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Woodworking PROJECT



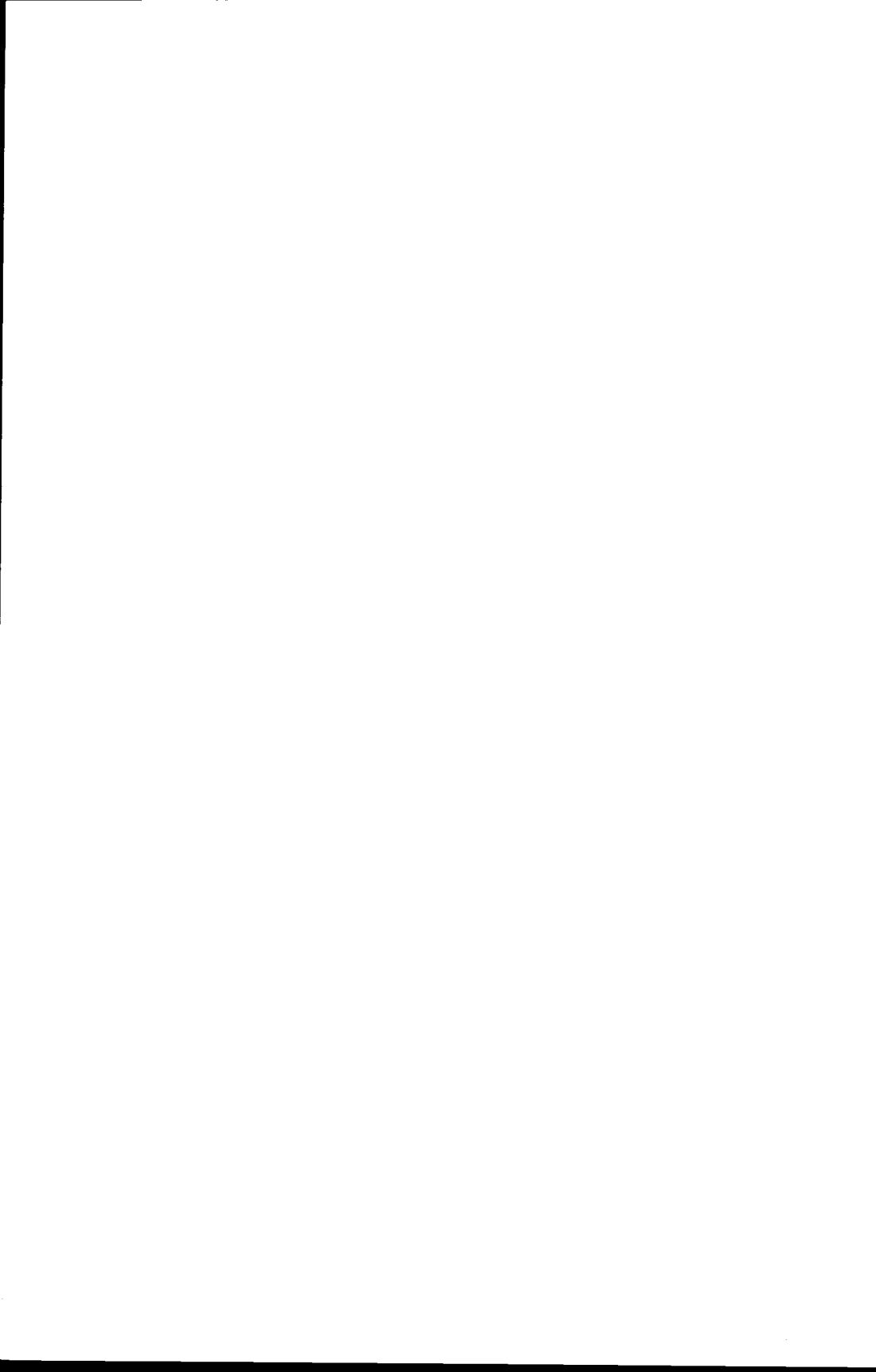
*Federal Cooperative
Extension Service,
Oregon State College,
Corvallis*

READ

Cooperative Extension Work in Agriculture and Home Economics, F. E. Price, director. Oregon State College, the United States Department of Agriculture, and the State Department of Education co-operating. Printed and distributed in furtherance of the Acts of Congress of May 8 and June 30, 1914.

Club Series U-5

August 1951



4-H *Woodworking* Project

A standard 4-H woodworking club has five or more members, an adult leader, and a program of work. It will hold 10 or more meetings, will have a demonstration team, and will participate in a 4-H exhibit, fair, or an achievement day program.

In a 4-H woodworking club you may learn:

- ▶ How to select, care for, and use common carpenter's tools.
- ▶ How to care for your equipment.
- ▶ How to use hand tools skillfully.
- ▶ How to make useful articles of wood.
- ▶ How to follow instructions.
- ▶ How to appreciate good workmanship.

To be a 4-H woodworking club member you must be 9 years old before January 1 of that club year. You will need to own or have available for your use a square, saw, and hammer. Other tools are desirable. You will need a place to do your work—at home or in a shop where your club meets. When you join a 4-H club, you are expected to attend meetings regularly, to do the work required, and to complete your project. You must be willing to do your share and to cooperate with the other members of your club.

Requirements

Because one of the purposes of this project is to train members in the use of hand tools, it is recommended that no power tools be used until club members have their leader's permission. Articles for exhibit in the Home Woodworking division must be made entirely with hand tools.

Articles to be made

You must make at least three useful articles of wood during the club year. You may use 4-H woodworking or other plans. You should select articles that you would like to make, make as many articles as you wish, and tell about all of them in your record book.

Record book

You will keep a record of tools and materials used and articles made in the record book provided. This record book is to be completed and turned in at the end of the club year. It is also part of your exhibit.

Exhibit

You will make an exhibit at a Club, community, or county fair. Your exhibit will be the articles you have made during the Club year and your completed woodworking record book. The basis for scoring will be 75 per cent on articles made and 25 per cent on your record book. You may exhibit in any one of the following divisions:

Division I: Home Woodworking—Three articles, useful in the home or shop, made entirely with hand tools.

Division II: Farm Woodworking—Three articles useful on the farm. Power tools may be used.

Division III: Machine Woodworking—One major or three smaller articles. A desk, chest, table, or similar article shall be considered a major article.

Tools and Their Uses

Measuring tools

- ▶ Rule—used for finding length and width.
- ▶ Framing square—a large metal square used for finding length and laying out rafters.
- ▶ Try square—used in squaring edges and testing surfaces and angles.
- ▶ Compass—used to describe circles or parts of circles.
- ▶ Gauge—used in marking lines parallel to the working face.

Cutting tools

- ▶ Saws
 - Cross-cut saw*—used for cutting across the grain.
 - Rip saw*—used for ripping the lumber; sawing with the grain.
 - Compass saw or keyhole saw*—used where it is not possible to use a larger saw for cutting curves.
 - Back saw*—used on fine work, and is somewhat similar to a cross-cut saw except that it has more teeth per inch.
- ▶ Planes
 - Jack plane*—15" to 18" long; used for smoothing surfaces.
 - Smoothing plane*—looks something like a jack plane but is shorter and wider.
 - The block plane*—small plane used for squaring up the ends of stock.
- ▶ Chisel—used for making square or rectangular holes and paring.

- ▶ Draw knife—used for cutting out curves or for roughing out work.
- ▶ Bit—used in the brace for boring holes.

Other tools

The hammer and screwdriver should be part of every tool kit, and need no explanation. Files are handy tools to include in your kit.

Selecting Tools

Select only tools of well-known brands, starting with those which you will need most. You may add more tools as needed. Where you have your own tools, be sure to put them in good shape. Sharpen all edged tools before starting any project and whenever they need it. It is a good plan to have your club leader or your father assist you in selecting your tools.

Suggested tools

Rip saw	Brace and bits:
Cross-cut saw	$\frac{1}{4}$ " , $\frac{1}{2}$ " , $\frac{3}{8}$ " , and $\frac{3}{4}$ "
Chisels: $\frac{1}{4}$ " , $\frac{1}{2}$ " , and 1"	Jack plane
Hammer	Try square
Screw driver	Framing square

Other desirable tools

Vice for work bench	Spoke shave
Draw knife	Coping saw
Back saw	Compass saw
T bevel	Wood rasp
Marking gauge	

Care of Tools

It is important to have a clean, dry place for tools. Tools may be kept in a cabinet over a work bench, in drawers in the bench, or in a tool box. Oil should be used on tools to keep them from rusting, but should be used sparingly. If tools become rusty, remove the rust by rubbing with pulverized pumice stone, then oil thoroughly.

Keep tools with cutting edges sharp. It is no fun to work with a dull tool.

Saws

Saws need the most care of all woodworking tools. They dull easily and are hard to sharpen correctly. It is best to keep them in separate racks where they do not rub against each other or against other tools. If you bend a saw, determine exactly where the "kink" or bend occurs, place it on the end grain of a block of hardwood, and tap it back into line with a hammer.

Never allow a saw to rust. Besides dulling the teeth, rust may cause the saw to bind in a cut. When rusty, clean it with steel wool and rub with oil or tallow. New saws should be oiled or treated with tallow, which makes them less likely to rust and easier to use.

Planes

The plane blade should be drawn up with the adjusting screw before storing the plane, thus protecting it from damage. The plane should be kept rust-free, with all working parts in good order. It should be taken apart occasionally, the parts inspected, and wiped with an oily rag. The sole of the plane should be smooth and clean so it will slide well. The handle and knob should be screwed tight at all times.

Auger bits

If a bit becomes bent, roll it on a level surface to locate the high spot and tap it back into line with a hammer.

Bits rust if they are not cared for properly. Rusting usually is due to moisture from the hands or from the sap in wet wood. You can prevent rust by wiping the bits with an oily rag after such exposures.

Chisels

Chisels should be kept in excellent condition. Handles of tank or socket chisels should be kept tight on the blade. This gives longer life to the handles and prevents their loss.

Hammer

The hammer should be kept in a tool cabinet or other suitable place, out of the weather so that the handle will not rot and the head will not rust and pit. Be sure the head is tight on the handle. In difficult or awkward pounding positions be careful not to strike over the object and hit your fingers or chip and shatter the handle.

Try square

Be sure the try square you buy is true, then be careful to keep it in good condition.

The try square should be kept in a tool box or chest in a special rack where it will not be struck and jostled about by other tools. Never use a square to pry, to pound, or to drive screws. The metal is fairly soft and is damaged easily by hammering and rough usage. Try squares usually are made of rustproof metal but should be kept dry and out of the weather at all times.

Screwdriver

Keep the handle tight on the shank if possible. Some types are riveted together and are easy to tighten. The blade tip should be kept properly ground and free of twists.

Files

Files should be stored in individual compartments if possible, so they will not be dulled by bumping against one another. Do not allow them to rust. Files should be kept clean with a wire brush, file card, or a soft block of wood. Make it a rule to fit a handle to a file when using it, so that you will not injure your hand with the spike, or "tang," end.

Stones and strops

The stone should be set in a solid or built-up block slightly larger on sides and ends so about one-half the thickness of the stone will be exposed. This will allow the stone to be clamped in a vice or made solid to a special table or bench. The stone should be provided with oil or water as recommended by the manufacturer. Use the full surface of the stone so it will not become hollow in the middle. Hollow stones may be trued up by rubbing them on a window glass, using light oil or turpentine mixed with No. 120 carborundum dust as a cutting compound.

Paint brushes

Never put oil-base paint or varnish brushes in water, either before or after they are used. Water will make the bristles soft and mopy and will spoil the brush. Oval brushes, however, may be tightened by pouring a little water on the butt end of the handle in the center of the brush. This swells the wood and holds the bristles tight.

After use, suspend brushes in raw linseed oil so that the oil covers the bristles completely. Do not allow the bristles to touch the bottom of the can. Varnish brushes should be kept in separate containers and washed out in some paint solvent, such as turpentine or Leptyne. Thoroughly wash out calcimine and whitewash brushes and suspend them, bristles down, to dry. Color brushes should be

suspended in turpentine in dust-proof containers. Brushes used in shellac should be cleaned with alcohol. Lacquer brushes usually are cleaned with lacquer thinners.

Sharpening Your Tools

Emery wheels and grindstones are used for sharpening many edged tools. For effective grinding, the circumference of the wheel should operate at least 4,000 feet per minute.

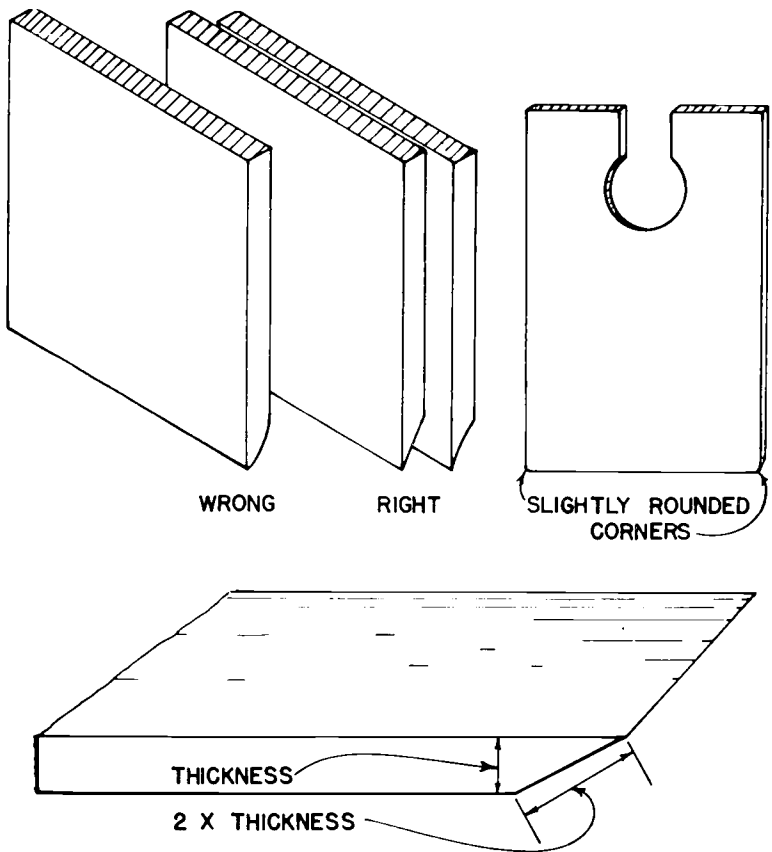


Figure 1. The angle of the bevel and the right and wrong way to sharpen a plane blade.

Plane bit

The plane is one of the most important tools for the woodworker. By keeping it sharp your work is made easier and your workmanship is improved. On some planes, such as the jack, jointer, fore, and smoothing, the edges are curved slightly upwards at the ends. The correct angle for the bevel is shown on opposite page.

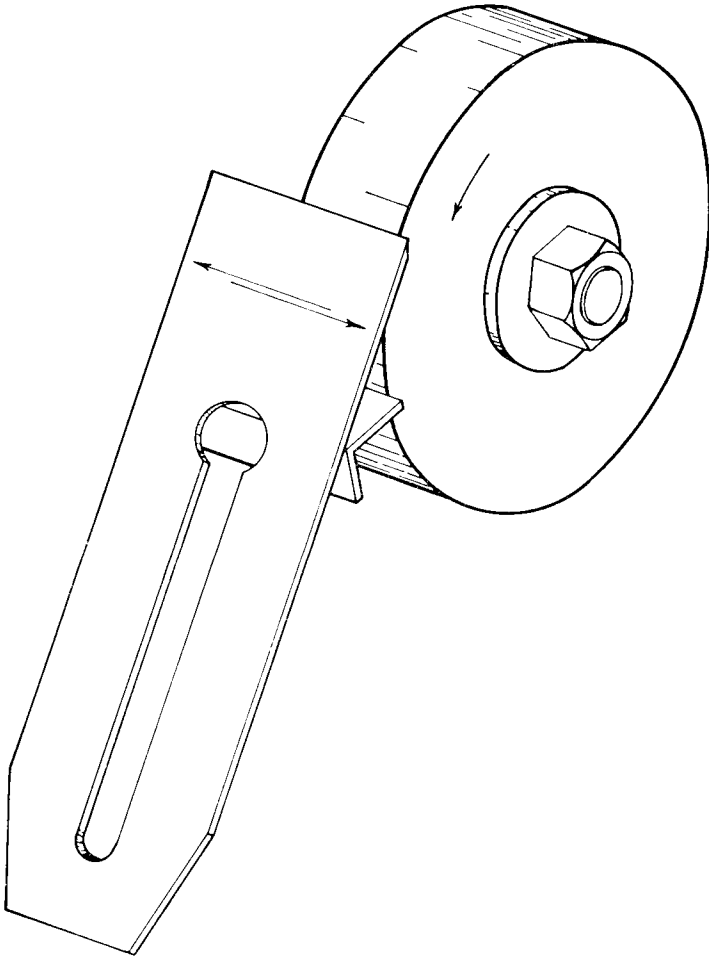


Figure 2. Grinding a chisel or plane blade on an emery wheel. A tool rest is essential for holding the blade at the correct angle.

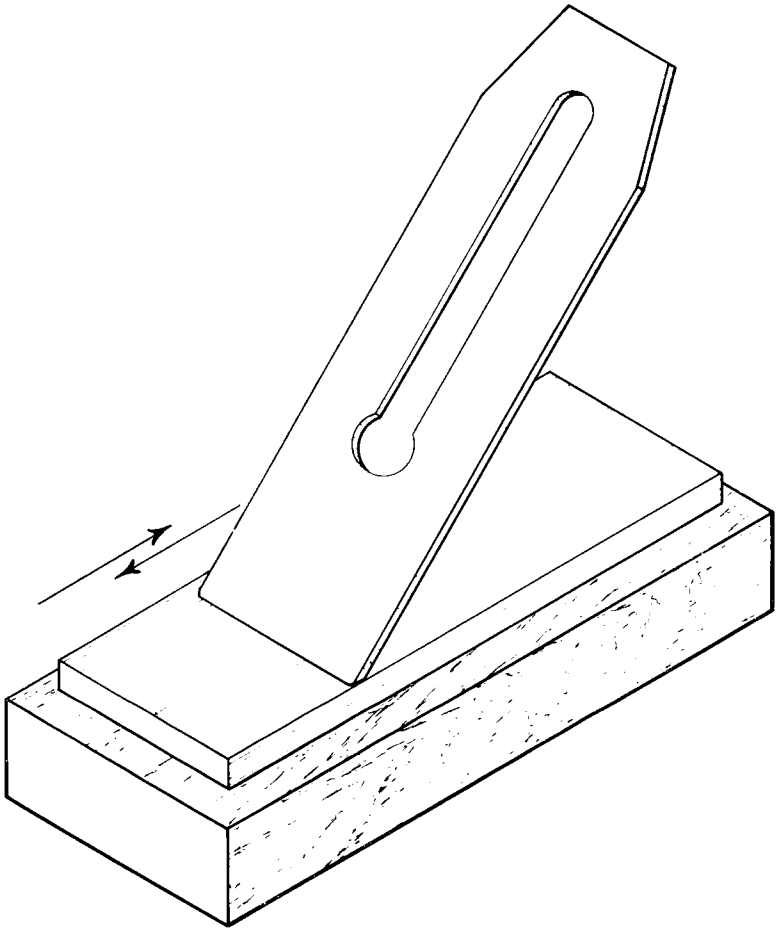


Figure 3. Honing the chisel or plane blade after grinding to give a finished cutting edge.

A grindstone or emery stone may be used for sharpening. In either case, a tool rest should be used. When grinding on an emery stone, move the bit gradually from side to side, so that the cutting edge will be smooth and straight, using a light pressure. Be careful not to overheat the bit. Dip it in water to cool it. Grinding should continue until the dull edge is eliminated and there is a fine burr or wire edge.

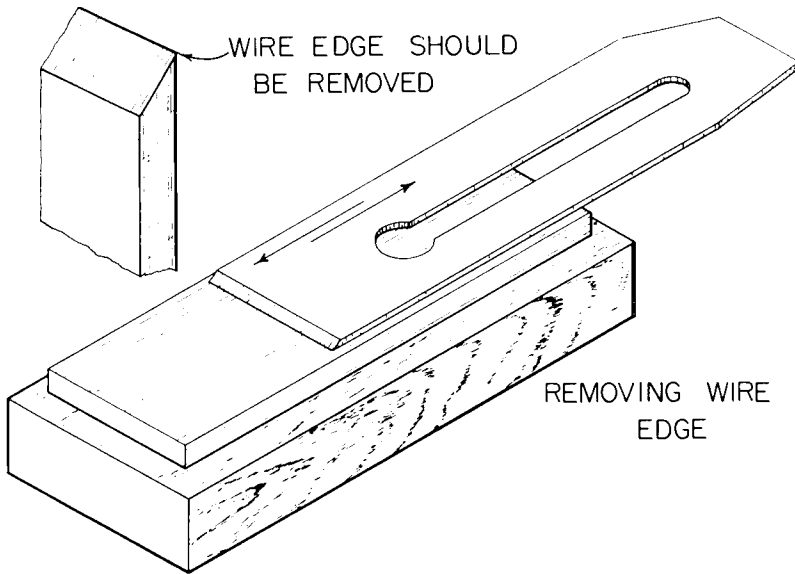


Figure 4. Removing the wire edge.

The finishing should be done on a sharpening stone or fine oilstone. When using such a finishing stone, hold the bit in both hands, moving it forward and backward with pressure on the forward stroke only. When starting, place the iron on the stone at a very low angle and raise it gradually until the bevel is flat with the surface of the stone. Always move the bit slightly from side to side with each stroke. This will help keep the surface of the stone level.

Turn the bit over, hold it flat, and take a few light strokes to remove the wire edge. Be very careful when placing the blade in the holder. You can ruin the edge of the bit by carelessness.

Once the bevel has been ground properly, the bit can be kept sharp for a long time by using an oilstone or carborundum stone.

Wood chisel

An emery grinder is preferred for sharpening chisels, but a good job can be done on a grindstone. In either case, a tool rest should be used so that a uniform bevel can be obtained. In case of nicks, the edge should be ground square and a new bevel ground as before. The same procedure is used for finishing as for the plane bit.

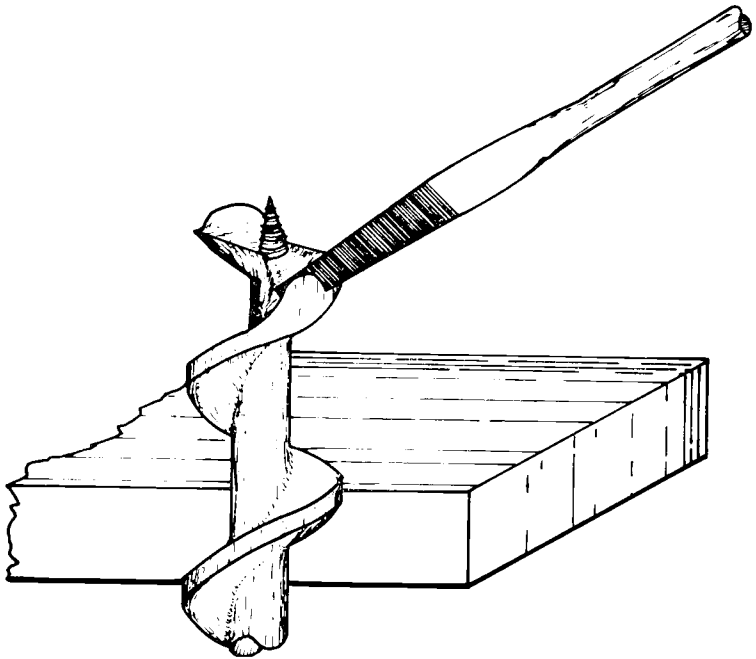


Figure 5. Filing the spurs on the inside is the correct method.

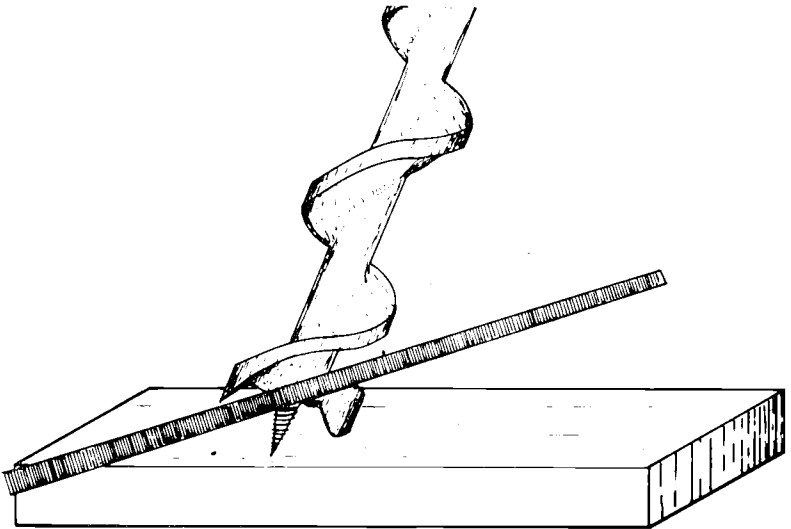


Figure 6. The lip should be filed on the top or shank side to avoid losing clearance and provide longer life for the bit.

Auger bits

Auger bits are sharpened with a file made especially for that purpose called an auger-bit file. The auger-bit file is flat and thin and is better suited for the smaller bits than is the triangular file. The first thing to check on a dull bit is the spur. If it has been bent, the bit should be placed on a flat bench and a file laid lengthwise on the bit so that when filing it touches the other twists of the bit. The spur is then filed to an edge which must cut straight or it will tend to undercut the bore size. The inside of the spur is then filed with the auger-bit file as shown in Figure 5.

Other tools

Wood cutting tools such as axes, hatchets, drawknife, and others should be sharpened on either a grindstone or emery wheel and finished with an oilstone or carborundum stone.

Saws

A complete discussion on the sharpening of saws would require considerable space. There is excellent instruction on saw sharpening available from saw manufacturers.

Using Certain Hand Tools

The hand saw

One might think that anybody can take a saw and saw on a straight line, but that is not true. One of the first things a carpenter must learn is the proper use of the hand saw.

To start on a line, first guide the saw against the thumb and, second, draw the saw up at least once and maybe several times. It should be drawn up slowly and carefully on the last cut before starting the downward saw strokes. Avoid "riding" the saw blade to get it to cut faster; little or no pressure is needed.

Hold the saw firmly and use fairly long strokes. The wood or boards should be level at all times so you will learn, by practice, to saw a square cut. You can easily catch on to this at first by testing the saw after it is started with a try square.

Two kinds of saws are commonly used for sawing wood. They are the cross-cut saw and the rip saw. The cross-cut is the saw used for cutting across the grain. Its teeth are small and filed to a point. The rip saw cuts with the grain more as a chisel does and has fewer teeth, farther apart. The teeth of both saws are alternately bent or "set," one to the left and one to the right, making a "kerf," or cut, wide enough to keep the blade from binding.

The plane

The plane is nothing more than a wood chisel set in a block of wood or metal, which serves as a guide to regulate the cut. When the plane is not being used on the bench, it should be laid on its side. Before using, always inspect the blade by turning the plane over. Check the corners of the blade to see if they are level. Most planes have an adjusting lever for this purpose.

Always raise the plane off the surface when returning it for the next stroke, or it will quickly become dull. A 14-inch jack plane is advised for general work about the home shop.

Wood chisels

A wood chisel is a carving tool and its proper use requires steadiness of hand and eye. It is better to make the shavings thin and to cut with the grain of the wood so the surface will be kept smooth. Cross-grain and shearing cuts may be made, but use care and take thin cuts.

Use this tool with caution to avoid serious injury. Do not place the free hand ahead of the sharp edge, but use it to hold and to guide in the work of cutting.

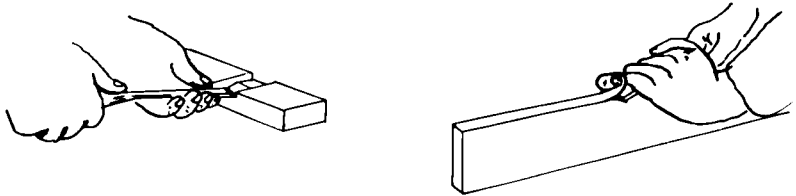


Figure 7. Using the chisel for paring. Always keep hands behind the cutting edge.

The bit

When boring holes, cut until the spur, or point, appears on the other side. Turn the wood over and finish from that side. This makes a clean hole, while boring a hole through from one side splinters the wood. Guide the bit carefully so that the hole will be drilled at the angle you desire.

The size of auger bits is indicated by figures on the tong in 16ths of an inch. Thus a size 10 means 10/16 inch in diameter.

The try square

The try square is used most often for measuring right angles, but also is used for making short measurements and for laying out lines. The 8-inch square is most popular.

Screwdrivers

Screwdrivers vary in size according to the screws, but a good tip and a long shank are desirable features for most purposes. Every tool kit should contain several screwdrivers so that the right size can be used for each screw. If the tip is rounded or beveled, it will rise out of the screw slot. It should be ground square.

When fastening two pieces of wood, a hole to take the shank of the screw must be bored in the upper part and sometimes a small or starter hole in the second piece to avoid splitting. In soft woods the lower hole may not always be necessary. A neater job results if flathead screws are countersunk.

Claw hammer

The claw hammer is used for nailing and all general driving but should not be used on metal harder than its face. The claws are used for pulling nails. To protect the claws and prevent breaking the handle when pulling longer nails, a block of wood should be used under the hammer head.

Finishing Wood Surfaces

The first thing to do is to prepare the surface. The wood should be planed and scraped so that all roughness is removed and a smooth surface obtained. Then the surface is sanded with fine sandpaper. Sandpaper should be moved with the grain to avoid scratching the wood.

There are many materials for finishing wood, including the following: paint, enamel, stain, oil polish, wax polish, varnish, and French polish.

Paint and varnish manufacturers make a large variety of wood finishes and furnish complete directions for their use.

Here are some suggestions for painting.

- Stir the paint thoroughly before use.
- Do not paint during cold or frosty weather.
- Keep the surface dry and free from grease and dirt.
- Shellac knots to prevent pitch or sap from coming through paint.
- Do not paint over loose or blistered paint—scrape all rough surfaces.
- Be sure that all previous coats of paint are dry before applying the next coat.
- Putty holes *after* the priming coat.

- Use a good brush—worn brushes result in poor work.
- Brush the paint in.
- Several thin coats are better than one thick coat.
- Finish wood surfaces in a dust-free place.

These suggestions apply equally well for both inside and outside painting, or for any painted surface.

Enameling is more difficult. Enamels generally require a flat undercoat as a proper foundation before applying the finish coats. The use of an undercoat is necessary because the finish coat is partly transparent, but follow manufacturer's recommendations—some flat paints should not be used under enamel. The undercoats should be lightly sanded.

Several types of stains are available, including water stains, chemical stains, spirit stains, oil stains, and varnish stains. Of all, the oil-base stains are probably the easiest to handle.

Many woods have large pores that require filling before the surface can be made smooth. Fillers are available in different shades. Instructions should be followed in their use.

The object of filling is to close the pores of the wood and give a perfectly smooth and level surface for the varnish. Wax, oil, shellac, paste, and liquid wood filler are used extensively for this work. Fillers are prepared in several colors to match with various colors or stains. The filler should be allowed at least 24 hours to dry before further work is done on the surface.

One of the simplest finishes for things to be used around the house is a coat of stain, followed by several coats of shellac, each rubbed down with fine sandpaper and then a rubbing wax.

For good work, varnish should be applied at the temperature of 60° to 70° F. It may be left glossy or, to produce a dull finish, rubbed with a felt pad moistened with water and pumice stone. Always rub with the grain and carefully wash and dry.

An oil polish is simple to apply and is durable. Use equal parts of boiled linseed oil and turpentine, apply sparingly, and rub vigorously. This application and rubbing is repeated three or four times for the first finish job. This finish is resistant to heat and water marks.

Here are some combinations and steps for finishing after wood surface has been properly prepared.

- ▶ Natural wood, filler, shellac, varnish, wax.
- ▶ Stain, filler, shellac, varnish, wax.
- ▶ Stain, filler, shellac, sand, wax.

- ▶ Natural wood, boiled linseed oil, rub.
- ▶ Natural wood, boiled linseed oil, rub, (leave dull finish).

Some don'ts

- Don't try to cover saw marks and rough spots with paint or finish—it can't be done.
- Don't take deep cuts with the plane.
- Don't apply the finish until well sanded.

Estimating Lumber Needed

Lumber is sold by the board foot or foot board measure. While the unit of measure in handling lumber is the board foot, lumber is generally priced on the basis of 1,000 board feet. "Per M" is the abbreviation used to designate 1,000 board feet.

A board foot is the amount of lumber in a piece 1 inch thick, 1 foot wide, and 1 foot long.

A simple formula for figuring the square feet in lumber is as follows:

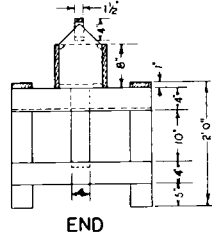
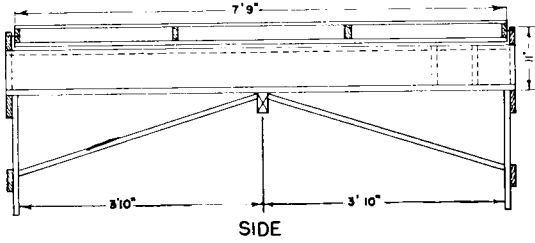
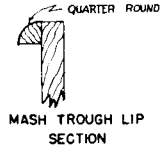
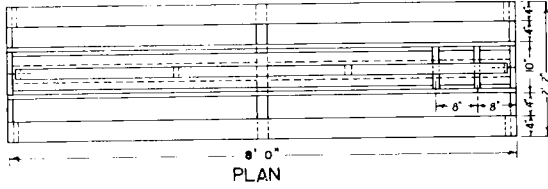
$$\text{Feet, board measure} = \frac{\text{Number of pieces} \times \text{inches thick} \times \text{inches wide} \times \text{feet long}}{12}$$

For example, to find the feet, board measure, in three two-by-fours, each 10 feet long:

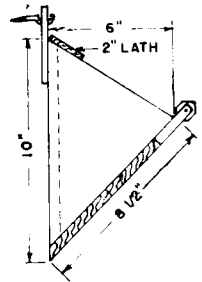
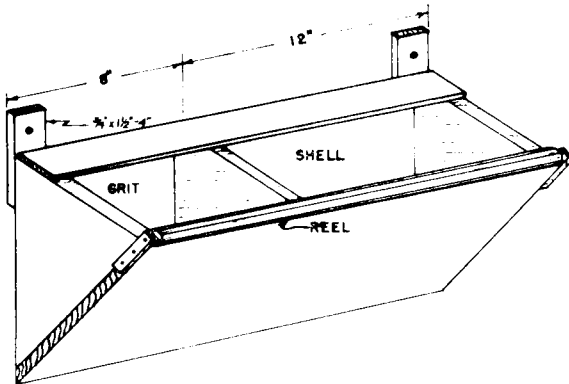
$$\text{Feet, board measure} = \frac{3 \times 2 \times 4 \times 10}{12} = 20 \text{ feet, bm.}$$

Dressed or mill-surfaced lumber is never full width or full thickness due to the waste removed when the boards are surfaced or planed. Board measure, however, is always figured on the full width and thickness before it was planed. For example, although a two-by-four measures only about $1\frac{5}{8} \times 3\frac{5}{8}$ inches it is always figured as a full 2 x 4 inches. These dressed sizes need to be considered when buying lumber to cover a given surface.

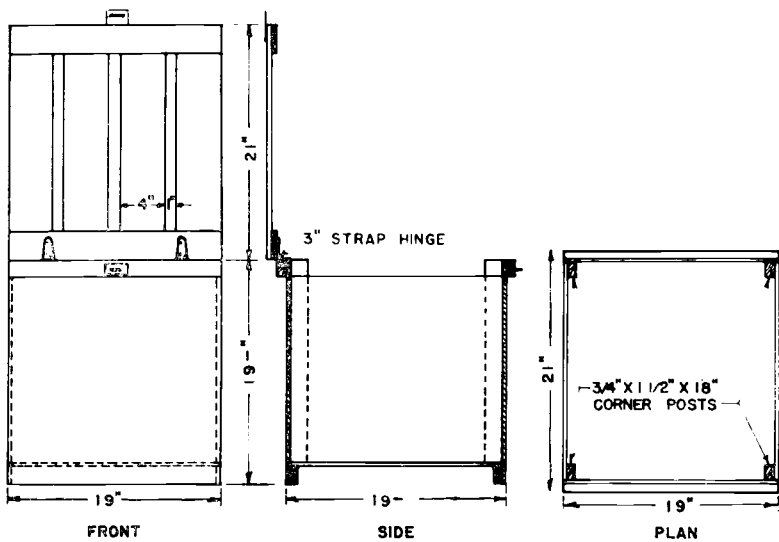
Poultry



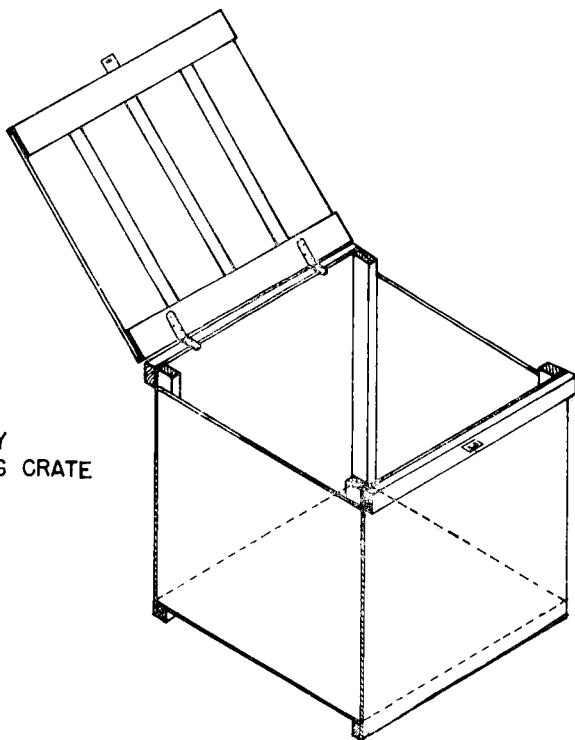
POULTRY FEEDER



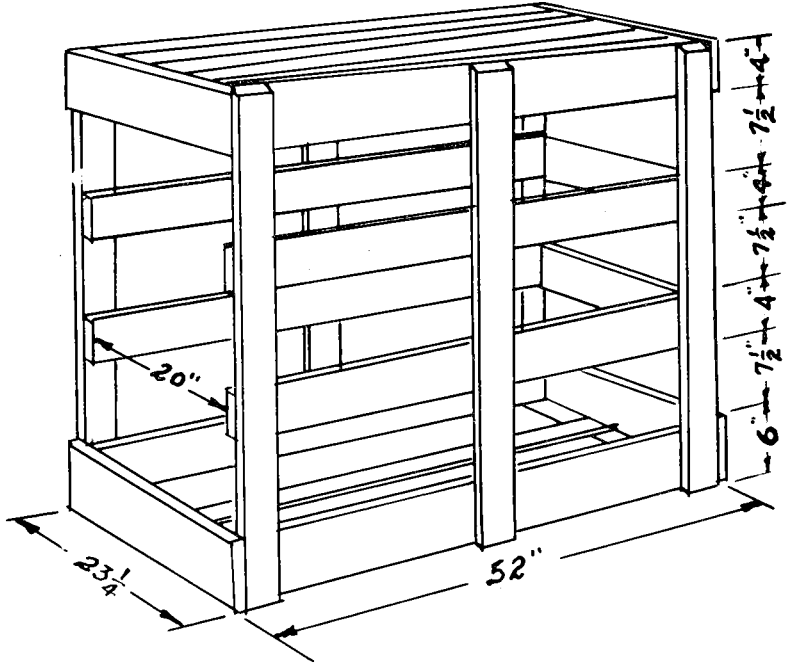
GRIT & SHELL HOPPER



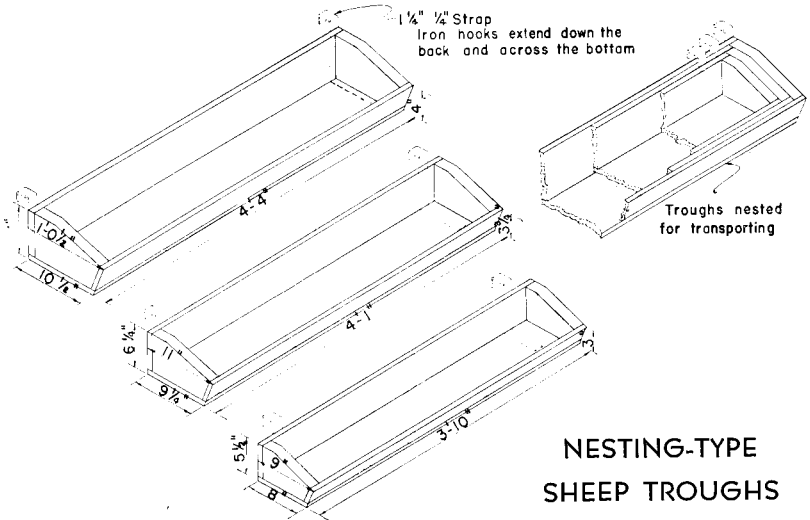
POULTRY SHIPPING CRATE



Sheep

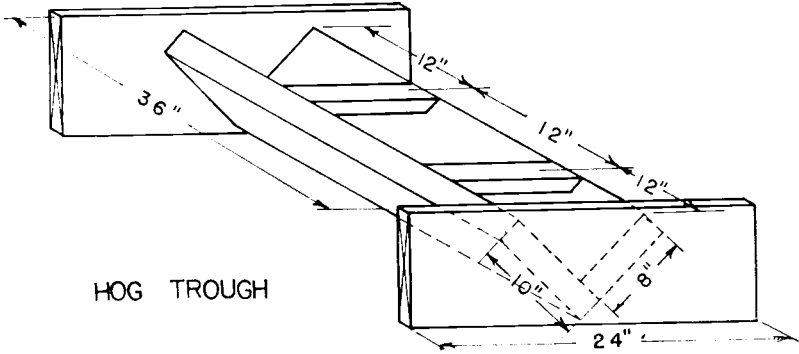


SHIPPING CRATES FOR SHEEP



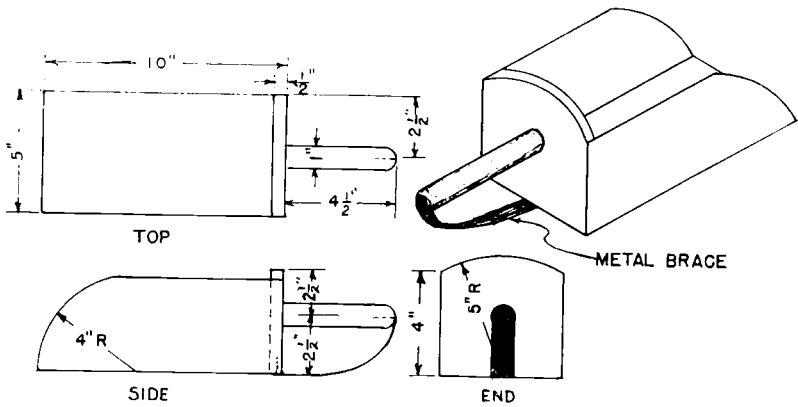
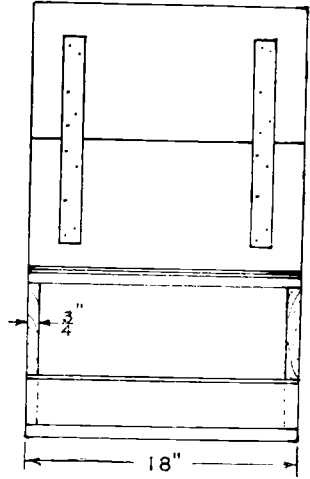
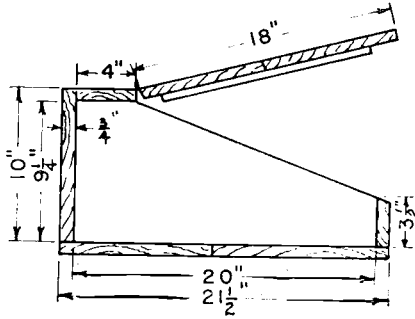
NESTING-TYPE
SHEEP TROUGH

Hogs

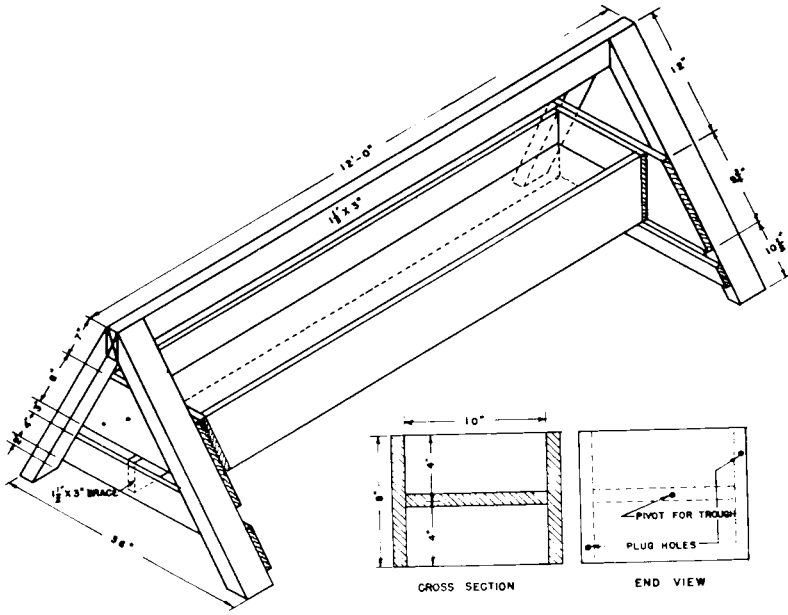


Dairy

DAIRY BARN RECORD DESK

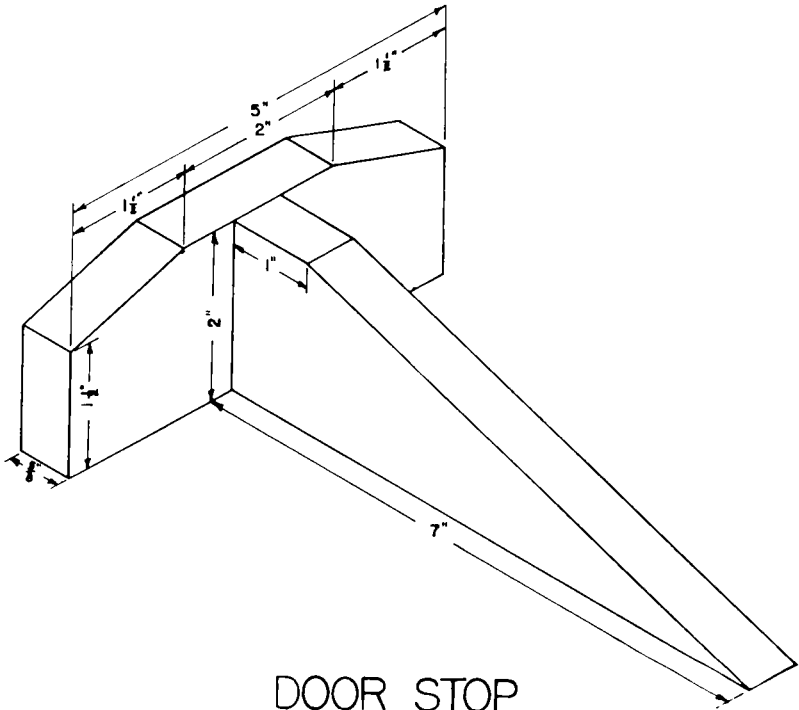


FEED SCOOP

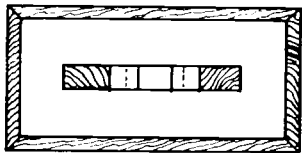


REVERSIBLE MOVABLE GRAIN TROUGH

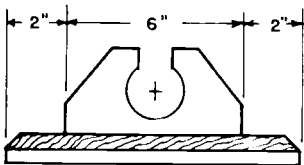
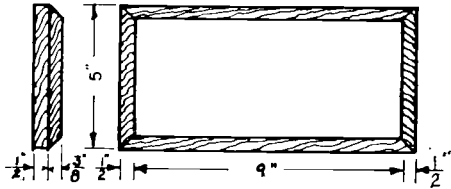
Household



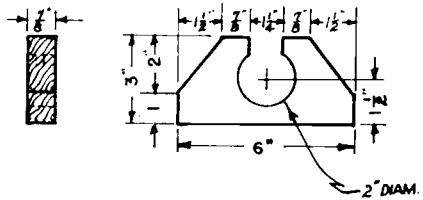
DOOR STOP



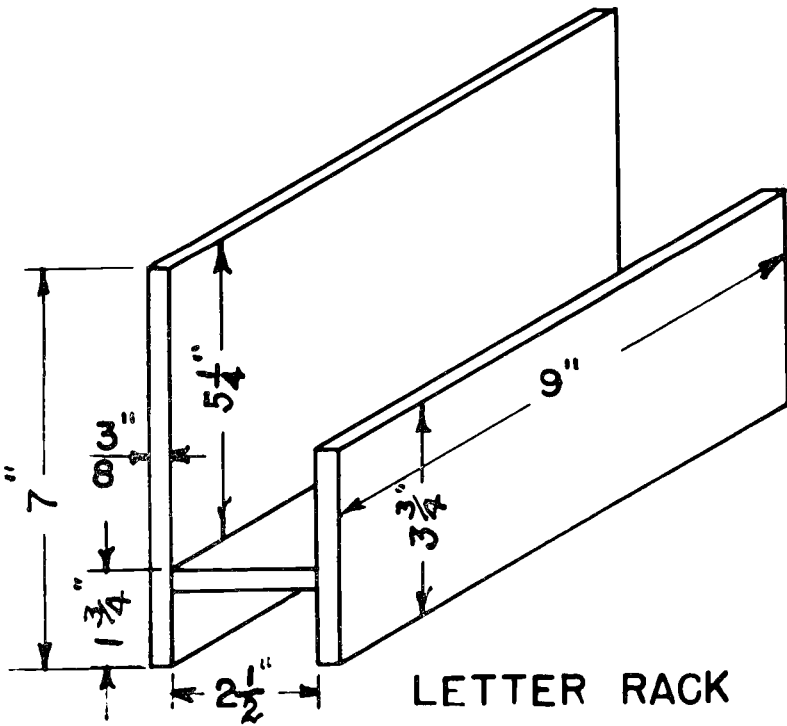
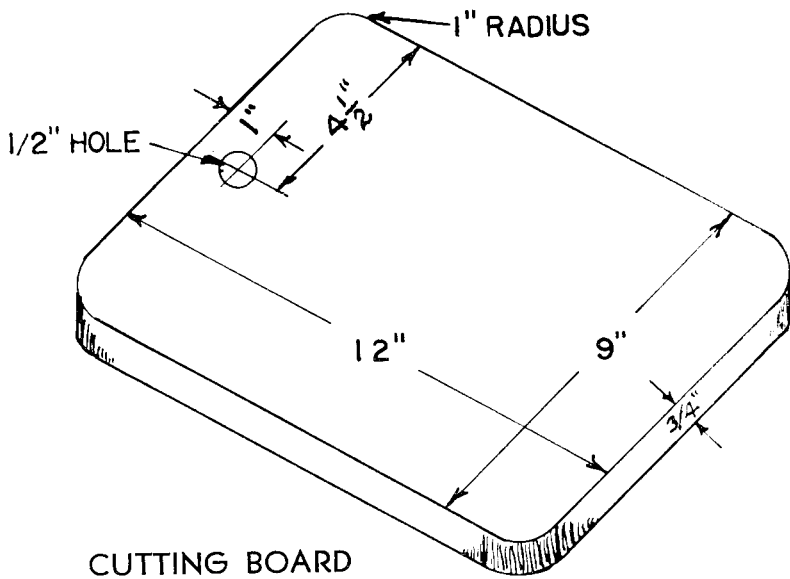
TOP VIEW

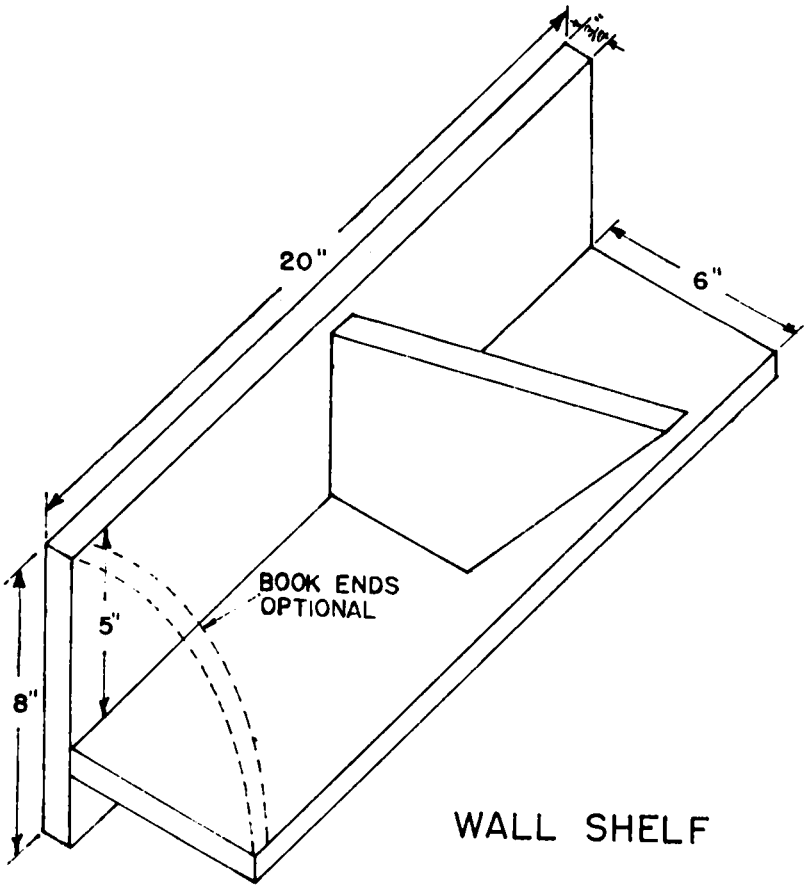
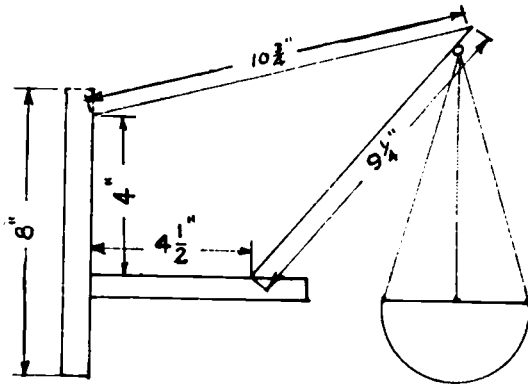


SIDE VIEW

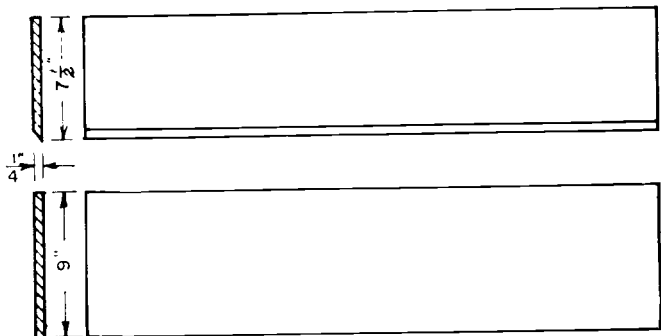
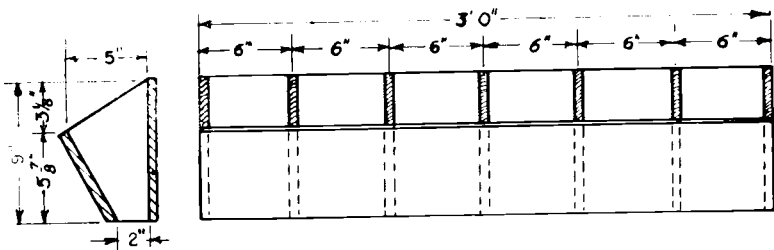


BROOM HOLDER

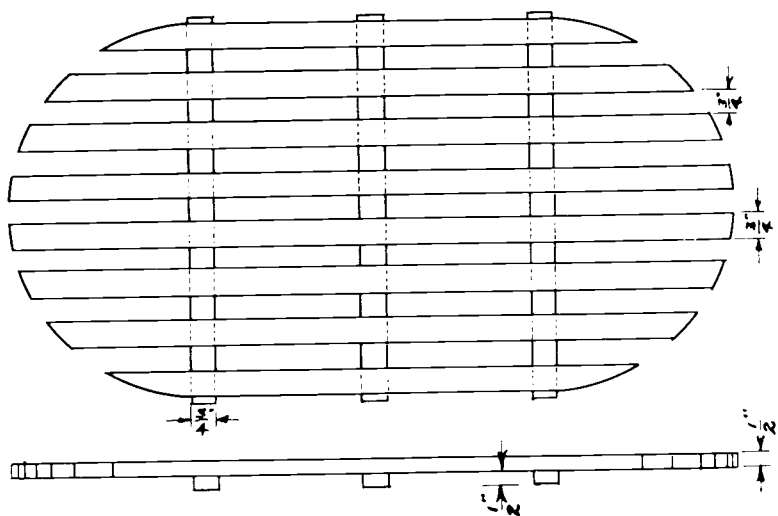




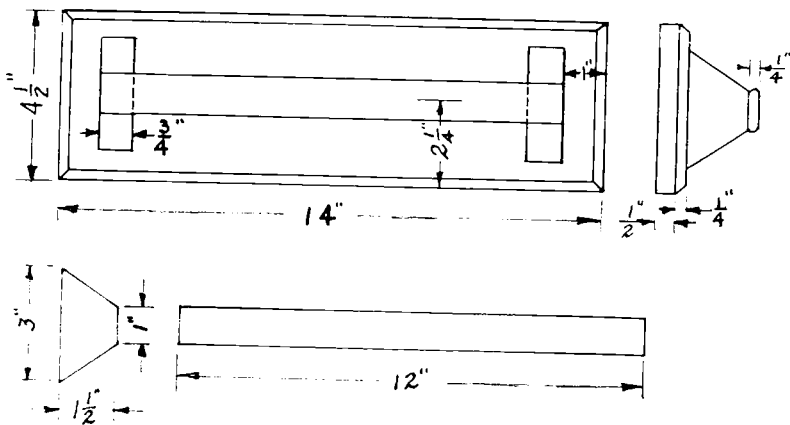
WALL SHELF



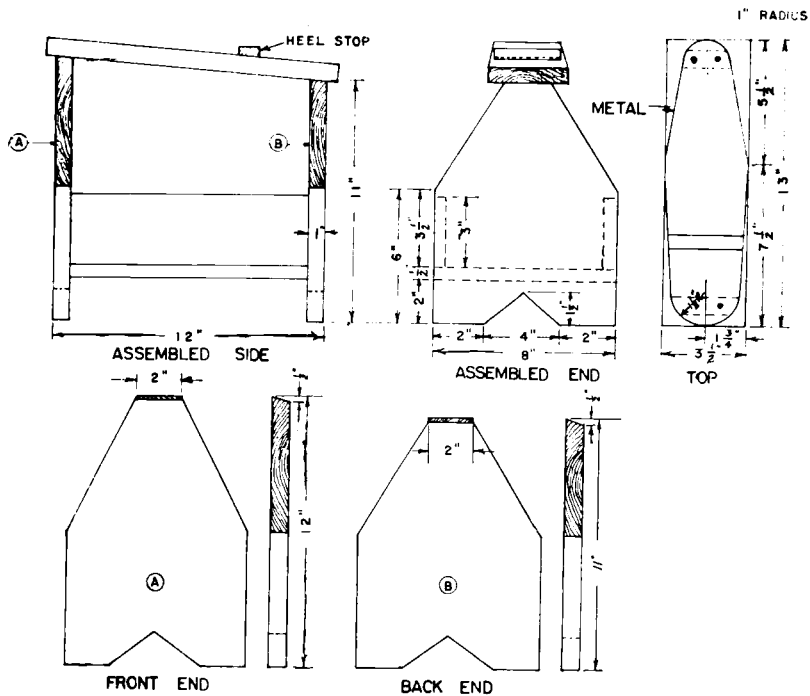
SHOE RACK



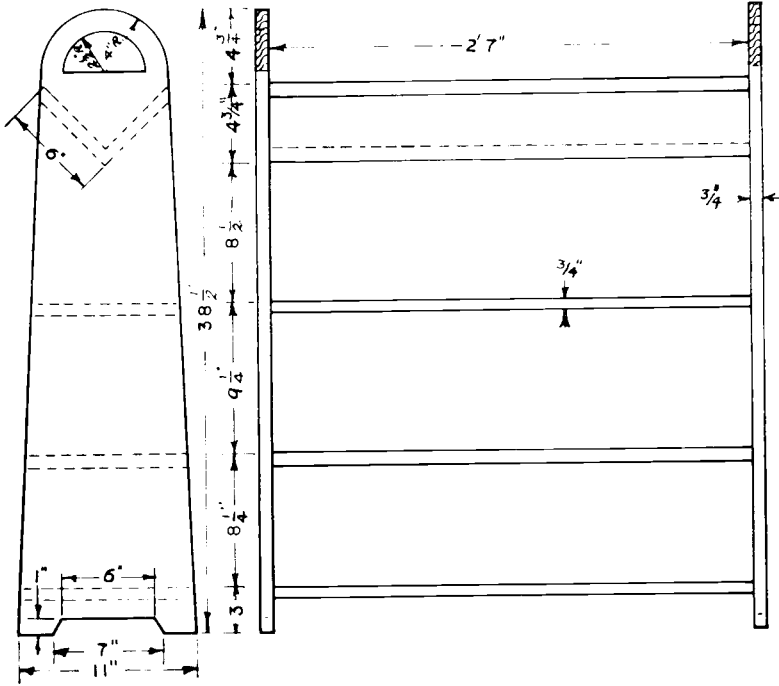
BOILER BOTTOM



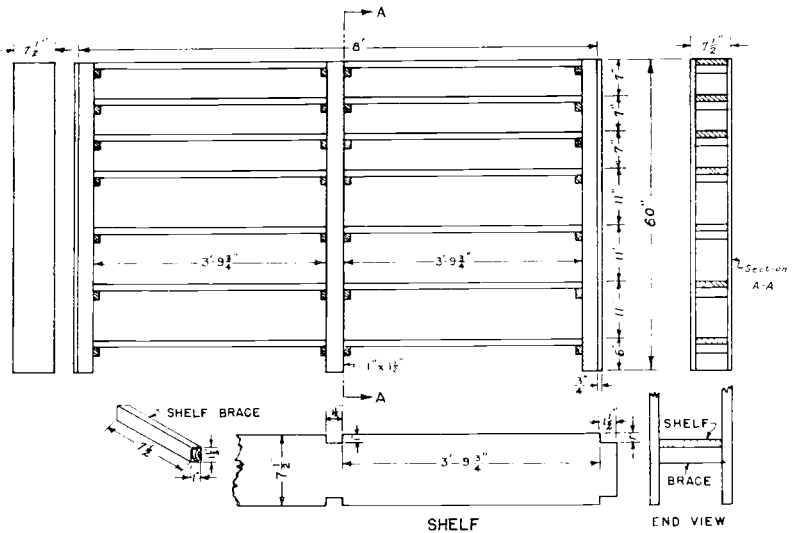
NECKTIE RACK



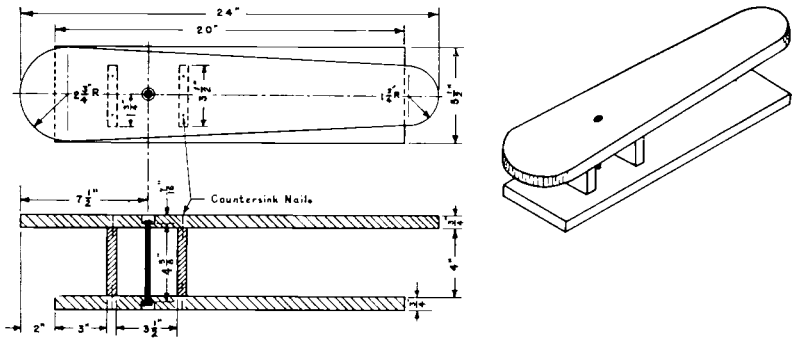
SHOE SHINE RACK



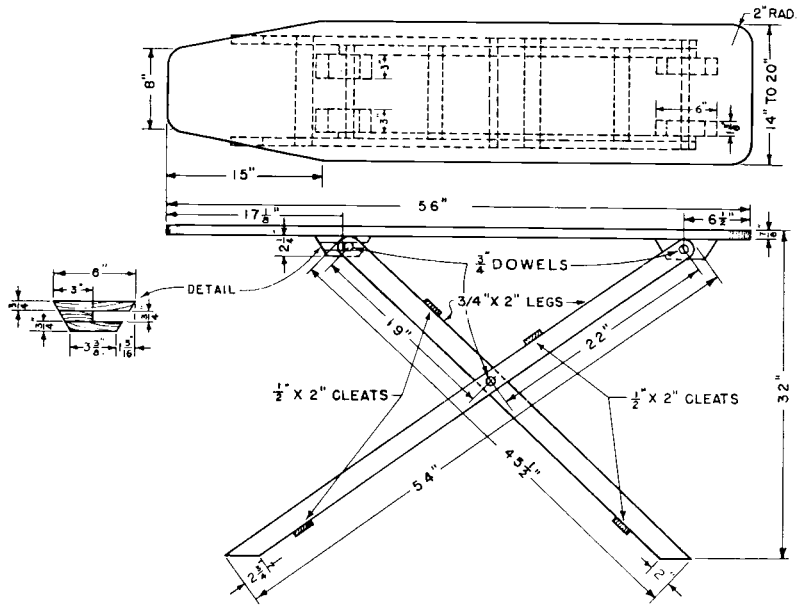
BOOK SHELF



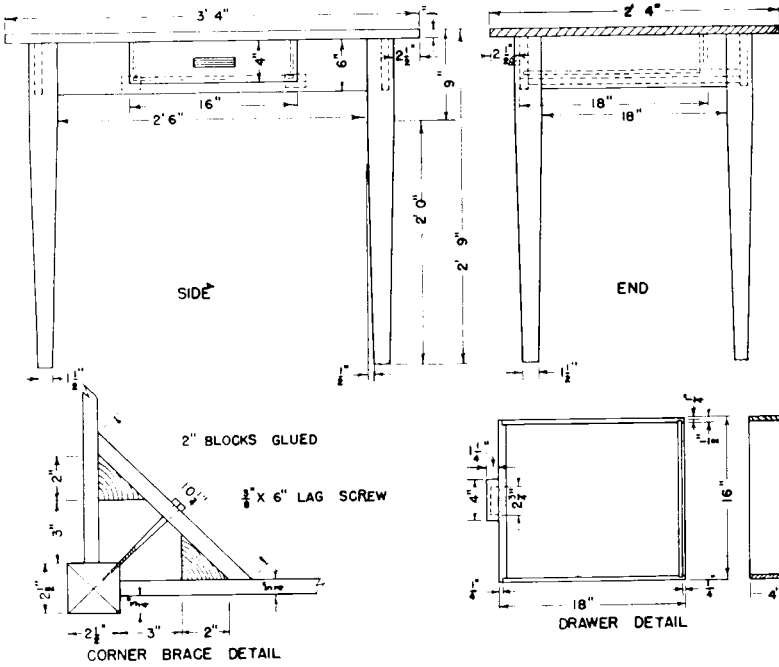
CANNING SHELF



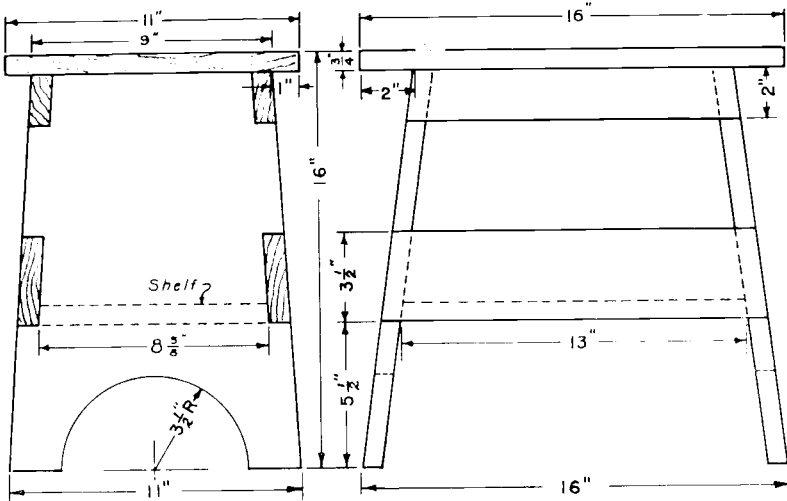
SLEEVE BOARD



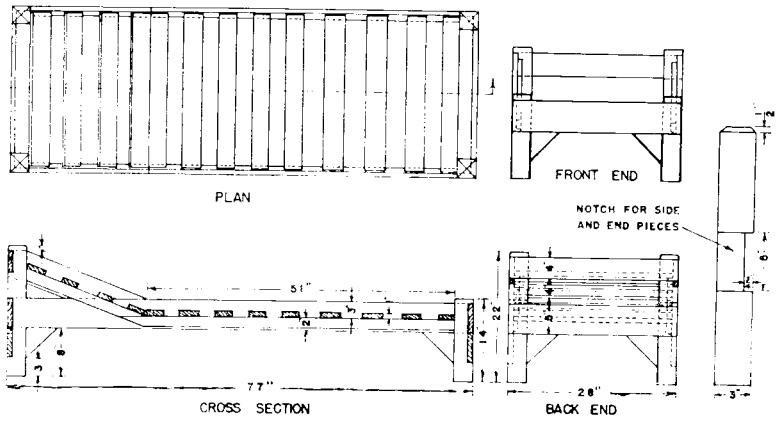
IRONING BOARD



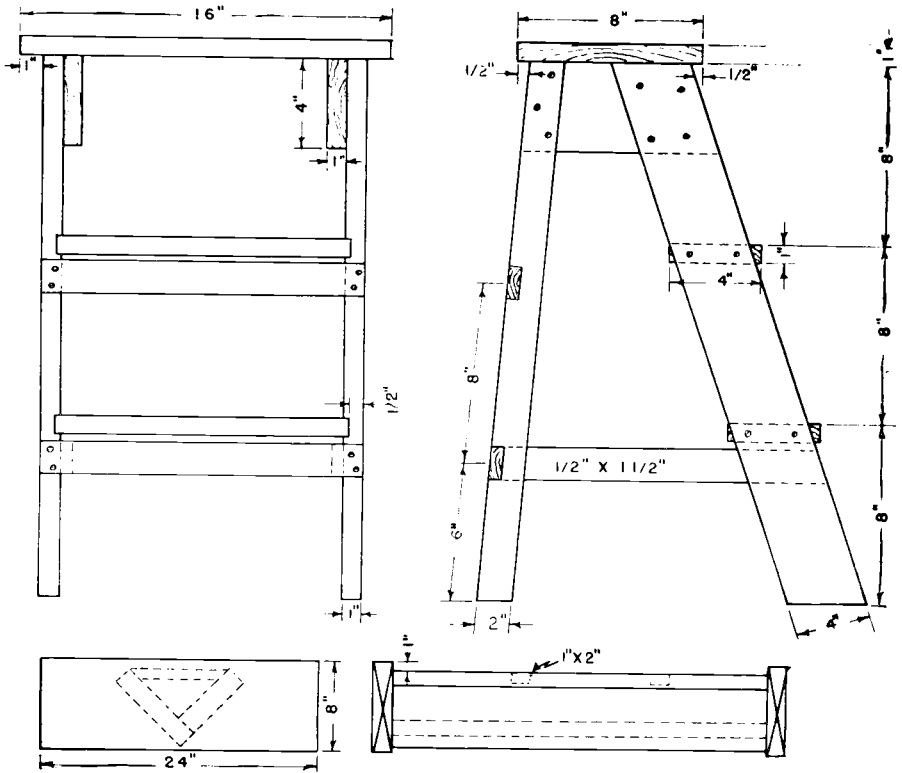
KITCHEN TABLE



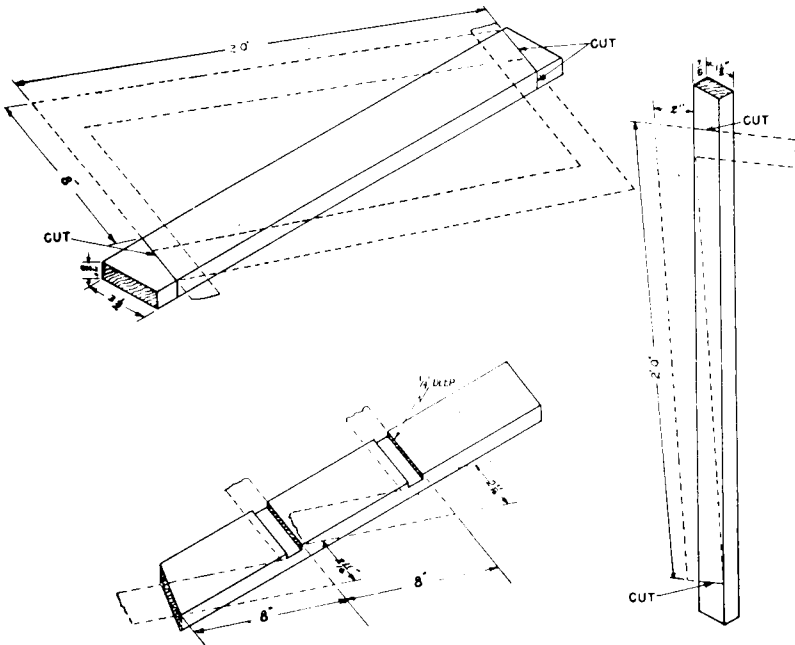
KITCHEN STOOL



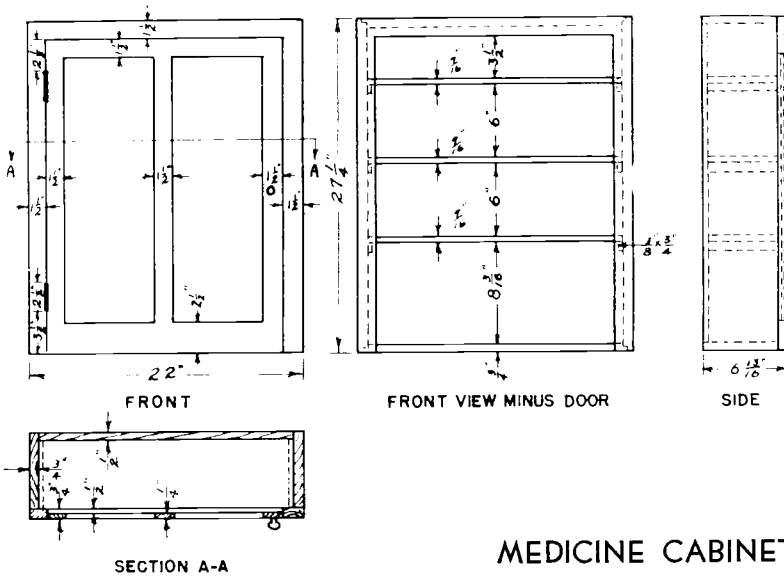
LOUNGE



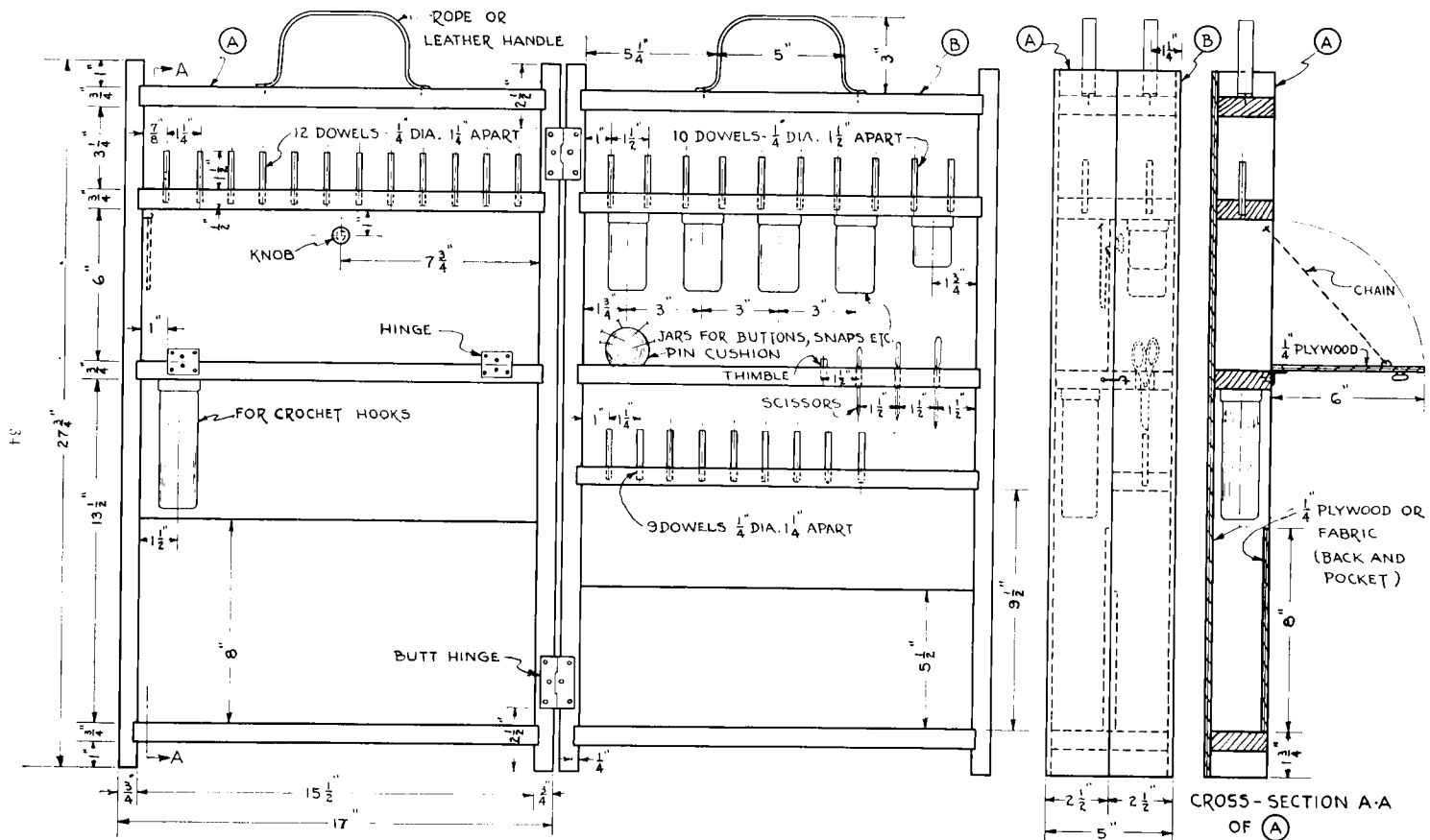
KITCHEN STOOL and STEPLADDER



SHEET OF KITCHEN STOOL and STEPLADDER

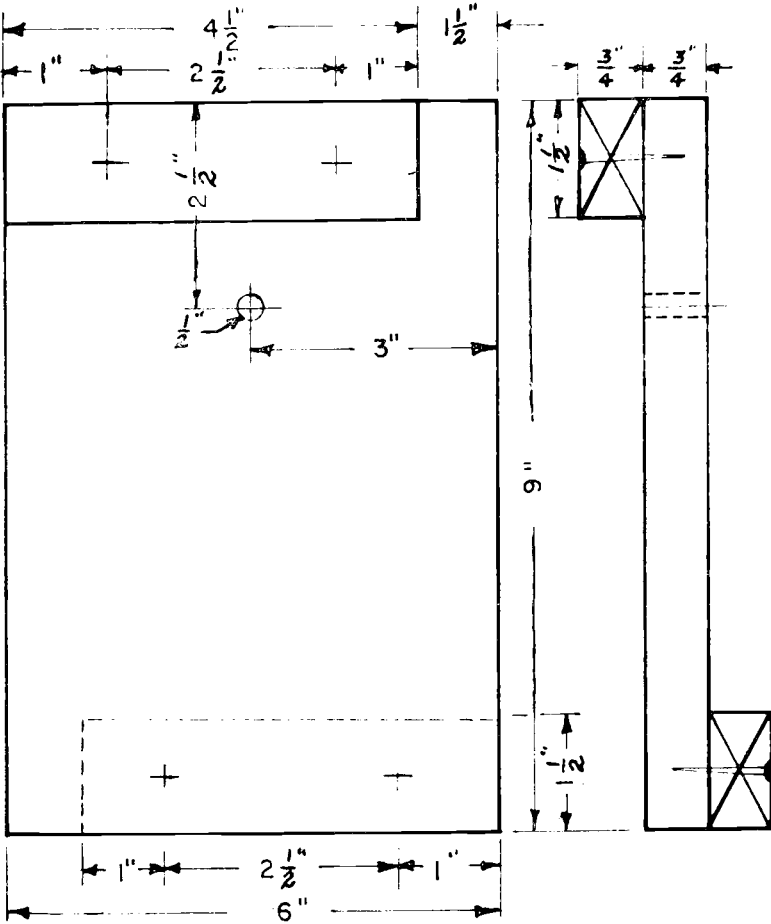


MEDICINE CABINET

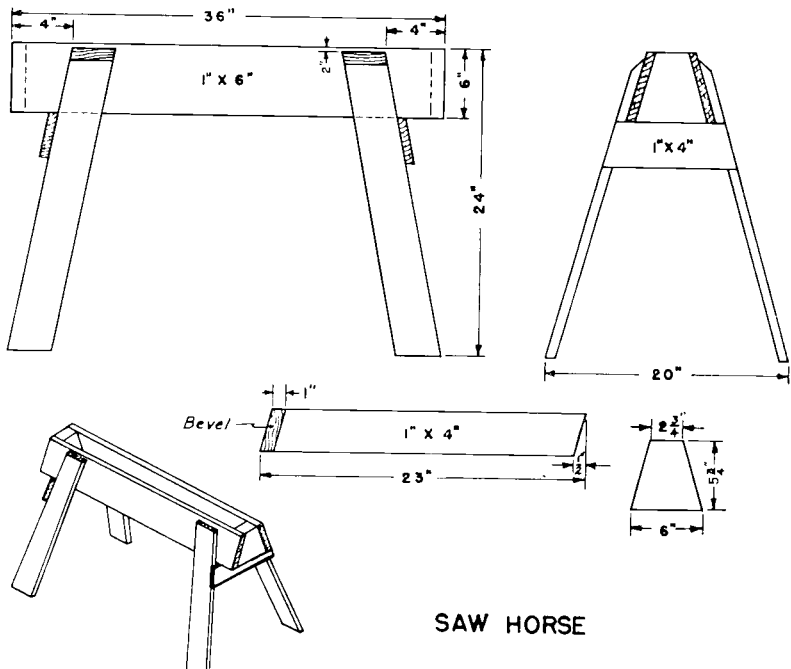


SEWING CABINET

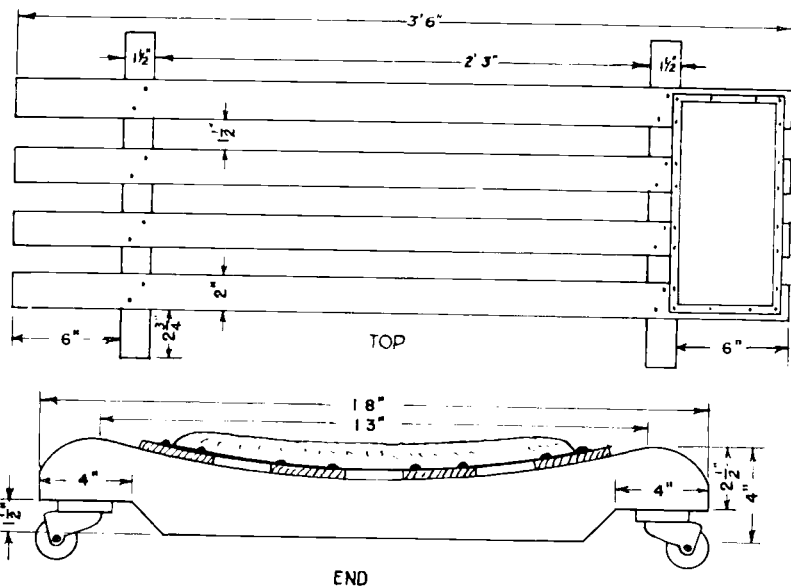
Shop



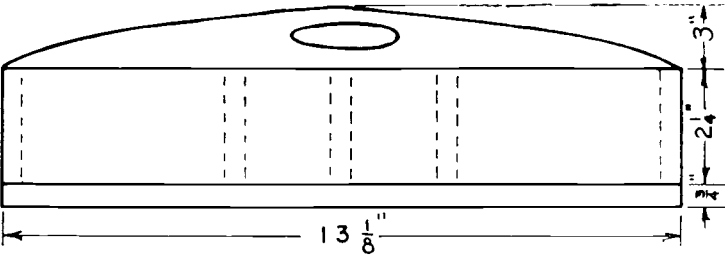
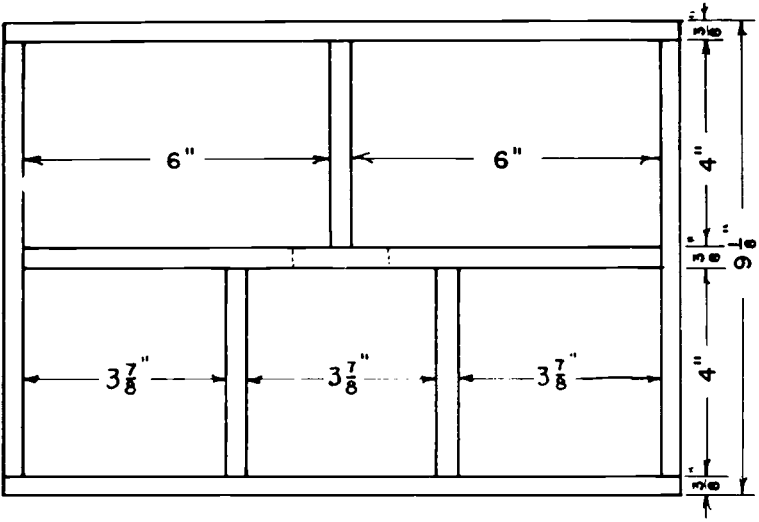
BENCH HOOK



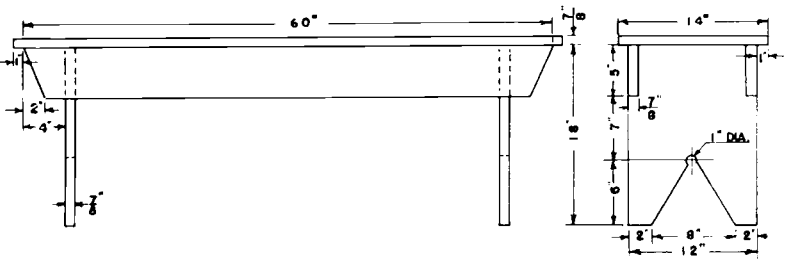
SAW HORSE



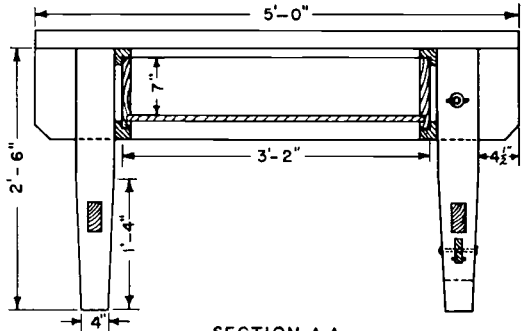
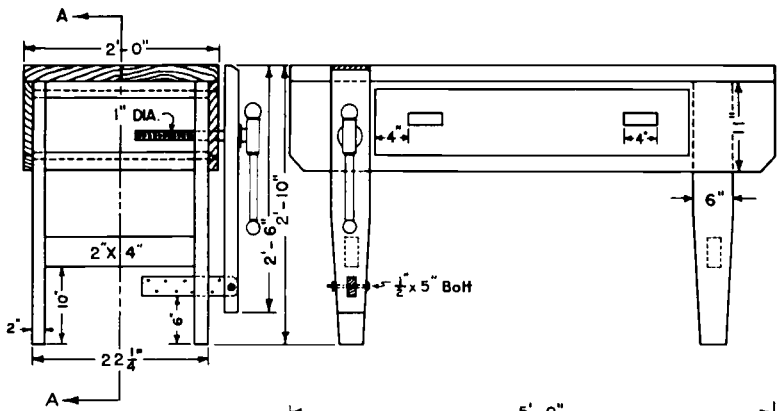
END
SHOP CREEPER



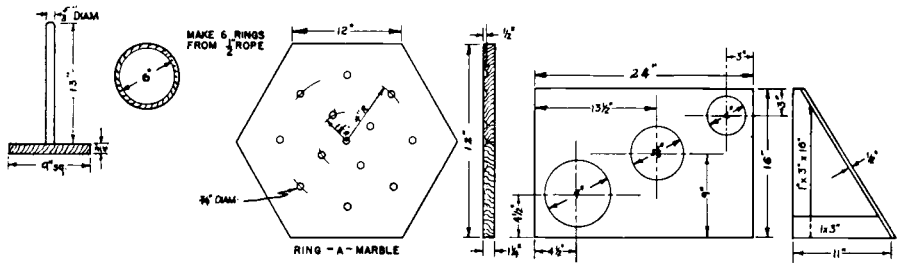
NAIL BOX



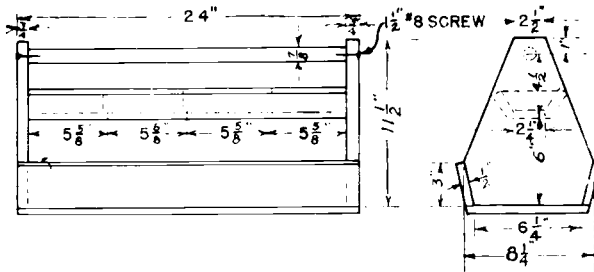
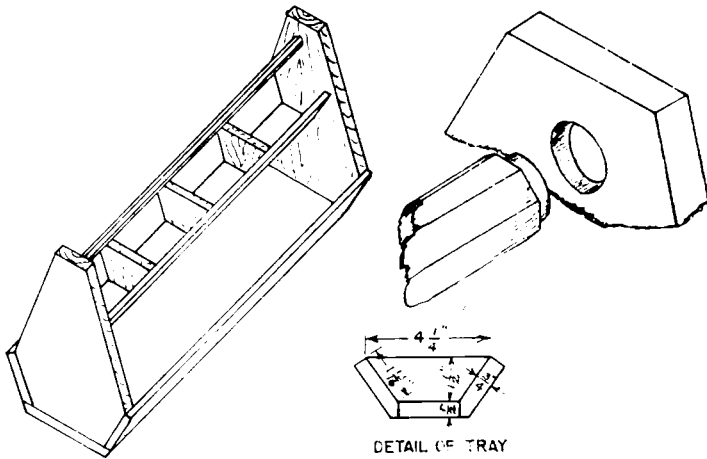
BENCH



WORKSHOP BENCH



GAMES



TOOL BOX

1000