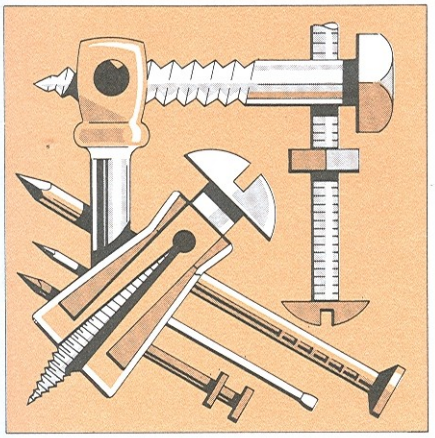
# UNIT 8



# Fastening Systems

Many kinds of metal fastening devices are used for construction purposes. Nails are still the most commonly used fastener; however, the use of staples to attach wood structural members is growing. For certain operations, screws and bolts are required. In addition, various metal devices exist for anchoring materials to concrete, masonry, and steel.

An important development in the building industry is the increasing use of adhesives (glues and mastics) in combination with, or in place of, nails and screws. Different types of adhesives are suitable for different types of jobs.

## NAILS

Nails come in many shapes and sizes, with a variety of heads, shanks, and points. See Figure 8–1. Some nails have greater holding power than others. Some have other special properties. Aluminum, stainless steel, and galvanized steel nails,

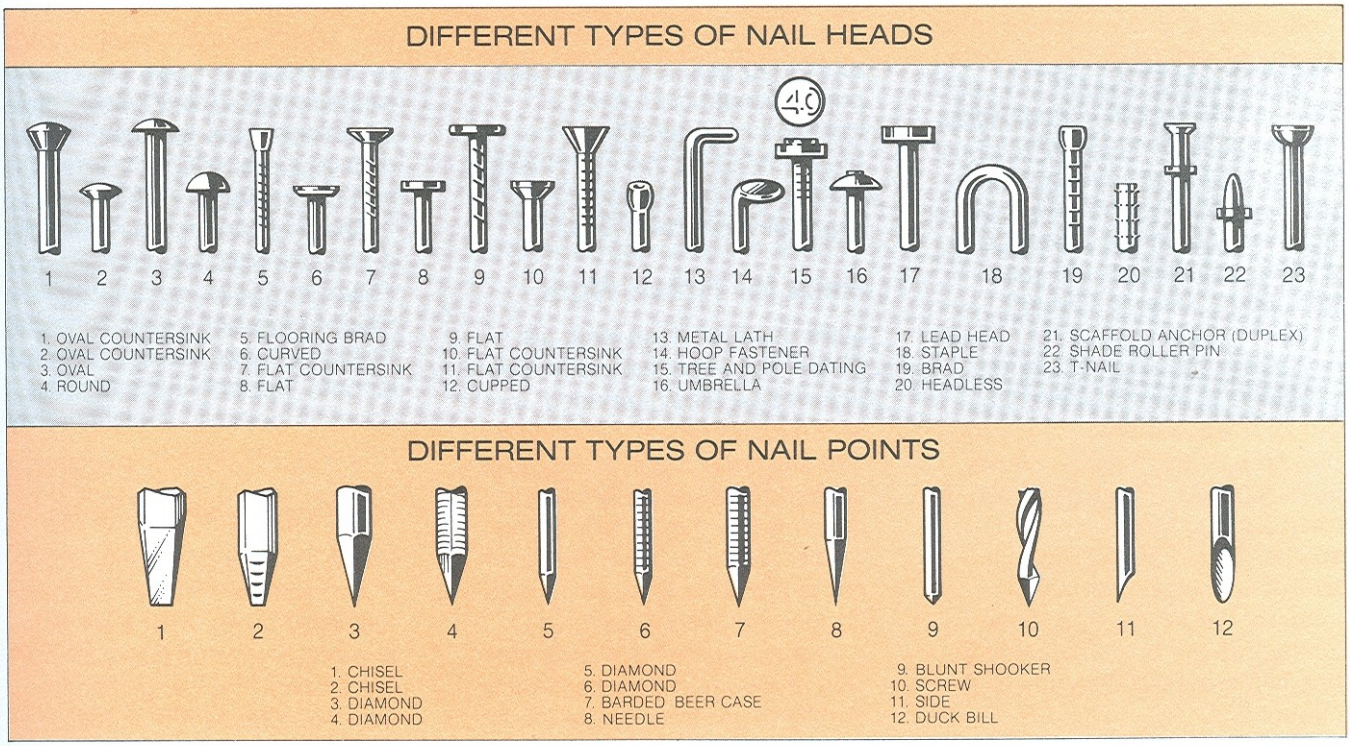



Figure 8–1. Nails come with a wide variety of heads, shanks, and points. The flat-head, diamond-point nails are most often used by carpenters.

for example, are used to fasten finish materials on the outside of a building because they are rust-resistant. These nails will not cause rust streaks on the surface of wood materials.

This unit covers the types of nails used most often for rough and finish carpentry work. Other, more specialized types of nails are discussed in later units.

## Penny System of Nail Size

Nail sizes are designated by a number and the letter *d*. Typical sizes are 6d, 8d, and 16d. A 6d nail is 2″ long, an 8d nail is 2½″ long, and a 16d nail is 3½″ long. See Figure 8–2. The letter *d* stands for *denarius*, an ancient Roman word for coin (or penny). At one time nail sizes were designated by the word *penny*, probably because when the penny system began in England, hundreds of years ago, nails were priced by how many pennies they cost per hundred. Smaller sizes of nails cost less per hundred than larger sizes.

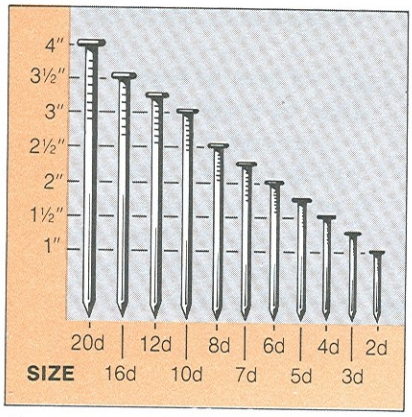



Figure 8–2. Examples of frequently used nail sizes.

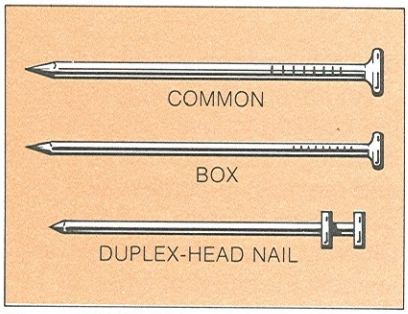



Figure 8–3. Nails used for rough work. The common wire nail is used most often.

## Nails for Rough Work

The nail used most often in wood frame and form construction is the *common wire nail*. See Figure 8–3. This type of nail is cut from wire and given a head and a point. It is available in sizes from 2d (1″ long) to 60d (6″ long).

The *box nail* is similar in appearance to the common nail, but its head and shank are thinner, so it is less likely to cause splits in wood. This type of nail is often used to fasten exterior insulation board and siding. It is available in sizes from 2d (1″ long) to 40d (5″ long). A disadvantage of the box nail is that it bends more easily when hammered.

The *double-head nail* (also known as the *duplex-head nail* or *staging nail*) is used for temporary construction such as formwork or scaffolding. The double head on this nail makes it easy to pull out when forms or scaffolding are torn down.

## Nails for Finish Work

Nails used for finish work are thinner than common nails. See Figure 8–4. They are used where appearance is important. The *finish nail* has a small, tulip-shaped head, which is easily driven below the surface of the lumber with a nail set. The finish nail is available in sizes from 2d (1″ long) to 20d (4″ long).

The *casing nail* is a thick version of the finish nail. Its head is slightly larger than that of the finish nail and is tapered toward the bottom. Casing nails are used to fasten heavier pieces of trim material.

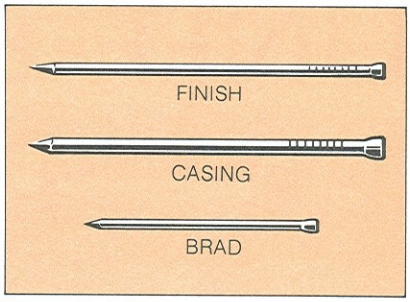



Figure 8–4. Nails used for finish work are thinner than nails used for rough work.

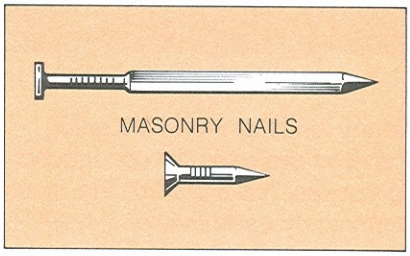



Figure 8–5. Masonry nails can be driven into concrete or masonry.

Wire *brads* are identified by their length in inches rather than by the penny system. Their sizes range from 3/16″ to 3″ long. They are thinner than finish or casing nails and are used with very light trim materials.

The *masonry nail* is made with a special hardened steel. See Figure 8–5. It is used to fasten wood to masonry (solid concrete, hollow concrete blocks, bricks, or stones). Masonry nails must be driven in perfectly straight or they may chip the masonry.

## Holding Power of Nails

When a nail is driven into wood, it compresses and pushes aside the wood fibers. After the nail is in place, the wood fibers spring back toward their original position. The pressure of the wood fibers against the surface of the nail gives the nail its holding

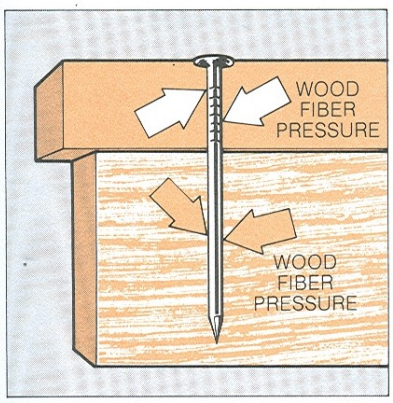



Figure 8–6. The arrows show how the wood fibers press against the shank of the nail. This pressure gives the nail its holding power.

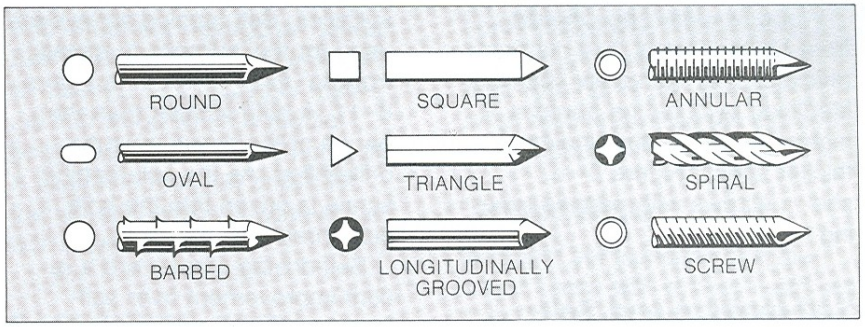



Figure 8–7. The first two shanks (round and oval) shown here are considered smooth shanks. The other types of shanks give greater holding power than smooth shanks.

power. See Figure 8–6.

Smooth-shank nails have sufficient holding power for most construction purposes. If greater holding power is needed, nails with different types of shanks are available. See Figure 8–7. Holding power is also greater with nails that are coated with cement, resin, or zinc.

## STAPLES

Today staples are often used where nails were used in the past. Staples are available in a variety of shapes and sizes. See Figure 8–8. They are usually used to fasten subflooring, sheathing, and paneling. Heavy-duty staples are driven in by electrically or pneumatically operated tools. Smaller staples are sometimes driven in by hand-operated tools.

## SCREWS

Screws provide greater holding power than nails. However, their use is limited, since they are too costly to be used as commonly as nails.

Carpenters use wood screws, sheet-metal screws, and machine screws. These screws are used for fastening hardware to wood or metal, attaching cabinets to walls, and fastening trim to metal surfaces. Additional types of screws used for special purposes are discussed in later units.

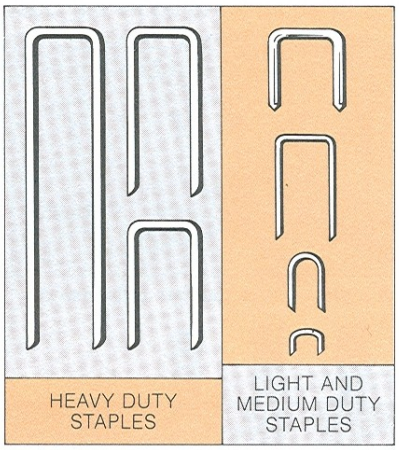



Figure 8–8. Heavy-duty staples are used to fasten plywood sheathing and subflooring. Light-duty and medium-duty staples are used for attaching molding and other interior trim.

Most screws are made of soft steel. Brass, bronze, and copper screws are also available. For decorative purposes and for matching different hardware finishes, steel screws come in many finishes, including nickel, chromium, silver plate, and gold plate.

## Wood Screws

Wood screws have flat, round, or oval heads. The screw head may have a single slot or a recessed cross slot (Phillips).See Figure 8–9. The Phillips screwhead is easier to grip than a single-slot screw head when driven by an electric screwdriver. It also has a more attractive appearance when in place.

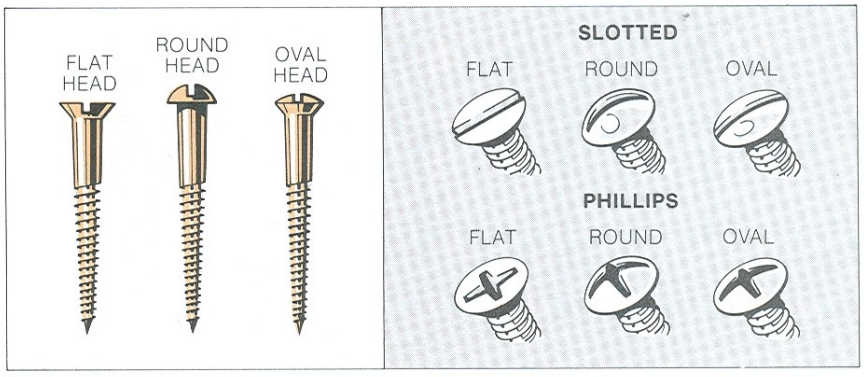



Figure 8–9. The three basic screwheads are flat, round, and oval. They have either a single slot or a recessed cross slot.

Wood screws range in size from ¼″ to 5″ long. The diameter (thickness) of the screw shank is identified by a gauge number. A higher gauge number indicates a thicker screw. Figure 8–10 shows screws with gauges ranging from 1 to 14.

## Self-tapping and Self-driving Metal Screws

In commercial construction, carpenters often work with materials that must be fastened to metal surfaces. Self-tapping screws are used for this purpose in metals from ¼″ to ½″ thick. See Figure 8–11. A hole smaller than the gauge of the screw must be drilled first. As the self-tapping screw is driven into the hole, it cuts threads in the metal.

Self-driving screws are a recent improvement over self-tapping screws. Mounted in an electric screwdriver, the self-driving screw drills a hole, cuts the threads, and fastens, all in one operation.

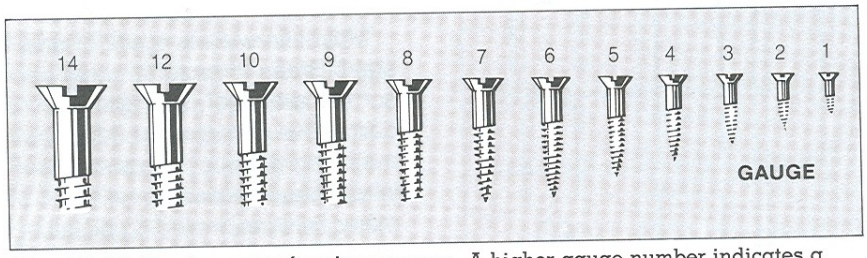



Figure 8–10. Wood screws of various gauges. A higher gauge number indicates a thicker screw.

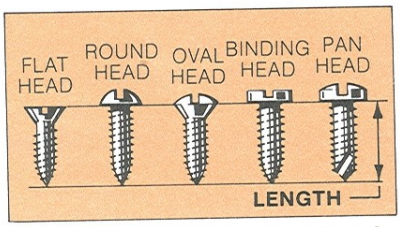



Figure 8–11. Self-tapping sheet-metal screws are used to fasten materials to metal surfaces.

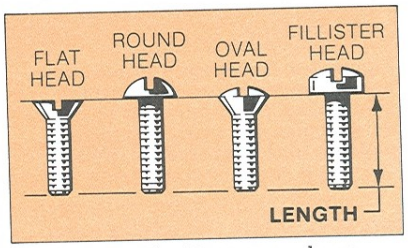



Figure 8–12. Machine screws have greater holding power than other types of screws that fasten to metal.

## Machine Screws

Machine screws are available with heads of various shapes. See Figure 8–12. They screw into threaded holes in the metal and have greater holding power than other types of screws that fasten to metal. Some examples of their uses are fastening door hinges, push plates, locks, and door closers to metal jambs and doors.

## BOLTS

Various bolts are used to fasten together heavy wood and metal materials. See Figure 8–13. All bolts require nuts. Whenever a nut bears against wood, a washer should also be used. The washer distributes the pressure over a wider area, and this prevents the nut from digging into the wood. A description of some types of bolts used in construction work follows:

*Carriage bolts* are used only in wood. The square section below the oval head of a carriage bolt is embedded in the wood as the nut is drawn up. This prevents the bolt from turning as the nut is tightened. See Figure 8–14.

*Machine bolts* have square or hexagonal heads. They are used to fasten together wood or metal pieces.

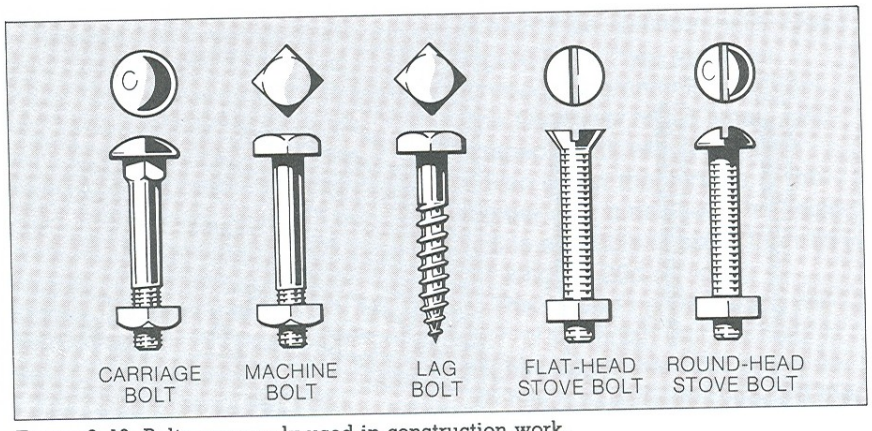



Figure 8–13. Bolts commonly used in construction work.

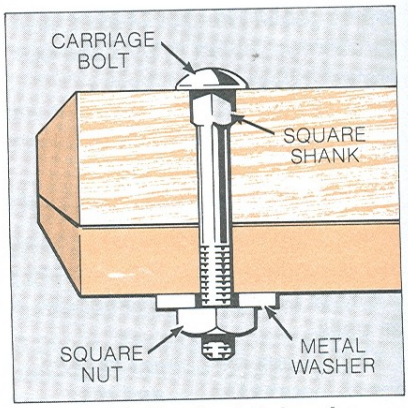



Figure 8–14. The shank below the head of a carriage bolt is embedded in the wood.

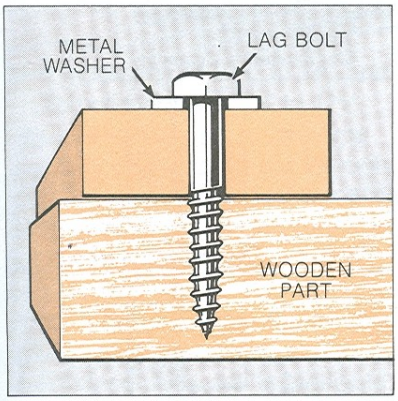



Figure 8–15. Lag bolts are often used when it is inconvenient or impossible to use a nut-and-bolt arrangement. Washers should be used under the head.

*Stove bolts* are used for lighter work. They have a smaller size range than the other types of bolts. They are available in lengths from ⅜″ to 6″ and in thicknesses from ⅛″ to ⅜″. Unlike other bolts, they have slotted flat or round heads. Stove bolts of shorter lengths, up to 2″, are threaded up to the head.

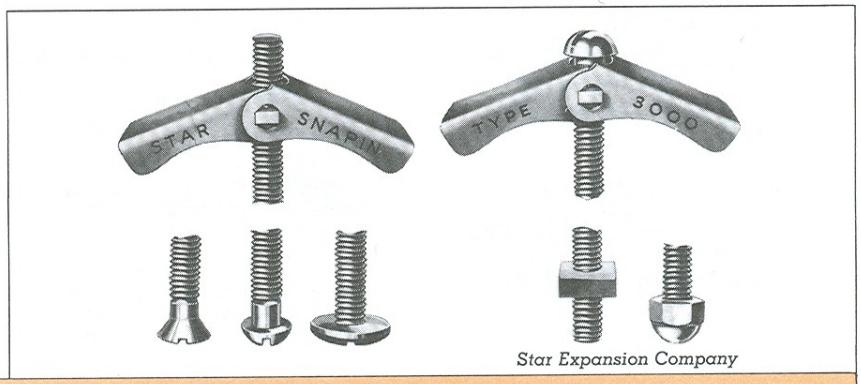
*Lag bolts* are not true bolts. They are actually heavy screws with square or hexagonal heads. See Figure 8–15. They are used to fasten heavy pieces of material into wood when a regular bolt-and-nut system will not work. A pilot hole must be drilled for the lag bolt, which is screwed in with a wrench.

## FASTENERS FOR HOLLOW WALLS

Several anchoring devices exist for fastening light materials to hollow walls. Examples of hollow walls are wood or metal partitions covered by plaster or plasterboard, and hollow-block masonry walls. One frequently used anchoring device is the *toggle bolt*. Another is the *screw anchor*, also known as the *expansion anchor*.

### Toggle Bolts

A toggle bolt consists of a machine screw with a wing-head nut that folds back as the entire assembly is pushed through a prepared hole in the wall. The wing head springs back inside the wall cavity. As the screw is tightened, the wing head is drawn against the inside surface of the finish wall material. See Figure 8–16. Spring-action wing-head toggle




*Star Expansion Company*

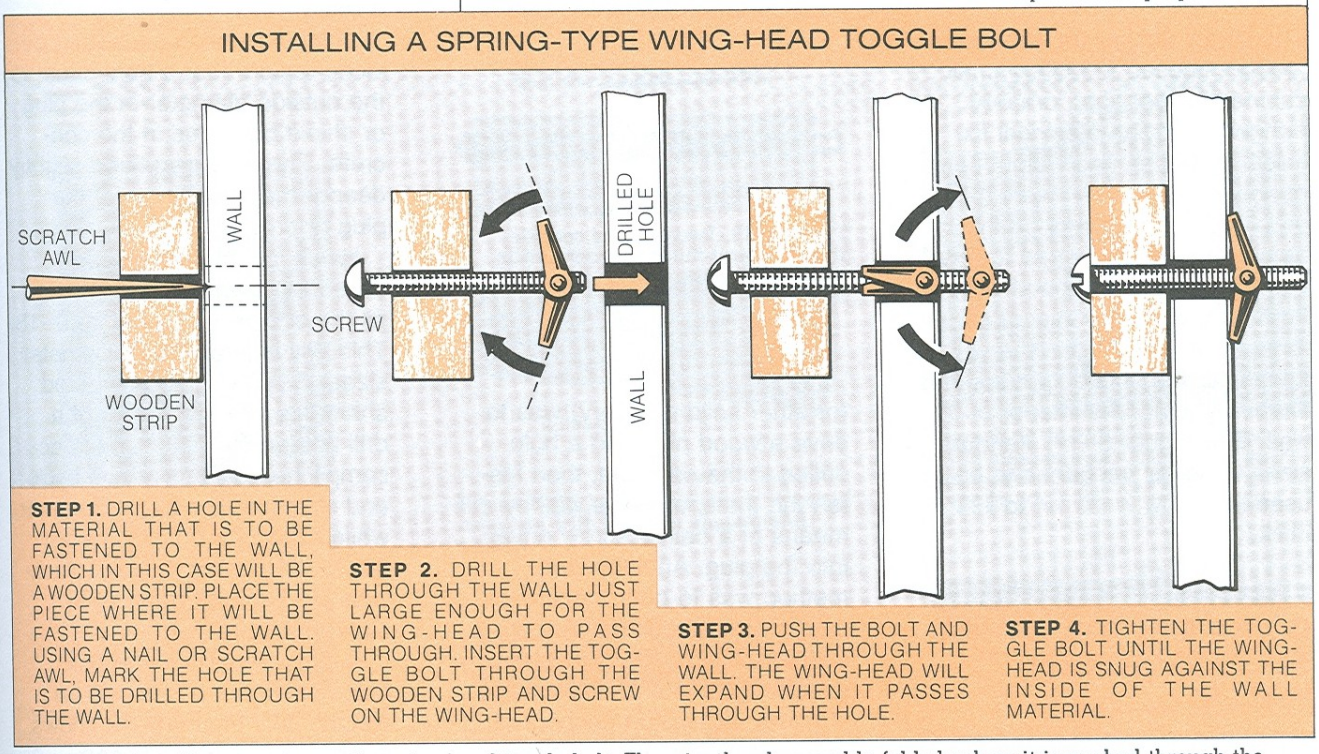



Figure 8–16. Installing a spring-action wing-head toggle bolt. The wing-head assembly folds back as it is pushed through the hole, then springs back inside the wall cavity.

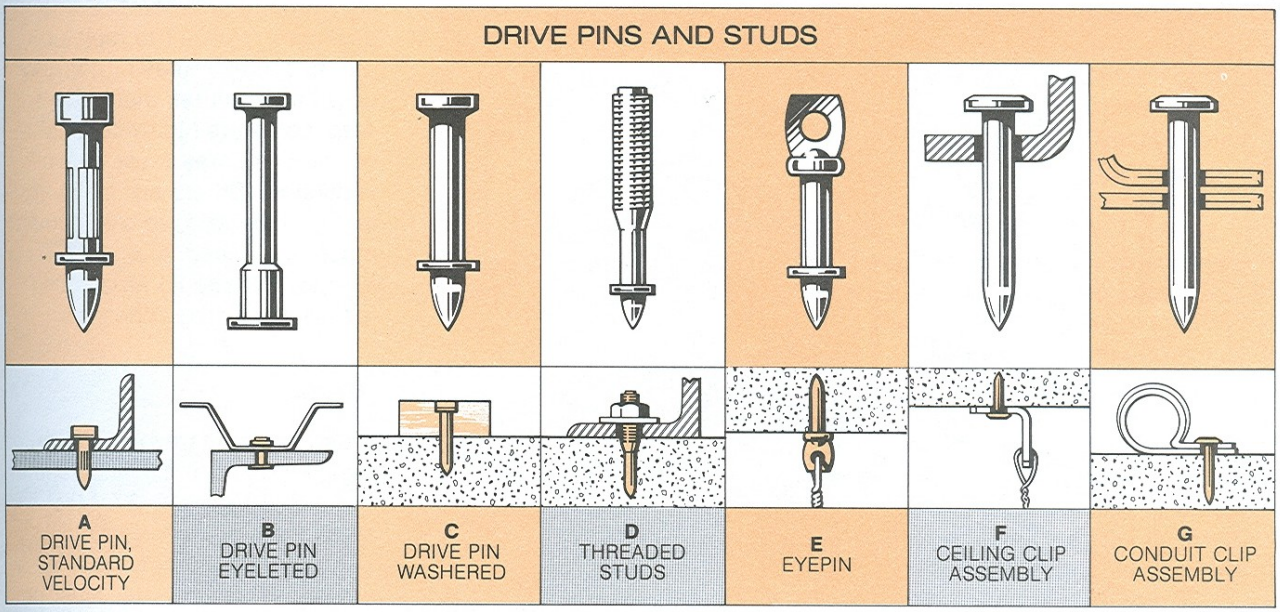



Figure 8-35. Many types of drive pins and studs can be driven into concrete or other masonry with a powder-actuated tool.

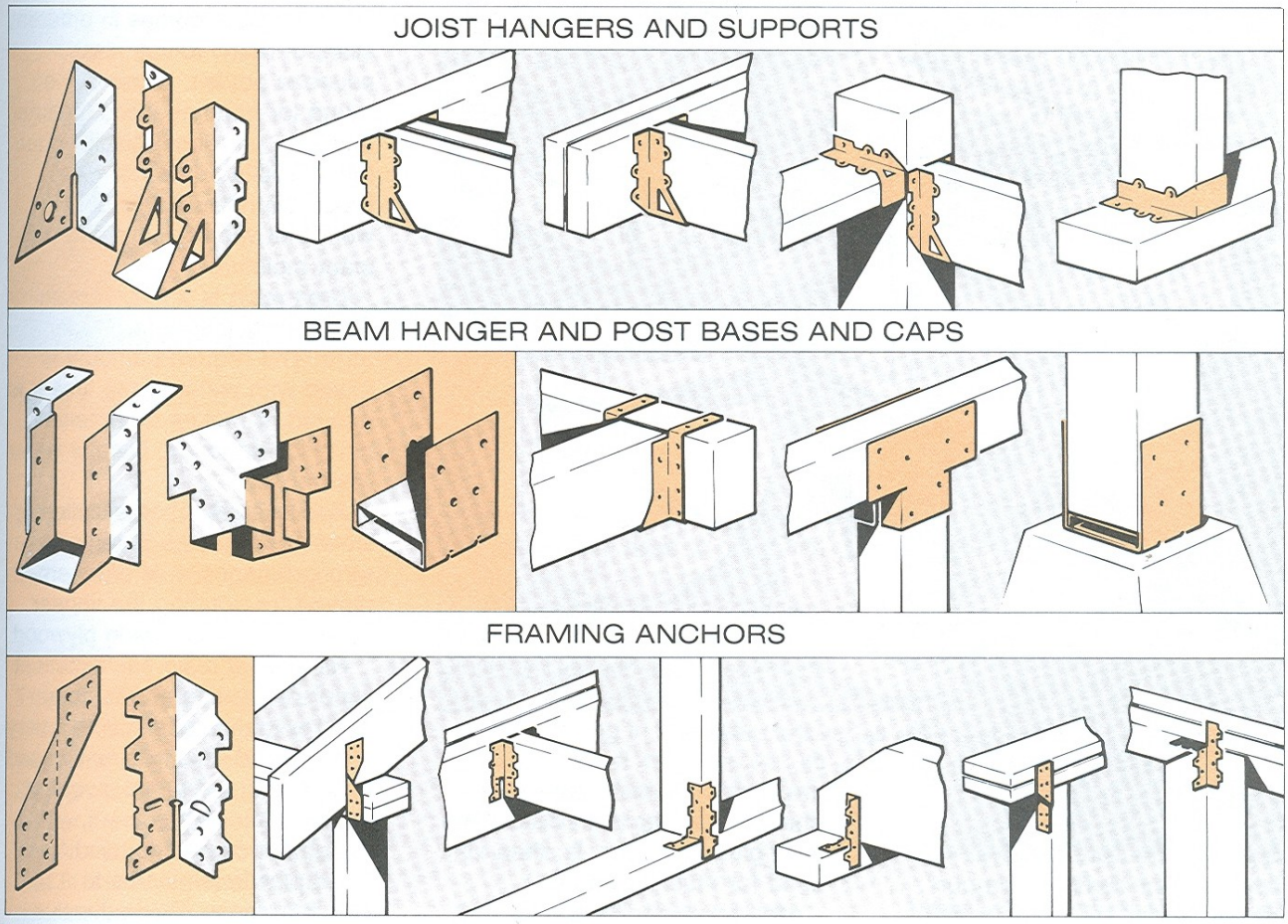



Figure 8-36. Some typical metal fasteners used to tie together members in wood-framed construction.

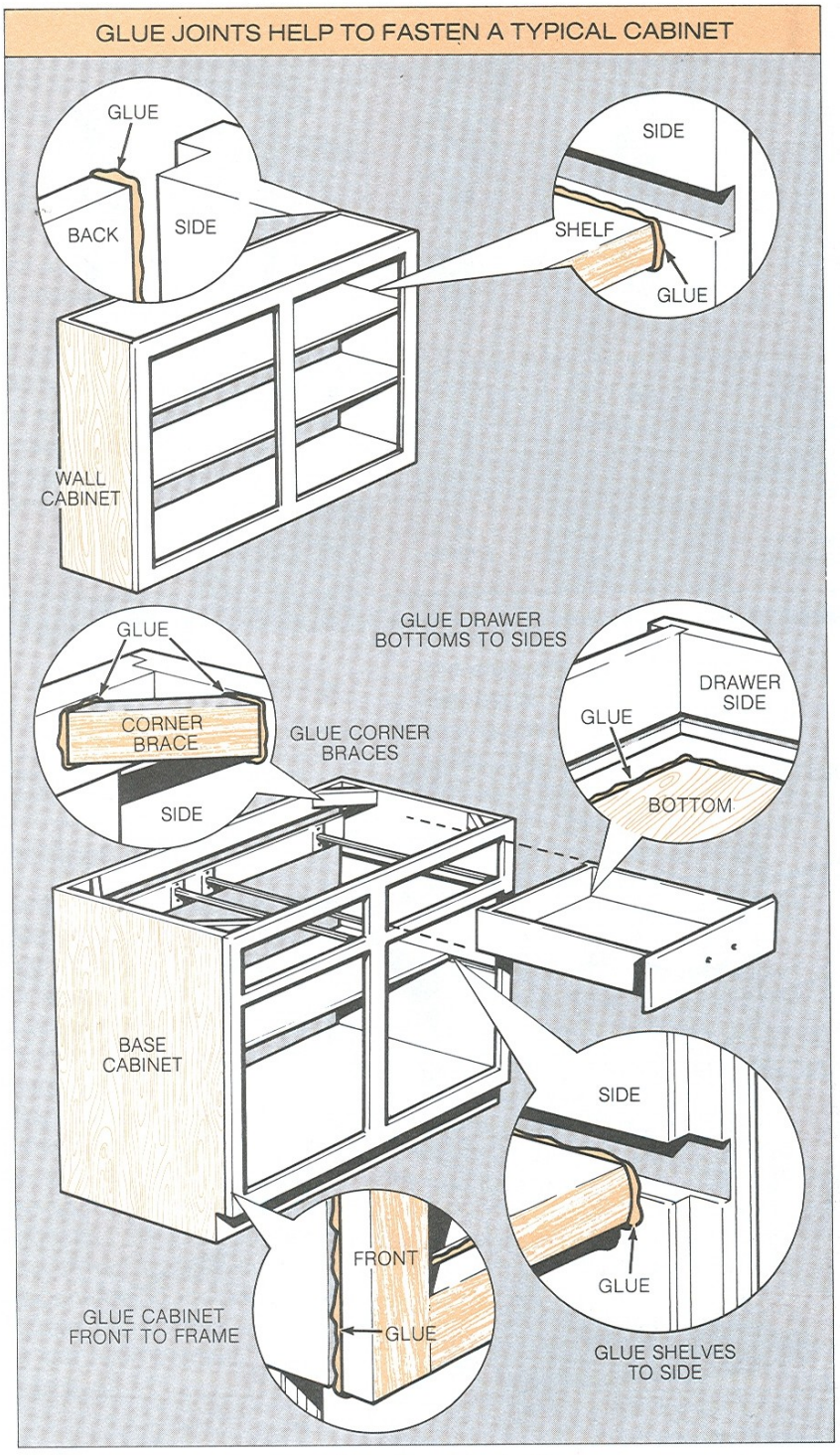



Figure 8-37. Glue is used to help fasten the joints of cabinets.

## ADHESIVES

Several types of adhesives are available for construction purposes. Some are *glues*, which have a plastic base, and others are *mastics*, which have an asphalt, rubber, or resin base. (The term *glue*, however, is often used for mastic systems.)

Method of application, drying time, and bonding characteristics vary among adhesives. Some are more resistant to moisture and to the extremes of hot and cold temperatures than others. Also, some are highly flammable, so the work area must be well ventilated. Others are highly irritating to the skin, so skin contact must be avoided. Manufacturer's instructions should always be followed in using adhesives.

### Glues

Glues are primarily used to hold together joints in mill and cabinet work. See Figure 8–37. Most glues have a plastic base. They are sold in a liquid form or as a powder to which water must be added. Many types are available under different brand names. A description of some of the more popular products follows:

*Polyvinyl resin*, better known as *white glue*, comes in different sizes of ready-to-use plastic squeeze bottles. It has a good rating for bonding wood together and sets up (dries) quickly after being applied. It is not waterproof. Do not use this glue on work that will be subject to constant moisture.

*Urea resin* is a plastic resin glue that comes in a powder form. The required amount is mixed with water at the time it is needed. It makes an excellent bond for wood and has fair water resistance.

*Phenolic resin* has excellent water resistance and temperature resistance. It is often employed for bonding the veneer layers of exterior grade plywood.

*Resorcinal resin* has excellent water resistance and temperature resistance and makes a very strong bond. It is frequently used for bonding the wood layers of glued, laminated timbers.

*Contact cement* is used to bond plastic laminates to wood surfaces. This adhesive has a neoprene rubber

## Use and Care of Striking Tools

Finger injuries are the most frequent accidents caused by striking tools. To avoid such injuries:

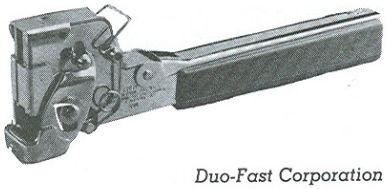
1. When using a hammer or hatchet with a wood handle, be sure the head of the tool fits tightly on the handle.
2. Always replace a cracked wood handle.
3. Use a flat-faced hammer for driving nails.
4. Hammer heads should be of proper hardness. Soft heads will mushroom and chips can break off.
5. Be wary of the nail claw of the hammer or the blade of a hatchet on the backswing.
6. Do not strike two hammer heads together in order to pry out nails.
7. Be sure mechanical staplers are pressed firmly against the work before releasing staples.

## Staplers

As a rule, hand-operated mechanical staplers (tackers) are not part of the carpenter's basic tool collection. They are usually provided by the building contractor. These heavy-duty stapling tools can perform many operations previously done by hammer and nails.

*Duo-Fast Corporation*

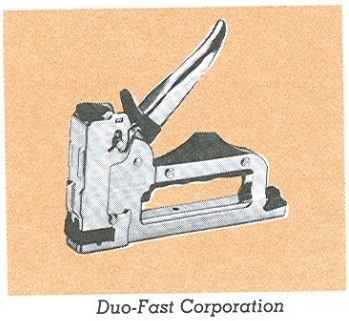
Figure 10–16. A strike tacker is used to fasten floor underlayment.



*Duo-Fast Corporation*

Figure 10–17. A hammer tacker is used to fasten insulation batts.

The *strike tacker* is operated by striking the plunger with a rubber mallet. It is often used to fasten floor underlayment. The model shown in Figure 10–16 drives 18-ga. narrow-crown staples from ⅞″ to 1⅛″ long.



*Duo-Fast Corporation*

*Duo-Fast Corporation*

Figure 10–18. Heavy-duty staple guns are used to fasten vinyl flooring, insulation, roofing paper, carpet padding, tar paper, screening, carpeting, and ceiling tile.

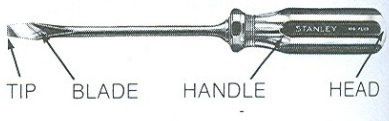
The *hammer tacker* allows one-hand operation, since it releases a staple when it is struck against a surface. It is often used to fasten building paper, felt roof underlayment, and insulation. Insulation batts are shown being stapled in Figure 10–17.

The *gun tacker* is a heavy-duty stapler that also allows one-hand operation. It is used for a wide variety of fastening operations, including vinyl flooring, insulation, roofing paper, tar paper, screening, carpet padding, carpeting, and ceiling tile. The model shown in Figure 10–18 drives .050-ga. staples from ¼″ to 9⁄16″ long.

## Screwdrivers

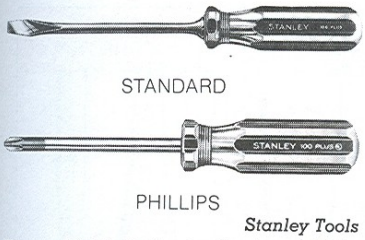
The parts of a screwdriver are the *head, handle, blade* (also called *shank*), and *tip*. See Figure 10–19. The size of a screwdriver is identified by the length of its blade. The more frequently used lengths are 3″, 4″, 6″, 8″, and 10″. Screwdrivers with longer blades allow the worker to apply greater force, which is required to drive larger screws. The various types of screws used for construction purposes are discussed in Section 2.

The two basic types of screwdrivers are the *standard* and the *Phillips* screwdrivers. See Figure 10–20. Both types are used by carpenters.



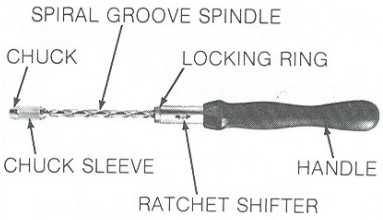

*Stanley Tools*

Figure 10–19. Parts of a screwdriver. The size of a screwdriver is identified by the length of its blade.




*Stanley Tools*

Figure 10–20. Both standard and Phillips screwdrivers are used by carpenters.




*Stanley Tools*

Figure 10–21. The spiral-ratchet screwdriver can be fitted with different types and sizes of bits.

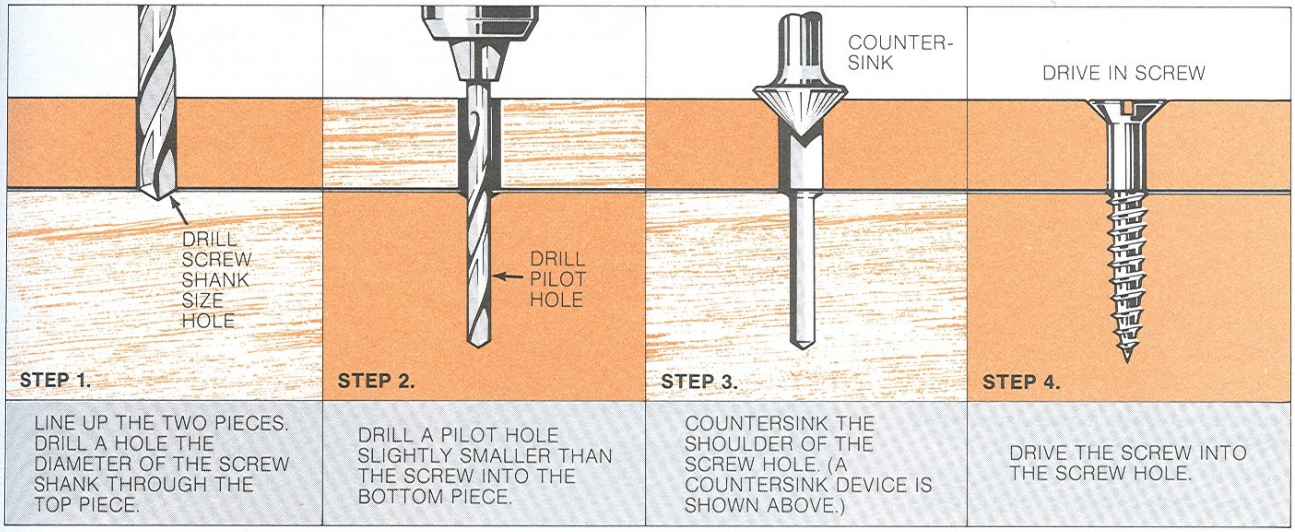



Figure 10–22. Fastening wood pieces together with wood screws. For harder woods, a pilot hole is necessary.

**Standard Screwdriver.** The tip of a standard screwdriver fits into a single slot in the head of the screw. Tips range in width from ⅛″ to ⅜″. Longer screwdrivers normally have wider tips, although there are exceptions to this rule. For best results, use a screwdriver with a tip the size of the screw slot.

**Phillips Screwdriver.** The tip of a Phillips screwdriver is shaped like a cross. It is used to drive the double-slotted head of the Phillips-type screw. The size of a Phillips screwdriver is determined by the length of the blade as well as by the tip size. Point numbers ranging from 0 to 24 specify the bit sizes.

**Spiral-ratchet Screwdriver.** The spiral-ratchet screwdriver is an effective hand tool for driving screws. See Figure 10–21. It is widely used to fasten door hinges and finish hardware. The spiral-grooved spindle turns as the screwdriver handle is pushed forward. This exerts a strong and rapid force on the screw. The *ratchet shifter* allows the spindle to either drive or withdraw screws. The ratchet unit can also be locked in place when desired. An important advantage of this tool is that different types and sizes of bits can be easily inserted in the chuck.

**Driving Wood Screws.** When driving screws into harder woods, drill a pilot hole slightly smaller than the thickness of the screw. In the case of a flat-head screw, the shoulder of the hole must be countersunk with a countersink tool. This will allow the screw head to be even with or slightly below the surface. A pilot hole is not always required when driving screws into softer woods with a spiral-ratchet screwdriver. Also, flat-head screws driven into softer woods tend to countersink themselves. Rubbing wax or soap on the screw threads also makes it easier to drive a screw. Figure 10–22 describes the proper procedure for fastening materials together with wood screws.

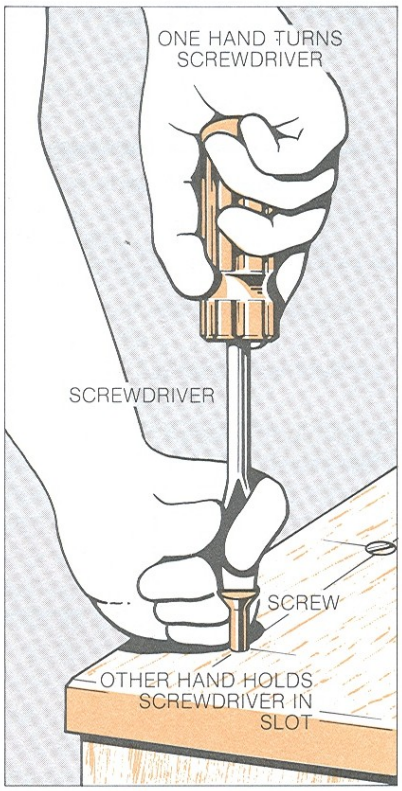



Figure 10–23. Proper way to hold a screwdriver. The right hand turns the screwdriver while the left hand holds it in position.

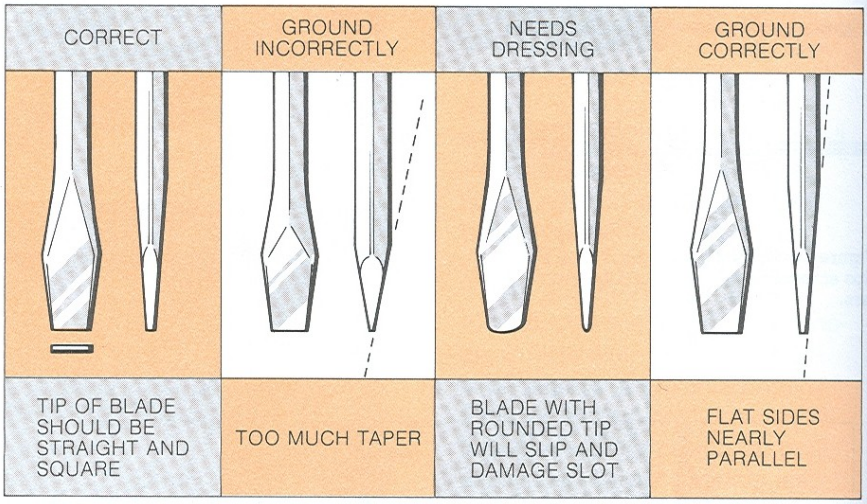



Figure 10–24. The screwdriver tip should be straight and square-cornered.

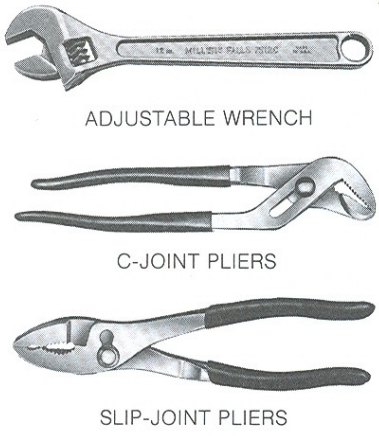



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Figure 10–25. Various gripping tools (pliers and wrenches) are used for tightening bolts.

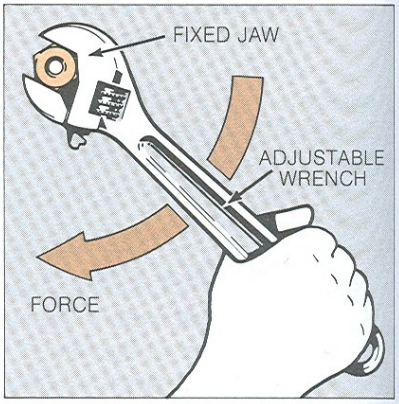



Figure 10–26. When using an adjustable wrench, be sure it is tightly adjusted to the nut. Pull the wrench so that the force is on the side of the fixed jaw.

**Use and Care of Screwdrivers.** Accidents with screwdrivers can cause puncture wounds in the hand. To avoid hand injuries, hold the screwdriver properly, as shown in Figure 10–23. Another important work and safety factor is the condition of the screwdriver tip. It should be straight and square-cornered, not rounded or excessively tapered. See Figure 10–24. Other safety rules are:

1. Do not use a hammer or wrench on a screwdriver.
2. Do not use a screwdriver as a punch, chisel, lever, or nail-puller.
3. Do not carry a screwdriver in your pants pocket.

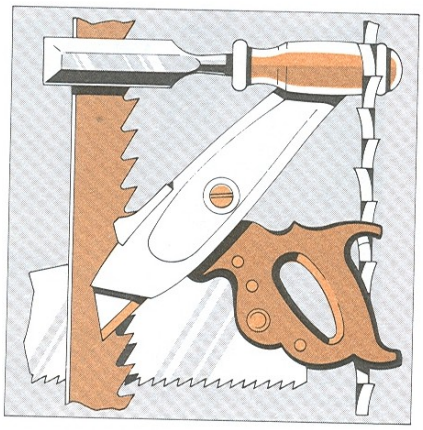
## Pliers and Wrenches

Various types of bolts are used to fasten structural members together. Gripping tools (pliers and wrenches) are needed to help install the bolts. See Figure 10–25. Two types of pliers used for this purpose are *slip-joint* and *C-joint* pliers.

**Use and Care of Wrenches.** Using the wrong type of wrench or using a wrench improperly can cause scraped knuckles, pulled back muscles, or a bad fall if the wrench slips. Rules to follow are:

1. Check for worn, cracked, or sprung jaws on the wrench.
2. Use the right size wrench for the job.
3. Whenever possible, always *pull,* rather than push, on a wrench. See Figure 10–26. There is a much greater danger of a wrench slipping and causing a hand injury when a pushing pressure is applied to the tool.
4. Never use a wrench as a hammer.

# UNIT 11



# Sawing and Cutting Tools

Sawing and cutting tools are used to trim construction materials to their proper dimensions. Saws and chisels are used most often. For metals and plastics, however, other implements such as tin snips are sometimes necessary.

## HANDSAWS

The main parts of a handsaw are the *blade* (including the *toe* and *heel* of the blade), *teeth, back,* and *handle.* See Figure 11–1. Although the basic construction of all handsaws is similar, there are many differences in the length and shape of the blade and the number and shape of the teeth. Also, although most handsaws have a straight back, the older type of curved-back saws (*skewback saws*) are still manufactured.

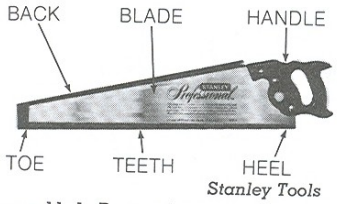



Figure 11–1. Parts of a typical handsaw. Although basic construction is similar for all handsaws, there are many differences in the length and shape of the blade and the number and shape of the teeth.

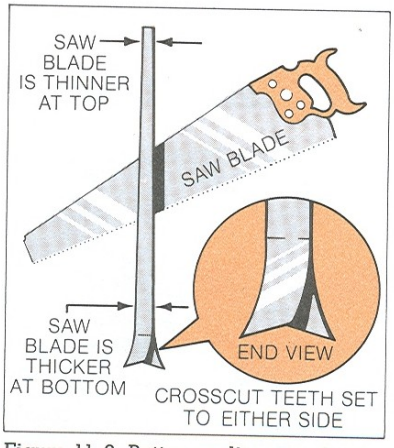



Figure 11–2. Better quality saws have a taper-ground blade. The blade is thinner at its top than at its cutting edge.

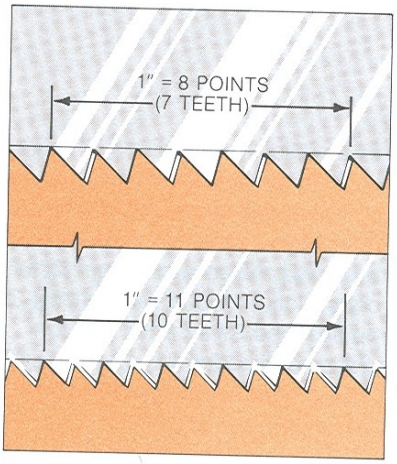



Figure 11–3. An 8-point saw has larger teeth, and less teeth per inch, than an 11-point saw.

The cut made by a saw is wider than the thickness of the saw blade. If this were not the case, the wood fibers pressing against the blade would cause the saw to *bind,* making the cutting action more difficult. To prevent this, the teeth of the saw are *set* so that they are alternately bent from side to side. Better quality saws have a *taper ground.* See Figure 11–2. The top side of the blade is thinner than it is at the cutting edge, requiring less set in the teeth.

A saw usually has a number printed on its blade giving the number of *teeth points* per inch. See Figure 11–3. The lower the number is, the larger the teeth are. For example, an 8-point saw has larger teeth than an 11-point saw.

The teeth of most handsaws are shaped to cut across the grain of the wood. These saws are called *crosscut saws.* Saws designed to cut with rather than across the grain are *ripsaws.*

### Crosscut Saws

The teeth on crosscut saws are shaped like knives, which are the most effective shape for cutting across the grain of wood. See

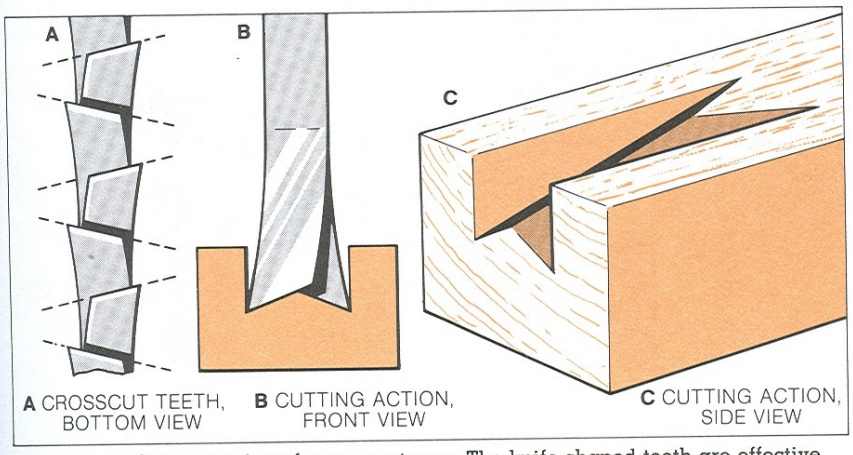



Figure 11–4. Cutting action of a crosscut saw. The knife-shaped teeth are effective for cutting across the grain.

Figure 11–4. Crosscut saws should be held at a 45° angle to the work.

The most popular type of crosscut saw for rough work has a 26″ blade with 8 points per inch. Crosscut saws for finish work usually have a shorter blade, such as 20″ or 22″, with 10 or 12 points per inch.

**Compass Saw.** The compass saw is used to cut curved lines and to saw holes. See Figure 11–5. It can start saw cuts in tight spaces where a regular saw will not fit. The compass saw's blade is 12″ or 14″ long, with 8 or 10 points per inch.

**Keyhole Saw.** The keyhole saw is similar to the compass saw, but it has a narrower and shorter blade and its teeth are finer. It is used to make curved cuts in areas too small for the compass saw to be used. In the past, one of the main functions of the keyhole saw was to cut out the keyholes for a type of mortise lock that is seldom used today.

**Backsaw.** The backsaw is used with a miter box to make very fine cuts in finish work. See Figure 11–6. The backsaw's blade is 10″ to 26″ long and 3¼″ to 6″ wide. Its teeth are 10 to 14 points per inch. A reinforcing strip at the top stiffens the blade.

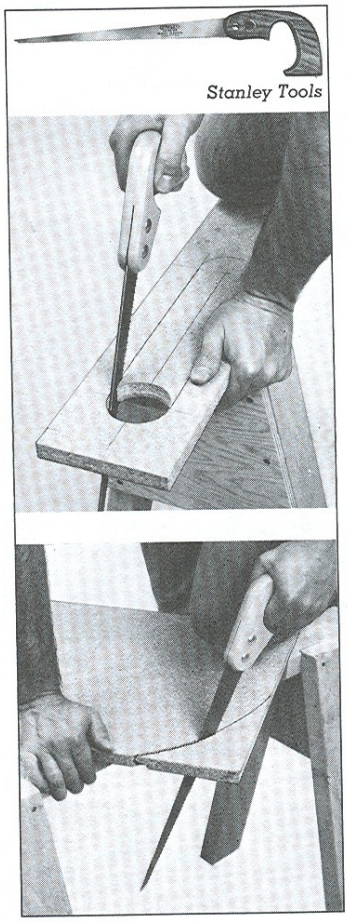
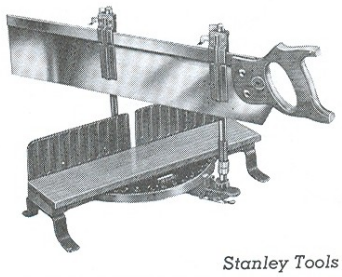



Figure 11–5. A compass saw is used to make curved cuts.

The miter box that is used with the backsaw is not considered part of the carpenter's basic tool collection, but is normally placed on the job by the employer.

**Dovetail Saw.** The dovetail saw is similar to the backsaw, but it is smaller and has a round handle and a narrower blade. See Figure 11–7. It is used to make fine cuts in molding and other smaller types of trim materials. The type of dovetail saw used most often has a blade 10″ long and 2″ wide, with 15 points per inch.

**Coping Saw.** The coping saw is useful for cutting curves and irregular lines in thin material. See Figure 11–8. It is frequently used to cut



*Stanley Tools*

Figure 11–6. A backsaw is used with a steel miter box to make very fine cuts in finish work.

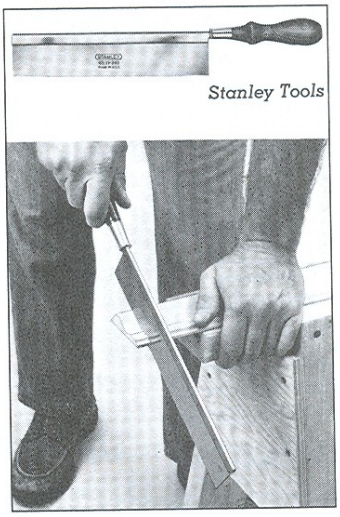
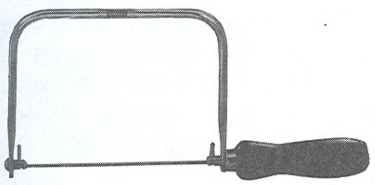



Figure 11–7. A dovetail saw is a smaller version of a backsaw.



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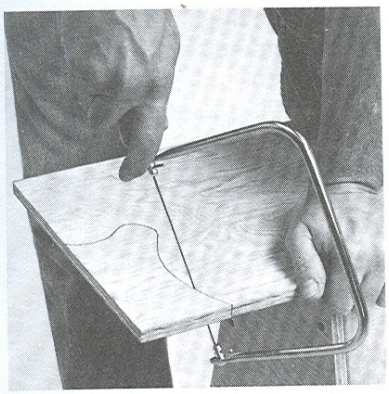

Figure 11–8. A coping saw is used to make fine, irregular cuts in thin materials.

*coped* joints when fitting the inside corners of molding. The coping saw preferred by most carpenters has a blade 6⅜" long and ⅛" wide. The blade can be adjusted to make angle cuts easier.

## Ripsaws

The teeth on ripsaws are shaped like chisels, which are the most effective shape for cutting with the grain of wood. See Figure 11–9. Most ripsaws have a blade 26" long, with 5½ points per inch. A ripsaw should be held at a 60° angle to the work.

Sawing with the grain takes much more time and effort than sawing across the grain. For this reason, power tools have generally replaced ripsaws for ripping lumber on the job. Even so, some carpenters still carry a ripsaw.

## Metal-cutting Saws

Two metal-cutting saws are the *hacksaw* and the *nail saw.* A hacksaw is used for cutting metal

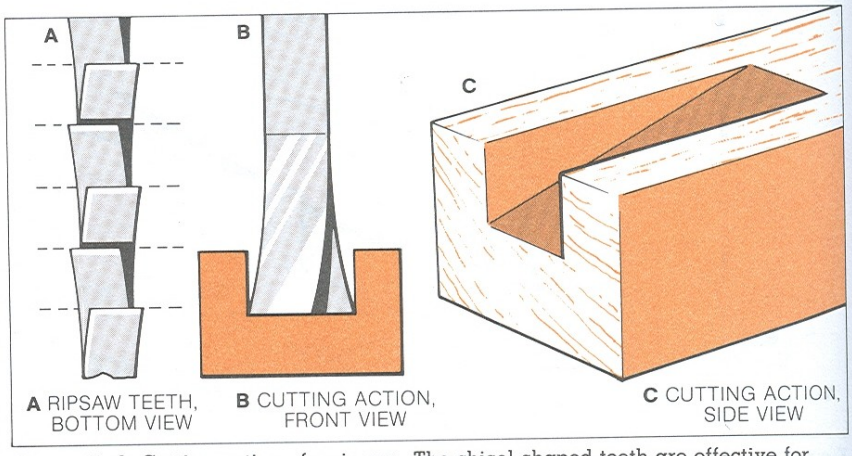


Figure 11–9. Cutting action of a ripsaw. The chisel-shaped teeth are effective for cutting with the grain.

Stanley Tools

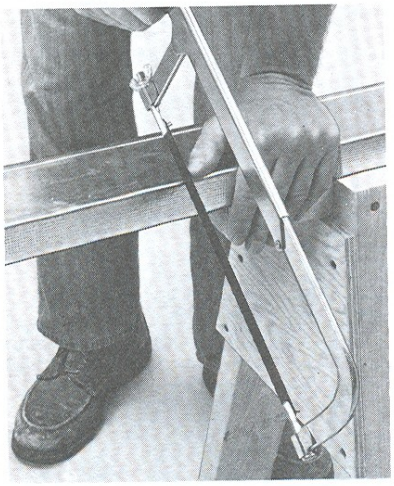

Figure 11–10. A hacksaw is used to cut metals.

materials such as metal framing members, metal molding and exterior wall covering, and door thresholds. See Figure 11–10. A nail saw is often used in remodeling work where nails must be cut in order to tear apart framing members with a minimum of damage. One type of nail saw is shown in Figure 11–11. Its blade fits into a metal or plastic handle similar to that of a compass saw.

Figure 11–11. A nail saw is used to cut nails so that framing members can be more easily parted.

## Use and Care of Handsaws

Proper sawing methods enable accurate, fast cuts with less effort. Improper use of handsaws can cause the saw blade to jump out of the saw cut and bite into the non-sawing hand resting on the material. To avoid hand lacerations from a handsaw:

1. Press thumb lightly against the blade when starting the cut. See Figure 11–12.
2. Hold up on the handle so that the blade moves very lightly back and forth until a beginning saw kerf has been made.
3. Move the non-sawing hand a safe distance away from the blade. See Figure 11–13.
4. Do not *ride* (dig in with) the

blade. A sharp blade will cut quickly and accurately with very little pressure.

5. Always cut on the waste side of the cutting line.

Saws should be placed in the tool box so that the teeth of the saw are protected from contact with other metal objects. Many carpenters fasten a slotted, hardwood sawblock at the bottom and to one side of the tool box. The saws can then be placed in the slots of the sawblock.

Some carpenters wipe a thin film of oil on the saw blade at the end of the working day. This prevents the blade from rusting and prolongs the life of the tool.

Saws must be kept sharp. Dull saws are difficult to work with and they can cause injuries. In the past, some carpenters sharpened their saws using a saw set and appropriate files. Most carpenters today have their saws sharpened by professional saw filers who use special grinding machines.

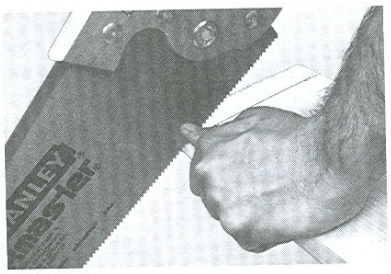

Figure 11–12. Press thumb lightly against blade when starting a cut with a handsaw.

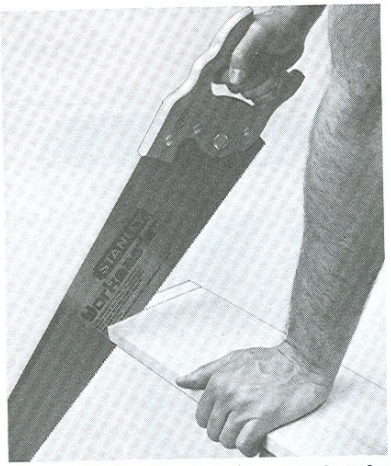

Figure 11–13. Move non-sawing hand a safe distance away from blade after making beginning saw kerf.


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Figure 11–14. A flooring chisel is used for rough work.

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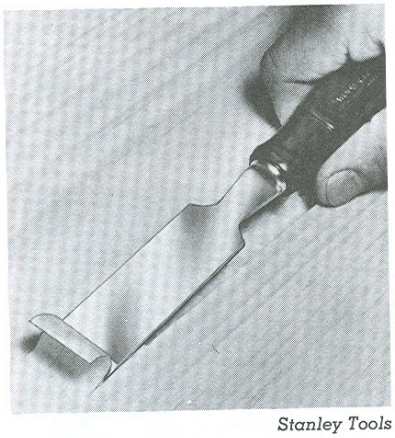

*Stanley Tools*

Figure 11–15. A butt chisel is often used to mortise lumber for door hinges and other types of finish hardware.

## OTHER CUTTING TOOLS

In addition to saws, several other cutting tools are used by carpenters, including chisels, knives, and special implements for cutting tin and wire.

### Wood Chisels

Wood chisels are hand tools used for rapid removal of waste stock. Some are designed for very rough work, such as the all-metal *flooring chisel* shown in Figure 11–14. Others are designed for finish work, such as the *butt chisel,* which is used for mortising for door hinges, flush bolts, and other kinds of finish hardware. See Figure 11–15. (A detailed procedure for mortising for door hinges is discussed in Section 13.)

The butt chisels used today usually have a plastic handle that holds the blade. Chisels are still available with the older type of wood handles, but they do not wear as well as plastic. The top of the handle is protected by a steel cap, which receives the direct hammer blow.

Chisels come in widths of ⅛″ to 2″ and blade lengths of 3″ to 6″. Carpenters who do finish work must carry chisels in an assortment of sizes. The chisels are often stored in a plastic roll to protect the cutting edges.

**Use and Care of Wood Chisels.** Wood chisels must be kept sharp. A dull chisel requires greater effort to use and results in sloppy work. A dull chisel may also cause injury. The sharpening procedure for chisels is identical to the one described for plane irons in Unit 13.

To avoid injury from improper use of a wood chisel:

1. Do not carry a chisel with an exposed cutting edge in your pocket.
2. Do not use a wood chisel with a loose or cracked handle.
3. Do not use a chisel as a wedge or pry bar.
4. Always keep the hand holding the material in back of the cutting action of the chisel. Always cut away from your body. See Figure 11–16.

### Cold Chisels

Cold chisels are forged from special hardened and tempered

Figure 11–16. When using a wood chisel, keep free hand out of the way of the chisel, and cut away from body.

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Figure 11–17. A cold chisel is used to cut metals and chip concrete.

alloy steel. See Figure 11–17. They are used to cut through nails and other metals, to chip concrete, and to cut through stucco or plaster. Cold chisels are available in widths of ¼″ to 1″ and blade lengths of 6″ to 12″.

Wear protective goggles when working with cold chisels. They develop mushroomed heads during use, and a mushroomed head creates the hazard of flying steel chips when it is struck. See Figure 11–18. As soon as a mushroomed head develops, it should be ground off.

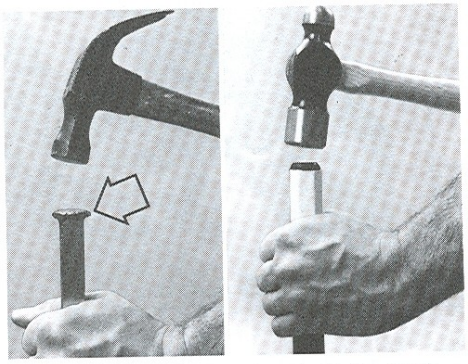
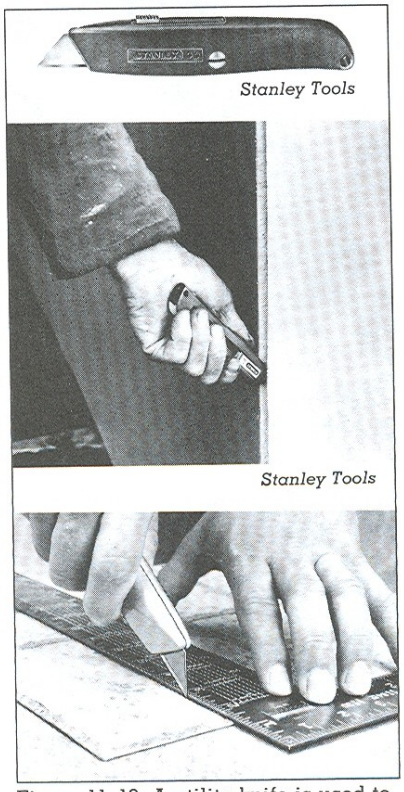


Figure 11–18. Chips can break off the mushroomed head (see arrow) of a cold chisel and cause a serious eye injury.



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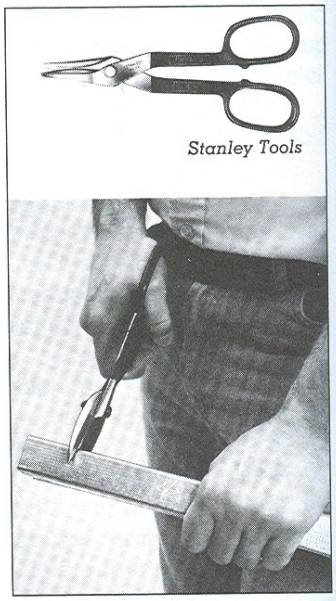
*Stanley Tools*

Figure 11–19. A utility knife is used to cut materials such as gypsum board, fiberboard, and insulation materials.

## Knives

Carpenters use knives for cutting gypsum board, fiberboard, insulation materials, and many other items used in construction. The *utility knife* is frequently used. See Figure 11–19. It has a retractable blade, which is an important safety feature. The blade is pulled back into the body of the knife when it is not being used. Additional blades are stored in the handle.

When using a knife, always cut away from your body. Keep your free hand out of the way of the knife blade.



*Stanley Tools*

Figure 11–20. Tin snips are used to cut metal framing members.

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Figure 11–21. End nippers are a handy tool for twisting or cutting wires and pulling or cutting nails.

## Tin Snips

Tin snips are available in several designs in addition to the type shown in Figure 11–20. A carpenter uses tin snips when working with metal framing members.

## End Nippers

Sometimes called *carpenters' pinchers,* end nippers are used for cutting and twisting wire. See Figure 11–21. They are also useful for cutting off or pulling out nails.