size and design may vary. Study picture shown.

#### SEWING CABINET
- Ends:
  - 2 pieces $\frac{3}{4}''$ or $\frac{3}{8}''$ veneer $12'' \times 17''$
- Sides:
  - 2 pieces $\frac{3}{4}''$ or $\frac{3}{8}''$ veneer $7\frac{1}{4}'' \times 13''$
- Tops:
  - 2 pieces $\frac{3}{4}''$ or $\frac{3}{8}''$ veneer $7'' \times 15\frac{1}{2}''$
- Base: 2 pieces $1'' \times 1'' \times 10''$
- Brace: 1 piece $\frac{3}{4}'' \times 1\frac{1}{4}'' \times 13''$
- Bottom: 1 piece $\frac{3}{4}''$ or $\frac{3}{8}'' \times 5\frac{1}{4}'' \times 13''$
- Handle: 1 piece $\frac{3}{8}'' \times 3'' \times 8''$
- Brace: 2 pieces $\frac{3}{8}'' \times 2'' \times 15\frac{1}{2}''$
- 2 turned knobs
- 4 small hinges
MODERN END TABLE

PERSPECTIVE MINING LIGHTENED TOP AND SHELVES ARE STAINED DARKER END AND SHELVES ARE STAINED DARKER

0 DOWELS
TOOL CHEST

Top and Bottom—
2 pieces ½" x 11" x 28"
Front and Back—
2 pieces ½" x 9" x 28"
Lid—2 pieces ½" x 2½" x 28"
Ends—2 pieces ½" x 9" x 10"
Lid—2 pieces ½" x 2½" x 10"

Saw Cleat—1 piece 2" x 3" x 10"
Drawer Brace—2 pieces ½" x 1" x 9"
Drawer Sides—4 pieces ½" x 2¼" x 10"
Drawer Sections—
8 pieces ½" x 1″ x 5½"
Drawer Braces—1 piece ½" x 1½" x 9"
2 hinges

MALLET

1 piece 1⅛" x 4" x 6½"
1 piece 1" x 1" x 9½"

UMBRELLA STAND

Braces—8 pieces ½" x 2¼" x 11"
Legs—4 pieces 1⅛" x 1¾" x 29"

RANGE MASH HOPPER

Roof—
Top and Ends—3″ x 2′.1″ x 5′.0″
Box—
Ends and Bottom—1 piece 3″ x 10" x 6'-6"
Sides of Box and Reel—1 piece 3″ x 6" x 12'-2"
Reel End—Scrap 4" x 4"
2 ½" bolts

MARTIN HOUSE

3 Floors, Roof, and Top Ends—1 piece 3″ x 24" x 7'-4"
Sides—1 piece 3″ x 6" x 12'-0"
Inside Partitions—1 piece 3″ x 6" x 8'-6"
Molding—1 piece 12"
DETAIL OF JOINT

UMBRELLA STAND
**RANGE MASH HOPPER**

Measurements and notes:
- Box: 9' x 10''
- Roof: 6' x 9''
- Stock: 4' x 1''
- Use bolt to assemble.

**MARTIN HOUSE**

- Typical section below roof: 6'' x 6'' x 6''
- Leave open for ventilation: 1''
- Drift screws from ledge into 1'' moulding.
- Roof is screwed on as is bottom.
ADVANCED EXERCISES

LAYING MASH HOPPER

Legs—1 piece \( \frac{3}{8}'' \times 1\frac{1}{2}'' \times 10'-8'' \\
Perch and Runners—1 piece \( \frac{3}{8}'' \times 1\frac{1}{2}'' \times 14'-0'' \\
Box—\\
  Ends and Bottom—1 piece \( \frac{3}{8}'' \times 7\frac{3}{4}'' \times 5'-2'' \\
  Sides and Partitions—1 piece \( \frac{3}{8}'' \times 6'' \times 7\frac{3}{8}'' \\
  Reel Sides—1 piece \( \frac{3}{8}'' \times 3'' \times 6'-0'' \\
  Reel End—Scrap—1 piece \( 4'' \times 4'' \\

WHEELBARROW

Frame—\\
  1 piece \( 1\frac{1}{8}'' \times 1\frac{1}{2}'' \times 4'-0'' \\
  1 piece \( \frac{3}{8}'' \times 3'' \times 10'-0'' \\
Legs—1 piece \( 1\frac{3}{8}'' \times 1\frac{1}{2}'' \times 3'-0'' \\
Sides, Bottom, Front—\\
  1 piece \( \frac{3}{8}'' \times 2'-0'' \times 6'-0'' \\

VANITY BENCH

Top—1 piece \( \frac{3}{8}'' \times 15\frac{1}{2}'' \times 26'' \\
Aprons—2 pieces \( \frac{3}{8}'' \times 4\frac{3}{8}'' \times 23\frac{3}{8}'' \\
Legs—2 pieces \( \frac{3}{8}'' \times 12\frac{3}{8}'' \times 18'' \\

WHEELED LAWN TABLE

Top—5 pieces \( 1\frac{1}{8}'' \times 5\frac{1}{4}'' \times 30'' \\
Braces—1 piece \( 1\frac{1}{8}'' \times 3'' \times 84'' \\
Wheels—4 pieces \( 1'' \times 10'' \times 10'' \\
Legs—4 pieces \( 3'' \times 3'' \times 17'' \\

STUDIO COUCH

1 piece \( \frac{3}{8}'' \times 16'' \times 76\frac{3}{8}'' \\
1 piece \( \frac{3}{8}'' \times 16'' \times 76\frac{3}{8}'' \\
2 pieces \( \frac{3}{8}'' \times 21\frac{1}{8}'' \times 35\frac{3}{8}'' \\
2 pieces \( \frac{3}{8}'' \times 27\frac{1}{2}'' \times 29\frac{1}{4}'' \\
2 pieces \( \frac{3}{8}'' \times 11\frac{1}{2}'' \times 27\frac{1}{2}'' \\
2 pieces \( \frac{3}{8}'' \times 11\frac{1}{2}'' \times 23\frac{3}{4}'' \\
2 pieces \( \frac{3}{8}'' \times 11\frac{1}{2}'' \times 21\frac{1}{4}'' \\
2 pieces \( \frac{3}{8}'' \times 13\frac{1}{2}'' \times 21\frac{1}{4}'' \\
2 pieces \( \frac{3}{8}'' \times 13\frac{1}{2}'' \times 21\frac{1}{4}'' \\
Stock \( \frac{3}{8}'' \times 2'' \times 50'-0'' \\

A BED IN A CABINET

1 piece \( \frac{3}{8}'' \times 16\frac{3}{8}'' \times 9'-2'' \\
2 pieces \( \frac{3}{8}'' \times 16\frac{3}{8}'' \times 9'-0'' \\
1 piece \( \frac{3}{8}'' \times 7\frac{3}{8}'' \times 9'-\frac{3}{8}'' \\
1 piece \( 1\frac{1}{8}'' \times 5'' \times 6'-4\frac{3}{8}'' \\
4 pieces \( 1\frac{1}{8}'' \times 5'' \times 4'-7\frac{1}{4}'' \\
1 piece \( \frac{3}{8}'' \times 8'' \times 6\frac{3}{4}'-4'' \\
3 pieces \( \frac{3}{8}'' \times 3'' \times 29'' \\
2 false doors \( \frac{3}{8}'' \times 24\frac{3}{8}'' \times 60\frac{3}{8}'' \\
8 false drawer fronts \( \frac{3}{8}'' \times 10\frac{3}{8}'' \times 15\frac{1}{32}'' \\
1 piece \( \frac{3}{8}'' \times 2\frac{3}{8}'' \times 9'-\frac{3}{8}'' \\
4 drawers \( 14'' \times 9'' \times 14'' \\
8 drawer pulls \\
2 false hinges \\
Standard spring, \( 43'' \times 6\'\) \\
Steel bar \( \frac{3}{8}'' \times 1\frac{3}{8}'' \times 5\'\) \\
\( \frac{3}{8}'' \) steel cable \( 18'' \\
2 window weights \\
4 large hinges
LAYING MASH HOPPER
WHEEL IRONS ARE MADE TO FIT WHEEL (APPROX. 15" x 3")

IRON STRAPS HOLD REMOVABLE SIDES IN PLACE

FRAME

SIDES, FRONT, & BACK - 3/4" THK.
VANITY BENCH

FRONT VIEW

END VIEW

Attach top with angle irons.
Length of table 3' to 5' as desired:

1 piece 1" x 24" x 48" (may get number of pieces together)
4 pieces ¾" x 6" x 31"
2 pieces 1" x 6" x 48"
2 pieces 1" x 12" x 48"
12 pieces ½" x 2" x 44¼"
2 pieces ¾" x 2¾" x 17"
2 pieces ¾" x 15" x 17"
8 pieces ¾" x 2¾" x 13"
2 pieces 1" x 3" x 22"

CE:
Top—1 piece ¾" x 18" x 36"
Front and Back—2 pieces ¾" x 15½" x 36"
Ends—2 pieces ¾" x 15½" x 18"
1 piece ¾" x 9" x 33½"
2 pieces ¾" x 2¼" x 33½"

D:
Bill of material will depend upon material used.

VANITY
Legs—4 pieces 1½" x 1½" x 26½"
Top—1 piece ¾" x 19½" x 43"
Apron—1 piece ¾" x 4" x 41"
Apron—2 pieces 1" x 2" x 15½"
Drawers—
2 standard drawers 3" x 18" x 22½"

FIVE-BOARD
Bottom—1 piece ¾" x 12" x 22½"
Front—2 pieces ¾" x 12" x 18"
Braces—1½" x 8"

MODERN FENCIN
Depends upon style and length

HELM LAMP
Base—1 piece 1½" x 8½" x 8½"
Upright—1 piece 4" x 4" x 9"

Base—1 piece ¾" x 3½" x 4½"
Handle—16 pieces 1" x 1" x 4
BREAKFAST NOOK
Length of table 3’ to 5’ as desired. Width 2’ to 2’-6” (2’-4” is listed here)
1 piece 1” x 24” x 48” (may glue a number of pieces together)
4 pieces ¾” x 6” x 31”
2 pieces 1” x 6” x 48”
2 pieces 1” x 12” x 48”
12 pieces ¾” x 2” x 44½”
2 pieces ¾” x 2½” x 17”
2 pieces ¾” x 1” x 15” x 17”
8 pieces ¾” x 2½” x 13”
2 pieces 1” x 3” x 22”

4 pieces 1” x 3” x 18”
2 pieces ¾” x 2½” x 44½”
1 piece ¾” x 4” x 27”
2 pieces ¾” x 5½” x 29”
1 piece ¾” x 2½” x 30”
1 piece 2” x 2” x 18”
12’ of molding
8 yds. burlap

CEDAR CHEST
Top—1 piece ¾” x 18” x 36”
Front and Back—
2 pieces ¾” x 15½” x 36”
Ends—2 pieces ¾” x 15½” x 18”

Bottom—1 piece ¾” x 16½” x 34½”
Rests—4 pieces 2” x 1” x 6½”
Handle—2 pieces 1” x 2” x 4½”

TRAY
1 piece ¾” x 9” x 33½”
2 pieces ¾” x 2¼” x 33½”

DOG HOUSE
Bill of material will depend upon size of house and kind of lumber, veneer or metal used.

VANITY DRESSING TABLE
Legs—4 pieces 1½” x 1½” x 26½”
Top—1 piece ¾” x 19½” x 43”
Apron—1 piece ¾” x 4” x 41”
Apron—2 pieces 1” x 2” x 15½”
Drawers—
2 standard drawers 3” x 18” x 15”

Brace—1 piece 1” x 1” x 40”
Braces (ends)—2 pieces 1” x 1” x 16½”
Drawer Rest—1 piece ¾” x 2” x 40”
Frames for mirrors—hinges—screws

FIVE-BOARD MODERN END TABLE
Bottom—1 piece ¾” x 12” x 22½”
Front—2 pieces ¾” x 12” x 18”
Braces—1½” x 8”

Short Side—1 piece ¾” x 12” x 11”
Long Side—¾” x 12” x 18”

MODERN FENCING FOR THE HOME GROUNDS.
Depends upon style and length of fence.

HELM LAMP AND AQUARIUM HOLDER

LAMP
Base—1 piece 1½” x 8½” x 8½”
Upright—1 piece 4” x 4” x 9”
Wheel—1 piece ¾” x 6½” x 6½”
Spokes—6 pieces 1” x 1” x 5”

AQUARIUM
Base—1 piece ¾” x 3½” x 4½”
Handle—16 pieces 1” x 1” x 4”
Wheel—2 pieces 2” x size to fit glass bowl
CEDAR CHEST

- Cut off lid after nailing box in form of 36" x 18" x 15".

- Lower and inside corner of handle is gouged.

- Section showing cut for finger hold to lift lid.

- Round all corners.
DETAILS OF FRAMEWORK

LAYOUT OF RAFTER
SHOWING ROOF SLOPE

DOG HOUSE
A FIVE BOARD MODERN END TABLE
MODERN FENCING FOR THE HOME GROUNDS

POSTS SET IN
CONCRETE
OF EARTH

8 FT. SECTIONS
KITCHEN

Legs—4 pieces 1¾” x 1¾” x 2’-5”
Top—1 piece 1” x 2’-0” x 3’-10”
Wings—2 pieces 1” x 8” x 3’-10”
Frame—2 pieces 1” x 5” x 3’-1½”
Frame—2 pieces 1” x 5” x 11’-7½”
Swing Cleats—2 pieces 1” x 5” x 5”, each cut diagonally

SEWING

4 pieces 1¾” x 1¾” x 29”
10 pieces ½” x 4” x 16¼”
1 piece ¾” x 14¾” x 28”
2 pieces ¾” x 3¼” x 11¼”
1 piece ¾” x 6¼” x 11¼”
1 piece ½” x 16½” x 11¼”
3 pieces 1” x 10¼” x 10¾”

CHEST

Upright—1 piece 1½” x 1½” x 49”
Legs—3 pieces ¾” x 9” x 12”

SPEW

Legs—4 pieces 2¾” x 2½” x 28”
Top, Hinged—1 piece 3¾” x 9½” x 38”
Top—1 piece ¾” x 9½” x 38”
Back—1 piece ¾” x 7½” x 35”
Sides—2 pieces ¾” x 7½” x 18”

MAIZE

2 pieces ¾” veneer x 7½” x 35”
Drawer of compartment 3/16” steel
Slide—1 piece ¾” x 16½” x 34½”

2 pieces ¾” x 1¾” x 16”
1 piece ¾” x 2¹/₄” x 31½”
Drawer stops, etc.
Steel dome tacks (8 required)
Felt disks ¾” diam. (6 required)
Hinges for top
drawer pulls
HOG HOUSE

See drawing for detail of framework. Siding or shiplap can be used for walls, Shingles or roofing paper.

KITCHEN WORKTABLE

Legs—4 pieces 1¾” x 1¾” x 2'-5”
Top—1 piece 1” x 2'-0” x 3'-10”
Wings—2 pieces 1” x 8” x 3'-10”
Frame—2 pieces 1” x 5” x 3'-11¾”
Frame—2 pieces 1” x 5” x 11'-7¾”
Each cut diagonally

Swing Cleats—2 pieces 1” x 5” x 15½”

Bread Board—1 piece ¾” x 17” x 15½”
Drawer Support—
1 piece ¾” x 3” x 14½”

Drawer Rest—2 pieces ¾” x 3” x 15”
Drawer Rest—1 piece ¾” x 3” x 14”

SEWING CABINET

Legs—4 pieces ½” x 4” x 16½”
1 piece ½” x 14½” x 28”
2 pieces ¾” x 3½” x 11½”
1 piece ¾” x 6½” x 11½”
1 piece ¾” x 16½” x 11½”
3 pieces ¾” x 10½” x 10½”

10 pieces ½” x 4” x 16½”

4 pieces ¾” x 3½” x 11½”
2 pieces ½” x 3½” x 11½”
1 piece ½” x 6½” x 11½”
2 pieces ½” x 6½” x 11½”
3 pieces ¾” x 1½” x 12½”
1 piece 1½” x 1½” x 12½”

4 pieces 1¼” x 1¾” x 29”

2 pieces ½” x 3½” x 11½”

1 piece ½” x 8” x 13”

Chair Lamp

Upright—1 piece 1½” x 1½” x 49”
Legs—3 pieces ¾” x 9” x 12”

Arm—1 piece ¾” x 8” x 13”

SPINET DESK

Legs—4 pieces 2½” x 2½” x 28”
Top, Hinged—1 piece ¾” x 9½” x 38”
Top—1 piece ¾” x 9½” x 38”
Back—1 piece ¾” x 7½” x 35”
Sides—2 pieces ¾” x 7½” x 18”

Front Rail—1 piece ¾” x 3” x 35”
Side Rail—2 pieces ¾” x 2½” x 14”
Drawer Slides—2 pieces ¾” x ¾” x 16”
Leg Block—2 pieces 1½” x 2½” x 17”
Drop Front—1 piece ¾” x 4½” x 35”

COMPARTMENT

2 pieces ¾” veneer x 7½” x 35”

Drawer of compartment 3/16” stock
Slide—1 piece ¾” x 16½” x 34⅛”

6 pieces ¾” veneer x 3¼” x 7½”

MAIN DRAWER

2 pieces ¾” x 1½” x 16”
1 piece ¾” x 2½” x 31½”

1 piece ¾” x 1½” x 31½”
1 piece ¾” veneer x 16” x 31”

Drawer stops, etc.
Steel dome tacks (8 required)
Felt disks ¾” diam. (6 required)
Hinges for top
Drawer pulls
Erect frame after planks are spiked to runners.

Framework for movable hog house.

The drawer and bread board need not be included. Sizes may be changed to fit various wants.
KITCHEN WORKTABLE

THE DRAWER AND BREAD BOARD NEED NOT BE INCLUDED
SIZES MAY BE CHANGED TO FIT VARIOUS WANTS

DROP LEAF BRACES ARE HINGED
SEWING CABINET & CHAIR LAMP

Perspective drawing showing construction
COMBINATION TELEPHONE STAND

1 piece ¾" x 3" x 44"
2 pieces ¾" x 3" x 16½"
1 piece ¾" x 3" x 11"
2 pieces 1½" x 3½" x 5½"
1 piece ¾" x 3" x 14"
1 piece ¾" x 2¼" x 19½"
1 piece ½" x 2½" x 28½"
1 piece ¾" x 2½" x 23½"
2 pieces ¾" x 2" x 22"
1 piece ½" x 4" x 4" cut diagonally
1 piece ½" x 5" x 10"

1 piece ¾" x 16" x 26"
2 pieces ¾" x 16" x 11½"
1 piece ¾" x 10½" x 16"
2 pieces ¾" x 10½" x 10½" (veneer)
1 piece ¾" x 2¼" x 12"
2 pieces ½" x 2½" x 14"
1 piece ¾" x 2½" x 9½"
9 7¼" coil springs
3½" x 11½" webbing
Upholstering material

WRITING DESK

Small Compartment Tops
1 piece ½" x 6" x 18"
Top—1 piece ½" x 20½" x 40"
Legs—4 pieces 1½" x 29½"
Front Rail Braces—
2 pieces ¾" x 4½" x 4½"
Standard Drawers
2 drawers
2 drawers
1 drawer
2 drawers

Length Width Depth
18" x 8" x 3"
18" x 8" x 4"
18½" x 18" x 3½"
7½" x 7" x 2½"

WORK BENCH

Legs—4 pieces 2" x 6" x 34"
Top—3 pieces 2" x 10½" x 8½"
Apron—2 pieces 2½" x 10½" x 13½"
Vise—1 piece 2½" x 6½" x 32½"
Frame—2 pieces 2½" x 4½" x 8½"
1 screw vise
Drawer material if wanted:
2 pieces ¾" x 4½" x 16½"
2 pieces ¾" x 4½" x 30½"
1 piece ¾" x 16½" x 30½"

SELF FEEDER

Roof—1 piece ½" x 12½" x 5½"
Sides—1 piece ½" x 10½" x 10½"
Bottom—1 piece ½" x 8½" x 5½"
Ends—1 piece ¾" x 8½" x 10½"
1 pair 1½" butt hinges
Partition—1 piece ¾" x 8½" x 5½"
Lip—1 piece ¾" x 3½" x 5½"

ROUND TOP TABLE

Top—1 piece 1½" x 27½" x 27½"
Rail—3 or 4 pieces ¾" x 3½" x 30½"
Legs—3 pieces 2" x 2½" x 26½"
Braces—2 or 4 pieces 1½" x 4½" x 20½"

CHAIR

Back Legs—2 pieces 1½" x 4½" x 38½"
Front Legs—2 pieces 2½" x 2½" x 20½"
Frame—1 piece 1½" x 2½" x 5½"
Top Brace—1 piece 1½" x 3½" x 15½"
Back Rest—1 piece ¾" x 5½" x 17½"
Bottom Braces—
1 piece 1½" x 1½" x 16½"
2 pieces 1½" x 1½" x 18½"
COMBINATION TELEPHONE STAND

MEASURE ABOVE SOCKET AND DIAL FOR ADJUSTMENT. CONTROL AND DIAL ARE WHERE INDICATED. Build up covering twice and place back.

COOPERATIVE EXTENSION SERVICE
### LIBRARY TABLE

<table>
<thead>
<tr>
<th>Component</th>
<th>Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top</td>
<td>1&quot; x 28(\frac{3}{4})&quot; x 47(\frac{3}{4})&quot;</td>
</tr>
<tr>
<td>Legs</td>
<td>4 pieces 2(\frac{3}{4})&quot; x 2(\frac{3}{4})&quot; x 30&quot;</td>
</tr>
<tr>
<td>Stretcher</td>
<td>1 piece 2(\frac{3}{4})&quot; x 6&quot; x 43&quot;</td>
</tr>
<tr>
<td>Front and Back Rails</td>
<td>2 pieces 2(\frac{3}{4})&quot; x 3(\frac{3}{4})&quot; x 43&quot;</td>
</tr>
<tr>
<td>Side Rails</td>
<td>1 piece 4(\frac{3}{4})&quot; x 22&quot; x 22&quot;</td>
</tr>
<tr>
<td>Legs (Drawing)</td>
<td>1 piece 2(\frac{3}{4})&quot; x 2(\frac{3}{4})&quot; x 24&quot;</td>
</tr>
<tr>
<td>Side Rails (Bottom)</td>
<td>2 pieces 2(\frac{3}{4})&quot; x 2(\frac{3}{4})&quot; x 24&quot;</td>
</tr>
<tr>
<td>Back</td>
<td>1 piece 2(\frac{3}{4})&quot; x 2(\frac{3}{4})&quot; x 22(\frac{3}{4})&quot;</td>
</tr>
</tbody>
</table>

### MODERN DESK

<table>
<thead>
<tr>
<th>Component</th>
<th>Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top</td>
<td>1&quot; x 16&quot; x 34&quot;</td>
</tr>
<tr>
<td>Side Panels</td>
<td>2 pieces 2(\frac{3}{4})&quot; x 16&quot; x 29&quot;</td>
</tr>
<tr>
<td>Shelves</td>
<td>3 pieces 2(\frac{3}{4})&quot; x 12&quot; x 15(\frac{3}{4})&quot;</td>
</tr>
<tr>
<td>Front and Back</td>
<td>2 pieces 2(\frac{3}{4})&quot; x 3(\frac{3}{4})&quot; x 20(\frac{3}{4})&quot;</td>
</tr>
<tr>
<td>Sides</td>
<td>2 pieces 2(\frac{3}{4})&quot; x 3(\frac{3}{4})&quot; x 14(\frac{3}{4})&quot;</td>
</tr>
<tr>
<td>Legs</td>
<td>2 pieces 2(\frac{3}{4})&quot; x 2(\frac{3}{4})&quot; x 28(\frac{3}{4})&quot;</td>
</tr>
</tbody>
</table>
| Drawer             | 1 piece 2\(\frac{3}{4}\)" x 3" x 28\(\frac{3}{4}\)"
| Back               | 1 piece 2\(\frac{3}{4}\)" x 3\(\frac{3}{4}\)" x 19\(\frac{3}{4}\)" |
| Bottom             | 1 piece 2\(\frac{3}{4}\)" veneer x 13" x 19\(\frac{3}{4}\)"
|                    | 2 pulls for drawer |

### PIANO BENCH

<table>
<thead>
<tr>
<th>Component</th>
<th>Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Legs</td>
<td>4 pieces 1(\frac{1}{4})&quot; x 1(\frac{3}{4})&quot; x 19(\frac{3}{4})&quot;</td>
</tr>
<tr>
<td>Bottom Braces</td>
<td>2 pieces 3(\frac{3}{4})&quot; x 2&quot; x 12&quot;</td>
</tr>
<tr>
<td>Side Rails</td>
<td>2 pieces 2(\frac{3}{4})&quot; x 4(\frac{3}{4})&quot; x 33&quot;</td>
</tr>
<tr>
<td>End Rails</td>
<td>2 pieces 2(\frac{3}{4})&quot; x 4(\frac{3}{4})&quot; x 12&quot;</td>
</tr>
<tr>
<td>Stretcher</td>
<td>1 piece 4(\frac{3}{4})&quot; x 3&quot; x 35&quot;</td>
</tr>
<tr>
<td>Top</td>
<td>1 piece 4(\frac{3}{4})&quot; x 16&quot; x 38&quot;</td>
</tr>
<tr>
<td>Bottom</td>
<td>1 piece 4(\frac{3}{4})&quot; or 4(\frac{3}{4})&quot; x 12&quot; x 33&quot;</td>
</tr>
</tbody>
</table>

### RADIO END TABLE

<table>
<thead>
<tr>
<th>Component</th>
<th>Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Legs</td>
<td>4 pieces 2(\frac{3}{4})&quot; x 4(\frac{3}{4})&quot; x 26(\frac{3}{4})&quot;</td>
</tr>
<tr>
<td>Top</td>
<td>1 piece 2(\frac{3}{4})&quot; x 14(\frac{3}{4})&quot; x 24(\frac{3}{4})&quot;</td>
</tr>
<tr>
<td>Shelf</td>
<td>1 piece 2(\frac{3}{4})&quot; x 11(\frac{3}{4})&quot; x 25&quot;</td>
</tr>
<tr>
<td>Apron</td>
<td>2 pieces 2(\frac{3}{4})&quot; x 4&quot; x 21&quot;</td>
</tr>
<tr>
<td>Side Panels</td>
<td>2 pieces 2(\frac{3}{4})&quot; x 13(\frac{3}{4})&quot; x 18&quot;</td>
</tr>
<tr>
<td>Back</td>
<td>2 pieces 2(\frac{3}{4})&quot; x 11(\frac{3}{4})&quot; x 9&quot;</td>
</tr>
<tr>
<td>Apron</td>
<td>8 (\frac{3}{4})&quot; x 1(\frac{3}{4})&quot; dowels</td>
</tr>
</tbody>
</table>
SECTIONAL VIEW SHOWING JOINT OF LEG AND RAILS

LIBRARY TABLE
PIANO BENCH

CORNER JOINT

LOWER CENTER JOINT

VEINER

BRASS HINGES

DOWELS
PLASTICS

Plastic materials are now available in many forms. Attractive articles can be made out of plexiglass, lucite and other forms of plastic materials.

Saws, drills and machine tools are used in making various forms and patterns. Wooden jigs should be constructed and used to shape the heated plastic.

Suggestions for handling plastics:

1. Plastic sheets are protected with a tough paper. This should be left on as long as possible.
2. Cut the large sheets into desirable dimensions stock.
3. Scribing may be done on the surface with a sharp instrument.
4. Threading can be done without chipping, if care is taken not to remove too much material at once. Keep the plastic cool.
5. Forming. Since it is thermoplastic, plastics become soft and pliable when heated to 220 to 275 degrees Fahrenheit. At this stage, they can be bent to any shape. When the material cools, it retains the shape to which it is bent. This form plastic will, however, reverse to its original flat shape when reheated to the above temperature.
6. Heating is done in ovens which may be regulated within 220 to 275 degrees Fahrenheit. Forms may be hung vertically or placed on trays with asbestos cloth bottoms. A kerosene stove oven will be satisfactory for small work. In an emergency, an electric hot plate may be used, but the plastic should not come in contact with the heating element.
7. Cementing. With care and practice, it is possible to obtain a cemented joint, which will closely approximate the plastic itself. Most cementing is done by the soak method, which consists of placing one of the two pieces to be cemented into the cement for about three to five minutes or until a cushion is formed. Upon removal, the soaked surface is pressed against the opposite dry surface. The excess cement forms a smaller second cushion that makes a firm contact. A good cement is the 1A, a 50-percent mixture of Monomeric and Methyl Methacrylate. The viscous cement is better for amateurs and is made by adding a small amount of plastic to cement 1A. The viscous cement is used similarly to glue. Place a small amount on each surface – press together firmly and let dry.
8. Polishing. Scrape edges with scouring powder, bringing out the luster.
9. Coloring. Dyes may be used to various shades. Plastics can be coated with colored enamels.

WOOD

The amateur craftsman will probably choose solid and veneer, but he is provided with gum wood, maple, beech, birch and exotic and oriental veneers such as rosewood, mahogany, walnut and mahogany. In the solid wood classification, birch is considered to be the most suitable for their staunchness and ability to withstand continued drying, but recognizeable and is the lowest cost wood. Therefore, we also treat the finishing of the furniture of the above-mentioned qualities than all others.

We cannot treat the finer details of wood finishing, for the junior craftsman must learn how to refinish the furniture of the hard woods. We also treat the finishing of the furniture of the above-mentioned qualities than all others.

We classify the types of finishing, for the junior craftsman must learn how to refinish the furniture of the above-mentioned qualities than all others.

Period furniture is "classical" in the sense of the sanding of the coats, and the simplicity, yet elegance typical to it. The sanding of the coats, and the simplicity, yet elegance typical to it.

*By Fred A. Brown of the Dutch Furniture Institute.
8. Polishing. Scrape edges with a sharp knife to remove saw marks. Use scouring powder, simonize cleaner, or rubbing compound to bring out the luster.

9. Coloring. Dyes may be used to change the colorless plastic to various shades. Plastics can, however, be bought in all colors.

WOOD FINISHING*

The Woods

The amateur craftsman will find many woods available, both in solid and veneer, but he is probably chiefly concerned with finishing on gum wood, maple, beech, birch, and solid walnut rather than the exotic and oriental veneers such as the furniture manufacturer uses.

In the solid wood classification we recommend maple, beech and birch for their staunchness and ability to withstand moisture and continued drying, but recognize also that gum wood is easily available and is the lowest cost wood of all. The junior craftsman will probably use the above-mentioned woods in a much greater proportion than all others.

We cannot treat the elements of finishing without considering refinishing, for the junior craftsman, if he learns nothing else but to refinish the furniture of the home, has accomplished a great deal. Therefore, we also treat the finishing of veneered surfaces, including walnut and mahogany. In nearly all cases the finishing procedure is similar, but with many of the solid woods operations such as filling are omitted, making for simple application of finishing coats.

Types of Finish

We classify the types of finish as antique, period, modern, and enamel. Of these the antique is by all means the most interesting, because of the softness of luster, the shaded antique appearance that one produces, and the simplicity, yet the artistry of this type of finish.

Period furniture is "classically well done". We mean it is simply "tops" for wood finishing, and the filling and staining of the wood, the sanding of the coats, and the rubbing out of the finishing coat are of the greatest importance.

*By Fred A. Brown of the Dutch Kraft Corp.
The modern type is different, because it is used as a type of finish to bring out the beauty of fancy woods—particularly light treatments of those woods—and the finish in its final coat is highly polished to produce a mirror-like appearance. On many woods this type of finish will look tawdry and cheap, whereas on the finer, more exotic veneered woods, it will produce richness matched by no other wood nor finish.

The last division which we make of finishes is the enamel type finish, which is produced on any or all woods by undercoating and enamel, to obtain, as desired, a satin or high gloss finish. There is no beauty such as the beauty of color, yet the American public for several years has rejected this type as a finish for house furnishings. If it still exists, it exists in a minority, so only old furniture to be refinished should be to any degree considered as enameled furniture.

The Undercoats

To produce correctly finished furniture, one must keep in mind at all times that no job is worth doing that is not worth doing well, and even though the time and effort seem tremendous for the results obtained, patience will reward the young finisher who goes slowly at his work and proceeds with caution.

Individual Third Year Articles.
The Surface

Of the many elements of wood finishing, probably the most important in making for success is a smooth surface. After the article has been constructed, the hardest work is still ahead, that of scraping, planing, sanding, and polishing to a smooth, clean surface, without an irregularity, with all holes and dents patched up, and grease spots and oil and wax removed. If glue has been used, the excess glue must be removed by a scraper, sandpaper, or a razor blade. Grease spots and other discolorations from oily or sweaty compounds can be taken out with a cloth dipped in benzine or gasoline. Sometimes indentures spoil the surface, and a piece of wet muslin can be wrung out and laid on the dented surface, and then treated with a hot pressing iron. This light pressing operation oftentimes swells the wood sufficiently to draw the indenture out. Sandpapering will then level the surface which was injured.

Cracks

Crack filling is difficult and takes patience and time, but this preparation of the wood surface is so important that the operation must be carefully done. Sometimes a large hole, or a knot hole which has to be removed, can be plugged with a piece of wood cut to fit the size and glued in with any ordinary glue mixture. Sandpapering with a block will oftentimes level this to the main surface. A simple crack filler may be compounded at home, using one part of cornstarch, one part of ordinary wheat flour, and one part of linseed oil. A small portion (¼ to 1 part) of Japan drier, or any other varnish or paint drier, will make this mixture fill, adhere, and dry nicely, yet without too much resistance to water or oil stain.

When this type of crack filling is accomplished, an excess of crack filler must be deposited on the wood, then with fine sandpaper and a block, leveled so it matches perfectly the surface of the wood.

The junior craftsman is cautioned that whereas a piece of glass with a straight edge is a fine scraping surface, it is also dangerous. Likewise, the handling of a razor blade must be attended with utmost caution. No crueler weapon can be put in the hands of a youth than a razor blade or a sharp piece of glass. With the surface smooth, clean, and polished, without indentures or bruises, we are ready for the first finishing operation.
Water Stains

Almost all woods should be stained. While there are many types of coloration mixtures for wood pores, none exists which is more perfect for the amateur craftsman than water stain. Dispensed by manufacturing firms in dry powder, these materials, when put in solutions ranging from one teaspoonful to four teaspoonfuls per gallon of water, produce varied dye effects for all types of wood.

Without adequate weighing devices, care must be taken to get formulas worked out on some suitable basis, and we suggest the teaspoon as the measuring device. A teaspoon can be measured easily and leveled with a knife to almost the same accuracy as can be obtained with a chemical balance.

Combinations of basic stains, such as mahogany, a walnut, and a yellow maple stain, will produce any desirable color, and the penetration and concentration on the wood is regulated by the number of teaspoonfuls to the gallon of warm water, or the manner in which it is applied by the user, who may allow it to lay upon the wood surface wet, or can, at his discretion, wipe it quickly with rags, waste, or some other wiping medium.

Oil Soluble Stains

The second type of stain recommended for this work is the prepared oil stain solutions. These are simple to use. They dry almost instantly, and while they do not produce permanent, non-fading coloring, the ease of application, the lack of difficulty in storing, and the rapidity of drying recommend their use.

With water stain a fuzziness, or grain raise will be noted, which must be reduced with additional light sanding, but with the oil stain, no grain raise occurs. This advantage held by oil stains is offset to some degree by another fault, as on some woods, notably gum and tupelo, a peculiar distribution of color is effected, and clear, attractive staining is sometimes almost impossible.

The amateur is cautioned that the end grain of wood will absorb much more stain than the smooth, flat surfaces. Half strength stain should be used on edges, end grain, and turnings, because it is always better to use several lightly applied coats of stain than one single heavy application. The color in this way is much more evenly distributed, and the only mistake that can be made is that the wood is stained too lightly. When it is stained too darkly, the mistake cannot often be remedied.

The next operation concerns such as walnut, mahogany, some which have on the surface a perfect finishing. Paste wood if the stain has properly dried, and filler with V. M. P. naphtha, gas ency, so it can be brushed into a thin coat of shellac — half shellac and sanded before the filler is applied parallel to the grain, with the filler must be brushed well into a finish will become sunken, or flat. Ation is complete, the solvents be minutes is usually necessary for a flatness is apparent. Then a wax, or soft paper toweling, is use filler paste is wiped off. The finish with care so none of the excess face, and if possible, cotton was This is a very important operation; otherwise, the work when or entirely unsatisfactory.

Filler must be allowed at least sphere. If cabinet work is filled in sufficiently well to withstand the and will later on shrink, leaving.

For the old world antique filling is not required, and a the may be used.

Caution must be used to prev-paste filler. Better filling is acco than a heavy one. Many woods filling is required. This must be the first filling, with a thinner fill intervening before finishing coat.

As a general rule the follow mahogany, birch, poplar, cherry,
Filling

The next operation concerns only those woods which are porous, such as walnut, mahogany, some types of birch, and oriental woods, which have on the surface a pore which requires filling to permit of perfect finishing. Paste wood fillers are used over the stain (after the stain has properly dried), and the usual procedure is to reduce the filler with V. M. P. naphtha, gasoline, or turpentine to a thin consistency, so it can be brushed into the pores. (If an oil stain is used, a thin coat of shellac — half shellac and half alcohol — should be applied and sanded before the filler is applied.) The first brushing movement is parallel to the grain, with the final movement across the grain. The filler must be brushed well into the pores of the wood, otherwise the finish will become sunken, or flattened out and dull. After this operation is complete, the solvents begin to evaporate, and between 10 and 20 minutes is usually necessary before all solvent evaporates out and a flatness is apparent. Then a wiping process, using rough cloth, burlap, or soft paper toweling, is used in a circular motion, and the excess filler paste is wiped off. The final wiping of the filler must be done with care so none of the excess filler is allowed to remain on the surface, and if possible, cotton waste or soft toweling is recommended. This is a very important operation and must be done slowly and with care; otherwise, the work when completed will look cloudy, muddy, or entirely unsatisfactory.

Filler must be allowed at least 24 hours to dry in a warm atmosphere. If cabinet work is filled in a cold room, the filler may never dry sufficiently well to withstand the solvent attack of the finishing coats and will later on shrink, leaving a hungry, open-pored finish.

For the old world antique finish, or the English oak finish, perfect filling is not required, and a thinner solution of filler and solvent may be used.

Caution must be used to prevent the use of too heavy a mixture of paste filler. Better filling is accomplished with a thin mixture, rather than a heavy one. Many woods have such an open pore that a second filling is required. This must be accomplished in the same manner as the first filling, with a thinner filler being used, and another 24 hours intervening before finishing coats may follow.

As a general rule the following woods require filling: Walnut, mahogany, birch, poplar, cherry, oak, and any of the imported orien-
tal, South African, or Indian woods. Woods which in general do not require filling are maple, beech, gumwood, pine, sycamore, basswood, and cottonwood.

The amateur craftsman should always select a wood filler which has a slightly darker color than the stained color of the wood. The lighter filler causes a bleached-out appearance, whereas a darker one sharpens the color and accentuates the grain of the wood. In general, one mahogany filler, one walnut filler, and one natural filler will suffice, with blends of these various colors being produced to suit the color requirement.

Care must be used in the picking out of corners, joints, and crevices so no muddiness will be found later on when the finishing coats have been applied. The cleaning up of the filling operation is arduous but necessary.

The Materials

For the amateur, whose equipment is limited and whose finishing shop may be a barn, a cellar, or a spare room, we select those materials which will produce the best finish under those circumstances.

It is, therefore, appropriate to discuss very briefly nitrocellulose lacquer finishes, because while they are recognized among furniture finishes as the best, due to many of their fine characteristics — to the amateur they will only provide opportunities for trouble. It is to be recommended that all lacquer finishes be eliminated from the list of supplies which the amateur intrepidus for proper application an lead to difficulty.

White shellac should always be over-coating brings poor drying, edges and lap streaks. It must be flowed out as are varnishes. A thin between coats and steel wooled to a hard polishing wax. The results on high grade furniture.

Much mention is made of wax projects, and it is difficult to record. Commonly known floor waxes, square are generally acceptable. The type dissolved or suspended in a turpentine emulsion waxes are not the type to Caution must be used with the application. much may be applied or too great time. Small areas smeared on and results in the long run. Whereas under warm conditions, it is a fluid plied in the direct rays of the sun. It will harden too rapidly and appears smooth and even.
supplies which the amateur intends to use. They require spray apparatus for proper application and if used without experience, always lead to difficulty.

**White Shellac**

In a contrary fashion, white shellac is recommended for almost all interior finishing work. While the waterproofness and wearing ability of resin varnishes is far superior to that of white shellac, the ease of application, the quick drying, the freedom from dirt, and the manner in which shellac may be sanded and waxed, recommend it as the No. 1 material of the amateur craftsman. Shellac is sold in a 4 or 4½ pound to the gallon cut of shellac gum in denatured alcohol. Its thinner, therefore, is denatured alcohol of almost any type. It is readily available, brings out the true color of the stain, dries to a dull satiny luster, may be sanded within four to six hours, and when waxed freely, produces a fairly waterproof, durable coating.

White shellac should always be brushed out in a thin coating, as over-coating brings poor drying, possibilities of checking, and heavy edges and lap streaks. It must be brushed quickly and cannot be flowed out as are varnishes. A two-coat shellac finish, sanded down between coats and steel wooling on the final coat may be waxed with a hard polishing wax. The resultant finish will be perfectly acceptable on high grade furniture.

**Wax**

Much mention is made of waxes in the finishing of furniture objects, and it is difficult to recommend any particular type of wax. Commonly known floor waxes, sold under often-heard trade names, are generally acceptable. The type of wax to be used is wax compound dissolved or suspended in a turpentine or naphtha solution. Water emulsion waxes are not the type to be used for this protective coating. Caution must be used with the application of hard waxes, because too much may be applied or too great a surface may be attempted at a time. Small areas smeared on and lightly polished will produce better results in the long run. Whereas finishes should always be applied under warm conditions, it is a fact that waxes should never be applied in the direct rays of the sun or where too much heat is present. It will harden too rapidly and become sticky, so the work never appears smooth and even.
Varnishes

The varnishing processes are many, and the chief choice which the amateur must make is in the type of varnish to be used. Even a beginner has no difficulty in flowing out a good varnish, his only mistake being that he applies too heavy a coat, that he does not pick up his laps and runs and sags properly. Varnishes normally do not set for 20 to 30 minutes after application, and, therefore, touching up of runs and sags is easy. Varnish, however, must be applied in thin coats in order to prevent checking and poor drying. When a varnish dries on top and the coating is heavy, we call that "top drying" and the surface will check or crack within a short time. A good rule to apply is "Always put on the lightest and thinnest coating possible". Three thin coats produce a good job, whereas two heavy coats may produce a ruinous job.

Long, steady strokes produce good work in varnishing, and the rapidity and smoothness of the stroking of the brush usually marks the good varnisher. When air bubbles arise and a foaming is present, it indicates too much pressure and too much bending of the brush across its bristles. Light application is desirable rather than heavy.

Varnishes of all types are manufactured for the amateur. We recommend for interior woodwork a satin sheen flat varnish. This type dries out to a dull finish upon being allowed to dry 24 hours, and oftentimes will present a beautiful finish without any rubbing, steel wooling, polishing, or the like.

Exterior Varnishes

For exterior work, one must consider what is known as spar varnish, a long oil varnish, which will present resistance to moisture, the attack of the sun, and all weathering conditions. The term "long oil" also means slow drying, and the tougher, more resistant the spar varnish is, the slower it usually dries. Forty-eight hours between coatings of this type of varnish is quite normal, whereas the interior varnishes can be readily dried in 24 hours for recoating. Varnishes for window sills, casings, doors which open outside, exterior appliances, and the like must always be finished in spar varnish.

Floors must always be finished in especially constructed varnishes made to withstand the wear and tear which a floor varnish experiences.

Semi-flat or dull varnishes are made expressly for furniture use, and using any of the types of varnish use will endanger the resistance.

When varnishes become hot turpentine, and when turpentine, naphtha or gasoline may be used while stirring. If the varnish does not dry, the room is too full of moisture. When a very small amount of grease, soot, moisture or sweat of the palm is of utmost importance that an other than a clean, bright, naphtha or gasoline and sandeb.
using any of the types of varnishes for a purpose other than its intended use will endanger the resistance or the beauty of the object coated.

When varnishes become heavy with age, their reduction fluid is turpentine, and when turpentine is not available, a small amount of naphtha or gasoline may be worked into the solution, if slowly added while stirring. If the varnish does not flow, turpentine must be added. If it does not dry, the room atmosphere is not sufficiently warm or is too full of moisture. When varnish is applied over old surfaces, a very small amount of grease, soap, water, or dirt of any kind, including moisture or sweat of the palms, will bring about poor drying, so it is of utmost importance that any surface to be recoated with varnish, other than a clean, bright, new surface, be carefully washed with naphtha or gasoline and sanded before the recoating process.

Enamels

The final materials to be considered are those used in the painting of interior surfaces. We use the term "paint" as applying to any vehicle which contains pigment and which produces a solid covering material. For the amateur's particular usage, it would concern undercoating and enamel. The two go hand in hand and enamel should never be applied to new surfaces without first the undercoating.

To produce a smooth, finished appearing job over a wood which has a pore, the first application must be that of wood filler; the second an undercoat; the third the vigorous use of sandpaper to produce a smooth, flush finish; and the fourth and fifth the enamel. Of all finishing procedures where a brush is used, the hardest for the amateur to get perfect results with is enameling. The most important feature of this work is the preparation of the unseen surfaces. Using a smooth, well-sanded wood, it is absolutely necessary to first obtain—

1. Sealing, to prevent suction and flat spots,
2. Covering, to get evenness of color distribution,
3. Elimination of all grain or sanding marks, and
4. Adhesion, through the use of an undercoating.

An undercoat is similar to an enamel except that it dries hard and contains a great amount of pigment which sands easily. When the undercoat has been used and sanded properly, the before-mentioned qualities and conditions are met successfully, and the remainder of the work is only to apply one or two coats of enamel in very thin,
perfectly-brushed-out coatings. On a flat surface this can be accomplished with ease, but on an upright surface sagging, runs, crawling, and all of the difficulties imaginable occur. Therefore, the greatest of care must be used in enameling any object whether it be new or old.

Only experience can help the amateur, so we warn him of these difficulties and hope that he can find them early enough in his work to avoid them later on.

An additional warning which is necessary for the amateur is that in the process of undercoating in an enamel finish, fine sandpapering with the finest of sandpaper is oftentimes as important as the brushing. We caution that the finest scratch shows up magnified in the mirror-like gloss of the finishing coat.

**Brushes**

The materials discussed in this chapter are actually the materials of wood finishing, and constitute the final protective and beautifying coats. No finish is complete without them, yet they cannot be applied without one more medium, which causes success or failure—the brush. As aforementioned and often repeated, if the job is worth doing, it is worth doing well. Oftentimes the brush is the instrument which marks the difference between a good job and a poor one.

Brushes are somewhat like human individuals, and they must be well taken care of or poor results will reward the effort. When the surface dries out and indicates the presence of a large amount of dirt, one is apt to believe that the room atmosphere was full of dust and dirt particles, when often the dirt has been applied through the medium of the brush. Successful finishers always take care of their brushes, just as a good carpenter takes care of his chisels, knives, and planes. A brush which has been neglected will require hours of work to be put into serviceable condition again, and usually falls short of good performance even though cleaned carefully and arduously.

The brush must always be washed carefully (even a new brush must be washed in warm water and allowed to dry before being used), and it is important that the proper medium for cleaning the brush be used at all times. The rubber-set type brush with long bristles will probably produce the best work if properly treated. A brush container may be easily constructed, using an empty can, with supports created on the edges so the brush can dangle into the can without the bristles touching the sides or bottom. Sometimes drilling a hole through the handle will make this appliance work perfectly, and while several types of containers have been varnishers, any one which keeping the bottom of the can will

If a so-called “liquid brush

half pine oil and half kerosene

Before using the brush again, and wiped dry.

Before a brush used in va

should be washed in turpentine soap. The excess water should wrapped around the brush, all the edge of the paper. A brush soft, clean, and ready for use. / fully in denatured alcohol until from the brush. It should then dried carefully, and wrapped i

It is to be recommended t

of finishing: One brush for s

filling, one brush for shellackin; cleaned brushes for varnishing

Painting protects the wood which conceals the surface entirely on wood which must w

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to make it more attractive. F

brief study of paints and pain

Ingre

Paint is made up of a base

is ordinarily used as the bas

pigment is the color added eit

Raw linseed oil is considered

boiled oil is preferred for ins
types of containers have been created by experienced painters and varnishers, any one which keeps the brush suspended without touching the bottom of the can will suffice.

If a so-called “liquid brush holder” is desirable, a mixture of half pine oil and half kerosene will keep the brush from going seedy. Before using the brush again, it should be washed out in naphtha and wiped dry.

Before a brush used in varnishing or enameling is put away it should be washed in turpentine or naphtha, then warm water and soap. The excess water should be shaken out and a piece of paper wrapped around the brush, allowing the bristles to come even with the edge of the paper. A brush allowed to dry in this way is always soft, clean, and ready for use. A shellac brush should be washed carefully in denatured alcohol until all traces of shellac have disappeared from the brush. It should then be washed with warm water and soap, dried carefully, and wrapped in paper.

It is to be recommended that a brush be used for each division of finishing: One brush for staining, inferior worn-out brushes for filling, one brush for shellacking, and another brush or set of carefully cleaned brushes for varnishing.

PAINTING

Painting protects the wood by covering it with a coating of material which conceals the surface entirely and has come to be used almost entirely on wood which must withstand the elements. The beauty of painted woodwork is all in the paint. When the surface of the wood is in proper condition to receive the paint, the best grade of material should be used. Almost anything painted, smeared, or dabbed over the surface of the wood will change the appearance, and someone can always be found who will call it beautiful. The object of painting, however, is not only to protect the surface from the weather but also to make it more attractive. Because of the many kinds of paint, a brief study of paints and painting is necessary.

Ingredients in Paint

Paint is made up of a base, a vehicle and a pigment. White lead is ordinarily used as the base, linseed oil as the vehicle, and the pigment is the color added either in the form of a paste or powder. Raw linseed oil is considered best for outside painting, while the boiled oil is preferred for inside use.
### Quantities of Materials Needed to Make Home-mixed Paints.

<table>
<thead>
<tr>
<th></th>
<th>Exterior Painting</th>
<th>Interior</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Priming Coat</td>
<td>Body Coat</td>
</tr>
<tr>
<td>Soft paste white lead</td>
<td>3 parts</td>
<td>2 parts</td>
</tr>
<tr>
<td>Raw linseed oil</td>
<td>4 parts</td>
<td>1 part</td>
</tr>
<tr>
<td>Gum turpentine</td>
<td>2 parts</td>
<td>1 part</td>
</tr>
<tr>
<td>Drier</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

This form of home-mixed white paint can be tinted to any color desired by adding colors ground in oil.

Gum turpentine may be added and to hasten drying.

If raw linseed oil is used, add mixed. When the boiled oil is used, it can be tinted to any color desired by adding colors ground in oil.

Many paint failures are due to application.

In selecting a ready-mixed paint, look for the formula on the can labels and read the instructions for various types of paint.
How to Make Home-mixed Paint for Exterior Surfaces.

Gum turpentine may be added to paint to make it more penetrating and to hasten drying.

If raw linseed oil is used, add ¼ pint of drier to each gallon of paint mixed. When the boiled oil is used no drier is necessary. Paint may be tinted to any color desired by adding colors ground in oil.

Many paint failures are due to improper selection, mixing, and application.

In selecting a ready-mixed paint the club member should read the formula on the can labels and notice if the proportion of ingredients comes within the limitations of federal specifications. These limitations for various types of paint are:
### Pure white lead paint

<table>
<thead>
<tr>
<th></th>
<th>Not more than</th>
<th>Not less than</th>
</tr>
</thead>
<tbody>
<tr>
<td>White lead</td>
<td></td>
<td>98%</td>
</tr>
<tr>
<td>Tinting pigment</td>
<td>2%</td>
<td></td>
</tr>
</tbody>
</table>

The liquid shall contain not less than 87 percent of linseed oil, the balance to be drier and thinner.

Weight per gallon shall not be less than 19½ lbs.

### Lead and zinc base paint

<table>
<thead>
<tr>
<th></th>
<th>Not more than</th>
<th>Not less than</th>
</tr>
</thead>
<tbody>
<tr>
<td>White lead</td>
<td></td>
<td>70%</td>
</tr>
<tr>
<td>Zinc oxide</td>
<td>20%</td>
<td>15%</td>
</tr>
<tr>
<td>Tinting colors and minerals</td>
<td>10%</td>
<td></td>
</tr>
<tr>
<td>Matter soluble in water</td>
<td>0.8%</td>
<td></td>
</tr>
</tbody>
</table>

The liquid shall contain not less than 87 percent linseed oil and balance to be combined drier and thinner.

Weight per gallon shall not be less than 17½ lbs.

### Titanium—zinc lead paint

<table>
<thead>
<tr>
<th></th>
<th>Not more than</th>
<th>Not less than</th>
</tr>
</thead>
<tbody>
<tr>
<td>White lead</td>
<td></td>
<td>58%</td>
</tr>
<tr>
<td>Zinc oxide</td>
<td>25%</td>
<td>7%</td>
</tr>
<tr>
<td>Titanium dioxide</td>
<td>10%</td>
<td></td>
</tr>
<tr>
<td>Matter soluble in water</td>
<td>0.8%</td>
<td></td>
</tr>
</tbody>
</table>

The liquid shall contain not less than 85 percent linseed oil, the rest to consist of drier and thinner.

The weight per gallon shall not be less than 17 lbs.

There are numerous kinds of paint on the market, each manufactured for a given purpose. The common kinds of paint of interest to handicraft club members are:

1. Outside paint.
2. Interior flat finish paint.
3. Enamel paint (interior finish).
4. Floor paint.
5. Barn paint.
6. Implement paint.
7. Concrete and cement.

Thick paint will not penetrate as much better to apply two thin coats in addition to the priming coat for best results. Complete directions on container, but the following steps are:

1. Clean and smooth the surface.
2. Cover knots and sappy places and prevent the pitch from oozing.
3. Equal parts of paint and raw linseed oil.
4. Putty all holes and cracks and dried.
5. After the primer is thoroughly dried, allow at least 24 to 48 hours before:

### Surface Covering

<table>
<thead>
<tr>
<th>Coating Material</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oil paint (gloss finish)</td>
<td>Smooth wood</td>
</tr>
<tr>
<td>Oil paint (flat finish)</td>
<td>Smooth wood</td>
</tr>
<tr>
<td>Enamel</td>
<td>Smooth paints</td>
</tr>
<tr>
<td>Exterior spar varnish</td>
<td>Smooth wood</td>
</tr>
<tr>
<td>Interior finish varnish</td>
<td>Smooth wood</td>
</tr>
<tr>
<td>Shellac</td>
<td>Smooth wood</td>
</tr>
<tr>
<td>Calcimine (5 lbs. powder)</td>
<td>Plaster</td>
</tr>
<tr>
<td>Whitewash (4-5 lbs. hydrated lime)</td>
<td>Plaster</td>
</tr>
</tbody>
</table>
1. Outside paint.
2. Interior flat finish paint.
3. Enamel paint (interior work and furniture).
4. Floor paint.
5. Barn paint.
6. Implement paint.
7. Concrete and cement paint.

Thick paint will not penetrate the wood nor spread evenly. It is much better to apply two thin coats than one thick coat. Two coats in addition to the priming coat should be applied to the new wood for best results. Complete directions ordinarily will be found on the paint container, but the following steps will have to be observed:

1. Clean and smooth the surface.
2. Cover knots and sappy places with shellac. This will seal all pores and prevent the pitch from coming through.
3. Equal parts of paint and raw linseed oil may be used as a primer. Apply the paint evenly, brushing it out well on the surface.
4. Putty all holes and cracks after the surface has been primed and dried.
5. After the primer is thoroughly dry, apply the second coat. Allow at least 24 to 48 hours before the third coat is applied.

Surface Coverage of Paints.

<table>
<thead>
<tr>
<th>Coating Material</th>
<th>Character of Surface</th>
<th>Surface Covered by 1 Gallon</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1 coat</td>
</tr>
<tr>
<td>Oil paint (gloss finish)</td>
<td>Smooth wood</td>
<td>600</td>
</tr>
<tr>
<td></td>
<td>Rough wood</td>
<td>350</td>
</tr>
<tr>
<td>Oil paint (flat finish)</td>
<td>Smooth wood</td>
<td>500</td>
</tr>
<tr>
<td>Enamel</td>
<td>Smooth painted with undercoats</td>
<td>500</td>
</tr>
<tr>
<td>Exterior spar varnish</td>
<td>Smooth wood</td>
<td>500</td>
</tr>
<tr>
<td>Interior finish varnish</td>
<td>Smooth wood</td>
<td>450</td>
</tr>
<tr>
<td>Shellac</td>
<td>Smooth wood</td>
<td>600</td>
</tr>
<tr>
<td>Calkmine (5 lbs. powder)</td>
<td>Plaster</td>
<td>400</td>
</tr>
<tr>
<td>Whitewash (4-5 lbs. hydrated lime)</td>
<td>Wood</td>
<td>280</td>
</tr>
<tr>
<td></td>
<td>Plaster</td>
<td>300</td>
</tr>
</tbody>
</table>
MACHINERY PAINT

The care, repair, and painting of farm machinery has been added to the list of handicraft projects. Machinery should be painted with a protective red lead paint. The red lead may be purchased at hardware stores or paint factories. Four parts of red lead and one part of raw linseed oil are mixed together. (5 lbs. equals approximately 4 level cups.)

Stir the powdered red lead into 1 cup of raw linseed oil, adding the powder slowly to form an even paste. Do not pour the oil into the powder. Let this paste stand a few hours to allow the red lead to become thoroughly wet with the oil. Thin this paste red lead by adding 1 cup of raw linseed oil, ¼ cup of gum turpentine and ½ cup of liquid drier. Drier may be omitted if boiled linseed oil is used. The metal parts of the machine should be painted with this mixture. Any other colored paint or paints may be used as the second coat.

REFINISHING OLD FURNITURE

The problem of refinishing furniture and interior woodwork in general is one that should be of interest to advanced handicraft club members. Most homes have valuable pieces of furniture that need only a little repair and a new finish to make them attractive and useful. Occasionally a valuable piece with a family background can be made as serviceable as a new article, with a little work.

Painted Furniture or Interior Wood

The first step is to remove all the old paint or enamel. Paint and varnish removers may be used. A blow torch will quickly blister the old finish so that it may be removed with a scraper. Care will have to be used to prevent the wood from burning. Wash the surface with warm water and strong lye soap after the paint has been scraped away. Allow the surface to dry thoroughly. If the surface of the wood is raised because of the water action, it should be rubbed down with a No. 0 or No. 00 sandpaper. The wood must be perfectly dry before a new finish is put on. Fill all the holes with plastic wood or a sawdust and glue mixture, and if the wood is resinous, that is, pine and similar woods, shellac should be applied to the knots and the resinous section. After the shellac has been applied (about an hour), apply a coat of flat white paint. Allow 24 hours for this coat to dry before applying the second coat of the desired when dry with No. 000 steel v

Varn

If varnish is to be removed, fill the holes with plastic wood to remove any discoloration. Varnish is dry apply stain of the same color. The surface of the wood, and in may be a coat of shellac rubbed down, and then varnished an applied to the varnished surface. Colors woods which have been

Oil

Varnish should be removed with a steel remover. The remover should then scraped with a steel scrapper. The second coat of remover should be rubbed with steel wool. If necessary repair work be done

Oil polishing means the application of clear or colored oils to the wood and subsequent rubbing in. At present no furniture company to obtain a polish of this kind (linseed) will remove the pur
the second coat of the desired color. This coat may be rubbed lightly when dry with No. 000 steel wool. A third coat may be rubbed with pumice stone and water. A final rub with a cloth dampened in oil (linseed) will remove the pumice stone from the surface and leave a beautiful gloss.

Varnished Surfaces

If varnish is to be removed use a commercial varnish remover. Fill the holes with plastic wood or a sawdust and glue mixture. Sand down to remove any discoloration and surface scratches. When the wood is dry apply stain of the desired color. A coat of thin shellac (one part shellac and two or three parts alcohol) may be applied to fasten the color. The surface should then be rubbed down with fine sandpaper, No. 0 or No. 00. Wipe the surface with a damp cloth (turpentine) and finish according to individual wishes. It is well to remember that the type of finish most suitable depends upon a personal choice, nature of the wood, the type of the article and the place where it is to be used. The real purpose of finishing is to protect the surface of the wood, and in many cases to beautify it. One method may be a coat of shellac rubbed down and wax applied; another, shellacked, rubbed, and then varnished and rubbed. The wax may or may not be applied to the varnished surface. It will be difficult to finish in natural colors woods which have been formerly painted.

Varnish Remover

Varnish should be removed with the use of a commercial varnish remover. The remover should be applied, left stand a few minutes, then scraped with a steel scraper, putty knife, or a razor blade. The second coat of remover should be applied and after setting a few minutes rubbed with steel wool. If necessary, the process may be repeated until the old covering is removed. Next, the wood should be washed with turpentine or gasoline. The wood should then be rubbed and any necessary repair work be done before refinishing.

Oil Polishing

Oil polishing means the application of linseed oil to the surface of the wood and subsequent rubbing until a dull, satin luster is obtained. At present no furniture company can afford to spend the time in order to obtain a polish of this kind on a large scale. It is long and tedious,
and very few persons in general would be able to appreciate its value. Oil, besides being a polish, is one of the best preservers of wood. It seals every pore hermetically by filling, and of all polishes is least affected by climatic conditions. Warm water or hot dishes do not injure it. An occasional rubbing, perhaps only once a month, serves only to enhance its softness and to enrich its color.

The oil used in polishing is linseed oil, either raw or boiled. If the raw oil is used, dilute it with about one part of turpentine to five parts of oil. Allow it to simmer over a slow fire for several hours. Do not allow it to come to a boil. The boiled oil should likewise be heated before it is used. It is absolutely necessary to have pure oil because if it contains adulterants it is practically useless. The warm oil may be applied with a brush or cloth directly to the wood. No filler is generally used, but to hasten the finishing a thin coat of shellac may be added after two or three coats of oil have been applied. After this thin coat is thoroughly dry, the surface should be rubbed with fine sandpaper or steel wool to remove the excess shellac from the surface that is yet to be oiled. The object in oil polishings is to scrub the oil into the pores of the wood. It does not require a great deal of oil on the surface at one time. The polish is affected by rubbing or friction. The oil should first be rubbed across the grain and then with the grain. Two or three coats may be put on daily with a brisk rubbing between each coat. After a week of daily applications of oil and rubbing the polish should begin to appear. If the surface is spotted or uneven, it will be necessary to go over these spots with some fine steel wool.

This will bring the whole surface to an even polish. After each application of oil, the surface should be rubbed to a dry finish before the next coat is applied. After the finish is completed it should be rubbed a few times a year with oil to help it retain its beauty and to feed any pores which may have begun to open. If the surface retains a greasiness caused by the oil, it may be given a coat of shellac. This last application, however, should be rubbed down thoroughly before the article is used.

French Polishing

French polishing is perhaps the most difficult of all wood finishing. For this reason only small pieces of work should be attempted at first, and several of these should be done before a larger project is finished. French polishing is the application of shellac by rubbing it over the

1. First filling the pores of the
2. Smoothing the polish to get it
3. Spiriting out with pure alcohol

The polishing is done for the shellac. In most cases a compound of denatured or grain alcohol is used. The wood to be polished is filled with the polish itself. Probably would be better to use the wood which are rather open for polishing. The previous to the filling

The rubber for French polishing is moistened with the polish. Roll a piece of heavy muslin about three inches long and one inch wide. A piece of muslin about the same size is made simply by twisting up a rubber is held in the hand with the remainder grasped firmly and the rubber is lifted from the rubber, beginning light covering the whole surface

wood with a special construct
wood with a special constructed cloth called a rubber. It does not mean that you put on a coat of shellac with a brush, but is ordinarily divided into three distinct steps.

1. First filling the pores of the wood and putting on a body of polish.
2. Smoothing the polish to get rid of the early marks which the heavier polish has made.
3. Spiriting out with pure alcohol.

The polishing is done for the most part with either orange or white shellac. In most cases a commercial prepared shellac is too thick for any except the initial polishing. It should be thinned with about one part of denatured or grain alcohol to three parts of the shellac and well mixed before it is used.

The wood to be polished may be filled with a filler, or it may be filled with the polish itself. For some types of grained woods it probably would be better to use the polish as the filler, but in some of the woods which are rather open-grained, it will take too much time in filling with the polish. The wood naturally must have been stained previous to the filling with either a filler or polish.

The rubber for French polishing is composed of an inner core which is moistened with the polish and encloses two layers of well-washed muslin. Roll a piece of heavy cotton cloth in the form of a cone about three inches long and one inch or more in diameter at the base. A piece of muslin about the size of a large handkerchief that is free from lint may be folded over this cone to form an extra pad and a convenient shape to hold. The French polishing rubber should not be made simply by twisting up one piece of cloth inside of another. The rubber is held in the hand with two fingers on the point of the cone and the remainder grasped firmly in the palm. The rubbing surface must be entirely free from wrinkles or folds and neatly made into the necessary size for the piece of work to be done. At least three of these rubbers will be needed in the complete process of polishing. When the surface of one becomes worn, the cone must be changed so that a new rubbing surface will be available. In starting the polishing, the cone is taken from the rubber and saturated with a medium thick shellac. It is then replaced in the muslin and enclosed in the manner suggested. Pumice stone which has been tied in a small cotton sack should be dusted lightly over the surface of the wood. Rub the saturated rubber, beginning lightly on the wood with a circular motion, covering the whole surface without allowing the rubber to pause on
the wood. This is of utmost importance for as soon as the rubber rests on the polish it will stick. Keep the rubber moving from one place to another. When you have gone over the wood once, allow it half an hour or more to dry. If the pores are not filled the operation will have to be repeated, using the pumice stone and the polish as before. It may often require several coats of polish to fill a wood as open-grained as walnut, while many more will be needed for oak or chestnut. Each coat should be rubbed down with very fine sandpaper after it is dry. The more coats that are added, the longer time will be necessary for each one to dry. The first application may dry sufficiently to rub within 30 minutes, but the second should be allowed to remain at least an hour.

After the grain of the wood has been well-filled with shellac and pumice stone, the next operation is to obtain a good body of polish on the wood. This process involves more care than the first. The polish should be heavy in body, almost as thick as that used in the first process. The method of applying is similar to that which has been described, but great care must be taken lest the undercoat be picked up on the rubber. New rubbers will be necessary because the rubbing surface of the old one will probably be badly frayed or worn. Take the cone shaped wadding from the rubber and moisten it with polish. Replace the outside cloth and begin as before with a good full circular sweep, taking care not to go over the path of the rubber for a second time. As the rubber loses its moisture it will be necessary to press gradually harder. In case the rubber gets dry it will be necessary to stop and recharge it as often as needed.

The polish which has been applied in this manner will now be full of ridges and a circle of lines which the rubber has left in its path. These must be removed. First allow the body of the polish to harden thoroughly. It will be better if the work could be left for at least a day before the next operation is commenced.

Be sure that the rubber is in good condition with a smooth surface and a firm shape. This time use a thinner shellac, for the purpose is not to build up a polish but to smooth that which has already been applied. If prepared shellac is used, thin this with about an equal part of denatured alcohol and stir well. Remove the cone from the rubber and apply only a little polish to it and wrap it up. A little oil should be applied to the sole of it, and the rubbing begins lightly with a circular motion in the opposite direction to that which was used before. This will help to smooth the ridges left by the former process. Look at the sole of the rubber. If it is shiny, you are another place in the wrapping and rub as before. Do not rest on this part of the process and the surface by pressing harder will take a long time, and interval. Never continue to work the surface of your work is even longer. It will then be smooth.

The same rubber will again be used if it is smooth. Flake all the oil from the polish and free from all rubber marks as this procedure, but the corn pure alcohol. Merely moisten spread this over the rubber up oil in this process. In this s dry a rubber than one which allow the wood to dry frequently, stake, and you may either ma

SHARPENING

Handicraft club members should be able to nicked, or improperly sharpen, pride in his tools and derive when they are in the proper members should be able to communities to get first-hand in keeping a set of tools in a grindstone, an oil or carbifice, a flat file, a saw joiner, and a s
process. Look at the sole of the rubber often to see whether it is shiny. If it is shiny, you are using too much oil. Change the cone to another place in the wrapping and decrease the amount of oil used and rub as before. Do not allow the rubber to become very dry in this part of the process and do not attempt to smooth a soft part of the surface by pressing harder on the rubber. This part of the polishing will take a long time, and each of it must be followed by a drying interval. Never continue to work on a “tacky” or sticky surface. When the surface of your work is smooth, set it aside to dry for a day or even longer. It will then be ready for the final or “spiriting out” process. The same rubber which was used for the last process may again be used if it is smooth and soft. The purpose now is to remove all the oil from the polish and to make a beautiful varnished surface free from all rubber marks and flaws. No polish is generally used in this procedure, but the corner of the rubber is just moistened with pure alcohol. Merely moisten the palm of the hand with alcohol and spread this over the rubber upon the moistened palm. Do not use any oil in this process. In this step of finishing it is better to have too dry a rubber than one which is too moist. Take time in polishing and allow the wood to dry frequently. The beauty of the polish is now at stake, and you may either make or mar it.

SHARPENING SHOP TOOLS

Handicraft club members cannot do their best work with dull, nicked, or improperly sharpened tools. A good workman takes great pride in his tools and derives pleasure and satisfaction in using them when they are in the proper condition. Advanced handicraft club members should be able to keep their tools this way. Perhaps the boys may visit an experienced carpenter or cabinet maker in their communities to get first-hand knowledge of the various methods used in keeping a set of tools in condition. The special tools needed are a grindstone, an oil or carborundum stone, a three-cornered file, a flat file, a saw jointer and a saw set.
Hand Saws

Bottom, side and top views of correctly fitted crosscut saw.

Fig. 1

Fig. 2

Fig. 3

Fig. 4

Fig. 5

Fig. 6

Bottom, side and top views of correctly fitted ripsaw.

Fig. 7a

Fig. 7b

Showing uneven teeth on crosscut and ripsaws.

Fig. 8

Jointing the teeth.

Fig. 9

Fig. 10

Ripsaw teeth jointed and shaped ready for setting.

Five steps are usually necessitating a saw:

1. Jointing. The saw is placed on a flat surface. A flat file is placed in a sharp corner and file along the teeth and remove all burrs.

2. Shaping Teeth. All the teeth are shaped and smoothed. Place a corner of the file in a sharp corner of the teeth and file straight across the finished side of a tooth coming to the center of the tooth to the center of the file. (Note: This step should be repeated until the teeth are even.)
Views of crosscut and rip-saw teeth jointed down evenly. (Note gullies and flat top are still uneven.)

Fig. 9a

Fig. 9b

Fig. 10

Crosscut saw with teeth jointed and shaped properly ready for setting.

Fig. 11

Ripsaw teeth jointed and shaped ready for setting.

Five steps are usually necessary in doing a complete job of sharpening a saw:

1. **Jointing.** The saw is placed in a vise with the handle to the right. A flat file is placed in a small clamp or saw jointer. The file will ride the teeth and remove all high points, making them all even.

2. **Shaping Teeth.** All the teeth of a saw should be of uniform size and shape. Place a corner of the triangular file in the gullet between the teeth and file straight across the blade at a right angle until the finished side of a tooth comes up to a point. Go on to the next gullet.
and cut it down in a similar manner. Proceed in this fashion until the entire blade is shaped. Be sure to hold the file square and level and work at right angles to the blade so that the teeth will be cut out square and pointed. When all teeth are shaped and of equal height they are ready to be set.

3. Setting. This consists of bending the points alternately, one to the right, the next to the left, thus causing the saw to cut a channel which is slightly wider than the thickness of the blade. Best results in setting will be obtained if the saw set is used. This tool is adjustable, and is set so that about one-third to one-half of the tooth is bent. This will be plenty for most saws. It is much easier to set the saw from one side at a time, setting every other tooth in the same direction. When one side is completed the saw may be reversed, and the alternate teeth set in the opposite direction to the others.

4. Filing. Filing should point and shape the teeth at the proper angle so that they will cut the wood easily. Three-cornered files are used for this purpose.

A. Crosscut Saws. Teeth are saw in a clamp or vise (handle to the right) so that the teeth of the saw are just a trifle above the vise. Hold the file so that the handle is at about a 45-degree angle to the blade of the saw. The thumb of the right hand should be on top of the file handle, and the tip of the file held between the thumb and fore-finger of the left hand. Hold the file level and push it evenly through the gullets at about a 45-degree angle, bringing the tooth to the right and the one to the left of the file to a point at the same time, but beveled in the opposite direction.

The file should cut only on the push stroke. Continue the file in every other gullet, skipping the one between until the end of the then reversed in the vise and file omitted the first time. The file and all teeth and each tooth brought
A. Crosscut Saws. Teeth are given beveled edges. Place the saw in a clamp or vise (handle to the right) so that the teeth of the saw are just a trifle above the vise. Hold the file so that the handle is at about a 45-degree angle to the blade of the saw. The thumb of the right hand should be on top of the file handle, and the tip of the file held between the thumb and fore-finger of the left hand. Hold the file level and push it evenly through the gullets at about a 45-degree angle, bringing the tooth to the right and the one to the left of the file to a point at the same time, but beveled in the opposite direction.

The file should cut only on the push stroke. Continue the file in every other gullet, skipping the one between until the end of the saw has been reached. The saw is then reversed in the vise and file the alternate gullets which were omitted the first time. The file must be held at the same angle for all teeth and each tooth brought to a sharp point.
B. Ripsaws. Teeth are not beveled, but the file is held at right angle to the saw blade and pushed straight across, making the front edge of the tooth square. Otherwise, the procedure is the same as for crosscut saw. Every other tooth is filed from one side, then the saw is reversed, and the remaining teeth are pointed up.

5. Side-dressing. This consists of putting a final touch to the job after the saw has been set and filed. The saw is laid on a flat surface, and a worn file or whetstone is run along each side a few times. This removes the wire edge or unevenness at the point due to the filing.

NOTE: Figures illustrating saw sharpening are used through courtesy of E. C. Atkins and Company, Indianapolis, Indiana.

Wood Chisels

If the chisel is nicked, the nicks are first ground out by holding the cutting edge at a right angle against the grinding stone, the edges ground back squarely to the bottom of the nicks. The chisel is now ready for sharpening. Grind the chisel on the beveled edge only. The length of the bevel will depend upon the type of cutting to be done. For fine work a long bevel with a thin edge is preferred. For general work a bevel of \( \frac{3}{4} \)" long is most suitable, which means holding the chisel at about 25- to 30-degree angle to the stone. Continue the grinding until a uniform bevel is obtained and a wire edge has been formed. The corners of the chisel are kept square. After grinding, hone the chisel to a fine edge of the chisel down, and with a sharp by honing occasionally.

These are sharpened in the with two exceptions — the bevel very slightly rounded. The pl angle of 25 to 30 degrees, cutti longer than twice the thickness tant that the bevel be kept blades should also be honed to

A

These are sharpened by fili a very slim taper file is best. have been damaged, file away tip of the file around the thread do so only on the inside.
hone the chisel to a fine edge on an oil-stone; then turn the flat side of the chisel down, and with a few forward strokes remove any wire edge. Avoid making any bevel on the flat side. Chisel may be kept sharp by honing occasionally.

**Plane Blades**

These are sharpened in the same manner as described for chisels with two exceptions — the bevel should be shorter and the corners are very slightly rounded. The plane blade is held to the grindstone at an angle of 25 to 30 degrees, cutting a bevel about 3/16" long or slightly longer than twice the thickness of the plane blade. It is very important that the bevel be kept straight and of uniform width. Plane blades should also be honed to remove the wire edge.

**Auger Bits**

These are sharpened by filing. An especially made auger bit file or a very slim taper file is best. If the tip or edge of the screw points have been damaged, file away the loose part carefully by passing the tip of the file around the threads. If necessary to file the cuttings first, do so only on the inside.
FORMULAS

HARDWOOD CRACK PASTE

(a) 
1 part of cornstarch
1 part of wheat flour
1 part of linseed oil
1 part of Japan drier

(b) 
1 part of beeswax
1 part of powdered resin
12 parts of either orange or white shellac

STAINS (OIL) NATURAL

2 quarts of pure turpentine
2 quarts of raw linseed oil

To this add colors in oil according to proportions outlined below.

Cherry—1½ pints of burnt sienna
Mahogany—1 pint Vandyke brown
Light Oak—1 pint raw sienna

Dark Oak—1 pint raw sienna and a touch of burnt sienna
½ pint of Rose lake
¼ pint raw umber

Walnut—1½ pints of Vandyke brown or
1 pint of burnt sienna and
¼ pint of drop black

STAINING END GRAIN

For staining end grain the stain should be cut down with 3 or 4 parts of naphtha to 1 part of stain. Turpentine or linseed oil may also be applied to the end grain to prevent absorption of too much stain. Try diluted stain on a scrap piece of wood and compare color with flat surface.

FINE SAWDUST AND GLUE

This mixture when made into a thick paste can be packed into the holes of wood. Care should be taken not to smear the glue to the other parts of the surfaces.

STICK SHELLAC

Stick shellac can be purchased in many different colors. It may be applied with a small spatula. To heat the knife, use an alcohol or gas flame. An electric soldering iron is very convenient. When hole is filled and made smooth with hot knife, the rough spots can be scraped with a razor blade and polished.
WATER STAIN

Because of the many unusual colors that can be obtained by water stains, they have become exceedingly popular. Water stain should be purchased in powder form (analine). If water stain is to be used it will be necessary to sponge the article with warm water and allow 24 hours to dry. After drying, the article should be rubbed lightly with sandpaper to remove all the fuzz which will be very noticeable. Better results will be obtained if the stain is applied hot and heat will be necessary in order to get an even job. This stain penetrates very deeply and it might be suggested that the hands be greased with vaseline in order to prevent discoloration. It will be necessary to allow the stain to dry at least 24 hours and if a second coat is necessary it may be applied after varied sandings. After the second coat has dried it will be necessary to apply a coat of wash shellac. After the shellac is thoroughly dried it may be sanded lightly. Water stain cannot be used on oil surfaces.

WAX STAINS

1 part of beeswax 8 to 10 parts of turpentine and coloring to suit

Apply hot to wood and allow it to harden. Polish surface with old clothes brush. Several coats will be necessary.

FILLERS

Use type of fillers to correspond with the wood.

\[
\begin{align*}
\frac{1}{2} \text{ filler} & \quad \frac{1}{2} \text{ naphtha or non-leaded gasoline} \\
\text{Number 8-pound cut is recommended for fillers which means 8 pounds filler in 1 gallon naphtha, or 1 dry oz. filler in 1 fluid oz. naphtha or gasoline}
\end{align*}
\]

PASTE FILLER

1 part of brown Japan drier 2 parts of boiled linseed oil

This solution is mixed thoroughly and enough silex is added to make a paste. Any color may be added to this mixture.
LIQUID FILLERS FOR CLOSE GRAINED WORK

Varnish Filler—inside use—½ pound of fine silica
2 quarts of good varnish

Shellac Filler—inside use— Equal parts of white shellac and denatured alcohol
outside use—Varnish and silica to form thin paste—dilute
with turpentine to flow easily—one or two
coats—rub and add coat or two of spar varnish

SHELLAC WASH COATS

(a) 1 part shellac
3 parts denatured alcohol
for water stain surfaced and before filling

(b) 1 part denatured alcohol
2-3 parts shellac
to act as primer for varnish

WAXES

1 part of beeswax 1 part of turpentine

The beeswax is cut into small pieces and allowed to stand overnight in the turpentine.

PASTE WAX

½ pound of beeswax ¼ pint of raw linseed oil
1 pound of paraffin 1¼ pints of turpentine

Melt the paraffin and beeswax over a slow fire or in a double boiler. Remove from the stove; add linseed oil and turpentine (both are inflammable) and stir vigorously. The congealed wax should be kept in a covered jar. Two thin coats are recommended with each coat rubbed in well. It is recommended that shellac in varnishing should be done over the paint before the wax is applied. One pound of this wax will cover approximately 250 square feet.

PAINT PRIMER

8 to 10 pounds of white lead ½ gallon of turpentine
½ gallon of raw linseed oil

SECOND COAT

8 pounds of white lead 1 pint of turpentine
½ to ¾ gallon of linseed oil

Paint RE

1 ounce of ammonia 1 ounce of soda lye

PAINT AND VARNISH

White lead and turpentine as may be obtained by adding 4 parts
1 quart of linseed oil
1 quart of denatured alcohol
1 small cake of white paraffin or
beeswax

PAINT AND VA

Use equal parts of kerosene solution and wring it almost dry
cleaned with the moist cloth. Use a soft, clean cloth.

ASPHALT

1 gallon asphalt 2 ounces of aluminum

FURNITURE

(No. 1) 5 parts of spirits of alum 1 part of benite

BLEACH

Dark spots may be removed by
in one pint of hot water). Apply
is poisonous.
THIRD COAT

White lead and turpentine and a drier for flat work — The gloss may be obtained by adding 4 pounds of zinc white in a gallon of varnish. Add color.

PAINT REMOVER NO. 1

1 ounce of ammonia 5 ounces of water glass
1 ounce of soda lye

PAINT REMOVER NO. 2

1 cup vinegar mixed together
¼ can lye
1 pint lump starch

Add water to make thin paste. Put it on with an old brush and let stand for five minutes. Remove with cloth or scraping knife.

VARNISH REMOVERS

(No. 1) (No. 2)
1 quart of benzol 1 part banana oil
1 quart of denatured alcohol 2 parts of wood alcohol
1 small cake of white paraffin or
beeswax

PAINT AND VARNISH CLEANER

Use equal parts of kerosene and vinegar. Dip clean cloth into solution and wring it almost dry. Gently wash the surface to be cleaned with the moist cloth. Wipe the clean surface with a dry, soft, clean cloth.

ASPHALT PAINT

1 gallon asphalt Kerosene enough to make a paste
2 ounces of aluminum with the aluminum

FURNITURE POLISH

(No. 1) (No. 2)
5 parts of spirits of alum 1 part of boiled linseed oil
1 part of benite 1 part of vinegar
1 part of turpentine

BLEACHING

Dark spots may be removed by a solution of oxalic acid (2 ounces in one pint of hot water). Apply warm to dark spots. This material is poisonous.
PUTTY

Putty may be purchased already prepared or the ingredients may be obtained and putty made at home. When commercial putty is bought, the best quality should be obtained. The cheaper brands may be adulterated with marble dust to add weight, and kerosene, which is much cheaper than linseed oil. In the homemade putty, make a stiff dough by mixing the best bolted whiting with pure raw linseed oil. (This formula is for pure putty.) The putty that will be slightly harder when dry may be made by taking equal parts of white lead and whiting and mixing with linseed oil. A very hard putty will consist of equal parts of white lead and whiting and mixing with one part turpentine and two parts of linseed oil.

When not being used, putty should be kept in a tight container which will prevent the oil from oxidizing and the putty from becoming hard. It should be laid on tin, glass or porcelain, and not on any substance that will absorb oil, such as wood, paper or concrete. When the putty becomes too stiff to work conveniently, add a few drops of linseed oil, gradually working the putty in the hands until it is the right consistency. If too much oil is added and the putty becomes too soft, work more of the hard putty in with it, or add a little whiting. The linseed oil will oxidize, and the putty will become stiff and hard if exposed to the air for any length of time or laid upon any substance that will absorb the oil. In either event it may be softened by crushing it upon a board with a hammer and applying linseed oil and working it first with the putty knife and finally with the hands. Putty may be colored by working in dry colors, such as lampblack, burnt umber, burnt sienna, or ochre. If the dry colors make the putty too stiff a little linseed oil may be added. Most woods turn darker with age, and putty should be made a little darker than the stain it is matched with. Puttying should never be done until the wood is first primed as the wood absorbs the oil from the putty, and it may later fall out. A primer may be made of equal parts of paint and raw linseed oil. Putty will not take a stain and it is necessary to stain or stain and fill the wood before the putty is colored and used. The putty should be pressed tightly into the holes and filled completely. If this is not done the putty will be very apt to shrink and leave a flaw in the finish. A convenient procedure is to press the putty firmly into the bottom of the hole, and without moving the thumb away, cut the putty with a putty knife which is held in the other hand. The hole will be completely filled, and there will be no shrinkage and no flaw in the finish.

There are many forms of on the market to be used in fi Most of these are in a putty for upon exposure to the air. Wh wood, having all the properti liquids or plastic woods will t without splitting, can be plan in the lathe or worked with a m material may be purchased in t the more common furniture w rather difficult for the average the solvent that is used in the results are obtained with either either case the stain should be rubbed with a dry rag, not a surface. Additional applications wood will absorb the stain the liquid wood and mixed thorot openings of the wood. The av find it more advantageous to bu he is using rather than try to ma Before applying the plastic woo sanded clean and dry. The ac the method of inserting the ma
Liquid and Plastic Woods

There are many forms of liquid wood that may be purchased on the market to be used in filling the blemishes or holes in wood. Most of these are in a putty form that harden into a likeness of wood upon exposure to the air. When the material hardens it looks like wood, having all the properties of wood except the grain. These liquids or plastic woods will take and hold nails and screws firmly without splitting, can be planed, sawed, sanded and even turned in the lathe or worked with any of the wood-working tools. This material may be purchased in the natural wood and also in colors of the more common furniture woods. Staining these woods will be rather difficult for the average handicraft club member because of the solvent that is used in the preparation. Sometimes satisfactory results are obtained with either an oil or spirits (alcohol) stain, but in either case the stain should be applied with a brush and quickly rubbed with a dry rag, not allowing the material to remain on the surface. Additional applications doubtless will be necessary. If the wood will absorb the stain the color can be added to the plastic or liquid wood and mixed thoroughly before it is inserted into the openings of the wood. The average handicraft club member will find it more advantageous to buy the liquid wood in the color that he is using rather than try to match completely the patch by staining. Before applying the plastic wood the surface should be scraped and sanded clean and dry. The accompanying drawing shows briefly the method of inserting the material into the holes.

Fig. 18. When plastic wood is put into a hole without pressing it firmly to all sides.

Fig. 19. It draws away from the edges as in contracts, and loses its holding surface.

Fig. 20. Use a blunt tool to force the plastic wood thoroughly against all sides.

Fig. 21. Remove the tool, fill above the surface with plastic wood, and level it off when hard.

Illustrations, courtesy of A. S. Boyle Co., Cincinnati, Ohio.
WOODS AND THEIR TREATMENT

It is possible to give only a few general rules for the finishing of the more common woods. Because of the many inquiries about finishing, a brief discussion is given to those most frequently used. The handicraft club member must make the application to fit the condition.

Basswood is very light and soft. It is close-grained and will take stain well. Because of the lack of color or graining, the wood is ordinarily painted or enameled.

Beech is hard, heavy, and close-grained. The hardwood varies from reddish brown to almost white. Frequently beech is used as an imitation for walnut and mahogany. Its figure is a trifle prominent for this purpose. Because of hardness it will be difficult to stain, and the best results will be obtained if it is finished in the natural wood.

Birch is increasing in popularity as a furniture wood. Red birch is more valuable than either the yellow or white and has a beautiful reddish brown color. In some respects it is similar to cherry, although not quite so dark. The best imitations of mahogany may be made from this wood. On birch, water stains will raise the grain more than usual. Shellac should be used as a filler and rubbed slightly, and then the surface may be varnished. To finish the birch in the natural color use no oil, filler or varnish. White shellac will probably be the most suitable finish.

Cedar lacks the strength and the firmness of some of the other woods. The native cedar is lighter in weight and softer in composition than some of the furniture woods. Red cedar (Tennessee) is a beautiful wood and is used extensively for making chests and lining drawers and closets. It has a pleasant odor and a beautiful light red color. It is close-grained and soft in texture, but it will take a high polish. Use no stain, filler or varnish directly on the wood. Knots, which are common to it, should be well-smoothed, and any cracks filled with a thick shellac or sawdust and glue mixture. After sanding, apply successive coats of white shellac. Oil, if applied to the wood, will have a tendency to turn it a reddish brown. Varnish will also darken the wood because of its amber color. If varnish is to be used it must be applied over the two coats of white shellac which serves both as a surfacer and as a filler.

Cherry. This is a hard, close-grained, and strong wood. The grain has a natural waving. A stain may be used to give the beauty of the grain. If the natural color is preferred. A filler may be added (orange) will fasten the color as it is used. French polishing will be used if the surface is not flat.

Cypress. Because of its resiliency and is the one reason for its use. A water stain applied produces a beautiful surface. Resinous portions of the wood are best coated before it is polished. French polishing will be used if the surface is not flat.

Gum. Of the three varieties, the first is the best to use. It is soft and free from knots. Stains are used to conceal the knots and will not be necessary if shellac is used. Stains are used to conceal the knots and will not be necessary if shellac is used. Stains are used to conceal the knots and will not be necessary if shellac is used.

Maple. This is one of the most common. It is strong, close-grained, free of flaws, and takes any kind of a stain well. The best imitations of mahogany may be made from this wood. To finish the surface very carefully and apply a filler is needed. When thorough sanding is finished, apply successive coats of white shellac. Oil, if applied to the wood, will have a tendency to turn it a reddish brown. Varnish will also darken the wood because of its amber color. If varnish is to be used it must be applied over the two coats of white shellac which serves both as a surfacer and as a filler.

Mahogany is considered to be one of the cabinet woods. Mahogany resembles some species of cedar more common, consisting of alternating light and dark bands. One of the easiest ways of color...
Cherry. This is a hard, close-grained wood of a rich red-brown color. The grain has a natural wave and should be preserved in finishing. A stain may be used to give it the desired color. A deep color will hide the beauty of the grain, so the lighter shades are to be preferred. A filler may be added to obtain a smooth surface. Shellac (orange) will fasten the color and form a base for a varnish if it is to be used. French polishing will give cherry a fine finish. Waxes may be used if the surface is not French polished.

Cypress. Because of its resinous quality this wood is difficult to stain and is the one reason for paint and varnishes peeling from its surface. A water stain applied hot to cypress will give the best results. Resinous portions of the wood should be given at least one coat of shellac before it is painted. Drenching the wood with oil will not be satisfactory.

Gum. Of the three varieties of gum, red, black, and tupelo, the first is the best to use. It is a soft, fine, and close-grained wood, free from knots. Stains are used to bring out the figured portion. Fillers will not be necessary if shellac is used. Dark colors may be obtained by using a colored liquid filler composed of cornstarch, burnt umber, and varnish.

Maple. This is one of the best woods for club members to use. It is strong, close-grained, free from knots and flaws, of even texture and takes any kind of a stain well. The sugar or rock maple probably is the most common. To finish maple in the natural, prepare the surface very carefully and apply a thin coat of white shellac. No other filler is needed. When thoroughly dry rub down the surface with fine sandpaper or pumice or steel wool. Several other coats of shellac may be applied, using pumice stone and water instead of sandpaper or steel wool for rubbing. The last coat may be either white shellac or white copal varnish. When dry, rub to a gloss with pumice stone and water. Never use varnish directly upon maple which is to be finished natural. On bird's-eye maple or curly maple this same finish may be used. French polishing will also give a fine gloss to the wood.

Mahogany is considered to be the most valuable of commercial cabinet woods. Mahogany belongs to the cedar family of trees and resembles some species of cedars closely. The “stripy” figure is the more common, consisting of alternate stripes of dark and light wood. One of the easiest ways of coloring mahogany is to apply a coat of
raw linseed oil. The oil may be colored if a darker shade is desired. Mahogany, however, should not be heavily stained as a slight difference in the color or texture of the wood will affect materially the final results of staining. For this reason formulas will not act alike in all cases. Never apply stain to the wood until you have tested it carefully on similar pieces of wood. If oil is used as a natural finish, the pores will absorb enough to act as a filler. Shellac should be added after the oil and rubbed. Shellac will act as the final filler and also as a “grab” coat for the varnish if this is desired. If stains are applied, fillers should be used as mahogany is a very open-grained wood. A varnished or a polished surface will add to the beauty of the finish.

Oak. Of all the species of oak the most common are red, white, and burr. They all vary in size, color and compactness of grain, but all are common as cabinet woods. Because of the prominent medullary ray a desirable figure is obtained when the oak is quarter-sawed. Stains can be used on all oaks according to the individual taste. They may be diluted to give very little color, or darkened to almost any shade. A dilute mixture of a dark filler rubbed over the surface and given a coat of orange shellac will produce a golden oak finish, while a heavy shade of walnut stain or a dark filler and then a coat of shellac will make a dark oak stain. Because of its pores oak must be well filled in order to have a smooth surface.

Pine. Many of the species of pine are useful in outside work, but only a few are readily adapted to the needs of furniture making. All pines are more or less resinous, and such surfaces and knotty areas should always be shellacked to prevent “bleeding” through. A pine may be stained any color, but will be more satisfactory if painted or enameled.

Poplar. This wood is generally used in construction where paint or enamel is to be the final finish. Because of its greenish streaks in the wood, it does not blend itself toward a uniform stain.

Redwood is a coarse-grained wood of very strong color. Oil stains of the darker shades are used to obtain different effects between red and brown. Allow some time for the stain to sink in, but wipe it dry with a cloth before it is entirely dry. A base filler should also be used in getting a smooth surface.

Walnut is considered by many wood. Therefore, the color of walnut is brought out rather than hidden. The methods of finishing walnut are almost entirely, and the other uniform color. Shellac, waxes, and varnish can be used in either case. To some people the natural color is all right, to others it is objectionable. Shellac will act as the final filler and also as a “grab” coat for the varnish if this is desired. If stains are applied, fillers should be used as mahogany is a very open-grained wood. A varnished or a polished surface will add to the beauty of the finish.

DEMONSTRATION

One of the best methods of learning by doing is through books or lectures. All club members or other groups is the member learns by doing is usually through books or lectures. All club members and the team demonstration brings the subject of “Oil Polishing”. Frequently there is a difference in the shade of one ounce of dry filler to one ounce of a dark filler and then a coat of shellac will make a smooth surface.

A demonstration is usually given by a team, limiting their work to some demonstrations should frequently be given by individuals. This will give the members opportunity to afford the members opportunity to practice and confidence. For local club demonstrations by individuals. This will give the team to represent the club.

In a successful demonstration, all the time, the discussion begins in order to present their topics properly and to their subject, have proper equipment, and divide the demonstration into
Walnut is considered by many to be America's most beautiful wood. Therefore, the color of the wood and the graining should be brought out rather than hidden by the finish. The two most common methods of finishing walnut are the natural finish where oil is used almost entirely, and the other where stains are applied to make a uniform color. Shellac, waxes, or even varnishes may be used after either case. To some people the natural finish will be preferred, while to others it is objectionable. Oil has a beautifying and darkening effect on any dark wood and more so upon walnut. It is proof against any of the ordinary accidents which may spoil other finishes. Oil may be renewed like wax from time to time by merely rubbing over the surface. This particular method is explained more in detail under the subject of "Oil Polishing". The other method commonly used is to apply stain, filler, shellac and then varnish or wax, or perhaps both. Frequently there is a difference in color of boards, and a stain is used to make the shade uniform. A dark paste filler in the proportion of one ounce of dry filler to one ounce of gasoline is added to fill the pores and to make a smooth surface. A coat of shellac will add to the finish. After rubbing, varnish, wax, or both may be used.

DEMONSTRATIONS

One of the best methods of presenting various subjects to club members or other groups is through a demonstration. What a club member learns by doing is usually more lasting than what he learns through books or lectures. All club work is demonstrational in method, and the team demonstration brings out the means and methods used by club members.

A demonstration is usually given by two club members working as a team, limiting their work to some phase of the club project. Demonstrations should frequently be a part of the club meeting, as they afford the members opportunity for self-expression and gaining skill and confidence. For local club meetings the demonstrations may be by individuals. This will give each member a chance to try out for the team to represent the club.

In a successful demonstration the members of the team are busy all the time, the discussion being correlated with the work done. In order to present their topics properly the team members must study their subject, have proper equipment and illustrative matter, and divide the demonstration into logical parts.
A demonstration encourages the development of the team members in originality, initiative, poise, personality, accuracy in knowledge of subject and ability to think, speak and act before an audience.

A demonstration, if well chosen and well given, tends to arouse interest in some phase of the subject.

After the topic has been selected, the team should make a careful study of the different things to be discussed in the demonstration. Before demonstrating in public the team should be properly instructed and trained. Each team member should be sufficiently familiar with the subject to speak convincingly during the demonstration and to answer questions asked by the audience. This requires a good general knowledge of the subject.

To demonstrate means to show. Every successful demonstration requires some equipment to illustrate the different parts or phases of the work. Remember, illustrative material and equipment play a large part in helping to show or demonstrate the subject under discussion.

What one sees is remembered longer than what one hears. The materials and equipment to be used should be carefully selected before the demonstration and checked over so that everything may be ready. The following things may be suggestive in developing a team.

(a) The Team —

Members must be enrolled in project in which they are demonstrating.

1. Members of about the same height and ability usually work well together.

2. Cheerfulness and enthusiasm will invite the confidence of the audience.

3. Speak clearly, easily, not too fast, and just loudly enough to be heard well.

4. The use of good English is important to the success of the demonstration.

5. Stand erect and talk to the audience.

6. Wearing apparel should be simple, clean, and practical. Shoes should be appropriate for the occasion.

7. The amount of work to be divided as nearly equal as possible.

8. Each member of the team, having been instructed and trained, should be able to take a leading part.

9. The demonstration space should be clean and free from distracting objects.

10. Members should make sure that only the necessary apparatus is used.

(b) The Demonstration —

Divide the demonstration into:

1. Introduction — One member and himself, telling why the demonstration was selected.

2. Development — Demonstration of the subject under discussion.

3. Summary — The demonstration as a whole is summarized.

4. Question and Answer Period — Questions asked by the audience are answered by the members of the demonstration team.
7. The amount of work to be done and explanations to be made will be divided as nearly equally as possible between the members. Each member of the team, however, should know the entire demonstration and be able to take it up if necessary.

8. The team, not the leader should make a list of equipment and check it at the beginning and at the close of each demonstration.

9. The demonstration table should be well arranged, and the working space in full view of the audience. After each demonstration the team should leave that space in order for the next team.

10. Members should make their moves count. Do not “putter”.

(b) The Demonstration —

Divide the demonstration into three parts:

1. Introduction — One member of the team introduces his teammate and himself, telling where they are from and what they intend to demonstrate.

Demonstration of Steps in Finishing.
2. **Demonstration**—Outline what is to be done step by step; what is to be explained with each step; how to do it, and in some cases, why.

3. **Conclusion**—A brief summary covering the important steps of the demonstration will leave the audience better satisfied. Questions should be invited and answers cheerfully given.

   If you are unable to answer any question asked, refer to the handicraft bulletin or any other book on wood working. Courteously avoid answering questions that do not pertain to the work.

(c) **Preparation of Demonstration**—

1. The subject selected should be practical.
2. Demonstrations may deal with any phase of the present or past projects taken by the club members.
3. The phase to be developed should be covered thoroughly, giving enough explanation to prove the points.
4. Members should study their subject well, looking up material from reliable sources before starting to write the demonstration.
5. Illustrative material should be large enough to be seen clearly 30 feet away. Posters, charts, samples, or other means of illustrating the subject adds interest.
6. Make or obtain the necessary illustrative material.
7. Write the demonstration, giving due attention to what is being said and done at the same time. (See Method of Procedure.)
8. Team members should be accurate in their subject matter, cool in emergencies, willing to take suggestions, profit by criticisms, willing to work, and give much time to practice.
9. Know the demonstration but do not “memorize” it.

(d) **Conclusion**—

A summary of the demonstration, emphasizing the important steps, leaves a more complete picture of the entire process before the audience.

Ask for questions, accept them cordially, answer them courteously. It is well to re-state the question or answer it in such a way that everyone will know what question was asked.

If the team is not able to answer the question, refer the person to a bulletin or other reference where the answer may be found. If the
team promises to look up the answer, it should keep that promise and notify the person as soon as the answer is found.

**Leader's Part in Demonstration**

A leader may be of real assistance to a club member in urging him to participate in a demonstration. The leader may assist a team in planning a demonstration but should let the team write the demonstration, obtain the illustrative material, make a list of the necessary equipment, prepare the space and clear away everything after the demonstration has been given.

Suggestions for improvement, corrections, and comments may be expected from the leader.

A real leader never prompts nor signals to a team.

**Method of Procedure**

Subject of Demonstration

List of Equipment

<table>
<thead>
<tr>
<th>Demonstrator A</th>
<th>Demonstrator B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction.</td>
<td>Acknowledgment of introduction.</td>
</tr>
<tr>
<td>Greeting by A or B.</td>
<td></td>
</tr>
<tr>
<td>Introduction of members by either demonstrator.</td>
<td>Preparation of necessary materials.</td>
</tr>
<tr>
<td>(Given by either.)</td>
<td>(By either member.)</td>
</tr>
<tr>
<td>Statement of subject and purpose.</td>
<td>Work being done to correspond to steps in discussion.</td>
</tr>
<tr>
<td>Demonstration.</td>
<td>Discussion resumed developing new phase of subject.</td>
</tr>
<tr>
<td>Development of subject by discussion.</td>
<td></td>
</tr>
<tr>
<td>Steps in logical order.</td>
<td></td>
</tr>
<tr>
<td>Work to correspond.</td>
<td>Person talking may also work.</td>
</tr>
<tr>
<td>Charts or other materials to show, add interest.</td>
<td>Discussion and work alternated until demonstration is completed.</td>
</tr>
<tr>
<td>Working space should be kept orderly, clean and in full view of audience.</td>
<td>(By either.)</td>
</tr>
<tr>
<td>Conclusion—By A or B.</td>
<td></td>
</tr>
<tr>
<td>Summary.</td>
<td></td>
</tr>
<tr>
<td>Questions.</td>
<td>Questions usually answered by person who discussed the phase to which question pertains.</td>
</tr>
<tr>
<td>Concluding Statement. (By either.)</td>
<td></td>
</tr>
</tbody>
</table>
# SUGGESTED OUTLINE FOR A PAINTING DEMONSTRATION

<table>
<thead>
<tr>
<th>Demonstrator A</th>
<th>Demonstrator B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction.</td>
<td>Acknowledges introduction.</td>
</tr>
<tr>
<td>Brief talk on club work as carried on in our community.</td>
<td>Gets materials ready.</td>
</tr>
<tr>
<td>Title of demonstration.</td>
<td>Shows material mentioned by team-mate.</td>
</tr>
<tr>
<td>Importance of this topic.</td>
<td></td>
</tr>
<tr>
<td>Shows how to plane, sand, wipe, fill cracks, putty, plastic wood.</td>
<td>Discussion of how to prepare surface for painting.</td>
</tr>
<tr>
<td>Apply shellac coat to knotty or resinous sections.</td>
<td>(a) wood</td>
</tr>
<tr>
<td></td>
<td>(b) others</td>
</tr>
<tr>
<td>If time permits might take up the removal of old paint.</td>
<td>If time permits might take up the removal of old paint.</td>
</tr>
<tr>
<td>How to estimate the quantity of paint needed.</td>
<td>Shows charts on subject.</td>
</tr>
<tr>
<td>Spreading rates.</td>
<td>May apply paint to various surfaces.</td>
</tr>
<tr>
<td>Estimating requirements.</td>
<td>Color charts.</td>
</tr>
<tr>
<td>Discuss paint materials, base, pigments, and vehicle.</td>
<td>Show ingredients of paint.</td>
</tr>
<tr>
<td>Importance of good material.</td>
<td>Reading of printed material on paint can show composition.</td>
</tr>
<tr>
<td></td>
<td>May mix simple paints.</td>
</tr>
<tr>
<td>Have samples of several kinds of paint.</td>
<td>Mixed and home-made paints—advantages, disadvantages. Testing quality of paints.</td>
</tr>
<tr>
<td>Show labels on paint cans to emphasize contents.</td>
<td>Equipment necessary for home mixing.</td>
</tr>
<tr>
<td>Help teammate to prepare home-made paint.</td>
<td>Tell how to prepare at least one home-made paint.</td>
</tr>
<tr>
<td></td>
<td>Value of thinners, driers.</td>
</tr>
<tr>
<td>Summarize demonstration.</td>
<td>Assist teammate in summary and answers to questions.</td>
</tr>
<tr>
<td>Provide opportunity for audience to ask questions.</td>
<td>Collect materials.</td>
</tr>
</tbody>
</table>

### SUGGESTED OUTLINE FOR WOOD FINISHING DEMONSTRATION

<table>
<thead>
<tr>
<th>Demonstrator A</th>
<th>Demonstrator B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction.</td>
<td>Acknowledge introduction.</td>
</tr>
<tr>
<td>Appropriateness of demonstration.</td>
<td>Show several previously prepared panels, or small handicraft articles.</td>
</tr>
<tr>
<td>Importance of finish.</td>
<td>Wood-samples.</td>
</tr>
<tr>
<td>4-H Handicraft standards.</td>
<td></td>
</tr>
<tr>
<td>Differences in woods with reference to finish.</td>
<td></td>
</tr>
<tr>
<td>Expensive hard woods.</td>
<td></td>
</tr>
<tr>
<td>Cheaper woods.</td>
<td></td>
</tr>
<tr>
<td>Shows samples with defects. Work to get them ready. Fill cracks, holes.</td>
<td>Discuss importance of preparing the wood for finishing.</td>
</tr>
<tr>
<td>Wipe surfaces with (turpentine) moistened cloth.</td>
<td>Smoothing.</td>
</tr>
<tr>
<td>Use of stains and fillers.</td>
<td>Grease spots.</td>
</tr>
<tr>
<td>Classes of stains and how made.</td>
<td>Excess glue.</td>
</tr>
<tr>
<td>Application.</td>
<td>Dents.</td>
</tr>
<tr>
<td>Comments on fillers.</td>
<td>Holes or cracks.</td>
</tr>
<tr>
<td>Application and wiping of fillers.</td>
<td>Final smoothing.</td>
</tr>
<tr>
<td>Value of shellac.</td>
<td></td>
</tr>
<tr>
<td>As a wash.</td>
<td></td>
</tr>
<tr>
<td>As a filler—grab coat.</td>
<td></td>
</tr>
<tr>
<td>Use on sappy knots or resinous sections.</td>
<td></td>
</tr>
<tr>
<td>Applies wash coat and shellac.</td>
<td></td>
</tr>
<tr>
<td>Shows panels of varnished and enameled surfaces in process of completion.</td>
<td></td>
</tr>
<tr>
<td>Applies wax to old panels.</td>
<td></td>
</tr>
<tr>
<td>Charts showing ingredients of home-made waxes.</td>
<td></td>
</tr>
<tr>
<td>Summarizes demonstration.</td>
<td></td>
</tr>
<tr>
<td>Answers questions.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Demonstrator A:**

- Introduction.
- Appropriateness of demonstration.
- Importance of finish.
- 4-H Handicraft standards.
- Differences in woods with reference to finish.
- Expensive hard woods.
- Cheaper woods.
- Shows samples with defects. Work to get them ready. Fill cracks, holes.
- Wipe surfaces with (turpentine) moistened cloth.
- Use of stains and fillers.
- Classes of stains and how made.
- Application.
- Comments on fillers.
- Application and wiping of fillers.
- Value of shellac.
- As a wash.
- As a filler—grab coat.
- Use on sappy knots or resinous sections.
- Applies wash coat and shellac.
- Shows panels of varnished and enameled surfaces in process of completion.
- Applies wax to old panels.
- Charts showing ingredients of home-made waxes.
- Summarizes demonstration.
- Answers questions.

**Demonstrator B:**

- Acknowledge introduction.
- Show several previously prepared panels, or small handicraft articles.
- Wood-samples.
- Discuss importance of preparing the wood for finishing.
- Smoothing.
- Grease spots.
- Excess glue.
- Dents.
- Holes or cracks.
- Final smoothing.
- Shows sample stains.
- Mix one to show method.
- Prepares filler for partner.
- Prepares a shellac wash coat.
- 1 part shellac and 3-4 of wood alcohol.
- Shows samples and illustrative material.
- Discusses varnish and enamels.
- Conditions necessary.
- Value and importance of wax.
- Home-made waxes.
- Selection and care of brushes.
- Brushes may be cleaned if time permits.
- Helps teammate with questions.
- Collects materials.
**SUGGESTED OUTLINE FOR DEMONSTRATION ON CONSTRUCTION OF ARTICLES**

<table>
<thead>
<tr>
<th>Demonstrator A</th>
<th>Demonstrator B</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Introduction.</strong>&lt;br&gt;Brief talk on club work.&lt;br&gt;Title and purpose of demonstration.&lt;br&gt;Explains about article to be made and tools to be used in work.</td>
<td>Acknowledges introduction.&lt;br&gt;Hangs up charts.&lt;br&gt;Arranges equipment.&lt;br&gt;Shows completed article.&lt;br&gt;Starts working on various pieces.</td>
</tr>
<tr>
<td>Pieces may be cut, smoothed and fitted. If they are already cut, enough work should be done on them to demonstrate methods.</td>
<td>Explains the working drawings of the article. Purposes of drawings. Three dimensions of pieces. Dotted lines. Work in cutting, squaring and assembly of article.</td>
</tr>
<tr>
<td>Explains the assembly of article. Use of nails, screws and hardware. Tell briefly the steps necessary before article is ready for finishing.</td>
<td>Shows pieces made.&lt;br&gt;Refers to charts to check measurements.&lt;br&gt;Sands lightly the surfaces.&lt;br&gt;May use crack filler, plastic wood.</td>
</tr>
<tr>
<td>Shows completed article.&lt;br&gt;Arranges tools and equipment.</td>
<td>Summarizes demonstration.&lt;br&gt;Gives opportunity for audience to ask questions.</td>
</tr>
</tbody>
</table>

Both demonstrators clean up the work bench and arrange equipment.

---

**Suggestions for Speakers**

1. Demonstrators should face the audience.
2. Make the talks by each demonstrator short and direct.
3. Make the demonstration smooth and direct.
4. The demonstrators should be prepared to give the explanation.
5. Have something to say rather than fill up time with idle talk.
6. A demonstration should be an authoritative presentation of subject matter so that the audience will understand the manner of presentation.
7. Never stand in front of your audience when they are not interested in seeing as well as hearing.
8. If unable to answer the questions from audience, refer to serious publications on carpentry or other text books on the subject.
## SUGGESTED OUTLINE FOR A SAW FILING DEMONSTRATION

<table>
<thead>
<tr>
<th>Speaker A</th>
<th>Speaker B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduces himself and teammate in some novel way. Brief talk on club work as carried on in the nation, state and the community. Demonstration is part of club work. Nature and purpose of demonstration.</td>
<td>Gets material ready. Arranges tools, adjusts saw. Shows chart, etc.</td>
</tr>
<tr>
<td>Assists by showing parts of saw, pointing out differences as found and mentioned by speaker B. Shows good and bad features of saws as mentioned by his partner.</td>
<td>Speaks on use of saw. Parts, differences between cut-off, rip, back, keyhole and coping saws. What to look for in buying saws. How to handle a saw.</td>
</tr>
<tr>
<td>Discusses the following: Jointing. Proper set for good work, and different types of lumber.</td>
<td>Shows how to joint. Shows hand set and anvil set. Use charts if possible.</td>
</tr>
<tr>
<td>Demonstrates how to hold file and shows chart.</td>
<td>Tells how to file cut-off saw.</td>
</tr>
<tr>
<td>Tells how to file rip saw.</td>
<td>Demonstrates how to hold file. Shows chart.</td>
</tr>
<tr>
<td>Clears bench and prepares to help his partner answer any questions that may be asked.</td>
<td>Summarizes points. Asks if there are any questions. Closes.</td>
</tr>
</tbody>
</table>

### Suggestions for Demonstrators

1. Demonstrators should face the audience at all times.
2. Make the talks by each demonstrator as natural as possible.
3. Make the demonstration smooth and rapid; avoid delays.
4. The demonstrators should be busy at all times either working or giving the explanation.
5. Have something to say rather than have to say something.
6. A demonstration should be an interesting and natural presentation of subject matter so that those hearing it will be entertained by the manner of presentation and instructed by the information.
7. Never stand in front of your work. The audience will be interested in seeing as well as hearing.
8. If unable to answer the question, refer the questioner to the various publications on carpentry work—the handicraft club bulletin or other text books on the subject.
9. Courteously avoid answering questions that do not pertain to the work.

10. Team members do not have to be 15 years of age to represent their county at the district contests, but those making the trips to Michigan State Fair and the National Club Congress should be near this age.

Measuring Results of the Demonstration

Club members should look for the standards in a score card and measure their results according to these standards. In the same way a team demonstration may be judged.

In competitive demonstration contests it is almost essential to have an outline of some form or a score card to use in order to evaluate the main parts of the demonstration.

The following score card is given as a guide in judging demonstrations:

A. Subject Matter. 30%
   1. Importance with relation to problems of farm or home.
   2. Accuracy of statements.
   3. Approved methods.
   4. Completeness. Giving steps necessary to understand the process.
   5. Clarity and definiteness of statements on subject outlined.
   6. Replies to questions.

B. Presentation. 40%
   1. Preparation, arrangement and use of material.
   2. Organization of the work.
   3. Appearance and conduct of demonstrators.
   4. Skill shown by team.
   5. Ease of speech and system in procedure.
   6. Workmanship.

C. Results. 15%
   1. Effect upon audience.
   2. All processes made clear.

D. Practicability. 15%
   1. To demonstrators’ own community.
   2. To show an actual or needed club practice.
   3. Value to other handicraft members.

COOPERATIVE OTHER DEM

1. How to sharpen a plane.
2. The use of the miter box, etc.
3. The correct way to use a hammer and other tools.
4. The making of a dovetail joint.
5. The construction of any article.
6. The way to use a bench hook.
7. Demonstrate use of a T-bevel ruler.
8. Bending wood for skis, or other articles.
9. Staining, shellac, or varnish identified wood.
10. How to file a cut-off and a tool.
11. Cleaning paint brushes.
13. Refinishing furniture.
14. Weaving and recaning.
15. Tying knots and splicing rope.

WOOD IDENTIFICATION

The purpose of this contest is to teach 4-H handicraft members about the commercial wood properties and uses. Knowledge of wood is particularly needed by handicraft members when they consider the type of finish to apply in specific applications of the wood. Detailed information about the wood identification contest is in 4-H Club Bulletin 26, "Wood Identification." Handicraft clubs may obtain from their State Cooperative Extension Service 14 wood samples for this study.

The wood identification contest is given in the county or achievement day. It is optional for handicraft members, but all are urged to participate. The highest scoring boys in the county contest and the highest scoring team in the district elimination contests are invited to go to the Michigan State Fair. The two highest individuals in the state are invited to the National Club Congress.
Other Demonstrational Topics

1. How to sharpen a plane.
2. The use of the miter box, miter saw or power machinery.
3. The correct way to use a hammer, a plane, a square, a brace and bit and other tools.
4. The making of a dove-tail joint.
5. The construction of any article.
6. The way to use a bench hook.
7. Demonstrate use of a T-bevel.
8. Bending wood for skis, or curves of any kind.
9. Stain, shellac, or varnish demonstration.
10. How to file a cut-off and a ripsaw.
11. Cleaning paint brushes.
13. Refinishing furniture.
14. Weaving and recaning.
15. Tying knots and splicing rope.

WOOD IDENTIFICATION CONTEST

The purpose of this contest is to stimulate an interest in the study of Michigan's commercial woods and to learn their characteristics, properties and uses. Knowledge of woods will be of value to handicraft members when they come to select lumber for their articles. The type of finish to apply will largely be determined by the nature of the wood.

Detailed information about wood identification can be found in 4-H Club Bulletin 26, “Wood Identification for 4-H Clubs”. Handicraft clubs may obtain from their county extension agent a box of 14 wood samples for this study.

The wood identification contest is held sometime during the achievement day. It is optional with handicraft and forestry club members, but all are urged to participate. The two or three highest scoring boys in the county contest will be eligible to compete in the district elimination contests. At these events eight boys will be selected to go to the Michigan State Fair to compete in the state contest. The two highest individuals in the state contest are eligible to go to the National Club Congress in Chicago, Ill.
ACHIEVEMENT EXHIBITS

The achievement day will have a very significant meaning to all handicraft club members who have completed their project requirements. Most of the achievement days are now conducted as all-county events. Exhibits from every member and all of the clubs in the county will be on display. This will give every member a chance to make comparisons, and inspect the advanced years' work.

The 4-H exhibit is a public demonstration of what has been accomplished throughout the year, and is a means of interesting other boys in the work.

Handicraft exhibits are set up on long tables. Paper placed on the tables will give a neater appearance and help to show up the articles to better advantage. Each club will have a definite space and will place its exhibit according to the different years of work. Each boy's articles should be grouped together, and each article labeled with the name of the club member, year of work and name of the leader of the club.

Achievements may be held locally either before or after the county day. A short but instructive program should be given. The president of the club should preside at the meeting. A typical business meeting may be conducted. Roll call could be responded to by some statement pertaining to handicraft work, such as things that have been learned from the project. Articles made and cost. Properties and characteristics of Michigan's common woods could be given by some member exercise, sharpening tools, etc.

Talk: What I Think of Hand talks.
Talk: What I Think of Hand talks.
Club Songs.
Instrumental Music.
Reading the best story of the day.
Judge of Exhibits.
Social Hour — Games, lunch,

HANDICRAFT

The club meetings should have:

1. The business or formal part of the meeting.
2. Subject matter: Discussions, of interest to the members.
3. Social or recreational: Songs and entertainment.

Besides the regular work per business meetings during the season, more time and attention should be given to discussion.

The discussions will naturally and its individual members, as well as the club as a whole. A discussion leader may be appointed at each meeting in order to have something of interest to the members may be discussed. A few suggestions are offered:

1. What are the aims of 4-H handicraft work?
2. What relation does the project have to home life?
3. Why is "good housekeeping" important?
4. Suggest standards for good handicraft work.
5. What factors did you use in handicraft work?
6. Should a farmer have a workroom?
istics of Michigan's common woods. A short demonstration of some kind could be given by some members of the club, making some simple exercise, sharpening tools, reading working drawings, etc.

Talk: What I Think of Handicraft Club Work — Club Member.
Talk: What I Think of Handicraft Club Work — A Father.
Club Songs.
Instrumental Music.
Reading the best story of the Handicraft Club Members.
Judge of Exhibits.
Social Hour — Games, lunch, etc.

HANDICRAFT CLUB MEETINGS

The club meetings should have three definite purposes:

1. *The business or formal part in which parliamentary practices are learned and used.*

2. *Subject matter: Discussions, demonstrations, talks on the subject of interest to the members.*

3. *Social or recreational: Songs, games and other forms of social entertainment.*

Besides the regular work periods, the club should hold at least six business meetings during the season. Because of the nature of the advanced work, more time and attention should be given to discussions.

The discussions will naturally depend upon the interest of the club and its individual members, as well as the nature of the work at hand. A discussion leader may be appointed or selected in advance for each meeting in order to have something definite prepared. Most anything of interest to the members may be used as topics for discussions. A few suggestions are offered:

1. What are the aims of 4-H handicraft work?
2. What relation does the project have to club members' farm and home life?
3. Why is "good housekeeping" necessary to the shop?
5. What factors did you use in selecting your projects?
6. Should a farmer have a workshop? Why?
7. Farmer Jones has $10 to spend for tools. What tools would you recommend that he purchase?
8. What are the requirements of good lumber?
9. Why is lumber graded? What are the grades?
10. What is the penny system?
11. Name some precautions in the care of tools.
12. What equipment is necessary for sharpening tools?
13. Describe each of the five methods used in sharpening a hand saw.
14. Figure out the number of board feet and total cost of:

<table>
<thead>
<tr>
<th>No.</th>
<th>Piece</th>
<th>Kind of Wood</th>
<th>No. Bd. Ft</th>
<th>Price per M.</th>
<th>Total Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>H. Maple</td>
<td></td>
<td></td>
<td>$36</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>B. Walnut</td>
<td></td>
<td></td>
<td>220</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Basswood</td>
<td></td>
<td></td>
<td>40</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>White Pine</td>
<td></td>
<td></td>
<td>55</td>
<td></td>
</tr>
</tbody>
</table>

15. What ingredients are found in paint and what is the use of each?
16. Should ready-mixed or home-made paint be used?
17. What kind of paint would you recommend for: House, chicken coop, hayrack, wagon box, kitchen cabinet, garage, hog trough, bathroom walls, unfinished furniture?
19. What factors must be considered in choosing a finish?
20. What are some of the common kinds of finishes?
21. How should the wood be prepared for finishing?
22. What are the kinds of stain? How may they be applied?
23. What are fillers?
24. What procedure should be followed in applying shellac and varnish?
25. What is meant by an oil finish?
26. What are the objects of using wax?
27. How should old finishes be removed?
28. What steps would you recommend in refinishing an old enameled black walnut chest?
29. What is meant by the term "bleeding" in finishing?
30. Name three common kinds of 4-H work at the school house?
31. What are some advantages of having home-made tools at school house?
32. The advantages of power tools?
33. The value of home-made and power tools?
34. How can the school board encourage home-made tools?
35. Should prizes be given for the best home-made tools?
36. Give requirements of a good black walnut chest?
37. Should the wood identification be done at school house?
30. Name three common kinds of glue.
31. What are some advantages and disadvantages of doing handicraft work at the school house?
32. The advantages of power machinery for advanced work.
33. The value of home-made articles vs. factory-made articles.
34. How can the school board help your club?
35. Should prizes be given for handicraft work?
36. Give requirements of a good bird house.
37. Should the wood identification contest be continued and enlarged?

REPORT AND STORY

The report is a definite requirement for completion. A report blank will be furnished each member in order that the work may be summarized. This report form is exhibited with the handicraft exercises at the 4-H club achievement day.

Each club member should know the cost of the lumber, finishing supplies, nails, screws, and other hardware used in the making of each article.

If you have a camera take some pictures showing your club demonstration team, exhibits, or any other things of interest. These will add to the value of your report and will be a means of showing others the worthwhile things that you and your club have accomplished.

RECORD OF HANDICRAFT WORK

1. Date club was organized .................................................................
2. Date first selected exercise was started ........................................
3. Date last selected exercise was completed ....................................
4. Was work done at home or at school? .........................................
5. How many meetings did your club have? ....................................
6. How many did you attend? .........................................................
Financial Statement (Example)

<table>
<thead>
<tr>
<th>No.</th>
<th>Name</th>
<th>Cost of material used</th>
<th>Estimated value</th>
</tr>
</thead>
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(Note—Use additional sheet if necessary)

7. Total Estimated Value of Exercises ........................................... $12.00
8. Total Cost of Material Used on Exercises .................................. 6.66
9. Total Profit on Exercises .................................................. 5.34

COST OF MATERIALS

The cost of materials includes not only the amount for lumber but sandpaper, nails, screws, hardware and finishing supplies. If the purchase price of the new lumber is not known, the cost should be figured at 30 cents per foot. Reclaimed or used lumber should be figured at 10 cents per foot. For details on figuring the lumber bill, see page 9.

ESTIMATED VALUES FOR HANDICRAFT ARTICLES

It is impossible to set a definite value upon all of the articles made in the advanced years. These values will vary according to the kind and grade of lumber used; type of hardware selected, and quality of finishes applied. In order that all boys may have a more or less uniform report, the estimated values quoted below may be used. The real value to you will in most cases be much higher, because there is a certain amount of pride and satisfaction in having made the articles yourself. Your club leader should help you estimate the value of other articles which you have made, if they are not in the bulletin.

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8. Total Cost of Material Used on Exercises .................................. 6.66
9. Total Profit on Exercises .................................................. 5.34

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ESTIMATED VALUES FOR HANDICRAFT ARTICLES

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### Third Year Exercises

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### Fourth Year Exercises

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### Fifth, Sixth, and Seventh Year Exercises

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*Note: This is put in because it is hard to estimate the cost of fences because it will depend upon height, length, and other things.
REFERENCE MATERIAL

This list of books is given as reference material for handicraft clubs. One or more of these texts should be found in the library of every rural school, or they may be purchased by the handicraft club.

Books:

"Farm Woodwork," Roehl, published by The Bruce Publishing Company, Milwaukee, Wis.
"Farm Engineering," Robb & Behrends, John Wiley & Sons, New York, N. Y.

Magazines:

Home Craftsman, Walker Popular Mechanics, 200 Popular Science, 353 Deltagram, 600 E. Viem Fellow Crafters, 739 Boy Home Craft, General Pu

Commercial Literature:

California Red Wood Lab Calif.—Agricultural Sci Forest Products Labo Wood Products.
“Agricultural Woodworking,” Roehl, Bruce Publishing Company, Milwaukee, Wis.
“Agricultural Engineering,” (Smith), Lippincott, Wabash Avenue, Chicago, Ill.
“Farm Mechanics,” (Cook, Scranton & McColly), Interstate Printing Co., Danville, Ill.

Magazines:
Home Craftsman, Walker Turner Company, Plainfield, N. J.
Popular Mechanics, 200 E. Ontario Street, Chicago, Ill.
Popular Science, 353 4th Avenue, New York, N. Y.
Deltagram, 600 E. Vienna Avenue, Milwaukee, Wis.
Fellow Crafters, 739 Boylston Street, Boston, Mass.

Commercial Literature:
California Red Wood Lab., 405 Montgomery Street, San Francisco, Calif.—Agricultural Series of Red Wood Bulletins.
Forest Products Laboratory, Madison, Wis.—Technical No. 240—Wood Products.
Southern Pine Association, New Orleans, La.—100 Handy Helps—South Pine and Its Uses.
Sargent and Company, New Haven, Conn.—Literature on Saws, Squares, Planes, etc.
Detroit White Lead Works, Detroit, Mich.
American Steel and Wire Company, Chicago, Ill.—Nail Chart.
E. C. Atkins and Company, Indianapolis, Ind.—Literature on Saws.
Henry Disston and Sons, Inc., Philadelphia, Pa.—Literature on Saws.
National Lead Company, 900 West 18th Street, Chicago, Ill.—Handbook on Painting.
Berry Brothers, Inc., Detroit, Mich.—Natural Woods and How to Finish Them.
Brodhead Garrett Co., Cleveland, Ohio—Catalog on Manual Training Supplies.
Superintendent of Documents, Washington, D. C.—U. S. D. A. Bulletins:
Farmers Bulletin No. 1452—Painting on the Farm.
Miscellaneous Circular No. 66—Identification of Furniture Woods.
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<td>Under coats</td>
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<td>Value of articles</td>
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<td>Vanity bench</td>
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<td>Varnish remover</td>
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<td>Varnishes</td>
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<td>Wagon jack</td>
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<td>Wall shelves</td>
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<td>Wastepaper basket</td>
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<td>Wax</td>
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<td>Wood treatment</td>
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<td>Work bench</td>
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4-H CLUB MOTTO — "To Make the Best Better"

4-H CLUB • EMBLEM

4-H CLUB COLORS — Green and White

4-H CLUB PLEDGE

I pledge
My head to clearer thinking,
My heart to greater loyalty,
My hands to larger service, and
My health to better living

For
My Club
My Community and
My Country.