The Study of Gunsmithing



Sonoran Desert Institute

MODULE NUMBER 5

Gunstocks



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MODULE NUMBER 5

Gunstocks

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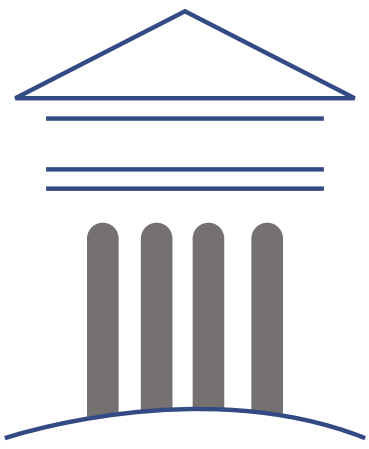
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Objectives

After completing this lesson, you should

1. Be familiar with the tools used to create a gunstock.
2. Know which woods are the best for a gunstock.
3. Understand how to sharpen woodworking tools.
4. Be familiar with the basic carving techniques.

Introduction

Working on gunstocks is a good place for the beginning gunsmith to start — mainly because few tools are required, and scrap pieces of wood for practice may be obtained at little or no cost.

Stock work can consist of a small repair, such as raising a dent in a stock with steam, or large repairs such as building a completely new stock from scratch. There are also many decorative or functional features that may be added: checkering, carving, trap buttplates, recoil pads, sling swivels, fore-end tips, etc.

Never rush your work because this is when mistakes appear. If you do not have time to do the work, wait until time is available. One slip at the wrong time can ruin an entire stock, wasting several hours of hard work.

The information contained in this lesson will introduce you to stocks and stockmaking, and like almost any other form of gun work, once you gain the basic knowledge, you must continually practice what you have learned to gain the most benefit and to become proficient as a stockmaker.



Figure 1: *Early flintlock rifles were made around 1790, this Leman flintlock rifle is from www.trackofthewolf.com and shown using curly maple.*

Wood for Gunstocks

Various types of woods have been used to stock all kinds of firearms, but among them, black walnut was perhaps the most popular in America. Black walnut was plentiful, lightweight, easy to work with, took a superior polish, and had a rich dark color. In fact, black walnut was so popular that most of the other woods for gunstocks were stained and finished to look like walnut. One of the few exceptions to this rule was hard, or sugar, maple. In some parts of the country this wood was used quite extensively for stocking —especially for the older muzzleloading rifles. Curled or tiger-stripe maple makes an especially attractive stock. The flintlock in Figure l, on the next page, has a curl in the grain. Soft maple was also used in some of the cheaper arms, but this type of wood was usually stained and finished to look like either hard maple or black walnut.

A good wood for gunstocks must have certain characteristics:

- It must be relatively light in weight.
- It must be close-grained and dense to resist moisture absorption and warping.
- It must be straight-grained in the pistol grip area.
- In one-piece stocks, it must be straight-grained through the fore-end.
- It should be cut from the main trunk of the tree with no sapwood.

The cheaper stocks and blanks often carry a wedge of light-colored, opened-grained sapwood which can be stained to match; or worse, they will contain a section of pith (the center of the trunk). Unless you are working with an existing stock, do not waste your time and your customer's money on such



Figure 2: *Black walnut gunstock blank.*



Figure 3: *Various wood samples (A) Black walnut; (B) Rosewood; (C) Screwbean Mesquite; (D) English Walnut.*

wood. It takes just as much effort, if not more, to finish out a lousy piece of wood as it would a piece of wood with good quality and appearance. Inferior wood is always reflected in its appearance, especially in the checkering, where the diamond pattern appears fuzzy rather than sharp and pointed.

Attractive, highly-figured stocks, with a burl, crotch, fiddle-back, etc., should always incorporate the pattern in the butt end of the stock. Such eye-catching figures do not increase the stock strength, but they do increase the beauty, desirability, and price of the wood. Figure 3 shows examples of different wood stocks.

European gunstocks were almost always made of walnut, and the comparatively trim and slim German and Austrian bolt-action rifles that came into the United States before and after World War I inspired many American stockmakers. With modifications, these European stocks evolved into the current American rifle stock.

The traditional stock wood today is still American walnut. The first American-made guns — like the Kentucky long rifles — had stocks made of American walnut, maple, and to a lesser extent, cherry. For example, the first Winchester, Marlin, and other early lever-action rifles utilized buttstocks that were almost pure Kentucky-made in appearance. These early flintlocks set a precedent for wood type and stock design that lasted until the early 1900s.

In general, there are four basic types of walnut used by American stockmakers:

- Black walnut, which is native to North America
- Claro walnut, a California hybrid of black and English walnuts
- English walnut, grown domestically
- Various imported European walnuts, such as French, Turkish, Italian, etc.

Black Walnut. Black walnut is the least expensive of the four basic types. But black walnut is not cheap by any means; it becomes increasingly scarce, and therefore more costly, each year. For this reason, many firearm manufacturers are switching to such economy hardwoods as birch and beech, which are stained to look like black walnut.

The main reason for the current walnut shortage is the fact that the United States always used black walnut for military stocks up through the now-obsolete M14 rifle. Then came the plastic-stocked M16 service rifle, which helped to conserve the present walnut crop for sporting guns. Furthermore, the demand for walnut veneer by domestic and foreign furniture manufacturers, and the demand for walnut by Japanese and European gun makers, has also helped deplete the supply.

Plain-grained walnut encompasses two distinct types of grain: *edge grain* and *flat grain*. There can be variations and combinations of the two in one gunstock. Both types are equal in strength and quality; the difference is made by sawing the stocks from the log at various angles to the annular rings of the tree. The choice is simply a matter of taste.

Fancy-grained, or highly figured, stocks are graded primarily on the figure and beauty of grain. Fancy-grained American black walnut is among the world's most beautiful wood. An especially nice stock comes from the crotch of the tree, where two forks of a tree join together, or a limb meets the trunk. This results in a curl, or hard-cross, figure, usually forming a spreading feather pattern across highly colored grain. Other attractive features come from irregular streaks or large spots of curl or wave, as well as from highly colored walnut with no uniform pattern.

Environmental factors, especially water availability, greatly influence a wood's suitability for gunstocks. Walnut trees grown in swamps, near river bottoms, or in areas which receive a heavy annual rainfall, grow fast and are softer and more open-grained than those growing in dryer climates. The best black walnut comes from the Ozark Mountains of Missouri, northern Arkansas, eastern Kansas, and Oklahoma, and from the hills of Pennsylvania, Tennessee, Ohio, and Kentucky.

Claro Walnut. This is a medium-cost gunstock wood that usually boasts a distinctive and beautiful swirl or flame pattern in dark brown and yellow shades. It is not as dense as black walnut, nor as strong or as easily checkered. However, the way stock blanks are cut and how the grain and figure are positioned within the blank have more to do with the strength of a gunstock than the type of wood used. Claro is generally dark er in color than black walnut.

Bastogne Walnut. This wood is exceptionally strong and firm, making it equal, in this respect, to even the best English or French. The figure in the wood, which is predominately fiddleback, resembles the best of Claro walnut, but the color is closer to English walnut.

English Walnut. Despite the name, English walnut trees grow worldwide, and only a small amount of wood is actually produced in England. Demand from British gun makers is so high that usually only substandard reject blanks ever find their way to the United States.

English walnut trees grow in the United States and in Europe, where varying climates produce woods of different characteristics.

Juglans Regia. This wood, commonly known as French, English, European, or Circassian walnut depending on where it is grown, is one of the very finest woods for gunstocks. A good grade of Juglans Regia is hard, strong, and uniformly dense, with small pores. It will take a very fine checkering with sharp diamonds. It is ideal for precise inletting and fine ornamental carving. The good grades with small pores can be finished without using any special filler. The more desirable pieces have contrasting light and dark grain, and sometimes very dark, irregular, smokey, watermark-type lines and streaks that give a mellow marbled appearance.

Circassian Walnut. This wood is native to the Caucasus Mountains of southeastern Asia, where the arid heights and mineral content of the soil contribute to the finest stock wood obtainable anywhere. Today, Circassian walnut is seldom available to the Western world. A true Circassian stock is characterized by vivid rose, red, and orange splotches, which contrast sharply with the basic wood color. The term Circassian is often used incorrectly to describe any exceptionally beautiful, highly figured wood. If you see Circassian gunstock wood offered or advertised, chances are they are offering high-grade French or German walnut instead.

Turkish Walnut. This wood is about as close to honest Circassian as you will ever see since it is grown close to the Caucasus Mountains. Turkish walnut is exceedingly dense, takes checkering well, and the straight grain prevents warping.

There are three basic types:

1. A fine-grain, rather undistinguished gray color wood which, nevertheless, produces near-ultimate accuracy,
2. A close-grain wood with deep shades of honey or gold and stripes about 1/8" wide,
3. A highly prized brown wood that is so dark it appears almost black, and has distinctive burls and color swirls Turkish walnut is expensive, hard to find, and a connoisseur's prize. Its weight ranges from 40-45 pounds per cubic foot.



Figure 4: *Turkish walnut gunstock.*

French Walnut. This type of walnut is also highly prized, and with good reason. It is highly figured and its close grain accepts checkering well. French walnut is rated at a density of about 37-40 pounds per cubic foot. There are two distinctive types.

One type is from inland France and has a striking broad grain with strong brown and gold tints—similar to Turkish walnut. However, it is considerably lighter in color and weight than the Turkish walnut.

The second, and more common, type grows near the German and Swiss borders. This wood often has a vivid cloud effect, as if a bottle of ink had been spilled on the surface of the wood.

Some types of French walnut have a bird's-eye effect resembling maple. Actually, you can find almost any grain effect, including ribbon and fiddleback. The grain color ranges from medium brown to dark chocolate.

Italian Walnut. So many shotguns are manufactured in Italy that nearly all Italian walnut is used domestically. The basic characteristics are close grain and good color — quite similar to German and French walnuts — although the color is usually darker and the grain and figure show less contrast.

Spanish Walnut. This wood has become familiar to Americans through the many Spanish shotguns imported into the United States in recent years. Due to varied climate and growing conditions, color and figure differ greatly. However, Spanish walnut is generally more open-grained and of lighter color than either the French or German woods. Little is available for export from Spain.

Czechoslovakian Walnut. There are two distinct variations of this wood:

1. A dark wood quite similar to German walnut
2. A very light-colored, straight-grained wood with little figure

Both types weigh about the same — about 35 pounds per cubic foot. While adequate for stockmaking, this type of walnut does not have the inherent beauty of the other walnuts.

Yugoslavian Walnut. In recent years, some fine walnut has been brought into the United States from Yugoslavia. This is exceptionally fine quality wood with a dense, fancy grain and weighing over 40 pounds per cubic foot. Most of this walnut is of a rich, medium-chocolate shade with darker and contrasting streaks.

Scandinavian Walnut. The most common type of Scandinavian walnut is the very light-colored walnut used by Sako of Finland. Sometimes this wood has very wide and contrasting bands, making an extremely attractive stock. At other times it is as bland as white pine.

Mahogany. Mahogany is lighter than walnut, is usually softer, and is subject to dents except in the crotch and highly figured areas. Most varieties finish well in a reddish cast and are readily checkered and carved.

Philippine Mahogany. Philippine mahogany is very soft, light, and porous, and should not be considered for stock wood. It is unsuitable for even cheap furniture.



Figure 5: Mahogany wood.

Apple Wood. This makes a very attractive stock. It is close-grained and finishes and accepts checkering well. The color is pale red. Apple is much harder to work than walnut, and will quickly dull gouges and chisels. Because of the work time required, unless a customer specifies this wood or perhaps has a blank, walnut is a better choice.

Pear Wood. This wood is similar to apple, but usually finishes in an attractive yellowish color, and is slightly softer and a bit easier to work. Pear accepts checkering well and has adequate strength for most rifle stocks. None of the fruit woods should be used for magnum calibers.

Wild Cherry. This is a traditional stock wood dating back to the early settlers. It is quite common in the central states where it is prized as a cabinet wood. Domestic cherry trees do not produce as good quality stocks as the hardier wild variety. The latter is an excellent and strong substitute for walnut, although its uniform brown color provides little in the way of contrast. Close-grained, like all fruit woods, wild cherry finishes and checkers well, and is only a bit slower to work than walnut.

Myrtle Wood. This is an exceptionally beautiful brown-toned wood, which varies widely in shade and contrast. The figure is often extravagant, and the wood is easy to finish, carve, and checker. Myrtle is prone to soft spots and tends to be more brittle than walnut. It should not be used for magnum caliber rifles nor for shotguns stocks where a little wood has to provide a lot of strength, as around sidelock shotgun actions.

Maple. This is another wood used in early days on Kentucky rifles. The grain is often distinctive, including bird's-eye, fiddleback, and ribbon figures. Close-grained, it finishes and checkers well. The weight is close to, but a bit lighter than, black walnut. Maple is quite strong and makes a fine stock that is sometimes a bit garish, except for traditional arms. The best-quality maple comes from the eastern United States.

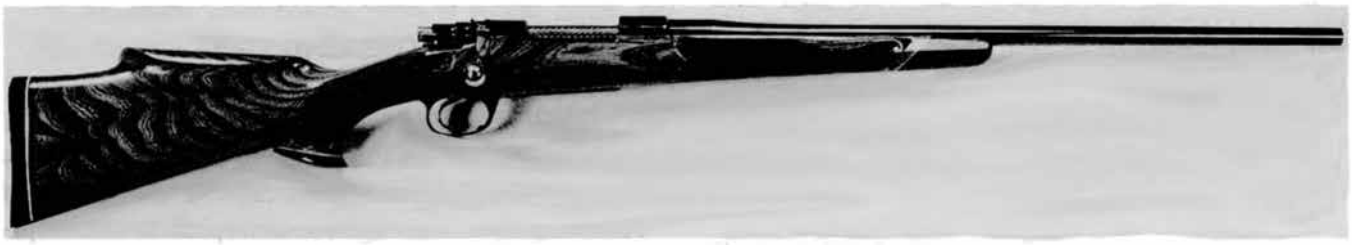


Figure 6: *Screwbean mesquite, so called because of the tightly curled beanpod, has a distinct, handsome, and bold beauty that complements modern gunstock designs. It is a strong, stable wood that makes a fine gunstock.*

Screwbean Mesquite. This wood is one of the more beautiful stock woods because of the profusion of curled bean pods, knots, twists, and whorls. The stock of the rifle shown in Figure 6 uses this type of wood. Few mesquite trees are large enough for one-piece stock blanks and the supply is limited — making this type of wood quite expensive. Mesquite is much heavier than walnut and also much stronger. It is difficult to work and dull tools tend to shred the wood; therefore, tools such as the drawknife and plane should be avoided when working with mesquite wood. Instead, depend upon the use of rasps. Mesquite is often riffled with holes and flaws, which do not weaken the wood, but do require expert inlay of matching wood. Colors can range from yellow to brown to near black, all on one stock blank.

Do not select this wood for your first stock. Mesquite requires extra skill, time, and patience; but it does make one of the more exotic-looking stocks, as can be seen on the fancier Weatherby rifles. It checkers readily, but all cutting operations should be performed with care and with very sharp tools.

Flat-Pod Mesquite. This variety of mesquite comes from the southwestern United States and Mexico. It has a much plainer figure and color contrast than the screwbean variety. Flat-pod mesquite is also very tough to work, but has fewer flaws, knots, etc. The color ranges from pale red to medium brown, with little contrast in the grain.

Madrona. This tree grows along the Pacific Coast. It is a very strong, close-grained wood of a lighter reddish color than walnut, but of the same relative weight. Many blanks contain a very attractive burl figure.

Beech. Beech is an extremely sturdy wood suitable for utility-type stocks and is often used in Europe for military and commercial stocks. The color is pale yellow or tan, without contrasting grain. It is now being used by some American gun manufacturers for cheaper-grade arms, notably rimfire .22-caliber rifles.

Sycamore. This is a common American wood that serves well for utility-type stocks or "working guns" which are subject to a lot of abuse and exposure. The lumber industry is pushing sycamore as a walnut substitute. The wood is light in color, accepts staining well, and takes an excellent finish. It lends itself to medium-fine checkering and is quite strong. Sycamore often shows a "lace effect" grain that is very attractive.

Miscellaneous Woods. Both holly and dogwood make excellent gunstock, but work badly due to the smallness of the trees. Birch is used for cheap guns and is stained to imitate either walnut or cherry. It has fine grain, and works very well, but it is sometimes inclined to warp.

Laminated Stocks. By epoxying thin layers of stock wood together and alternating grain direction, an extremely strong gunstock blank can be built up that is virtually waterproof and free from potential warpage. Laminated stocks, like the one shown in Figure 7, are commonly used for benchrest and varmint rifles. Contrasting woods can be used to make attractive color combinations such as walnut with maple, or cherry with maple. One attractive combination is made up of $^{1}/_{16}$" maple and $^{1}/_{28}$" walnut alternate lamination. It is probably the most stable and common wood combination that can be used in a gunstock.

Laminated walnut is made of $^{5}/_{16}$" horizontal strips. These thin, narrow pieces layered into one solid block result in a very stable gunstock.

Laminated blanks for sport-and varmint-style stocks will incorporate a slight bend in the laminations to simulate ideal grain structure. This lends a graceful appearance and adds strength to the toe area.

Laminated blanks constructed for competition-type stocks will have straight, parallel laminations. The lines of this style stock are parallel with the bore of the rifle.



Figure 7: A laminated thumbhole varmit stock made from walnut and maple.

WHY WALNUT IS BEST

Walnut is an acceptable and widely used wood for gunstocks because it meets the requirements better than other woods. Gunstock wood must be workable. It has to be shaped on the outside. It must also be inletted; that is, metal has to be let into the wood so that the wood covers at least half of the exposed metal of the firearm. Gunstock wood must be hard so it will not easily dent, mar, or compress from recoil. It must take checkering, which enables the shooter to grip the firearm securely, and must contribute to the appearance of the gun. Also, it must be a stable wood — not warping, expanding, or contracting to any great extent.

Walnut fills all of these requirements exceedingly well. However, some other woods do the same thing. Maple, for instance, is an extremely hard, very dense wood which has good wearing and inletting qualities and is rather pleasing to the eye. For those stockmakers desiring a blonde gunstock, maple is a good choice. However, most stockmakers in the United States prefer the soft, mellow tones of good walnut, and this trend will probably remain for many years to come.

FORE-END TIPS

There is a wide variety of exotic and colorful woods suitable for rifle fore-end tips, like the ones shown in Figure 8, and pistol grip caps. Most woods used for these purposes are grown in tropical or subtropical climates. With few exceptions, these woods are too heavy and dense to serve as stock wood. Some are so close-grained that they can be polished to a high luster using only elbow grease.

Following are some of the more common types:

Rosewood. Brazilian rosewood is undoubtedly the most popular wood for fore-end tips. It has a beautiful grain and color ranging from dark red with light stripes to a deep brown with near-black stripes. Indian rosewood is not as popular and is a purplish shade with dark streaks or a cloud effect. Both provide a distinct contrast to even dark walnut, which is essential in a fore-end tip.

Brazilian Ironwood. This is an extremely hard wood, usually with a distinct reddish to orange color. It is most often paired with light or medium-brown stock wood.

Cocobolo. This wood is quite similar in color to Brazilian ironwood, but is usually a deeper red with lighter contrasting streaks. Cocobolo is very popular for pistol grips and is considerably harder than rosewood.

Lignum Vitae. This so-called "tree-of-life" is sometimes used for fore-end tips because the dark greenish wood adds a distinctive contrast to light-colored stocks. It is most often combined with maple.

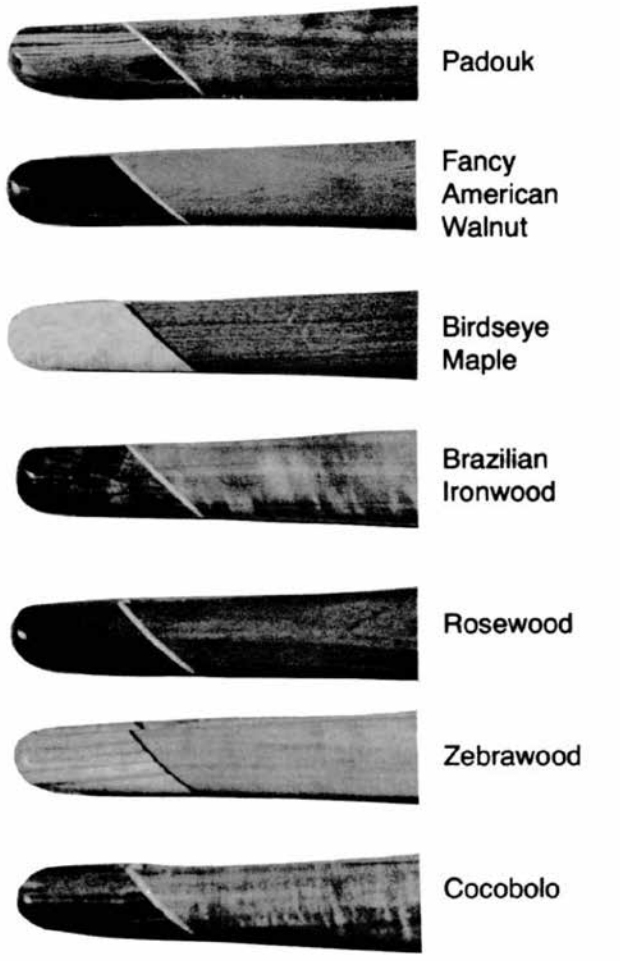


Figure 8: Several types of fore-end woods installed on walnut and maple gunstocks.

Ebony. This wood has long been the traditional fore-end tip on English big-game rifles, especially when used with ivory spacers and a matching pistol grip cap. Ebony is seldom used now, unfortunately, because the real thing looks like plastic. Consequently, black plastic is used for many fore-end tips. Ebony from Africa is solid black in color. Madagascar ebony, once considered to be inferior, is making a comeback because of its contrasting gray-streak pattern.

Domestic Woods. Domestic woods that are very light or dark and figured are often used for fore-end tips, pistol grip caps, and inlays. For example, a dark, fancy-figured piece of walnut, when inlaid into a light maple or apple wood stock, provides a pleasing contrast. Holly and persimmon, which are nearly white in color, are excellent for diamond inlays or for contrasting tips and grips on dark walnut stocks.

Ivory. This now rare and expensive material was commonly used for firearm decoration back to the time of the earliest matchlock. Even in recent times, occasional tips and caps of ivory, as well as bird and animal inlays appear on presentation-grade rifles and shotguns. Ivory is grained like wood and tends to split or show cracks, particularly if any strain occurs such as might be caused by overly tight screws.

SUMMARY

The wood for gunstocks should combine strength, lightness, and beauty, and at the same time be easy to work. The fibers should be very close and not inclined to split easily.

In the United States, black walnut is the most popular selection for modern firearms, followed by hard maple. However, Bastogne and French walnut seem to be the favorites of custom stockers since these types of walnut are denser in grain than black walnut and, therefore, will take a finer checkering pattern (more lines to the inch).

Regardless of the type used, the grain of the wood should be straight at the small of the stock, which is the weakest portion. Between the grip area and the butt it makes little difference how the grain runs, since the wood in this area is easily worked and there is plenty of thickness for strength.

Around the grip, due to the smallness, it is very important to make certain the grain is straight and runs in the direction of the shape given, and also continue straight until somewhat past the area where the receiver is set into the stock.

The best and most serviceable stocks are those made from parts of the tree where large branches join the trunk. These parts also have the curled and irregular grain that is much admired when the stock is made so that these irregularities come in the stock just in front of the buttplate.



***Figure 9**: Typical shrinkage and distortion in gunstock blanks as cut from various areas of the log. The direction of the angular rings determines these characteristics.*

When large trees are cut down, it will be evident that portions of the stump have a sort of convex form which extends downward and terminates in the large roots. If these can be dug up and separated from the stump by splitting them, they are almost always the proper shape and have the grain running nearly straight in the curves of a conventional rifle stock. Portions of some root pieces have a mottled appearance and are a different color than the wood cut from the trunk of the tree; this is especially true in black walnut. Figure 9 shows the typical shrinkage and warpage of a board. As you can see, where the board or stock blank is cut from the log will determine the shrinkage and warpage.

SELF-TEST QUESTIONS

Please check your answers on page 17.

1. ***True or False*. Gunstock wood should always be soft so it will be easy to work.**
2. **Name the two distinct types of plain-grained walnut.**
3. **The type of figured wood that results when nature knits together two forks of a tree or limb to the trunk in the crotch is known as _____.**
4. **The best all-around wood for gunstocks is still _____.**

Woodworking Tools

Although many gunstocks have been built using only basic tools, a better job can be done with the proper tools in hand.

Wood Rasps. The rasp resembles a conventional metal file at first glance, but differs from both the single and double cuts of files in the respect that the teeth are individually formed and disconnected from each other. In general, the rasp cut is a series of individual teeth produced by a sharp, narrow, punch-like cutting chisel, as shown in Figure 10. It is an extremely rough cut and is used principally on wood, leather, lead, and other soft substances. Stockmakers use rasps to shape gunstocks.

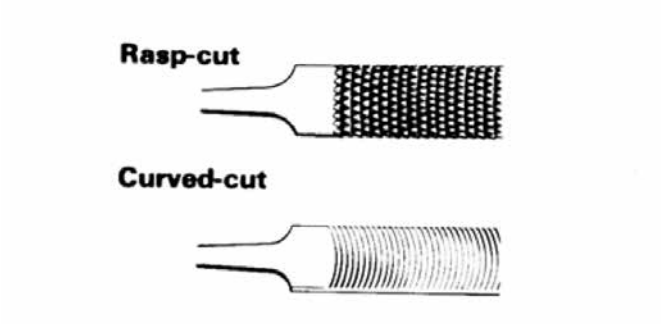


Figure 10: Rasps with different types of teeth.

On half-round wood rasps, the curved side is similar to that of the half-round metal file; but on the cabinet rasp and the pattern maker's and last maker's rasps, the radius is larger. Rasps are also made in flat and round shapes. Figure 11 shows a variety of rasps currently used by stockmakers.

Curved Tooth Files. These files cover a vast filing field and have a wide range of shape and structural characteristics. They are used for rough shaping stocks as well as final contouring of combs, grip areas, etc. For final finish work, the weight of the file alone will make "sawdust" cuts and leave the wood so smooth that fine sanding is usually all that will be necessary.

Cabinet Rasps. This type of rasp is used by cabinetmakers and woodworkers of all types and is available in flat, half-round, and round shapes. The cabinet rasp is less coarse than conventional wood rasps.

Pattern Maker's Rasps. Also called "last maker's cabinet rasps," this type of rasp is used where a smooth wood finish is required.

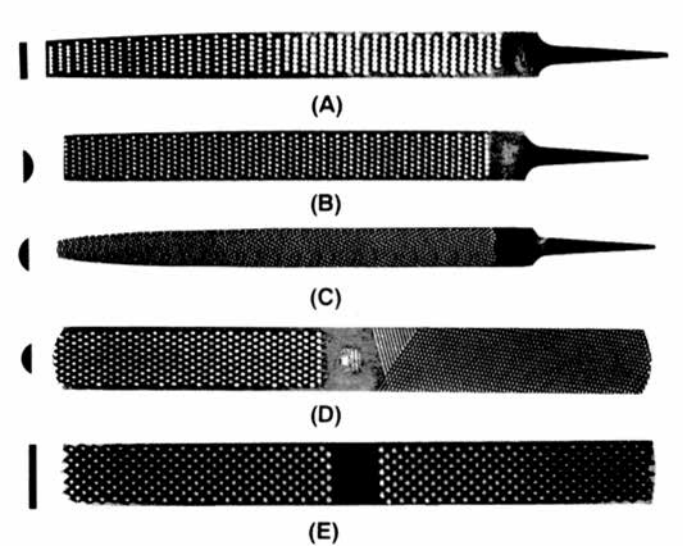


Figure 11: Several types of rasps are available for gunstock work. The more common rasps include the (A) wood rasp, (B) cabinet rasp, (C) patternmaker's and last amker's cabinet rasp, (D) 4-in-hand rasp, and (E) horse rasp.

4-in-Hand Rasp File. This versatile tool, formerly called a shoe rasp, is really four files in one, with a file section and a rasp section on the flat side and a file section and a rasp section on the half-round side. Everyone who works on gunstocks should have one.

Horse Rasps. This rasp is made in two different types: plain and tanged. *Plain* horse rasps are double-ended and have rasp teeth on one side and file teeth on the other. They are made in regular and slim. *Tanged* horse rasps are the same as plain horse rasps in tooth construction, with rasp teeth on one side and file teeth on the other, but are single-cut on the edges.

Plater's special horse rasps have rasp teeth on one side with file teeth on the opposite side. Both sides are safe (no teeth) $^{7}/_{8}$" at point. The plater's rasp cut is six teeth per row while all other horse rasps have five teeth per row.

Nicholson's Magicut Plater's Special Horse Rasp is cut deeper to last longer and work much faster than conventional horse rasps. The opposite side has a unique pattern of narrow chip breakers created by steep and angled serrations. This maximum cutting surface design provides rapid removal and smoother finish.



Figure 12: A draw knife is useful for rough shaping of a gunstock.



Figure 14: There is a style of rotary file and burr for every purpose.

While horse rasps are designed primarily for farriers for shoeing horses at racetracks and riding stables, these thin, fine-toothed rasps are also excellent for use on gunstocks.

Round Bastard Wood Rasps. This type of rasp is used for the same general purpose as regular wood rasps in places where their shapes make them particularly effective.

Double-End Rasps. Double-end rasps, shown in Figure 12, are excellent for fast cutting of wood during inletting, shaping, and relieving wood from the stock for sights and bolt knobs. They have a rasp on each end and a formed center for a firm grip. Several shapes are available to suit almost any application.

Bull Foot Bottoming Rasps. There are several shapes of bottoming rasps especially designed for the stockmaker. They are used in those hard-to-reach bottoming cuts. Three styles of bull foot rasps are shown in Figure 13.

Wood Files. Wood files are made in the same sections and size as half-round metal files except that wood files have especially coarse teeth, fitting them for use on wood. In general, they cut more smoothly than rasps.

ROTARY FILES AND BURRS

The tremendous growth of portable electric power tools, such as the Dremel Moto-Tool, has developed a widespread use for rotating-type files and burrs. They are also operated in lathes and drill presses and through variously driven flexible shafts. This versatility in application, plus their wide range of head shapes and sizes, makes them suitable for thousands of jobs in gun shops. They are especially suited for inletting gunstocks

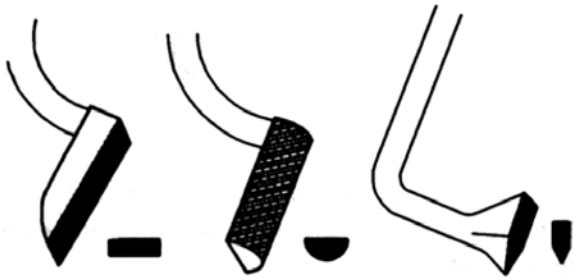


Figure 13: Three types of bull foot bottoming rasps.

Rotary files and rotary burrs are generally made from high-speed steel. Rotary burrs are also made of carbide and, though more brittle, these have up to one hundred times the serviceable cutting life of high-speed steel.

Cutting heads, in both file and burr types, are of many shapes, as shown in Figure 14. Tree, oval, cone, ball, inverted cone, cylindrical (with both flat and radius ends), barrel, flame, concave, and tapers or arcs (in various angles) are the most common. Head diameters vary from $^1/_8$" to 1¼", and shanks are usually of ¼" and $^1/_8$" diameters. Figure 15 shows how rotary files and burrs are measured.

For highest efficiency and longest life, rotary files and burrs should be operated at designated speeds based on their head diameters and the type of material being worked. The manufacturer's speed table and rules of usage should be closely observed.

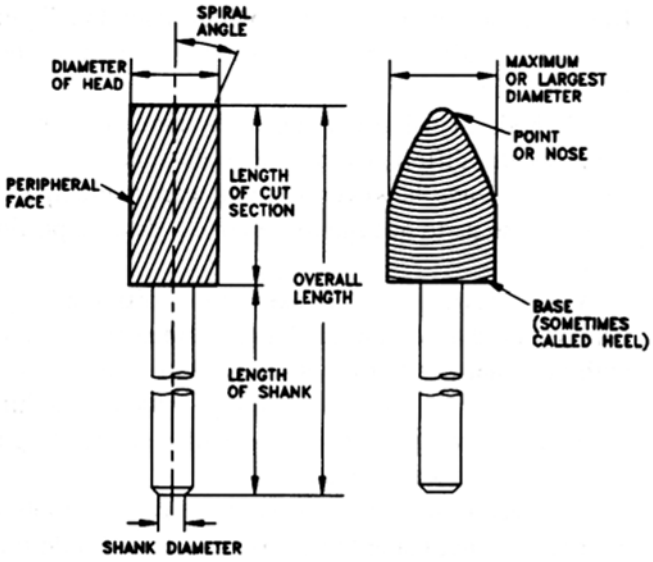


Figure 15: Method used to measure sizes and types of rotary files and burrs.

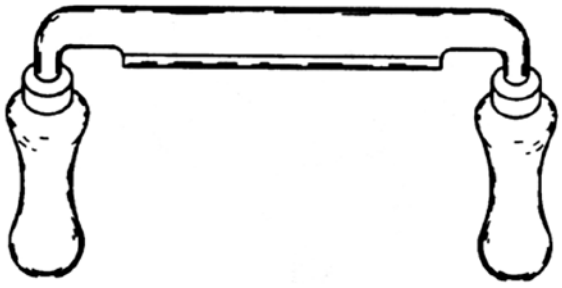


Figure 16: There is a style of rotary file and burr for every purpose.

Hand-Cut Files. These are cut by an expert hand cutter, and their teeth are irregular. As a result, they work better on hard and dense metals and are recommended for use on die steel, cast iron, welds, and forgings. This type of rotary file is more often used on stock furniture than the stock itself, but it does have certain stock applications as well. They are furnished in a full range of standard shapes in standard (medium), coarse, and fine cut. When dull, hand-cut rotary files may be resharpened.

Ground-from-Solid Files. These are precision-ground by a skilled operator; after hardening, this type of file has less tendency to clog. It is, therefore, more efficient for use on aluminum, brass, bronze, magnesium, and plastics, as well as soft steel. These files are furnished in a wide range of shapes in standard (medium), coarse, and fine cut. When dull, this type of file can be resharpened by regrinding.

Solid Carbide. Properly used, solid carbide burrs will outperform other types by as much as 50 to 1 and generally cut twice as fast. A wide variety of shapes are available in standard and coarse cuts. Standard cut is favored for general-purpose use on hard metals. Coarse cut is recommended for soft metals and plastic. These are available with several shank diameters. Standard 1/8" and ¼" shanks are used with die grinders and straight grinders.



Figure 17: Dremel moto-tools have many uses in gunsmithing.

MISCELLANEOUS WOODWORKING TOOLS

Spokeshave. The spokeshave is the universal tool for working down stock blanks after the heavy rasping is done and before final sanding operations are started. Scrapers are also used for this operation in stock shaping.

Drawknife. For quick removal of wood in rough shaping, the drawknife, shown in Figure 16, might be useful. However, it takes quite a bit of practice to use these tools without removing more wood than wanted. If you are not careful, it's quite possible to take a cut and find you have ripped out an inch or two of precious walnut — ruining the entire job.

There are scores of special inletting tools on the market to help the beginning stockmaker do a good job the first time around. In fact, you will probably have a hard time deciding which ones to buy.

A Moto-Tool, like the one shown in Figure 17, is also nice to have, not only for stock work, but for almost every other phase of gunsmithing. It is important to be extremely careful when using this device as the project nears the completion point. The rotary rasp and burrs have a tendency to "walk" and remove wood that can only be replaced by filling with epoxy or other wood filler. Be sure to get plenty of practice with this tool on scrap wood before using it on a good piece of walnut.

You will also want a sharp bench knife; a scorer; a tri-square; a good, solid workbench; and a solid bench vise with padded jaws. Sharpening equipment is necessary, since cutting tools must be kept sharp at all times.

As you progress in your career as a gunsmith, there will be other helpful tools that will be added to this list to speed up the stock inletting procedure. A brief description of some of these follows.

Barrel Channel Gouge. This tool has a long, precision-ground parallel blade for eliminating humps and bumps in the wood barrel channel. The full-length tool-to-wood bearing surface gives plane-like finishes and its cutting edge is beveled to the inside so it will cut when held flat in the channel.

Curl Scrapers. A set of curved and straight curl scrapers, like the ones shown in Figure 18, are highly recommended for

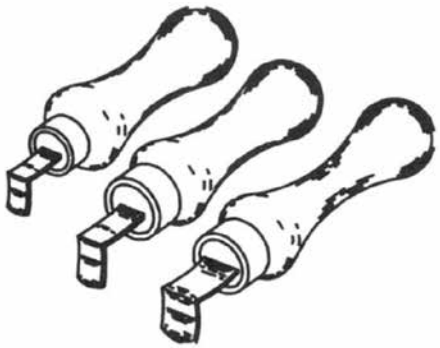


Figure 18: Curl scrapers always come in handy when inletting a gunstock.

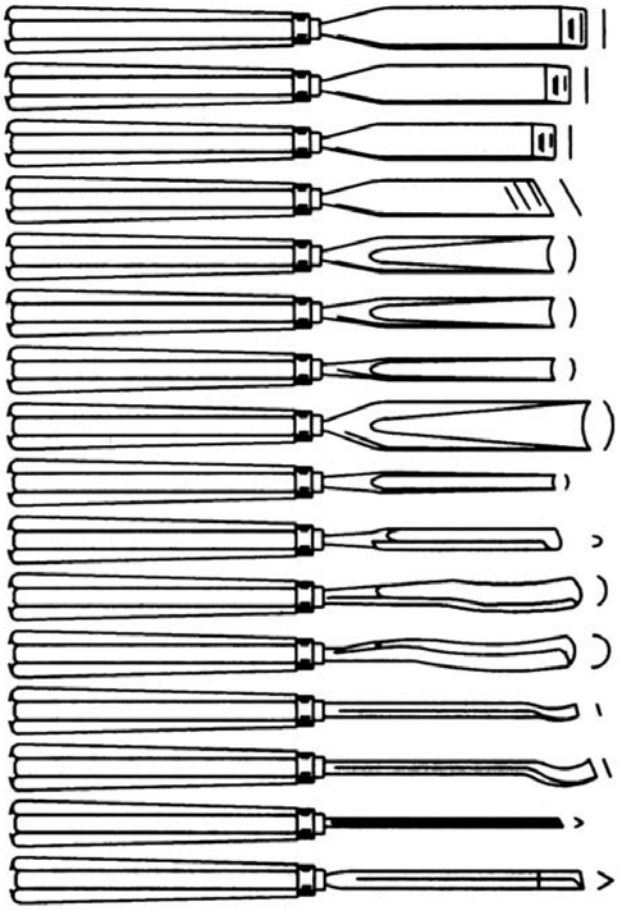


Figure 19: *Sizes and sweeps of professional cutting tools.*

inletting work. You will eventually find that final hand fitting is one of the real chores of inletting because you must be able to remove the tiniest possible curl of wood to get that exact fit that distinguishes a professional job. You will want a complete set of six.

Barrel Bedding Tools. There's a large array of these available to the stockmaker. In general, all are designed to shave out excess wood from the barrel channel without gouging, rasping, or final sanding. One handy tool is the Gunline Barrel Bedding Tool, which is available in four diameters: $^{9}/_{16}$, $^{5}/_{8}$, $^{11}/_{16}$, and ¾ inches.

WOODCARVING TOOLS

It does not take long to go through a small fortune when you start buying woodcarving tools, so you must be selective. Woodcarving tools are readily available from both Brownells and other on-line distributors. Figure 19 shows the sizes and sweeps (cutting edge) of professional carving tools in actual size.

Methods of using carving tools number nearly as many as the different kinds of tools available. However, after some experience, you will learn to manipulate each tool so as to accurately remove a desired portion of wood.

Woodcarving tools are used in two different ways. One is to hold the tool in one hand and then push it along with the other hand or tap it lightly with a mallet. This method is known as *chase carving*, which is nothing more than moving the tool along with a series of light, fast taps with a wooden mallet.

The second method is to hold the carving tools in your right hand, using the *engraver's hold*. To do this, grasp the tool about two inches from the cutting end with four fingers wrapped around the tool. Then lay your thumb along the side of the tool about one inch from the cutting edge. This hold gives maximum grip and lets you use the full strength of your hand and wrist for the carving motion.

Sharpening Woodworking Tools

Regardless of the quality of tools you have, they will be useless unless they are kept sharp at all times. Sharpening chisels and gouges consists of whetting, honing, and stropping the tools until a keen edge is obtained. Before these final operations, however, a bench grinder can be used to grind a sharp cutting edge on the tool, which saves a lot of hand work.

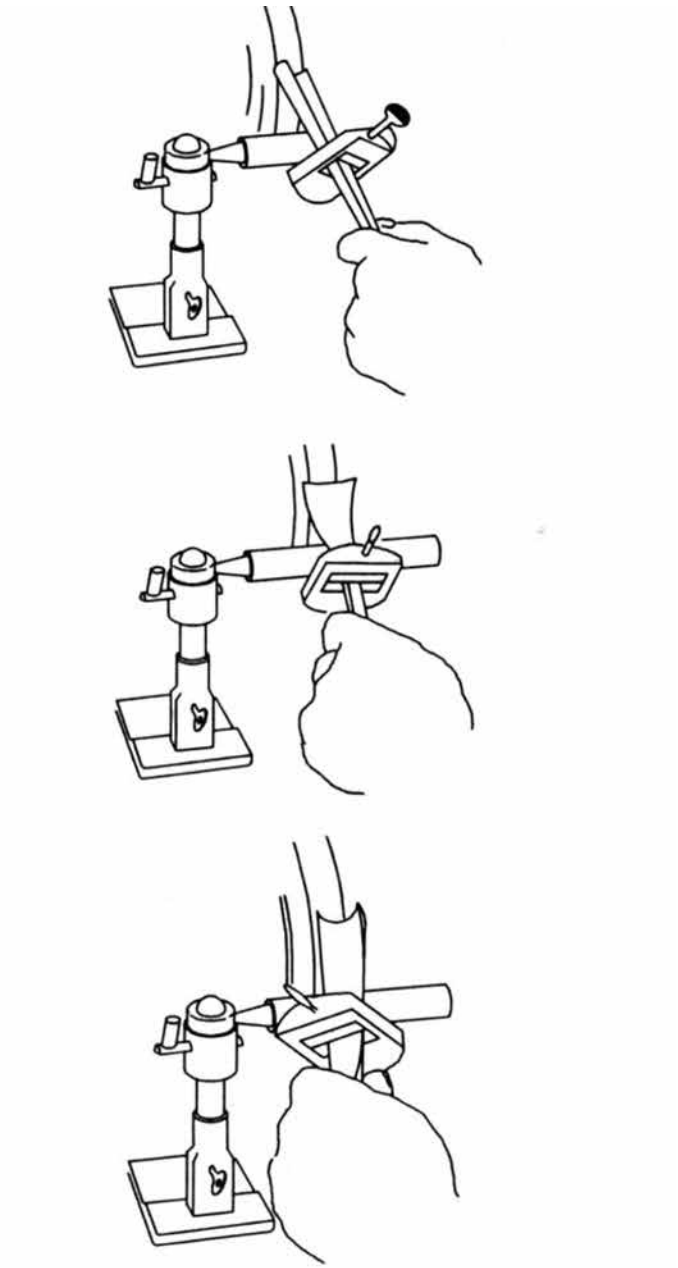


Figure 20: *The three steps necessary for obtaining a uniform curve and bevel on a gouge.*

A tool holder and stand for sharpening gouges, chisels, and V-tools on the bench grinder enables you to get the proper cutting angle (12°-15°) with the full size of the carving tool (up to 1¼"width), whether straight or long spoon.

A constant back-and-forth motion should be used when grinding all tools to avoid overheating and loss of hardness. Movement will result in a better sharpening job. Always have a container of water close at hand and dip tools frequently to prevent overheating. Curved cutting tools, such as gouges, should be moved over a convex surface for uniform curve, concentric sharpening, and for keeping an even bevel (angle), as shown in Figure 20.

After the proper bevel and sharp cutting edge have been ground on the grinding wheel, the carving tool must be whetted, honed, and stropped.

A carving tool should have two cutting bevels: outside and inside. The outside bevel should be ground on the grinder, but the inside bevel must be hand-whetted or honed, as shown in Figure 21. The amount of whetting to be done depends on the sharpness of the cutting edge after grinding.

Chisels. Whet the 12°-15° bevel in a circular or figure-8 movement on a flat India oil stone, which is very coarse, until a fine burr (wire edge) has turned up. The other side of the chisel, with the blade almost flat, should be rubbed on the oil stone until a short bevel can be noticed. Next comes the honing. Hold the tool in one hand and an Arkansas oil stone, which is a fine grain oil stone, in the other hand. Rub the oil stone in an up-and-down movement, with the pressure on the downstroke, against the cutting edge. Hone the large bevel first, then the small bevel. The bevels should be flat and the cutting edge square; do not round the corners (Figure 22 on next page).

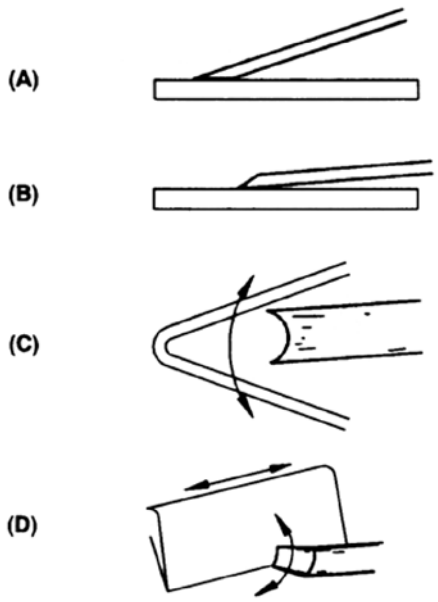


Figure 21: *(A) Whetting a chisel's outside bevel, (B) whetting a chisel's inside bevel, (C) whetting a gouge's outside bevel on the inside of a gouge slip, and (D) whetting and honing a gouge's inside bevel.*

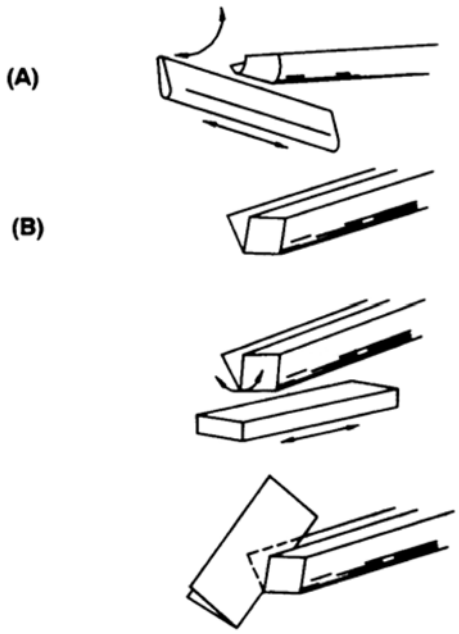


Figure 22: (A) Honing a gouge's outside bevel, and (B) whetting and honing a V-tool's inside edge.

Straight Skew Chisel. This type of chisel should have a 12°-15° angle on both sides, because the tool has to cut right and left in sharp corners. Whetting and honing is the same as for the chisel, except that both angles should be equal.

Gouges. The outside bevel can best be whetted by rocking it back and forth on the inside of an India gouge slip. For the inside bevel, use an India round-edge slip. Stroke the oil stone up and down until a bevel has been formed all around the sweep (curve) of the tool. On gouges with the No. 9, 10, or 11 sweep, use a round or pointed oil stone to prevent rounding the comers of the tool. For honing, use a hard Arkansas round-edge slip, use the flat side for the outside bevel, as shown in Figure 22 (A), and the rounded edge for the inside. On tools with the No. 9, 10, and 11 sweep, use a round or pointed Arkansas oil stone. When honing, apply the pressure on the downstroke.

V-Parting Tool. After the outside bevels have been carefully ground, they should be whetted until they form a burr at the inside of the V. To form the inside bevel, use a diamond or knife-shaped India oil stone. By grinding and whetting the outside bevel, a sharp edge is produced where the two sides of the bevel meet and a small protruding point appears at the apex of the V. For smoother shaving on the wood, the sharp edge must be rounded. The protruding point's outside corner must be rounded until it conforms with the inner angle. For honing the outside bevels and for removing all traces of roughness at the rounded edge, use the round-edge slip. For the inside bevels, use a diamond or knife-shaped hard Arkansas oil stone as shown in Figure 22 (B). All honing is done against the cutting edge.

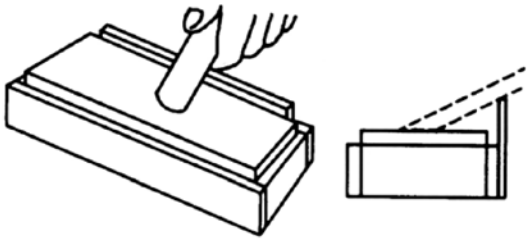


Figure 23: A small box used to gain the proper cutting angle while honing.

When a burr has formed that cannot be removed by honing, draw the edge of the tool across the corner of a wood block or cork a few times; this will remove the burr completely.

To prevent glazing of India and Arkansas oil stones, use honing oil or a light oil mixed with kerosene. A few extra drops of oil on the stone are better than letting the stone get dry. Clear the oil stone of metal particles frequently.

All tools should be stropped before using. A strop is a leather strap that is used for sharpening razors, chisels, etc. The tool is drawn across the strop with the cutting edge trailing to prevent the tool from cutting into the strop.

If you have difficulty keeping the proper cutting angle on chisels and gouges during sharpening or honing, make a small box, like the one shown in Figure 23, with one sideboard slightly higher to hold a flat oil stone. Lay the beveled side of the tool flat on the oil stone and hold the tool firmly in your hand with the index finger at the outside edge of the higher sideboard. By sliding the tool back and forth, you can keep the bevel at the same angle.

Flat chisels, skew chisels, and V-tools require only straight sliding. Gouges require a sweeping motion so that the tool is equally sharpened and honed.

With this basic knowledge, you're now ready to start learning design, layout, shaping, inletting, finishing, and other stock-making techniques.

SELF-TEST QUESTIONS

Please check your answers on page 17.

5. **One type of power rotary tool is the _____ .**
6. **The cutting area of a woodcarving tool is known as the _____ .**
7. **What sharpening operation must be performed on woodcarving tools after the final honing?**
8. **What is the main purpose of a barrel channel gouge?**

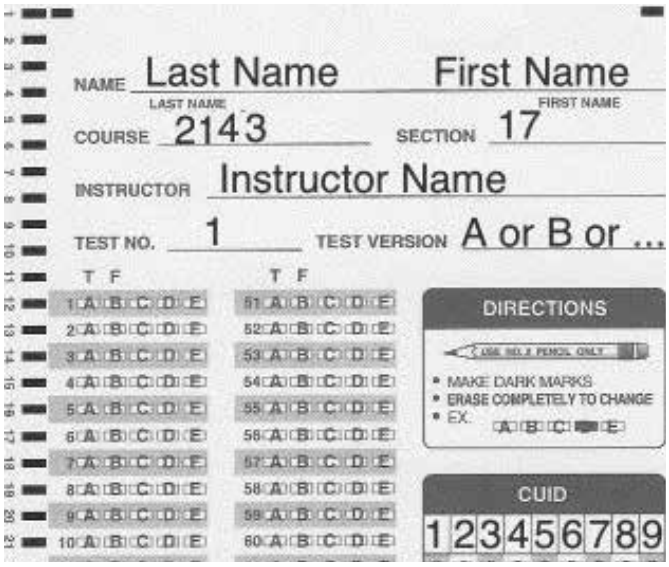
Answers to Self-Test Questions

1. False.
2. Edge grain and flat grain.
3. A curl, or hard-cross, figure, usually forming a spreading feather pattern.
4. Walnut.
5. Moto-Tool.
6. Sweep.
7. Stropping.
8. Removing humps and bumps (irregularities) in the barrel channel of the stock.

Lesson Questions

THIS IS LESSON NUMBER 2185.

Make sure you print your name, student number, and lesson number in the space provided on the Lesson Answer Form. Be sure to fill in the circles beneath your student number and lesson number.



REMINDER: A properly completed Lesson Answer Form allows us to evaluate your answers and send the results and additional study material to you. Do not hold your Lesson Answer Forms to send several at one time. You may run out of study material if you do not send your answers for evaluation promptly.

You may also complete your exam online at www.sdi.edu, click on the *online exams* tab.

1. **A California hybrid of black and English walnuts is known as:**
   a. French walnut.
   b. English walnut.
   c. Claro walnut.
   d. Circassian walnut.

2. **The best black walnut for gunstocks comes from all except**
   a. The Missouri Ozarks.
   b. Pennsylvania and Ohio.
   c. Tennessee and Kentucky.
   d. California.

3. **A type of mesquite wood with tightly curled bean pods is known as the**
   a. Flat-pod mesquite.
   b. Screwbean mesquite.
   c. Weatherby mesquite.
   d. Madrona.

4. **While laminated stocks can be made from many different types of wood combinations, which of the following is the most common?**
   a. Philippine mahogany and Brazilian ironwood.
   b. Cocobolo and Philippine mahogany.
   c. Walnut and maple.
   d. Rosewood and ivory.

5. **One characteristic of good gunstock wood is**
   a. The fibers or grain should be very loose.
   b. The wood must be heavy.
   c. The fibers or grain should be very close.
   d. The fibers or grain should be inclined to split.

6. **One difference between a metal file and a wood rasp is the teeth arrangement. Teeth on a wood rasp are**
   a. Individually formed and disconnected from each other.
   b. Cut simultaneously and connected to each other.
   c. Designed for very fine work.
   d. Always of the double-cut type.

7. **Which of the following types of rotary files and burrs will have the longest cutting life?**
   a. High-speed steel.
   b. Carbide.
   c. Cast iron.
   d. Bronze.

8. **Chase carving with woodworking tools is when**
   a. The cutting tool, held in one hand, is moved along with a series of light taps with a wooden mallet.
   b. The cutting tool is tightly held with both hands and pushed along.
   c. Two different cutting tools are used, one behind the other.
   d. The cutting tool is held and pushed with one hand.

9. **The three basic sharpening operations, in the correct order, are**

   a. Honing, stropping, and grinding.

   b. Honing, grinding, and stropping.

   c. Stropping, grinding, and honing.

   d. Grinding, honing, and stropping.

10. **To what angle should the cutting edge of a straight skew chisel be ground on both sides of the blade?**

    a. 2-6 degrees.

    b. 8-10 degrees.

    c. 12-15 degrees.

    d. 18-20 degrees.