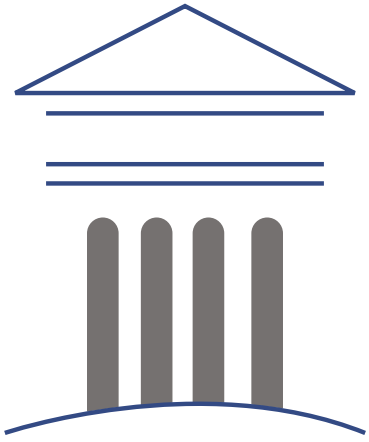
Finishing, Bedding, and Checkering Lesson: 2188

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Objectives

After completing this lesson, you should

1. Be able to identify the different styles of checkering.
2. Understand the different types of barrel and action bedding.
3. Be familiar with the steps required to produce a checkered stock.
4. Be familiar with the types of stock finishes and how they are applied.

Introduction

Checkering is the process of cutting diamond-like patterns on the grips and forearms of gunstocks and on handgun grips. The diamonds are usually formed by cutting crossing lines into the wood with hand tools or electrically powered checkering tools.

Three basic styles of checkering dominate the field:

- American checkering
- English checkering
- French checkering

There are variations, but nearly all patterns used on firearms since the turn of the century can be identified by one of these three basic styles (Figure 1).

In *English checkering*, master guidelines are first laid out at a proper angle to each other, and then scored lightly with a special woodcutting tool. The tool consists of two edges, one to "ride" in the groove previously cut, while the other cuts a new groove. Perfectly shaped diamonds are formed in this manner. The cut lines may be gone over several times to deepen them, but in English checkering, the diamonds are left flat.

American checkering is similar to English checkering, except the basic lines are gone over again with a V-tool, which deepens the cuts and bevels the edges of the diamonds. It is the checkering most often used on gunstocks made in the United States.

French checkering is also known as the "skip-a-line" checkering, since the final pattern is achieved by skipping cut lines at predetermined intervals. French checkering has traditionally been used on only high-quality guns, but this pattern has recently been used on some burnt-in patterns on Remington guns.



Figure 1: *The most commonly found checkering styles are shown above. French checkering is also known as "skip-a-line" checkering.*

Checkering Tools

The beginner can save a lot of time by buying one of the checkering kits available. Many of the basic kits start out around $65 and usually have three cutters. Each of these cutters is actually a miniature rasp that will quickly cut sharp, true diamonds once you have gained some practice. Most basic kits contain a single-line cutter, a two-line cutter, and a bend cutter designed to cut on the backward stroke. The basic kit alone will allow you to get started in checkering gunstocks and usually will suffice for most jobs you will encounter. More elaborate checkering kits can cost as much as $200.

Before starting to checker a gunstock, the stock must be secured firmly, yet allowed to rotate as the pattern is cut, keeping the work area at the most comfortable, controlled position. A checkering cradle (Figure 2) is the answer. Brownells, Inc. offers a reasonably priced checkering cradle, a very simple design that will handle stocks up to about 33" long without marring the finish, yet will permit turning the stock as the work progresses. This cradle is also handy for inletting, sanding, staining, and finishing gunstocks, allowing you to work with both hands free. While this cradle may be bolted directly to a workbench, it is recommended that it be secured in a sturdy bench vise. By doing so, you can adjust the height and angle to better suit the situation at hand.

If you are handy with tools and you have a scrap bin that contains a few odds and ends, you might want to build a cradle in your shop. Many different designs have been devised over the years, but most take on the basic form of the one shown in Figure 3. Even if you have to buy the material, you should be able to make one for less than $50.



Figure 2*: Checkering cradle available from Brownells for around $90.*

To build the cradle shown in Figure 2, note the material list alongside the drawing. Gather all the necessary components before starting, or you will more than likely end up with a half-finished project.

Start with the 48" long 2" x 4" timber. Take a sheet of sandpaper and a sanding block and round the sharp corners of the timber to prevent getting splinters in your hands. If the 2" x 4 " piece of lumber is very rough, you may want to sand down the entire surface to make a neater job.

With a T-square and pencil, layout the holes to be drilled in the 2" x 4" Note in Figure 2 that one end has 17 holes, ¼" in diameter, and spaced 1½" on center. The opposite end has seven holes, ¼" in diameter, spaced 3" on center. Begin laying out these holes by first drawing a centerline down through the middle of the timber, centered from either side. Then measure and mark the center of each hole. Lay your T-square on the side of the 2" x 4" and mark the line across the long centerline at the exact location of each hole. You may want to use a center punch to ensure that the holes will be drilled in line. Then use a drill press or hand drill and drill the required holes with a ¼" drill bit. Clean out these holes well and sand around them to remove all splinters and shavings.

At this point you should finish the wood while you are working on the metal portions of the cradle. Use a good wood sealer and then finish with a few coats of spar varnish.

The L-brackets are secured to the 2" x 4" frame with two carriage bolts for each bracket. The brackets are positioned the required distance apart to accept the stock being worked on. Each is quickly adjusted to obtain any number of varying distances between centers of the two ½" bolts.

The cradle can be secured to a workbench with a couple of C-clamps, but most gunsmiths like to secure it in a conventional bench vise; this allows adjusting the cradle to the desired working angle that suits each individual the best.

With the finished checkering cradle and a set of checkering tools, you are ready to start practicing. Note the word *practicing*, because you are going to need a lot of practice before you are ready to start on your first good gunstock. Start off with flat pieces of hardwood, then see if you can find an old wooden baseball bat or a damaged gunstock. The curved surfaces of a baseball bat will give you good practice for the rounded portions of gunstocks that will come later.

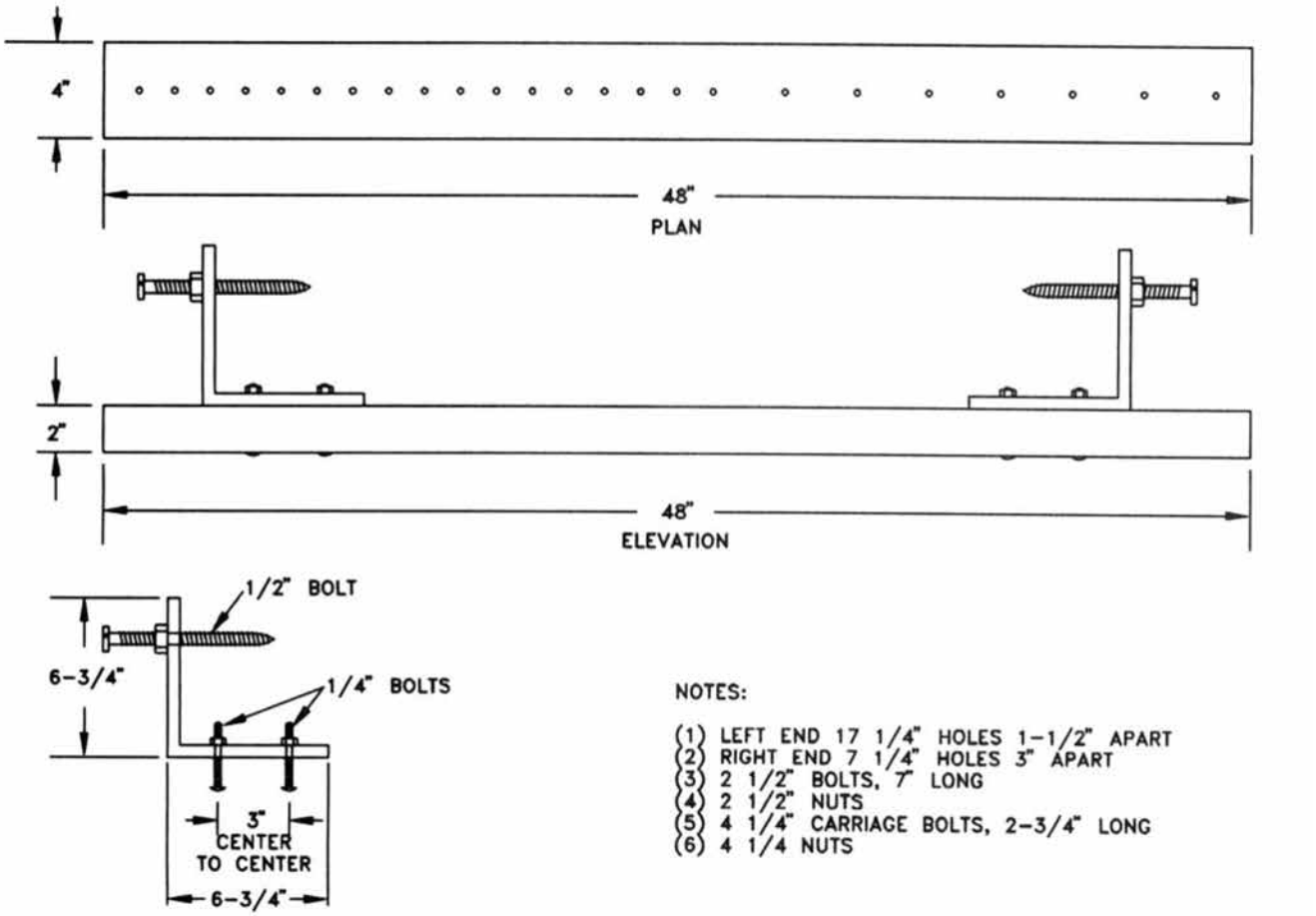


***Figure 3**: Plans for a suitable homemade checkering cradle. This simple cradle is less expensive and will handle almost every conceivable checkering job that the average gunsmith will run across.*

CHECKERING CUTTERS

Checkering patterns on gunstocks requires a minimum of three tools to cut the patterns. These tools are shown in Figure 4. First, a single-line or V-groove cutting tool is used to layout the pattern — that is, the borders and the initial angular master cuts. This same tool is also used for deepening and cleaning the shallow cuts once the pattern has been cut. The second tool needed is a two-line cutting tool designed to cut the two sets of intersecting parallel lines within the pattern. The third tool is a bordering tool used for cutting the border around the pattern. You will eventually want to add other helpful tools to these three, to make the work go smoother. One important tool is the Dem-Bart S-1 tool which gets into those tight corners, and along curves. This cutter is designed to cut backwards, allowing you to place the cutter right at the border. Checkering tools are available in kits from gunsmithing supply houses.

Gunline Tools makes a "Camp Perry" checkering set which is ideal for the professional or hobbiest gunstock maker. It will do the job from start to finish and is a balanced combination of the fast cutting slotted as well as finishing cutters. Inclusion of the Veiner tool is very handy for those fancy borders and tight curving lines. The 3-Edge Spacer included is useful for equalizing the checkering rows, assuring a more accurate pattern.

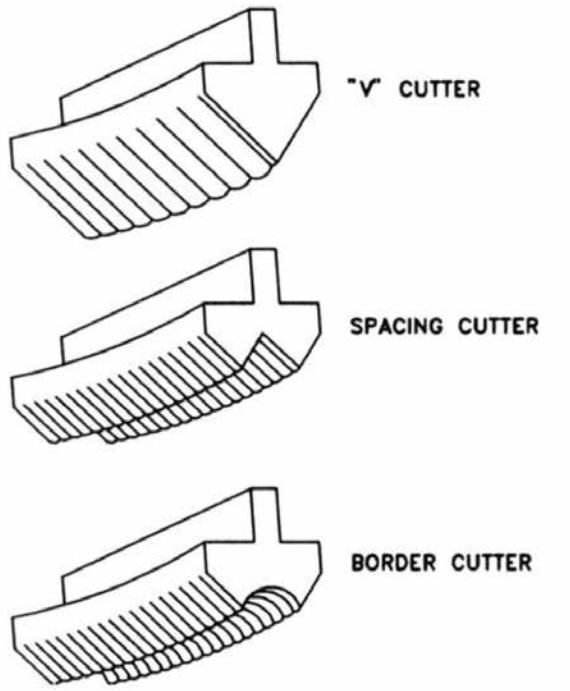


***Figure 4**: The three basic cutting tools you will need are (from top to bottom) "V" cutter, a spacing cutter, and a border tool.*



***Figure 5**: The Camp Perry Set includes 6 tools (handles with cutters): 2-Edge Spacer, 3-Edge Spacer, Border-Vex, V-Edger, Pointer-Long, Veiner Chisel, Checker-Gage Rule, Instructions and Sample Pattern Layout Designs*

POWER CHECKERING TOOLS

Most of the better checkering jobs have been done with hand checkering tools like the ones described so far in this lesson. However, there are several types of power checkering tools on the market that will make the work go faster and are especially helpful when a large volume of work is to be done.

Power tools are expensive — many costing from $700 upward — so they really cannot be justified unless a large volume of work is encountered. An individual or a gun shop that has only a few stocks a year — or even a month—would be better off sticking to hand tools. Even the most experienced gunsmith may be challenged using power checkering tools as they take a great deal of skill and one slip can ruin job very quickly.

Checkering by hand can often be very time consuming and very frustrating. For a professional gunsmith who does a great deal of checking, an electric checkering system may be extremely useful. One type of power checkering tool is the D-3 Electric Checkering system (Figure 6) which allows you to checker both metal and wood. The system operates on 2,000 to 35,000 RPM and additional cutters can be purchased to enhance your set.



Figure 6: *The D-3 Electric Checkering System comes complete with a D-3 checkering head, electric motor, electric control box and instructional manual and video.*

SELF-TEST QUESTIONS

Please check your answers on page 23.

1. **Name two uses for the single-line checkering cutter.**
2. **Once the guidelines have been established and cut on the gunstock, which tool is used to cut parallel lines to the guidelines?**
3. **What type of checkering tool is designed to cut backwards?**
4. **At what stage are power checkering tools warranted in the gun shop?**

Checkering Gunstocks

Before you start to layout a checkering design on a gunstock, it might be a good idea to look over the checkering jobs on other guns and get a good mental picture of what a checkering design should look like. Also examine the checkering jobs done by the master stockers, like the one shown in Figure 7. Remember, a job does not have to look fancy in order to be professional-looking. Neither does this depend on the size of the diamonds. The important thing is good workmanship in neat, clean, with perfectly cut lines, and this is going to depend on teamwork between you and a set of tools that are of the best design and construction.

You may want to design your own checkering patterns, or use decal patterns, like the ones in Figure 8, on the next page. There are many different patterns from very simple to very complex. The decal patterns may be difficult to find, however, you can easily create your own pattern templates.

To apply the decal patterns, cut the decal pattern sheet apart, as indicated by the dotted lines, so that the fore-end pattern and both grip patterns are separate. Soak them in water just long enough for the decal to begin to loosen from the backing paper. Dampen the areas on the gunstock where the designs are to go, and apply the decals by carefully sliding them off the backing paper into the desired position. Making sure the patterns on each side of the stock are in alignment, swab them smooth with a clean cotton cloth and wipe off excess water. Let the patterns dry thoroughly before attempting to checker over them. If you do not wait long enough, you will end up buying another set because they will wrinkle and tear apart when you start checkering. Wait about one hour before starting the checkering and you will have no trouble.

If you want to design your own patterns, several methods are available. One is to place a sheet of tracing paper over an existing pattern, then rub a soft lead pencil on the paper. The exact design — including all lines — will be reproduced on the tracing paper. The tracing paper can then be secured to the stock to be checkered and you can proceed as usual.

CUTTING THE CHECKERING

Before starting to checker, determine which size checkering (spacing of lines) to use. To be practical, the size of checkering should be coarse enough to cause and maintain definite friction between the hands gripping the stock and the stock itself. If the size is too fine, the lines will necessarily be shallow and will quickly fill with dirt, oil, and other debris. Should this occur, the original checkered surface will become smooth, causing much of the benefit of checkering to be lost. When the



***Figure 7**: Example of professionally checkered stock by Jose Valencia. Valencia tri-weave pattern was Jose's own creation.*

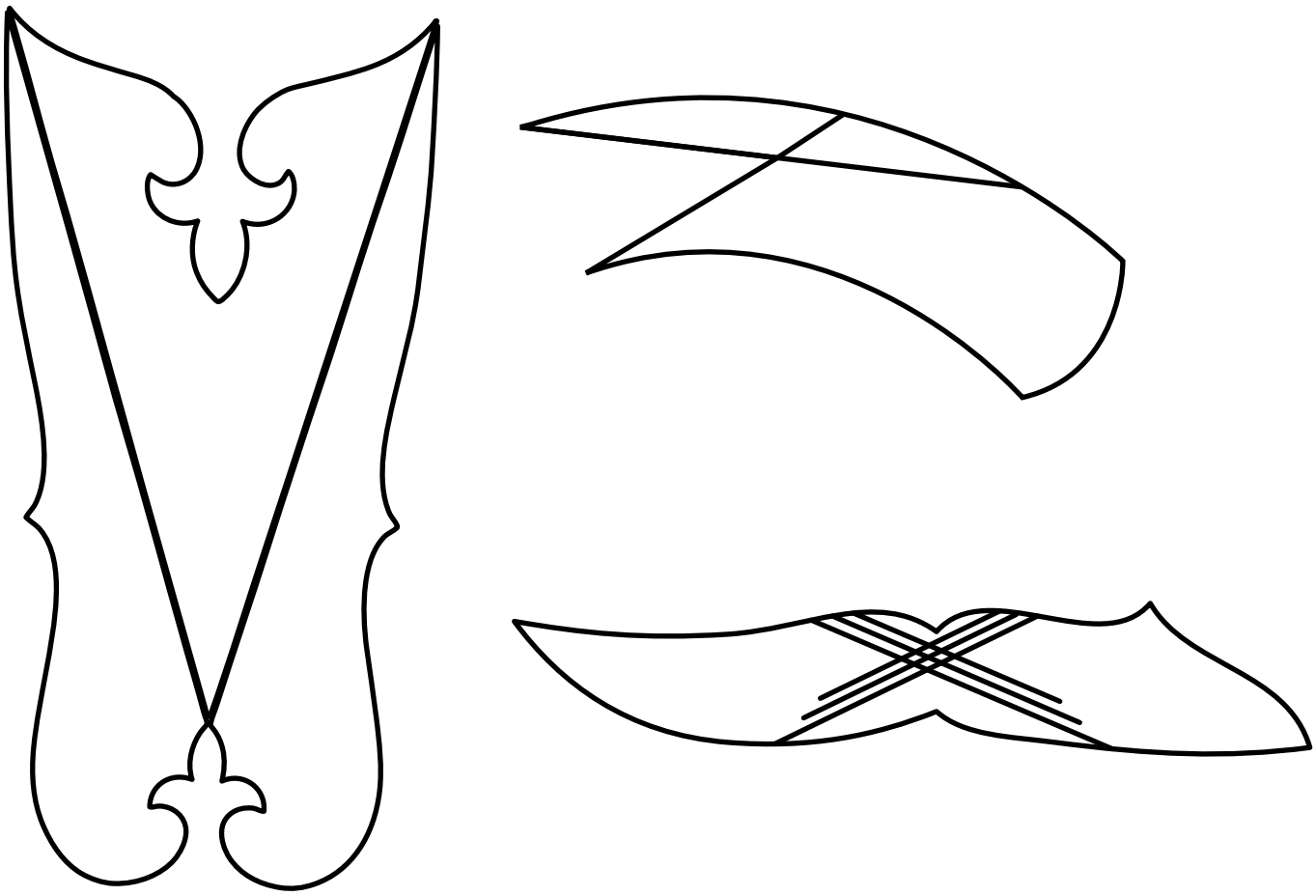


Figure 8: *Checkering patterns come in a wide variety, from easy (for the beginner) to difficult (for the pro).*

spacing is much greater than 18 lines per inch — 16, 14, etc. — the pattern will look somewhat crude and feel uncomfortably rough to handle. Condition and texture of the stock's grain are other considerations in selecting the size to use.

In general, checkering for hunting rifles should be between 18 and 24 lines per inch. Checkering patterns with lines spaced as close together as 32 lines per inch are sometimes encountered, but such patterns are mainly decorative, not functional.

The shape of the small diamonds formed by the checkering varies to some extent, but most stockmakers prefer an angle of about 30° between the intersecting lines. This shape gives a good-looking pattern along with a good grip (Figure 9).

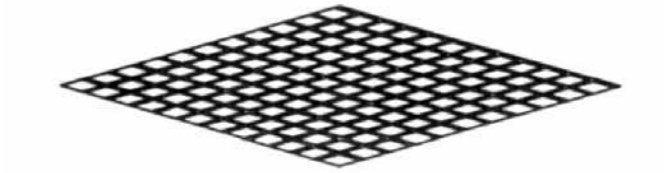


Figure 9: *Sample checkering pattern. Try checkering on a flat surface before moving on to curved surfaces.*

Pencil the border lines in first, and then draw in the guidelines using a flexible straightedge. Next, use a single-line cutter to partially cut these lines as shown in Figure 10. After these lines have been cut, the two-line spacing tool is used to finish the pattern as described previously—that is, after the first set of parallel lines is cut over the entire pattern, as shown in Figure 11, follow by cutting the intersecting set of lines to form the diamond. The entire pattern should now be deepened and cleaned with the single-line tool, which will equalize all four sides of the small diamond-shaped designs formed by the cutting tools, causing them to become pointed and sharp.

Once the pattern is completed, the entire design must be given some sort of finish. Methods vary with different stockmakers, but a lot of gunsmiths like to use Dem-Bart finishing oil. This solution is very thin and will cover the checkering without gumming.

Apply a coat or two of this solution on the checkering; after it is dry, use an old toothbrush to rub briskly in both directions of the intersecting lines to polish it.

When cutting checkering patterns, a three-line spacing tool can be helpful when used with two rows guiding and one cutting. This will help avoid wandering. Experience will eventually permit cutting two rows and guide on one only, doubling the speed at which a pattern may be cut.

Do not try difficult patterns until you have mastered the simpler ones. Remember, even the simplest patterns can look very professional if checkered correctly, while a fancy pattern poorly executed will look very sloppy.

RECUTTING EXISTING CHECKERING

When a checkered gunstock is refinished, the old checkering must be recut, but first remove the old finish as explained later in this lesson. Any sanding that is done to the stock should not be allowed to extend over into the checkering patterns.

To remove finish in the crevices of the checkering — especially if the stock has been varnished — an old toothbrush is helpful. Merely dip it in varnish remover and start scrubbing. However, when doing so, be sure to wear some sort of eye protection because the paint and varnish remover is very caustic and can damage your eyesight if any should accidentally come into contact with your eyes.

When the old pattern is as clean as possible, use the single-line checkering tool to point up and further clean the old checkering pattern. Apply just enough pressure to keep the cutting edge of the tool centered. Advance the tool in a push-pull motion, keeping your arm close to your body to maintain straight lines. Keep the grooves free of dust by blowing on them or brushing them with a clean toothbrush.

Many stockers prefer to use a single-line cutter when recutting old checkering. Never use spacing tools when recutting checkering. Even the most careful worker will get variations in spacing width, and regardless of how certain you might be that your spacer is the same as the original, experience has proven that the spacer will never be exactly the same as the old pattern. On several occasions many gunsmiths have thought so, but after cutting a few rows they suddenly discovered that the new lines just did not mesh with the old ones.

Once the old pattern is recut and cleaned, apply finish to the pattern.

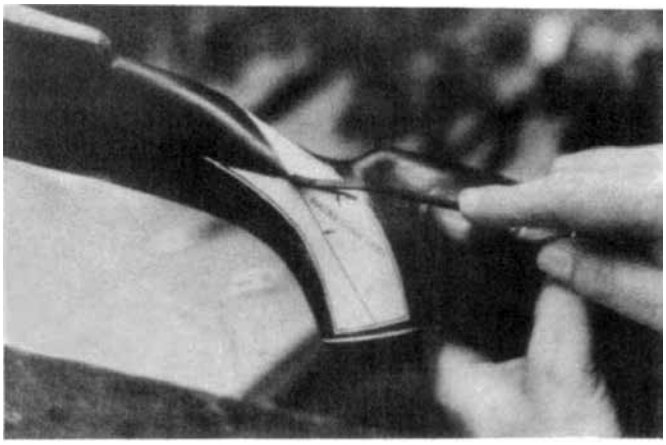


Figure 10: *Use a single-line cutter to cut out the border and guidelines of the checkering pattern, using the groove cut with the sharp knife as a guide.*

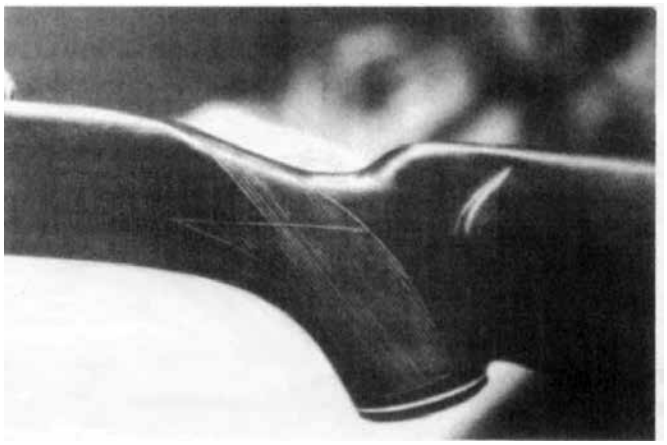


Figure 11: *Lines of a checkering pattern cut in one direction only. Note the one guideline which will be used to cut the lines in the opposite direction to form diamonds.*

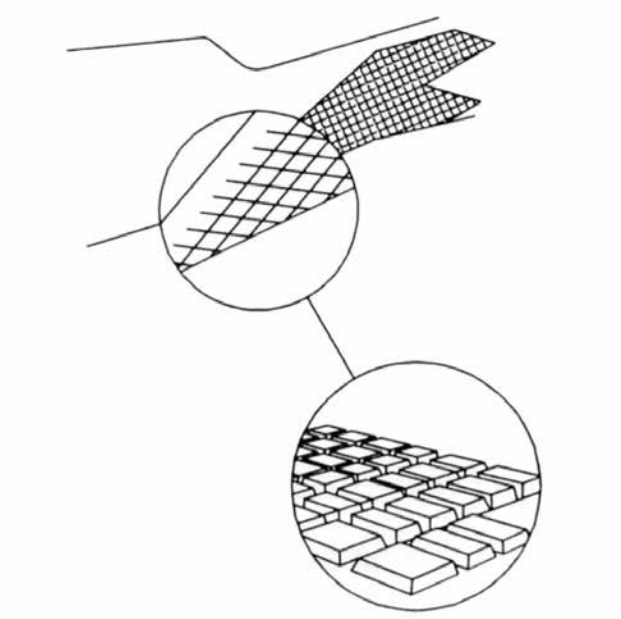


Figure 12: *English checkering; the diamonds cut in the wood are left flat.*

ENGLISH PATTERNS

Nearly all modern American checkering tools are designed to give the pointed-top diamond effect rather than the flat diamonds, shown in Figure 12, customarily found in English patterns. If you want a true flat diamond, then you'll have to either make, or have made, special tools. However, a reasonably good compromise can be had by using standard American checkering tools. Diamonds with sloping sides and very small flat tops, can be achieved by using conventional tools (which would normally give a pointed top effect), but not working the grooves deep enough to produce the full point. American checkering tools normally are available in 60° and 90° cutter blades, and where the semi-flat top checkering style is desired, the 60° cutters should be used.

BORDER LINES

Border lines must be considered on all checkering patterns. Some, as you will note by the illustrations throughout this course, are "borderless," containing no visible border lines — but this is a very difficult style of pattern to cut, especially at the beginning.

Whenever possible, the border should be the outer sides of the diamonds, particularly on a straight-gripped shotgun or rifle. The front borders on a stock with pistol grip are usually the sides of the diamonds, but the rear borders are arbitrary curves conforming to the line of the grip. On fore-ends, the front and rear borders are again the points, but the sides are normally lines cut parallel to the edges of the wood (Figure 13).

If you are new at checkering, as much of the border as can be predetermined should be marked out and cut with the grooving tool before starting the diamonds. This cut should be made to full depth, since it will be used through the checkering operation. Next, cut the master lines (the ones that will be used to guide the two-line spacer), and make these cuts right up to the border lines cut previously. Use the spacing tool as discussed



Figure 13*: Example of skip-a-line, or French, checkering pattern.*

previously to cut the pattern. Cut all lines in one direction before changing to the other angle, but do not make the first cut too deep. As these cuts approach the border, be extremely careful, working right up to the edge but not forcing the tool so that it overshoots the border line.

When the whole pattern has been cut to half depth, finish cutting any areas of the border that had been left incomplete. Then use the V-tool to work over the whole pattern again, this time cutting the grooves to their full depth. The beginner will want to make two or three final passes, cutting each one very shallow until experience is gained. Then the full depth can be cut completely on the second pass.

It would be nice to never have overruns, but these do occur — even to the best professional from time to time. These can be hidden, and the whole work given a nice "finished" appearance, by cutting another border line outside the first one. The space between the first and second border line can be left flat, but usually looks better — and hides overruns better — if it is given a concave contour. This can be achieved either by making a special tool or purchasing one of the bordering tools available on the market. Most tools made in this country produce a border that appears as a raised, rounded rib.

SELF-TEST QUESTIONS

Please check your answers on page 23.

5. ***True or False*. Checkering lines should be cut their full depth on the first pass with the checkering tool.**
6. **What type of chemical is normally used to remove the finish on existing checkering prior to recutting the checkering pattern?**
7. **What type of border is considered best for hiding overruns in the checkering lines?**
8. **How should the diamonds of a checkering pattern be cut to achieve English checkering?**

Bedding Gunstocks

Bedding, as applied to gunstocks, refers to the methods used to mate the metal (barrel and action) to the wood. There are three basic types of bedding in common use. The barrel can be bedded, fully or partially, against the barrel channel in the stock, or in an epoxy liner known as *glass bedding*. It can also free-float with a pressure point at the fore-end tip. This pressure point is often adjustable in order to vary the amount of pressure applied at various points.

There has been much controversy over which method is best; it all boils down to what purpose the rifle is to serve. Alvin Linden, for example, swore by an exact metal-to-wood contact the full length of the barrel channel for use on hunting rifles; Arthur Cook liked free-floating barrels with adjustable pressure points near the fore-end for his match shooting. Many shooters today will not own a rifle that is not glass bedded.

Of the types of bedding mentioned so far, the glass bedding method is probably the best to start with. First of all, you do not have to be as exact with the inletting procedure as with other types of bedding, and if the manufacturer's instructions are followed to the letter, even the beginner should have good results.

GLASS BEDDING

Brownells, Inc. offers two types of glass bedding kits, both of which have given good results. One type, Acraglas, works into a mixture about the consistency of molasses while the other, Acraglas Gel, (Figure 14), is a buttery smooth cream that will not drip or run as it is being applied. Both kits are very reasonably priced and should be tried by everyone who works with gunstocks of any type.

To use the kits, measure out the quantities desired according to the instructions accompanying the kits. Before doing so, make sure both the metal and wood are properly prepared to accept the bedding compound.

When inletting the stock, allow $^1/_{32}$" to $^1/_{16}$" clearance in the barrel channel and behind the recoil lug. The wood should be left rough rather than sanded smoothly — not to increase strength of the Acraglas Gel bond to wood, but to add strength to the wood itself by creating more exposed wood surface.

Some form of release agent must be applied to all metal parts that will come into contact with the bedding compound. If this is not done, you are going to have one solid piece of metal and wood. The release agent that comes with the kit is ideal for this situation. To use it, shake the bottle vigorously, and then apply the liquid solution to all metal parts that will come in contact with the bedding compound. When the first coat is dry, apply a second coat to ensure that it reaches all exposed metal surfaces. If any milled-out sections exist in the metal, such as dovetail slots, fill these sections in with putty or modeling clay and then smooth out with a spatula. Finally, cover the clay with waterproof tape and apply the release agent over the tape. Be sure to apply the release agent to all screws. After the release agent dries, apply a thin coat of gun grease or paste wax just to be sure.



***Figure 14**: Acraglas Gel glass bedding kit.*

When mixing the solution, be sure to measure carefully and follow the instructions closely; an incorrect mixture can cause the compound to set up incorrectly. *The following instructions accompany the Brownells' Acraglas Gel kit and are reprinted here with their permission.*

> Acraglas Gel need not all be mixed at one time. Mix only the quantity needed. The mixing ratio is 1:1 by volume. Weighing the components will give incorrect ratio. Use a spoon or other measure which can be easily loaded with Acraglas Gel components. (Note: A tablespoon holds ½ oz. volume. A teaspoon holds $^1/_6$ oz. volume. One tablespoon equals three teaspoons.) Using a clean mixing stick, ladle Acraglas Gel resin into the measure until full — being careful to eliminate voids and large air bubbles. Carefully level off the resin with the mixing stick to give exact full measure. Wipe the stick dry with a paper towel, and, using the same end, work all the resin out of your measure into the mixing dish with a careful "peeling" motion. Wipe the measure clean with a paper towel. Use the other end of the mixing stick to fill and level the cleaned measure with Acraglas Gel hardener. Wipe the mixing stick clean and use it to work all hardener out of the measure and into the mixing dish.

Thoroughly mix (do not whip) the resin and hardener with the measuring stick for two minutes. At the end of two minutes of mixing, add dye stain in the quantity needed to make Acraglas Gel slightly lighter in color than the gunstock wood. If atomized aluminum or atomized steel particles are to be used, you can add up to a ratio of 1: 1 at this time. (One part metal to one part Acraglas Gel by volume. For example, if you have used a tablespoon each of resin and hardener — a total of two tablespoons — you can add up to two tablespoons of atomized metal.) Mix thoroughly for two more minutes, for a total of four minutes. *Always mix a total of four minutes* whether or not you are adding stain or atomized metal. Your Acraglas Gel is now ready.

At 72-75° F, you have approximately 20 minutes working time before your Acraglas Gel becomes too stiff to use and give a suitable bonding between epoxy and wood. At higher room temperatures the stiffening occurs much more rapidly, with proportionate decrease in working time. Working time can be lengthened by setting the mixing dish in a shallow pan of cold water and stirring occasionally.

During wintertime in cold climates, be sure your containers of Acraglas Gel resin and hardener are at least 68° F before measuring and mixing. This same minimum temperature must be maintained during hardening as well. In warm or hot operating conditions, chill resin and hardener to approximately 76° F before mixing to prevent too-rapid set up.

For accelerated set up of Acraglas Gel, the barrel and wood should be heated until they are quite warm to the hand, which will be about 100 to 120° F.

For rapid setting, use a heat lamp 12" to 18" away from area where Acraglas Gel has been applied. Remember, adding extra hardener prevents complete hardening.

To perform the actual bedding operation, first secure the stock in a bench vise with the barrel channel of the stock relatively level. With a mixing stick, spread the prepared Acraglas or Acraglas Gel in a ridge down the center of the barrel channel, which will prevent air from being trapped when the barrel is later set into place. Also fill the recoil lug recess sufficiently to fill the recess completely when the barrel and receiver are fitted. A very thin coat should also be spread around the interior of the receiver recess. When all of these steps have been completed, firmly press the barrel and receiver to the desired depth in the stock. Some stockers prefer bedding the recoil lug and other gaps between the receiver and wood first, and then when thoroughly cured, the bedding compound is applied to the barrel channel and the remaining portions of the receiver area.

When the bedding compound shows signs of taking a firm set — usually five to six hours after application — remove any surplus compound that is exposed with a dull knife or spatula. Wetting the knife or spatula with saliva will speed things up and keep the instrument much cleaner. The next day after the bedding compound has been applied, it can be trimmed with a sharp knife or woodworking chisel, but be extra careful not to scratch the gun bluing. Many stockmakers like to leave a very small bead of the bedding compound above the wood — between stock and metal — to be sanded to the contours of the stock after final curing. Small traces of the compound adhering to the barrel, receiver, cutting instruments, and hands can be removed while still tacky by rubbing with a vinegar-saturated cloth.

Under normal conditions, the metal parts can be removed from the stock in about eight hours. In cases of extremely tight fit, however, the use of a soft rubber mallet may be necessary to separate the parts. Once the parts are separated, look at the bedding very carefully to see if any voids or air bubbles exist. If so, these can be filled by applying freshly mixed bedding compound in small quantities, after which the metal parts can be rebedded. In doing so, be certain that all voids are completely free of any release agent before filling — and you must recoat with release agent all metal parts that will come in contact with the new mixture.

For rifles with heavy recoil, many stockers prefer to first bed the recoil lug and other points of high recoil impact with Acraglas Gel containing either atomized aluminum or atomized steel particles. Then they bed the balance of the gun using pure bedding compound with perhaps a walnut stain. This method gives the strongest possible internal bedding job with the greatest exterior eye appeal to the finished gun.

PINCHING

Barrels and receivers should fit perfectly in the gunstock. By *perfect*, we mean an exact fit that is not too loose or too tight. In trying to obtain this perfect fit, many stockers tend to get an ultra-tight fit — causing a squeaky, pinched fit into the bottom of the receiver and barrel channel. It takes skill, but anyone can acquire this "perfect" fit with practice — and, most of all, patience. The ultimate goal is to bottom the action and barrel into the stock so they go in easily and yet appear to be growing out of the wood! It takes only a few thousandths of an inch to clear the wood, and anything beyond this clearance will look sloppy.

Should you take off a little more wood than necessary (it happens to the best of us from time to time), there is nothing wrong with glass bedding as discussed previously; just avoid a pinch when the guard screws are tightened.

GLASS BEDDING RECOIL LUGS

Even though you may not want to glass bed the entire barrel and receiver channel, most stockers nowadays do use fiberglass for bedding the recoil lug into the stock — especially on rifles with heavy recoil. However, merely cutting the back of the front side of the recoil lug and replacing it with glass will not do the trick. You will still have the same front and rear areas for the recoil to push against.

In glassing the recoil lug area, it is important that the ¼" extra be taken from both sides of the recoil area as shown in Figure 15 (A). When this area has been glassed in, it will amount to a ¼" steel-like bar of glass extending across the face of the recoil block and well into the side walls of the stock wood. This procedure, according to many experts, is far superior to the military crossbolt system found on many English and European big-bore, bolt-action rifles, and it does not show from the outside of the gun. It also serves as added insurance against break-back of the wood recoil block, especially in heavy magnum calibers.

In the mid-1940s, when Roy Weatherby brought out his super magnums, there were many centerfire rifles converted to these magnum calibers — especially to the .270 Weatherby Magnum. Rifles previously chambered for the .270 Winchester were rechambered for the more powerful Weatherby cartridge, feed rails and bolt faces were then opened to accept the larger cartridge case, and this was about the extent of the conversion. Practically every one of these conversions has a damaged stock, usually involving a split from the magazine recess forward to the recoil lug bolt. If you should run across one of these conversions that does not have a split stock, it is highly recommended that the recoil lug be glass bedded.

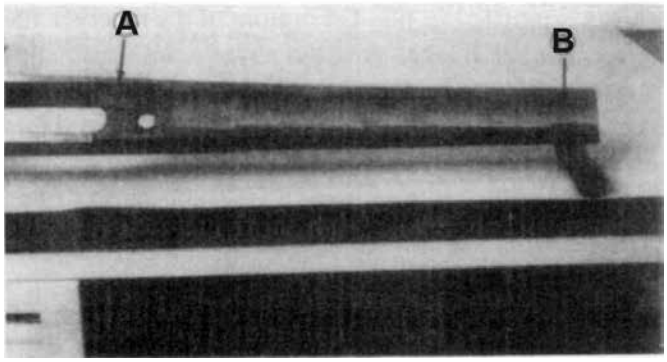


Figure 15: *(A) The recoil shoulder section of stocks should be strengthened with fiberglass compound on all magnum rifles. (B) The barrel should rest on 2 points, each of which is 45° off center from the bottom of the barrel channel.*

Glassing should be done in stages — that is, the recoil lug should be done first, then the other parts of the rifle, making certain that no pinching takes place and that enough release agent is used on the metal parts.

Careful attention should also be given the barrel channel. Again, all "pinchy" fits should be eliminated, as they will seldom be uniform and can seriously affect accuracy. However, there is no need to float the barrel; the inletting should appear almost is if the wood grew around the metal. A slight clearance is more than adequate.

Some shooters prefer a twin-bar, V block resting area for the underside of the barrel near the front end of the fore-end. This is shown in Figure 15(B). While such an arrangement works rather well in most cases, it does have the drawback of being sensitive to humidity—whenever the weather changes and the humidity fluctuates, the fore-end shifts its tension, causing the point of impact to change as the barrel actually bends very slightly.

The most acceptable way to bed a rifle to ensure good accuracy is to bed the action in the stock so that it is strain-free. Then glass bed the recoil lug area as mentioned previously. Relieve all pinches. Glass bed the chamber and the beginning main barrel taper section, leaving the remainder of the barrel full-floating.

Embedding a barreled receiver to a gunstock, the barrel rests equally on two points in the barrel groove at the fore-end tip. Each point is 45° off center from bottom of the groove. The barrel rests against these two points with a pressure of at least six pounds. The barrel should not bind, or touch with any pressure at any other point. These two points serve as a V block would. After firing, the barrel comes to rest against the fore-end at exactly the same position each time. This method eliminates all side play or changed location of barrel in the stock from one shot to another.

Guns with fairly heavy barrels and rigid fore-ends very often are glass bedded action-only, plus about two inches of the barrel ahead of action; the balance of barrel is free-floating. The latter method is especially recommended if the gun will be subjected to extreme climatic changes or very wet or humid conditions.

BARREL TENSION

Barrel tension in any direction will actually bend a steel barrel enough to seriously affect accuracy, even though the bend may be very slight. For example, upper tension near the fore-end will cause the rifle to shoot higher. Tension against the right-hand side of the barrel will cause the rifle to shoot to the left because the barrel is actually bent in that direction. Any tension of 15 to 20 pounds will affect accuracy. This change in the stock pressure will readily change the point of impact. The effect is like a strong bow. Maintaining a firm stock pressure against the barrel will gradually weaken the wood tension, causing it to shoot elsewhere. In general, you want to achieve a relatively snug fit, with no extreme pressure points anywhere on the metal.

SELF-TEST QUESTIONS

Please check your answers on page 23.

9. **Name two types of bedding compound.**
10. **What type of centerfire rifles should have the recoil lug area of the gunstock glass bedded?**
11. **What type of agent is applied to the metal parts of a firearm when using glass bedding in the stock?**
12. **To accelerate the set-up time for Acraglas Gel, the barrel and wood should be heated to what temperature?**

Gunstock Finishes

The appearance of any completed gunstock often depends more the quality of the finish — and the skill of the finisher — than on the wood itself.

Before a stock can be professionally finished, the finisher must first know what quality work is and the methods used to obtain the required finish. There are a number of different types of finishes available to the stockmaker. Linseed oil is the old standby, but time-consuming. Plain varnish has been used by firearm manufacturers for years, but is probably the worst finish that can be applied. Spray-on lacquer is currently used by many manufacturers, but should be avoided by the professional stocker unless a gun is to be restored to original factory specifications. Epoxy finishes are becoming very popular, but linseed oil with fast-drying additives is probably the best all-around finish for both the beginner and professional alike. Again, the techniques employed and the care taken by the stocker are, in most cases, more important than the type of finish used.

COMMERCIAL FINISHES

There are numerous stock finishes available that can produce practically any style or tone of stock finish you desire, and most are available from gunsmithing suppliers. If you want to experiment with the finishes used by the masters of yesteryear, there are several formulas listed in the latter part of this lesson.

Dem-Bart Stock Finish. This waterproof oil finish is the favorite of many stockmakers when they are trying to obtain a low-sheen, London-type finish on classic stocks. Due to the drying time required between coats, about a week is required to get a good finish. However, the fine results are well worth the extra waiting time and are highly recommended.

You will need the Dem-Bart Stock Sealer-Filler when using the finish on open-grain wood. This sealer-filler seals and protects the wood against moisture and prepares the stock for the final finish with minimum effort.

To use the Dem-Bart products, prepare the stock as for any other type of finish — that is, remove old finish and sand down using about 320-grit abrasive paper. Make sure the wood is in perfect condition before even thinking about applying the finish. You might even consider staining the wood if it is of a light color, but for good quality walnut, the natural color will usually suffice without further staining.

Apply the Dem-Bart Sealer-Filler with a clean brush; get a good heavy coat, but not so heavy that it runs. Allow the sealer to dry for at least 15 minutes, although 20 or 30 minutes is better. Then sand with about 220-grit abrasive paper to the bare wood — the sealer should be down in the pores and not on the surface of the stock. Repeat with a second application as before, let dry, and then again sand down to the bare wood. Two coats will normally do the trick, but on some open-grain woods, a third coat may be necessary.

When applying the Dem-Bart sealer to the end grain or similar area, do not sand. Merely apply a thin coat and let dry.

Once the wood pores are filled, apply the Dem-Bart Stock Finish with your fingers or use a clean brush. While this oil is still wet, sand the entire area with 280-grit production paper. Wipe off all excess oil to prevent running, and then set the stock in a dry area for three days. After the three-day waiting period, apply another coat and sand the stock down again with 280-grit production paper until all pores are completely filled. Wait another three days and apply another thin coat of oil; let dry for 15 minutes and wipe off all excess oil with a clean, lint-free rag. From this point on, apply another coat every 12 to 24 hours until the desired finish has been obtained. Four more coats will usually give a satin sheen similar to the stock in Figure 16.



***Figure 16**: There is a group of shooters that still prefer the satin sheen of a fine hand-rubbed stock to the more modern high-gloss finishes.*

Lin-Speed Oil. This type of stock finishing oil has been around for a long time and has been used by both amateurs and professionals alike. The stock wood is finished as usual before applying Lin-Speed oil, except for touch-up jobs. Apply "finger-dunks" of the oil and spread it evenly with moderate hand rubbing. When the oil is dry (about six hours), use 000 steel wool and sand the oil finish down to the bare wood. Apply more coats in the same way until the pores are filled. Then apply a very thin final coat and let dry without any sanding.

Birchwood Casey Stock Finishing Products. Birchwood Casey offers a wide variety of stock finishing products that are quite popular with hobbyists and professionals alike. Their famous Tru-Oil finish is a blend of linseed and natural oils; it dries relatively quickly, so most stocks can be completely finished in a day or two (depending on the weather and humidity).

This finish is available in liquid form for hand application, and in two sizes of aerosol cans.

Birchwood Casey Gunstock Wax is designed for use on guns, fine furniture, and the like. It provides a lustrous finish of exceptional beauty. It is also great for gun barrels and other metal parts. The rubbing compound reduces high gloss to a rich low-sheen satin without using steel wool or sandpaper. It is good for that final rubdown on a classic stock that has been refinished with a high-gloss finish.

The Gunstock Finish Remover is an easy way to remove old varnish and lacquer finishes without raising the grain or discoloring the wood. It comes in an aerosol can; just spray it on and let the chemicals do the work.

Birchwood Casey's Perma Water Stains come in a variety of wood finishes. All produce a clear, rich, sun-proof color which is never muddy. To use, make sure all the ingredients are well-mixed in the container. The stain is concentrated and must be diluted with water before use. Apply the stain with a clean brush or lint-free cloth and let dry. Should the wood be too dark for your preference, the color may be lightened by sponging the wood with water until the desired shade is reached. The stain should be allowed to dry about 12 hours before an oil finish is applied.

Gun Sav'r Custom Oil Gunstock Finish is specially formulated to give a clear, hard finish to protect and beautify gunstocks. Oil-modified urethanes resist scuffs and scratches but provide the look and feel of traditional, hand-rubbed oil finishes, without all the hard work (Figure 17).

If you want to save time, you can purchase a Miles Gilbert Advanced Stock Refinishing Kit. Everything needed for complete refinishing of a gunstock is included in the kit plus a "how-to" dvd. In most cases, however, you will have to purchase extra abrasive, especially if there are a lot of nicks and dents in the stock to be finished.

Other products can be found at most gunsmithing supply houses. Be sure to order one of their catalogs, as they are constantly coming out with new developments that can make gunstock finishing easier and better.



***Figure 17**: Gun Sav'r Custom Oil Gunstock finish is available at Brownells.*

EPOXY FINISHES

During the past decade or so, many manufacturers and custom stockers have been using a synthetic resin coating on some gunstocks to provide an ultra-hard, moisture-resistant finish with a high-gloss appearance. Such finishes were developed to provide maximum protection against abnormally hard use and weathering on boats, workbenches, desktops, and garage floors. They are also used to seal swimming pools. Therefore, it stands to reason that such finishes would have certain advantages when used on gunstocks. In fact, epoxy finishes are claimed to be more resistant to water, chemicals, and abrasion than an equal thickness of any organic material used alone or in combination with others. Still, epoxy will not furnish 100% protection under all conditions, so do not expect miracles!

The various polyurethane or epoxy finishes available to the stocker require more time and work to apply correctly than other finishes mentioned in this book. Because of the extreme hardness of these finishes when dry, checkering is almost impossible without carbide cutters on power checkering heads. It is possible to use hand tools, but conventional cutters will dull rapidly, requiring new cutters to be installed frequently.

Minor scratches and blemishes can be covered with a spot epoxy application, which is sanded with 400 to 600-grit wet-and-dry abrasive paper, then polished to blend with the adjoining finish. However, major dents and abrasions are a different story. These latter repairs can take quite a lot of time and trouble to properly repair because when the epoxy finish hardens, it will defy all stripping agents. Therefore, the finish over the damaged area must be sanded or scraped off. Then it takes a special touch to spot-in fresh epoxy and blend it properly into the area around the damaged spot (Figure 18).

When deciding whether or not to use an epoxy finish on your gunstocks, always consider the density of the wood. When the wood is close-grained and hard such as French walnut and other quality gunstock woods, the finish will be supported and resist dents and mars as well. Conversely, it is never a good idea to use epoxy finish over soft and open grained wood.

To use a polyurethane or epoxy finish on a gunstock, the wood is first prepared as for other finishes: the old finish should be removed and the wood sanded with various grits of abrasive paper until it is glass-smooth and no tool or sanding marks are apparent on the stock. Once sanded, wipe the wood with a tack cloth to remove all dust.

There are different ways to seal the wood prior to applying the epoxy finish. Some stockers use a paste filler made largely of Fuller's Earth, which is applied by rubbing the wood cross-grain with a rough rag. When dry, the stock is sanded down to the bare wood, leaving the pores filled. Commercial paste fillers are available in white and different "wood" colors. However, the possibility of a tinted or colored filler matching the wood exactly is remote. Therefore, most wood fillers used on gunstocks have a "built-in" stain to assure that the wood and filler will blend properly.

Some stockers use the finish material itself for sealing unless the grain is very porous. Sometimes even when an oil finish will be applied, epoxy is used to seal the pores. The compound is brushed or sprayed on, then sanded down to the wood when dry. A conventional hand-rubbed oil finish can then be applied. Such a finish combines the best of both techniques — absolute sealing and filling, followed by an oil finish. Epoxy sealers can make refinishing stocks difficult, however.

After the pores have been sealed and filled with an approved filler, or with coats of the finish itself, the finish is then sanded down to the bare wood and inspected. Make certain that no tool marks or sanding marks are present. Many small marks might not show up readily, so you will want to examine every detail closely in various lights to ascertain that none are present. Should you find any, use various grits of abrasive paper—ending with 600-grit — to sand them out.

Epoxy finishes are applied much the same as other types of finishes. Thin coats are brushed or sprayed on, with each coat sanded and/or steel-wooled after hardening. Some epoxy finishing kits include an aerosol applicator to apply the finish. When using these, care must be taken not to get the nozzle of the can too close to the wood. This will cause the still-wet finish to build up on the surface and run. If this occurs, you will more than likely have to start all over again, sanding the finish down to bare wood. Remember to use only thin coats rather than heavy coats when applying the final finish.



***Figure 18**: The epoxy finish on modern firearms are tough, but present a problem when they must be repaired or refinished.*

Drying times and applications vary with different manufacturers. In most cases, use the manufacturer's specific instructions when applying the finish unless you happen to detect something that will definitely be detrimental to its use on gunstocks.

After the first coat has hardened, gently rub down any dust spots, sags, or runs with 400-grit wet-or-dry abrasive paper and water. The first coat should soak in rapidly, and if carefully applied, will not sag or run.

A thorough cleaning of the surface is necessary after the rubdown to remove any loose material. Now, mix another small batch of the epoxy finish and give the entire stock another very thin coat, including the inletting. However, do not give the inletting more than one coat of the epoxy as this may adversely affect the fit of the metal parts to the stock.

This second coat should harden quickly, so you will want to work rapidly. Quickly apply it, smoothing out any sags or runs immediately, and then leave it alone. If you have any solution left over, store it in a cool place while the stock is drying. Another coat can be applied as soon as the surface is no longer sticky. A hair dryer or heat lamp will speed up the curing once the finish begins to dry. However, do not apply heat while the surface is still wet; only after it begins to set should any form of heat be applied.

At this point the stock should be stored overnight in a dry area of between 70°-80° F, where it will fully harden. Then, again gently rub the hardened coat down with a fine grit of wet-or-dry abrasive paper to remove dust and sags. Repeat the number of coats until you have an even, perfect-looking finish. Usually three coats will do the job, though more coats may be applied if necessary.

After the final coat and rubdown, you will want to smooth the finish further by using some type of fine rubbing compound. Traditional rubbing compounds are pumice stone and rottenstone, but some prepared commercial compounds may be better for stock work. For example, Brownells offers two types: Brownells Original Stock Rubbing Compound and Brownells Triple "F" Stock Rubbing Compound.

Once the stock has been rubbed sufficiently with a rubbing compound, it should be waxed. Birchwood Casey Gunstock Wax is recommended, because it protects and dresses up the epoxy gunstock finish, giving the best possible wax protection. This product contains silicones with the proper proportions of carnauba, beeswax, and special polymers.

Satin-finish epoxies have recently been introduced; these are very popular because they eliminate the shiny, high-gloss finish many shooters consider objectionable.

While there are several epoxy finishes available, one that is used in many gun shops is a Birchwood Casey product called Tuf-Sheen Polyurethane Stock Finish.

PROTECTING CHECKERING

When refinishing a gunstock that has previously been checkered, you will want to keep the filler and finish out of the checkering, including the borders (if any) around each checkering pattern. Use regular masking tape to mask off these areas. When the finish has been completed on other parts of the stock, remove the masking tape and brush a couple of coats of Dem-Bart Stock Finish into the checkering. You want to protect the checkering against dirt and perspiration, but you do not want to gum up the lines. Although the rest of the stock surface is finished with epoxy, use this Dem-Bart Stock Finish in the checkered areas. You will probably have a different shade in these areas, but this is not undesirable.

Since the idea is not to gum up the checkering, the checkering on many new stocks is cut after the stock has been finished, after which the checkered areas are given a light coat of Dem-Bart Stock Finish or some similar light oil. Some stockers like to use a 50-50 mixture of linseed oil and mineral spirits for this purpose. This mixture will usually dry more quickly and be ready for use sooner than linseed oil alone.

SELF-TEST QUESTIONS

Please check your answers on page 23.

13. **When using the Dem-Bart sealer on gunstocks, what is the minimum time that you should allow the sealer to dry?**
14. **What type of gunstock finish is still considered to be the best all-around finish to use?**
15. **What type of sheen is usually preferred for the classic gunstocks?**
16. **Another name for polyurethane gunstock finishes is _____.**

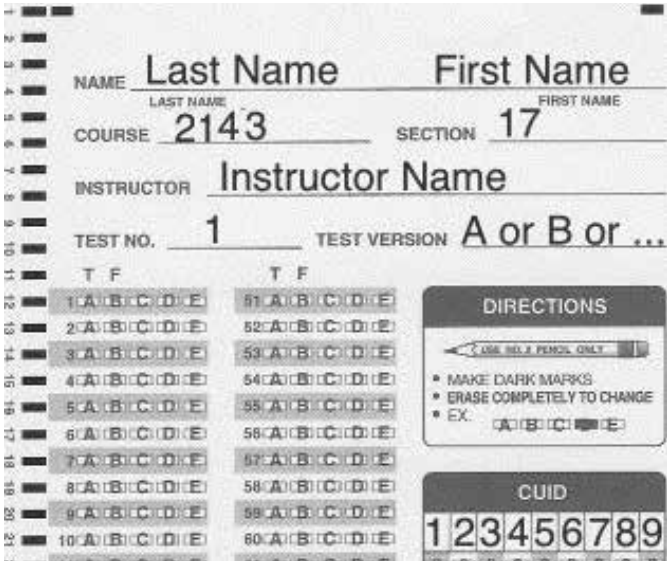
Answers to Self-Test Questions

1. Cutting guidelines and borders and cleaning up checkering cut.
2. Two-line spacing cutter.
3. S-1 tool.
4. When the amount of business warrants the purchase.
5. False. They should be cut to approximately half their final depth on the first pass.
6. Varnish remover.
7. Concave border.
8. The tops should be left flat.
9. Acraglas and Acraglas Gel.
10. Those chambered for magnum cartridges.
11. Release agent.
12. 100°-120° F.
13. 15 minutes.
14. Linseed oil with fast-drying additives.
15. A satin, non-glossy finish.
16. Epoxy finish.

Lesson Questions

THIS IS LESSON NUMBER 2188.

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. **What are the three types of basic checkering patterns used on modern firearms?**
   a. American, English, and French.
   b. Italian, German, and Indian.
   c. Cross-hatch, parallel, and concave.
   d. Light, medium, and deep.

2. **After guidelines are cut with a sharp knife on a checkering pattern, which one of the following tools is used to deepen the lines?**
   a. Two-line cutter.
   b. Three-line cutter.
   c. V-cutter.
   d. Border cutter.

3. **After an entire checkering pattern has been cut during the first pass, which tool would you use to deepen the lines to their full depth?**
   a. X-Acto knife.
   b. Single-line or V-cutter.
   c. Skip-a-line cutter.
   d. Border cutter.

4. **What is the best device to hold a gunstock during the checkering process?**
   a. A checkering cradle.
   b. A bench vise.
   c. Your hand.
   d. A C-clamp.

5. **When checkering, the border should usually be the outer sides of the diamonds?**
   a. True
   b. False

6. **What is the maximum number of lines per inch recommended for a checkering pattern to be functional?**
   a. 20.
   b. 24.
   c. 30.
   d. 36.

7. **When using checkering-pattern decals, how long should you wait after the decal has been attached to the stock before starting to cut the lines?**
   a. 1 hour.
   b. 45 minutes.
   c. 30 minutes.
   d. 15 minutes.

8. **When recutting old checkering, what tool should be used?**
   a. Two-line cutter.
   b. Three-line cutter.
   c. V-cutter.
   d. Border cutter.

9. **What type of finish is usually recommended on a modern gunstock when the maximum protection to the wood is desired?**
   a. Linseed oil.
   b. Epoxy.
   c. Walnut oil.
   d. Elmer's Glue.

10. **When inletting a gunstock with glass bedding, how much clearance should be left in the barrel channel and behind the recoil lug?**
   a. .007 inches.
   b. ½-¾ inches.
   c. 1-2 inches.
   d. $^{1}/_{32}$ -$^{1}/_{16}$ inches.