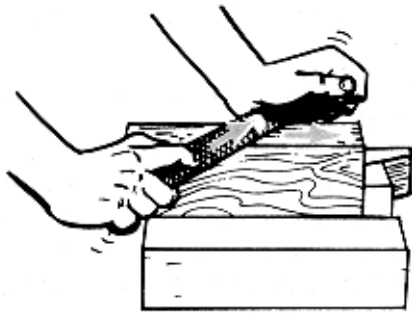




Sanding and Smoothing

Sometimes when you are sawing curves, they become off-square across the length of the wood. They are rough on the edges and need to be smoothed. You can use a round file, a half-round wood rasp, or sandpaper on a dowel to do the job.

You also may want to smooth out a straight, square, crosscut saw cut. For this type of cut, you can use multi-blade wood-forming tools, rasps, or sandpaper. You also can smooth the saw cuts of the pieces in a kit or pre-cut unit.

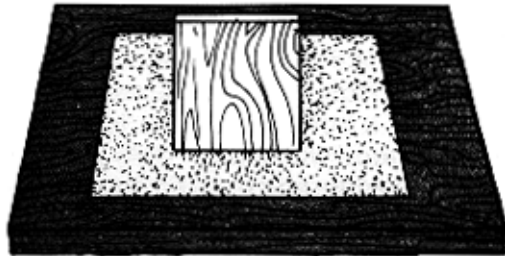


Crosswise and lengthwise stroke

When you use a **rasp**, move the tool lengthwise and diagonally. If you move it crosswise, you will be more likely to break off the edge of the wood.

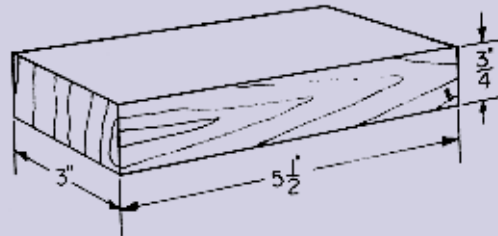
When sanding the edges or sides of the wood, sand in the direction of the grain of wood. If you sand across the grain, scratch marks will show.

Use either a part of a sheet of sandpaper on a block of wood, or glue a full sheet of sandpaper to a piece of flat plywood. Move your piece of wood across the full sheet of sandpaper that you attached to the plywood. For rough cutting, use coarse grit **flint paper** or 50-grit **garnet paper**. For easy smoothing, use fine grit paper or 150- to 200-grit garnet paper.

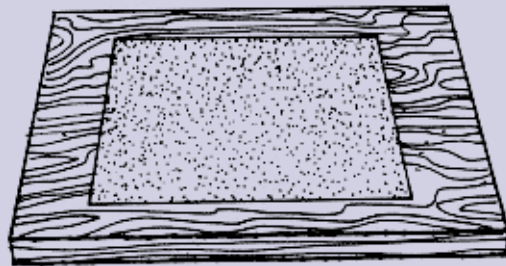


Keep board straight up and down

Tools you will need:



Sanding block to hold your sandpaper (commercial type may be used)



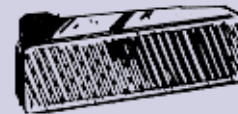
Sandpaper, available in various grades of fine, medium, and coarse grit. (Garnet paper is good, especially for hardwoods. It costs more than flint paper, but cuts faster and lasts longer.) Shown above is a full sheet of sandpaper glued to plywood.



Wood rasp



Shoe or utility rasp

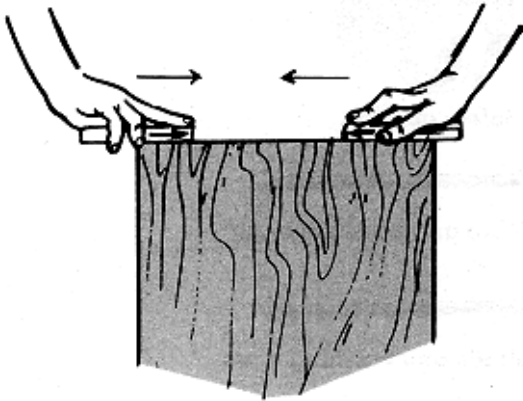


Multi-blade wood-forming tool to smooth and improve saw cuts



Smoothing Wood for a Finish

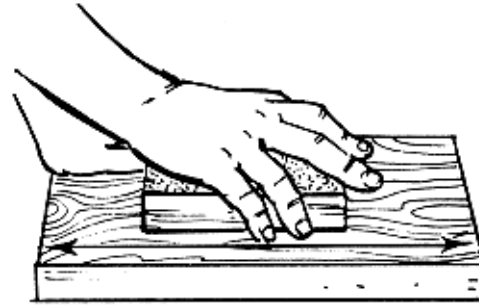
Smooth the ends, edges, and sides of your pieces prior to putting together your project. Then it will be ready for a finish. You may have to do a little touch-up sanding after assembling it. This depends upon how you intend to use the article you have made.



Prevent corner chipping.

To smooth an end grain with sandpaper or rasp, work from both edges towards the center to prevent the grain from chipping off the corners.

For most exterior use, lumber and plywood as they come from the lumberyard are good enough for finishing. But if the wood is dirty or oily, clean these spots either by sandpapering or washing them with a damp cloth that is not too wet.



Sand with the grain.

If you are making a toy, a game, or an article for the home, you may want to sand it. Some plywood is sanded at the factory and requires only a small amount of additional sanding with fine sandpaper. Lumber is not factory sanded. If you look carefully, you may see straight lines or small ridges going across the board, which were made by the planing mill. Your sanding will cut these ridges, producing a flat surface when they are sanded away. You can remove these marks using medium and then fine sandpaper.

Prior to completion, always finish with fine sandpaper. Then carefully wipe off the dust with a clean cloth.

Safety Notes

Remember...

Use special care with rasps and files. Handles that are fastened securely will keep sharp ends from jabbing into your hands.

Things you can do

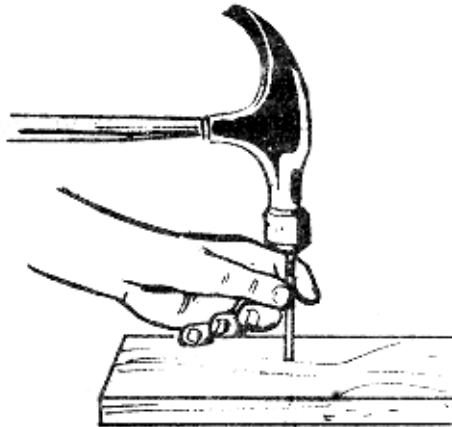
- Name some tools that are used in smoothing and sanding, and show these in an exhibit.
- Show what motion should be used when filing with a rasp, and when rubbing with sandpaper or a sander.
- See "Sandpaper Block" in the Working Plans.



Driving and Pulling Nails

There are many kinds and lengths of nails. Each is designed to do a special job. There are shingle nails, roofing nails, carpet tacks, and ring-shanked nails. Common nails, box nails, and wire nails have flat heads and are used where neatness is not important. Wire brads and finishing nails are used where neatness is important.

Most nails are ordered by “penny” size. The letter “d” is usually written instead of the word penny. One pound of six-penny nails may be written as 1 lb, 6d nails. The length of 2d to 10d nails can be figured out by multiplying the “d” number times $\frac{1}{4}$ inch and then adding $\frac{1}{2}$ inch to that number. How long is a 6d nail? To find out, we multiply 6 times $\frac{1}{4}$, which equals $1\frac{1}{2}$. To that we add $\frac{1}{2}$, which gives us 2. So a 6d nail is 2 inches long.



Grasp nail near the head

To drive nails, we generally use a hammer. A hammer also can be used to pull and straighten nails.

See if you can drive several nails into some scrap wood without bending them, and without making hammer marks on the wood. If you do not strike the nail squarely each time with your hammer, what will happen?

If you had to show someone who has never held a hammer before how to drive a nail, how would you teach him or her?

Most beginners start off holding the hammer near the head, and then move their hand further back as they gain experience.

Tools you will need:



A claw hammer with a small handle to pull, drive, and straighten nails. (You could also use a tack hammer.)



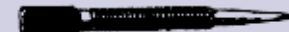
Safety goggles



Wire and common nails



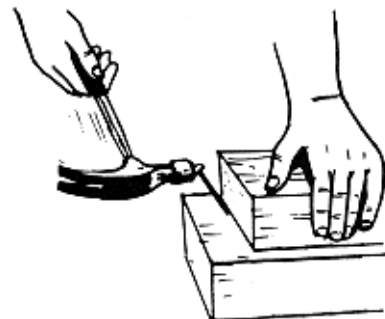
Brads and finishing nails



Nail set to drive nails into surface of the wood without leaving hammer marks

Bent nails may be straightened by holding a hammer or a block against the nail and pounding the leaning side of the nail against the object with another hammer.

Sometimes a short nail can be straightened without holding anything against it.



Straightening a long nail



Safety Notes

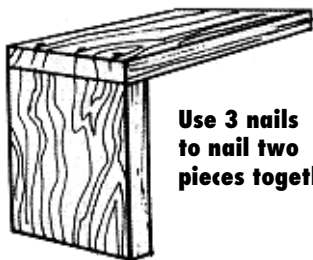
Remember...

- **Keep your fingers out of the hammer's way.**
- **Hit the target flat.**
- **Make sure the hammer head is on tight.**
- **Throw away damaged hammers.**

Nails that are too large, too close to the end of the board, or driven into lumber that is too thin can split the wood. If you must nail near the end of the board or into thin wood, use a small nail or drill a hole a little smaller than the nail.

Things you can do

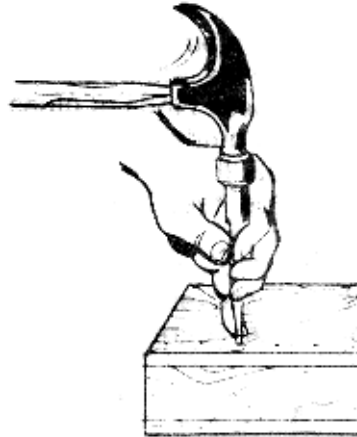
- Practice driving nails into scrap wood. Keep the nails straight and the wood free of hammer marks. Also practice driving in nails that are near the end of the block of wood.
- Drive nails of different lengths into a block of wood. Stop hammering before the head of the nail reaches the surface of the wood. Then practice pulling out the nails without bending them.
- See "Nail Point Design" and "Letter Holder" in the Working Plans.



Use 3 nails to nail two pieces together.

Using a Nail Set

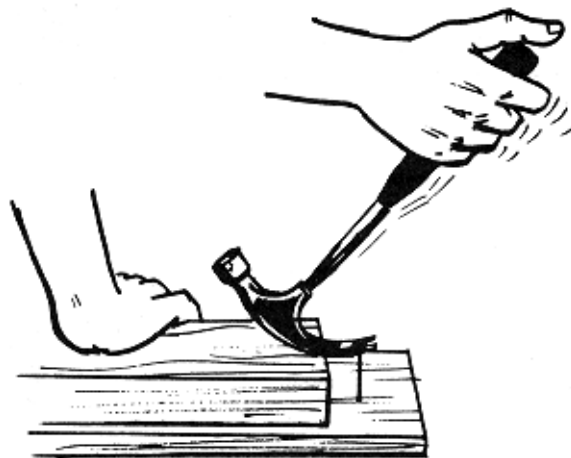
To drive down the nail so that it is even with the board, you may use a **nail set**. It often is used to drive or set the head of the nail below the surface of the wood. Use a nail set smaller than the head of the nail. Place the nail set directly over the head of the nail. Tap it with a hammer rather gently, especially if the nail is a small-sized one.



Using a nail set

Pulling Nails

The claws on the hammer are designed to pull nails. Slide the claws under the nail head, then grasp the hammer handle near the opposite end and apply a firm, steady pull until the nail is out.



Pulling a long nail

When pulling long nails, put a block of wood under the hammer head close to the nail.

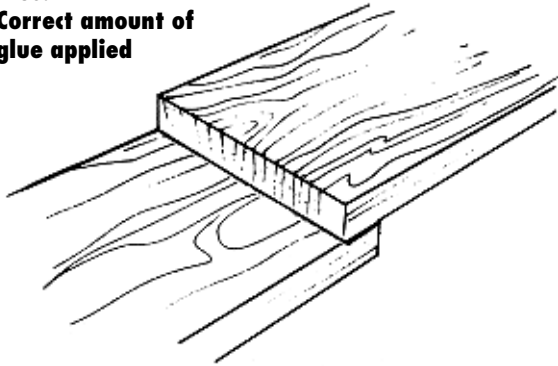


Using Glues and Wood Finishes

Working with glue is an interesting and important part of woodworking. The advanced units of the 4-H Wood Science Program have information on several different kinds of glue. For now, you will do well to use the polyvinyl-resin glues. People know them as “white” or “yellow” glues, which you can buy in a hardware store in plastic squeeze bottles. Although they work well indoors, most of these kinds of glues fail to hold if they remain outdoors in humid weather. For wood materials that will be used outdoors, use a special glue that is prepared for that purpose.

Make sure always to read the directions on the label and follow them carefully.

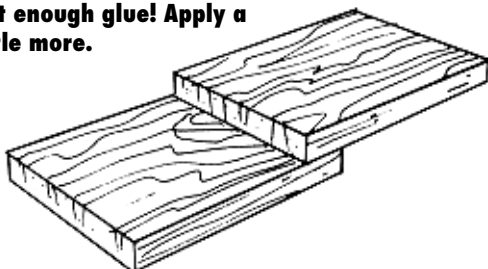
Illus. A
Correct amount of glue applied



Apply the proper amount of glue, as shown in Illustration A. When the joint is fastened together, a small amount of glue should squeeze out at the edges. No squeeze-out indicates a shortage of glue (B). Too much squeeze-out indicates a waste of glue (C). Wood covered with glue will not accept stain and finish in the same way as the natural wood, and it looks sloppy.

The pieces to be glued must be held together firmly while the glue is still drying. Do you have anything to hold together the pieces of wood while the glue is drying? Many woodworkers use C-clamps, pipe glue clamps, or a vise. Sometimes, nailing the pieces

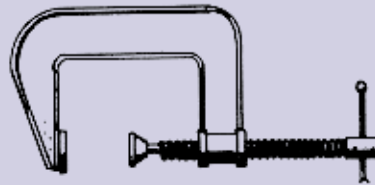
Illus. B
Not enough glue! Apply a little more.



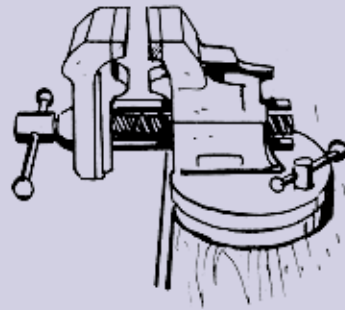
Tools you will need:



A 1-inch paintbrush to apply interior or exterior finishes



One or two 3-inch C-clamps to hold pieces of wood together for gluing, or to clamp boards together when boring holes

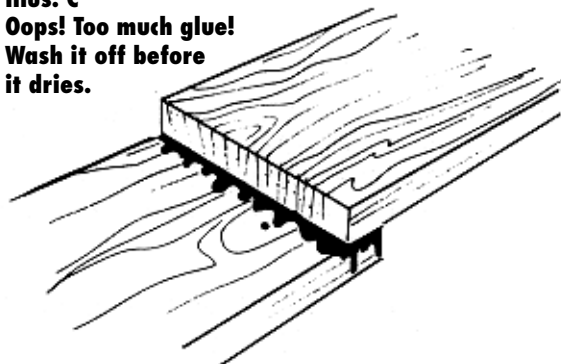


A homemade bench vise or a factory-made vise

together will work. If you do this, leave the nails in the wood after the glue is dry.

Outdoor Wood Finishes and Stains

Illus. C
Oops! Too much glue!
Wash it off before it dries.





Finishes made for outdoor use are stronger than the finishes that are made for indoor use. This is why articles made for outdoor use require different finishes than those for indoor use. Some finishes are more difficult to apply than others.

Water repellent or waterseal is the simplest exterior wood finish. Apply it with a brush or dip the article in the finish. To give it a little color effect, you may tint the article lightly with color in oil, with the help of your leader or parent. Articles that have been treated with this material should be retreated each year for several years.

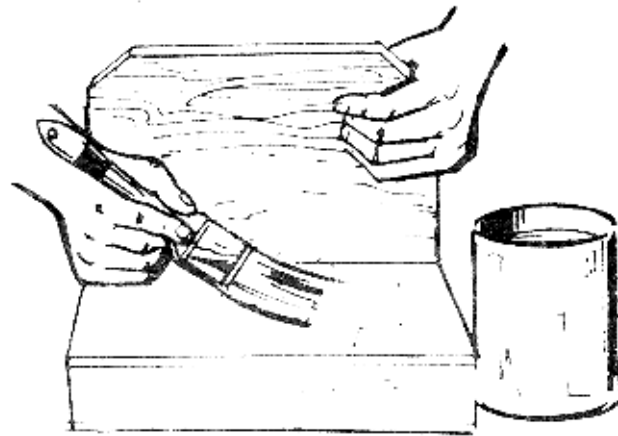
Outdoor wood stains soak into the wood without forming a film on the surface, and so will not peel off. They are easy-to-apply finishes that will make many of your projects look great! You can buy both oil base and latex stains of this type.

Apply the oil-base stain with a brush. Most of the stain will soak into the wood and give it color. One coat usually is enough on smooth wood. If it looks as though some of the stain is going to dry on the surface instead of soaking into the wood, wipe off the excess stain with a cloth. Remember that a cloth soaked in an oil-base stain can easily catch fire. When you are finished, be sure to spread the cloth out to dry in an open place where it would not damage anything should it happen to catch fire.

On rough surfaces, make a second application of the stain before the first application is totally dry.

Latex stain should be applied with a brush in two coats. Apply the second coat after the first one dries, which takes about 2 hours. You can make small batches of latex stain yourself. Just mix 1 cup of exterior latex house paint with 2 cups of water.

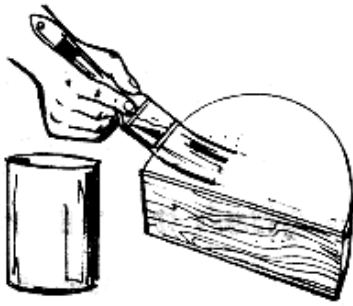
In addition to the above materials, you also may want to use outdoor paint by itself. This type of finish covers the entire surface of the wood with a dark material. Outdoor paints also come in oil base and latex. The oil-base paint should be cleaned with a paint thinner or similar material, while the latex may be cleaned with water.



Applying exterior stain for outside use

Special Hints

- **Follow the instructions carefully when using water repellent solution, waterseal, and stain.**
- **Always use a brush, except where you use the dip method of waterseal.**
- **Do not breathe the vapors.**
- **Do not splash the materials on your skin.**
- **Dry any rags soaked with oil. Such rags can start burning by themselves.**
- **Wash the paint brush used to apply the oil-base stain in paint thinner. Then wash it in water and detergent. Wash latex-stain brushes in cool water with detergent.**



Indoor Finishes

There are two common types of clear indoor finish materials. Oil finishes soak into the wood. Varnish-like materials form a layer of plastic on top of the wood. For the present, the oil finishes will give you the greater success. In more advanced units, you will learn how to use varnish-like finishes.

Oil finishes are sold at many paint stores. You can even mix your own batch. Either (1) dilute varnish at the rate of one part of varnish to two parts of paint thinner, or (2) dilute linseed oil at the rate of one part linseed oil to four parts of paint thinner.

Here's how to apply an oil-based finish:

1. Start with clean equipment and materials. Avoid dust in the air or on the wood. Wipe off all the sanding dust.
2. Apply the first coat of finish with a brush onto wood that is dry and clean.
3. Fifteen minutes later, wipe the wood with a dry, clean cloth. This removes the finish that has not soaked into the wood. Remember to dry or dispose of any oil-base rags in order to prevent fire.
4. After 24 hours, sand with 220-grit sandpaper or other material. Wipe off the dust with a clean cloth.

5. Apply the second coat of finish with a brush. Let the finish soak in for 15 minutes. Then, wipe it with a clean, dry cloth to remove the finish material that has not soaked into the wood.
6. After 24 hours, sand again. Then polish with furniture polish or wax if you wish.

Safety Notes

You are going to be painting and varnishing now. Most paints contain chemicals that could explode around fire or that could be poisonous to you.

- **Keep paints away from an open flame. Do all your painting in a room with lots of fresh air.**
- **Put your clean-up rags into a covered metal can. KEEP THE LID ON IT! Otherwise, "spontaneous combustion" can take place and cause a fire.**

Things you can do

- Give a talk on the proper way to apply and store glue.
- List the different ways pieces of wood can be held together while glue is drying. Experiment with some of these ways as time permits.
- As a group, exhibit your wood-stain projects in a public place. Be prepared to explain to your audience how outdoor and indoor finishes are applied.
- See the other fun ideas of things to make in the Work Plans section.

Special Hints

The oil-base finish can be purchased with color in it so that you can stain the wood at the same time you apply the finish. If you mix your own finish, you can color it by adding either color in oil or universal color.

Wash your paint brush in paint thinner. Then wash it in warm water and detergent. This way, your brush will be ready for you to use again when you need it and will last a long while.



Electric Wood Burning

Practice Burning Wood!

- Plug in your burning tool. Let it heat 3 to 5 minutes. Keep your fingers away from the hot tip!
- Touch your practice wood with the tip to see if it is hot enough to burn the wood.
- When it is hot enough to burn the wood, try this on your practice wood:
 - a. Make a line from corner to corner of the wood by slowly moving the tool with very little downward pressure.
 - b. Make a shorter line. Move the tool very slowly with more pressure.
 - c. Place the sloping side of the tip on the wood. Move it very slowly for $\frac{1}{4}$ inch.
 - d. Touch the wood with the pointed tip several times.

Check Your Work

- What movement of the tip made shallow, narrow lines?
 - What movement made deep, wide lines?
 - What kind of mark did the pointed tip make?
 - What did the sloping side of the tip do?
- Keep your hot woodburning tool out of the reach of your brothers and sisters. It might burn their fingers!

Now, for the Real Thing!

- Burn your design into the wood you chose for a wall plaque, hot pad, or other item.

Check Your Work Again

- Are the lines free of breaks or gaps?
- Is each line uniform in width?
- Is every line the same width?

Remember These Facts About Wood

- Some woods work better than others for wood burning. The best ones are balsa, basswood, poplar or aspen, white pine, sugar pine, or close-grain hardwoods. Other good woods include redwood, cedar, and ponderosa pine.
- It is easier to burn a good, uniform line into wood whose grain is not so obvious.

Tools and materials you will need:

- A wood burning tool (see picture)
- A scrap piece of wood at least 3 inches on each side for practice
- A pattern or your own design for a wall plaque or hot pad
- A good piece of wood about $5\frac{1}{2}$ inches on a side or whatever size your own design needs

