

STUDY UNIT 12 – PART 1

GUN STOCKS – WOOD SELECTION, BLANK LAYOUT, MACHINE SHAPING, AND INLETTING

STUDY  
UNIT  
12  
PART  
1

**LOST BUT NOT FORGOTTEN**

Few things in this world of stained birch and impressed checkering warm the cockles of the gun buff's heart more than the soft glow of a handsomely figured and finished, cleanly checkered rifle or shotgun stock. Such stocks, reflecting the pride and craftsmanship of the maker, are about as rare today as a Picasso at a garage sale.

As a gun pro, it's important that you know a good deal about gun stocks — the types of wood used and their characteristics; methods of stripping, refinishing, and checkering; how to remove dents and do touch-up work; the repair of cracks and splinters. You'll learn about all this and more very soon.

The art of stockmaking and customizing, if *not* lost, has been somewhat misplaced. If you have a feel for wood, and the patience to become proficient, then your local gun world may well beat a path to your door! There are many ways in which the gun pro, depending on his expertise, can make good money with stock work.

**MANY PROFITABLE JOBS ARE OFTEN THE EASIEST**

Among the easiest and most profitable chores (for the amount of time required) are simple glass bedding of the action and recoil lug to improve accuracy, and repairing with epoxy cracks at the tang and bolt recesses and in the stock itself (see Figure 2). Quite often a customer, dissatisfied with the crude appearance of his factory canoe paddle, will bring the piece to you for a facelift. Factory stocks can usually be made quite presentable by stripping, refinishing, and checkering. (Sometimes even counterfeit impressed checkering can be made honest with an educated checkering tool (see Figure 3). Other times, if the wood is hopeless, but the barreled action is excellent, a new stock is an easy-to-sell investment.

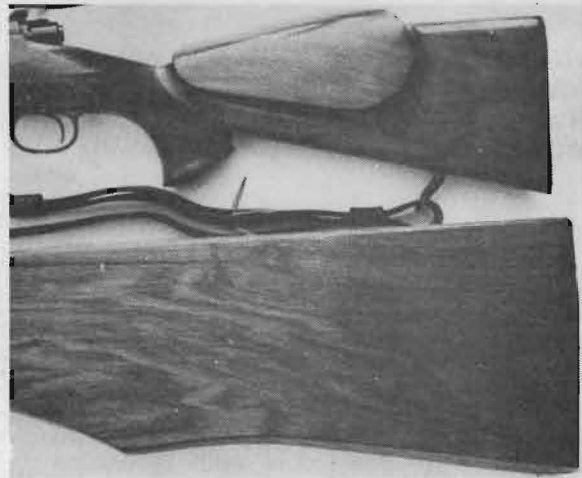


FIGURE 1 — Custom classic sporter stock by Colonel Burt Miller, with traditional cheek-piece and 20-lines-to-the-inch checkering. The stock was shaped from a plank-sawed black walnut flitch, comparable to the blank shown.

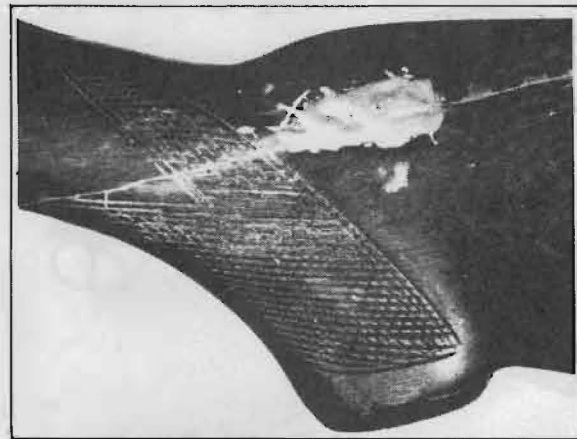


FIGURE 2 — Stocks broken through the grip/comb area are common. After epoxying the pieces together and filling in the piece chipped out (as shown), the excess is sanded off, the stock refinished, and the checkering recut. (Photo courtesy National Rifle Association)

GUN STOCKS – WOOD SELECTION, BLANK LAYOUT,  
MACHINE SHAPING, AND INLETTING



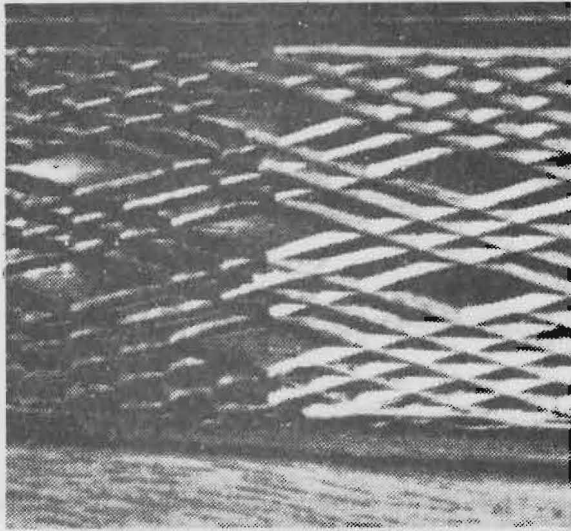


FIGURE 3 — Impressed checkering (dark area at left) can often be made into the real thing with a “V” checkering tool and a steady hand. (Photo courtesy National Rifle Association)

Oldtimers with stocks damaged or splintered beyond repair (L. C. Smith and Lefever shotguns, for example) afford profitable restocking opportunities (see Figure 4). Shape a semi-inletted buttstock and forearm to the traditional contours, duplicate the old checkering, and apply a hand-rubbed oil finish. You have restored the gun to use while increasing its value beyond the cost of your services.

As you gain experience and customers, you’ll probably want to build custom rifles — which is simpler than it sounds (see Figure 5). The job consists primarily (after polishing and blueing) of final stock shaping and inletting, glass bedding, and finishing and checkering the wood.

But first things first. Let’s start at the beginning, which is with the wood itself.

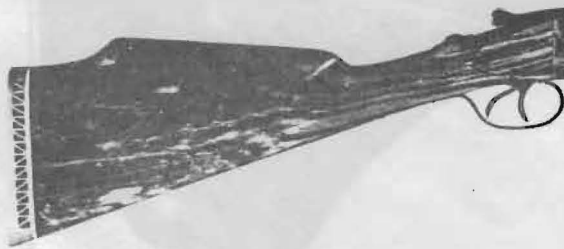


FIGURE 4 — Restocking old doubles, like the 20-gauge Ithaca shown, can be satisfying and profitable. The buttstock is of French walnut and of traditional English “straight-stock” design. (Photo courtesy National Rifle Association)

## TYPES OF STOCK WOOD

Desirable stock woods share a number of common characteristics: They must be relatively light, though close-grained and dense to resist moisture absorption and warping; they must be straight-grained in the pistol grip area; in one-piece stocks, they must be straight-grained through the forearm. Finally, they should be cut from the main trunk of the tree with no sapwood (see Figure 6).

The cheaper stocks and blanks often carry a wedge of light-colored, open-grained sapwood which can be stained to match; or worse, a section of pith (the center of the trunk). Unless you’re working with an existing stock, don’t waste your time and your customer’s money on such wood. It takes just as much effort, if not more, to finish out a lousy piece of lumber as it would a blank or stock of good quality and appearance. Inferior wood always reflects its lack of quality, especially in the checkering, where the diamonds come out fuzzy rather than sharp and pointed.

Attractive, highly figured stocks, with a burl, crotch, fiddleback, etc., should always incorporate the pattern in the butt end of the stock (see Figure 7). Such eye-catching figures, with the grain running in all directions, don’t do a thing for stock strength. They *do* increase the beauty and desirability (and price) of the wood.

The traditional stock wood today is walnut. The first truly American guns, the “Kentucky” long rifles, had stocks of walnut, maple, and to a lesser extent cherry. These guns set a precedent for wood type and stock design that lasted until the early 1900’s. (The buttstocks of the first Winchester lever-actions were almost pure “Kentucky” in appearance (see Figure 8). European gun stocks were almost always made of walnut, and the comparatively trim and slim German and Austrian bolt-action sporters that came into the U.S. before and after World War I inspired many American stock makers. With modifications, these European stocks evolved into the current American concept of what a rifle stock should look like (see Figure 9).

Before going on, please do Programmed Exercise 1. Make sure you write your answers on a separate sheet of paper before looking at the answers on the page specified.

### The Four Kinds of Walnut

There are four basic types of walnut used by American stock makers: (1) black walnut, which is native to North America; (2) English walnut, grown domestically; (3) claro walnut, a California hybrid of black and



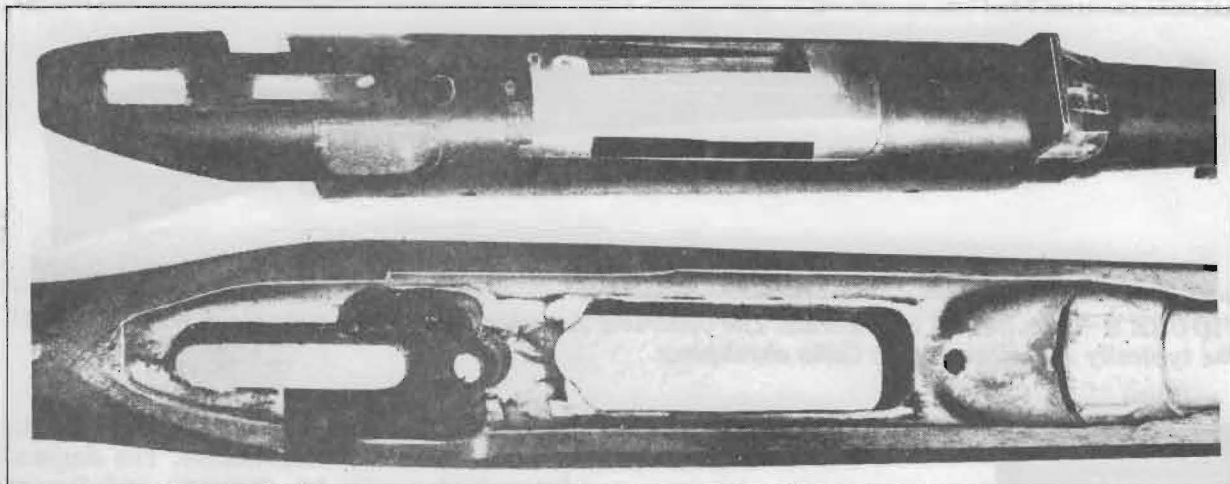


FIGURE 5 — Custom rifles usually utilize a barreled action, and a roughed-out, semi-inletted commercial stock. For optimum accuracy, the action is usually glass-bedded. (Photo courtesy National Rifle Association)

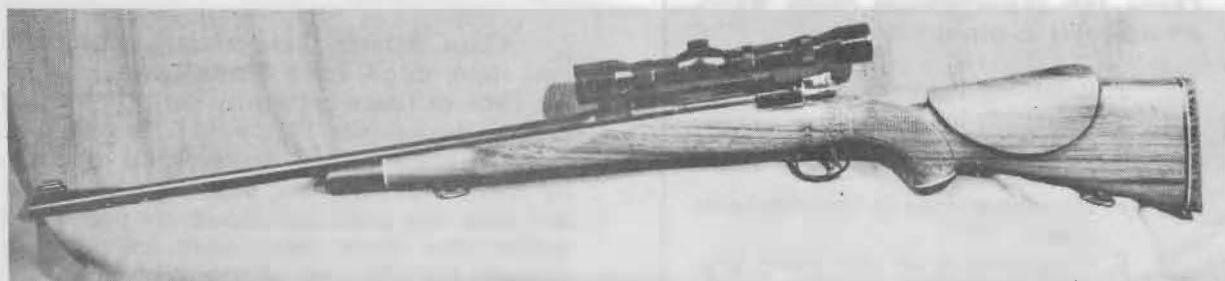


FIGURE 6 — Mauser sporter owned by Colonel Miller with ideal, although non-fancy grain configuration.

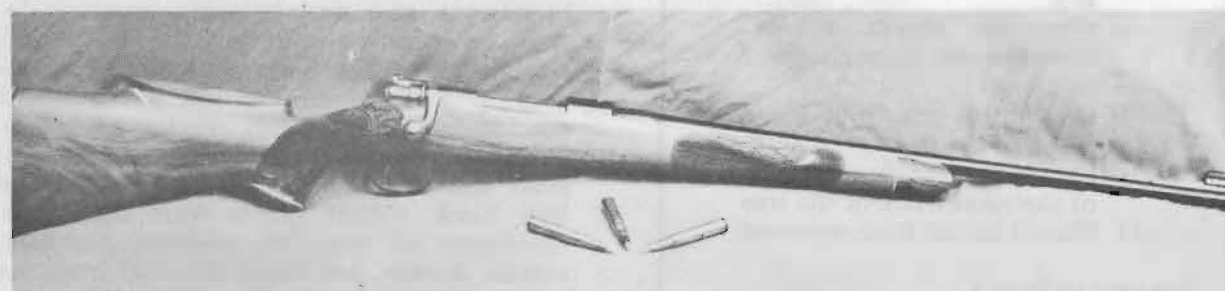


FIGURE 7 — This superb Mauser sporter has a straight grain in the forearm and an attractive figure in the butt — where it belongs. (From the collection of Colonel Miller)



FIGURE 8 — The stock design of the Kentucky rifles of the early 1700's influenced stock contours for nearly 200 years. Shown is the Winchester M1892 lever-action. (Photo courtesy National Rifle Association)

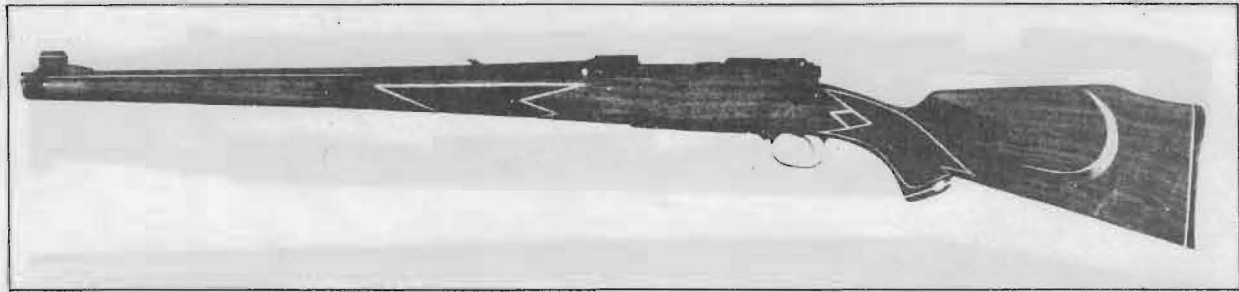


FIGURE 9 — The best of two worlds. The venerable Austrian Mannlicher-style stock combined with the typically American Monte Carlo cheekpiece.

PROGRAMMED EXERCISE

1

Check the characteristics below which are desirable in gun stocks:

- 1. Relatively light wood
- 2. Relatively heavy wood
- 3. Close-grained
- 4. Open-grained
- 5. Straight-grained in the pistol grip area
- 6. Cross-grained in the pistol grip area
- 7. One-piece stocks should be straight-grained through the forearm
- 8. One-piece stocks should be cross-grained through the forearm
- 9. Should be cut from the main trunk of the tree
- 10. Should be cut from the center of the main trunk of the tree
- 11. Should be cut from sapwood

Answers on Page 6

English walnuts; and (4) the various imported European walnuts.

**Black Walnut.** Black walnut, though the least expensive (Figure 10), is becoming increasingly scarce and costly, and many gun manufacturers have switched to such economy hardwoods as birch and beech imposters, which are stained to pose as walnut.

A big reason for the current walnut shortage is the fact that the U.S. has always used black walnut for military stocks, up to the fairly recent plastic-stocked M16 rifle.

Hopefully, the now obsolete M14 will be the last service rifle to use walnut. The demand for walnut veneer by domestic and foreign furniture manufacturers, and the scrounging around in the U.S. for walnut by Japanese and European gun makers, have also helped deplete the supply.

**Claro Walnut.** Claro walnut, a medium-cost stock wood, has a distinctive and beautiful swirl or flame pattern in dark brown and yellow shades (see Figure 11). It is not as dense as black walnut, nor as strong or as easily checkered. However, how the wood is cut and how the grain and figure are positioned within the blank have more to do with strength than the *type* of walnut used.

Environmental factors, especially water availability, greatly influence a given wood's suitability for gun stocks. Walnut trees grown in swamps, near river bottoms, or which depend on irrigation or receive a heavy annual rainfall grow fast and are soft and open-grained. Such wood has less strength and grain color, and will not checker as well as the wood from trees clinging to rocky hillsides and which receive scant rainfall. 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.

**English Walnut.** Although English walnut trees grow worldwide, only a small amount of wood is produced in England. Demand from British gun makers is so high that only sub-standard reject blanks, with few exceptions, ever find their way into the U.S.

So, the nut itself, regardless of where the tree is grown, is the same "English walnut" sold in grocery stores. While English walnut trees do grow in England, they also grow in the United States and in Europe, where varying climates produce woods of different characteristics. In discussing stock wood, walnut is usually named after the country of origin.

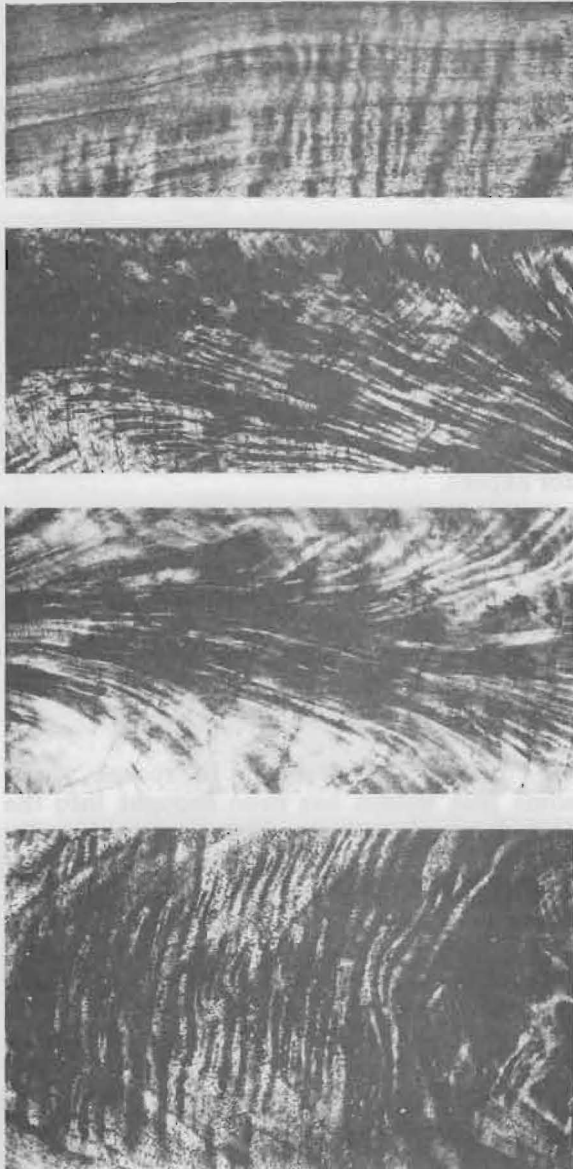


FIGURE 10 — Four types of American black walnut. A is a fiddleback grain, characterized by wavy lines at right angles to the grain; B is crotch or "flame grain"; C is also crotch, of the type found at the juncture of the trunk and a large limb; D is a burl figure, found near the roots of the tree.



FIGURE 11 — Classic sporter with distinctive claro walnut stock. Note the trim lines and the swirls or flame in the butt.

### The Imported European and Asiatic Walnuts.

*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 simply isn't available to the Western world. A true Circassian stock is characterized by vivid rose to red to orange splotches which contrast sharply with the basic wood color. The term "Circassian" is often and incorrectly used to describe any exceptionally beautiful, highly figured wood (see Figure 12). If you see "Circassian" stock wood offered or advertised, take it with a grain of salt. The chances are equally good that it came from the moon as from the Russian steppes.

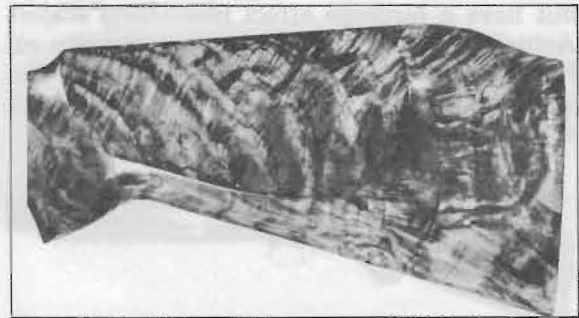


FIGURE 12 — High-grade French or German walnut, often erroneously called "Circassian."

*Turkish Walnut.* This wood is about as close to honest Circassian as you'll ever see (the growing locale is close to the Caucasus Mountains). Turkish walnut is exceedingly dense, checkers well, and the straight grain precludes warping. There are three basic types. One is characterized by a fine grain and a rather undistinguished gray color which nevertheless produces near-ultimate accuracy. The second type has the same close grain, but the grain stands out in deep shades of honey or gold, with stripes about 1/8" wide. The third type is highly prized, with the wood so dark brown as to appear almost black, and with



distinctive burls and color swirls. Turkish walnut is expensive, hard to come by, and a connoisseur's prize! Its weight ranges from 40 to 45 pounds per cubic foot.

*French Walnut.* This walnut is highly prized, and with good reason. It is highly figured and its close grain checkers exceptionally well (see Figure 13). French walnut is rated at a density of about 37 to 40 pounds per cubic foot. There are two distinctive types. One is from inland France and has a striking and broad grain with strong brown and gold tints, similar to Turkish walnut. It is, however, considerably lighter in color and weight. The second, 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. Some types of French walnut have a birdseye effect resembling maple. Actually, you can find almost any grain effect, including ribbon and fiddleback. The grain color ranges from medium brown to rich chocolate.



FIGURE 13 — Browning over-and-under stocked in fancy French walnut. (Photo courtesy National Rifle Association)

*German Walnut.* Although not as widely known as French walnut, this wood is nearly identical and grows throughout Bavaria and in the Black Forest. Much of it, when exported, is labeled "French walnut" (see Figure 14).

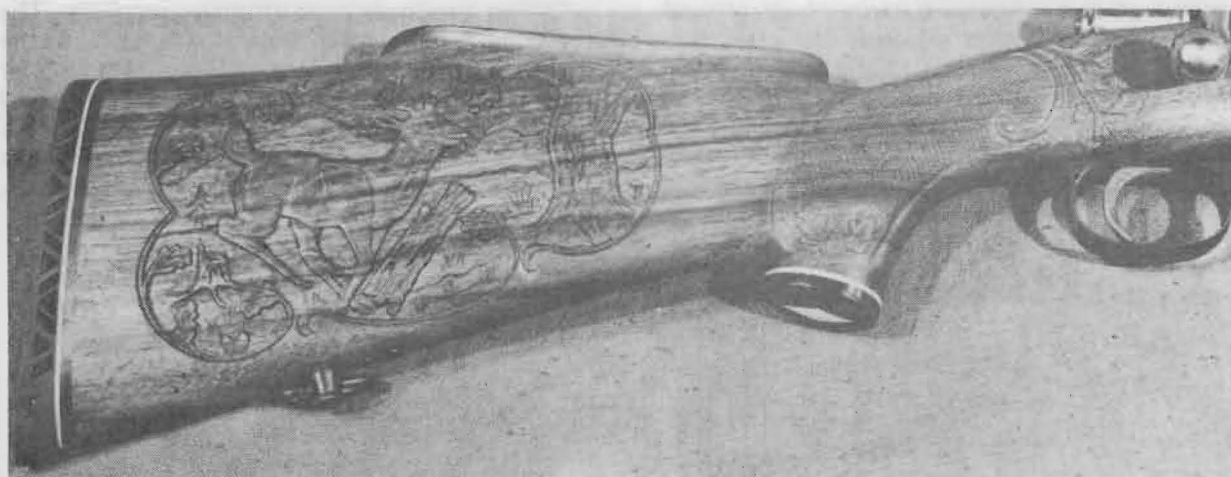


FIGURE 14 — Standard-grade German walnut carved and checkered stock, from the collection of Colonel Miller.

*Italian Walnut.* Because so many shotguns are manufactured in Italy, 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 exported to the U.S. 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.

*Czechoslovakian Walnut.* There are two distinct variations. One is dark, quite similar to German walnut. The other is of a very light color, straight-grained, and with little figure. It weighs about 35 pounds per cubic inch, and while adequate for stockmaking does not have the inherent beauty of other walnuts.

*Yugoslavian Walnut.* In recent years, some fine walnut has been brought into the U.S. from Yugoslavia. This is exceptionally fine-quality wood, of dense grain and considerable figure, weighing over 40 pounds per cubic foot. Most of this walnut is of a rich, medium-chocolate shade with darker and contrasting streaks (see Figure 15).

#### ANSWERS

1

Desirable characteristics are Nos. 1, 3, 5, 7, and 9.

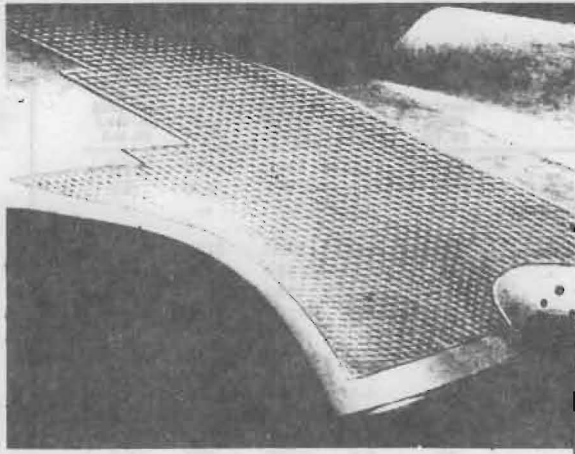


FIGURE 15 — Good-grade English walnut lends itself to fine, clear, sharp checkering. (Photo courtesy National Rifle Association)

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

#### Domestic Stock Woods

Almost every type of hardwood has been tried at one time or another for gun stocks. While walnut is still the overwhelming favorite, some other woods make up into splendid stocks (see Figure 16).

**Apple Wood.** This makes a very attractive stock. It is close-grained and finishes and checkers well. The color is a pale red. Apple is much harder to work than walnut, and will quickly dull gauges and chisels. Unless a customer specifies this wood or perhaps has a blank, walnut is a better choice, considering the working time required.

**Pear Wood.** This wood is similar to apple, but usually finishes in an attractive yellowish color, and is normally slightly softer and a bit easier to work. Pear checkers well and has adequate strength for most rifle stocks. None of the fruitwoods should be used for magnum-caliber rifles.

**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 more hardy wild variety. The latter is an excellent and strong substitute for walnut, although its rather bland brown color provides little in the way of contrast. Close-grained like all fruitwoods, 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 shotgun stocks where a little wood has to provide a lot of strength — as around sidelock actions.

**Maple.** This is another wood used in early days on Kentucky rifles. The grain is often distinctive, including birdseye, fiddle, 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 states.

**Screwbean Mesquite.** This, in many respects, is one of our most beautiful stock woods, due to the profusion of curls, knots, twists, and whorls. Few "trees" are large enough for one-piece stock blanks and the supply is limited, thus the cost is high. Mesquite is much heavier than walnut and also much stronger. It is difficult to work. Dull tools tend to "shred" the wood, as do such tools as a draw knife or plane — which should be avoided. Instead, depend upon the use of rasps. Mesquite is often riddled with holes and flaws which do not weaken the wood, but do require expert inlays 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 does make one of the most exotic-looking stocks imaginable. 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 states and from Mexico. It has a much plainer figure and

## SOME CENTRAL AND SOUTH AMERICAN WOODS

| Nomenclature Common   | Scientific               | Color of Heartwood  | Density <sup>1</sup><br>(lbs./cu. ft.) | Shrinkage <sup>2</sup><br>(percent) | Shear Parallel to Grain <sup>1</sup><br>(p.s.i.) | Hardness <sup>1,3</sup><br>Side | Shock Resistance <sup>1</sup><br>Static Bending Work to Max. Load<br>(in.-lbs./cu. in.) |
|-----------------------|--------------------------|---|--|-------------------------------------|--|---------------------------------|---|
| Angelique             | Dicorynia guianensis     | brown with purplish cast  | 45                                     | 11.2                                | 1660   | 1290                            | 15.2  |
| Banak                 | Virola koschnyi          | golden or reddish brown   | 33                                     | 14.5                                | 1300   | 640                             | 8.1   |
| Cocobolo              | Dalbergia retusa         | variation of reds, yellows, and orange with dark pigment streaks                            | —                                      | 5.6                                 | —  | —                               | —   |
| Courbaril             | Hymenaea courbaril       | reddish brown with dark streaks   | 52                                     | 10.2                                | 2470   | 2350                            | 17.6  |
| Crabwood              | Carapa guianensis        | reddish brown to dark brown   | 40                                     | 8.3                                 | 1680   | 1200                            | 13.4  |
| Determa               | Ocotea rubra             | light reddish brown   | 39                                     | 8.3                                 | 980  | 635                             | 6.4   |
| Greenheart            | Ocotea rodiaei           | yellowish green or light olive through dark olive or yellowish brown to dark brown or black | 65                                     | 13.4                                | 2300   | 2600                            | 21.8  |
| Mahogany              | Swietenia macrophylla    | light reddish brown   | 32                                     | 5.7                                 | 1330   | 845                             | 8.5   |
|                       | S. mahogani              | rich reddish brown  | 48                                     | 5.5                                 | 1480   | 1330                            | 6.2   |
| Mora                  | Mora excelsa             | dark reddish brown  | 62                                     | 15.1                                | 2330   | 2570                            | 21.5  |
| Purpleheart           | Pletogyne pubescens      | deep purple to dark brown   | 54                                     | 10.6                                | 2210   | 2760                            | 20.0  |
| Primavera             | Cybistax donnell-smithii | whitish to straw-yellow   | 30                                     | 6.6                                 | 1700   | 700                             | 10.3  |
| Rauli                 | Nothofagus procera       | reddish brown with darker streaks   | 34                                     | 8.4                                 | 1500   | 690                             | 12.8  |
| Roble                 | Tabebuia rosea           | light grayish brown   | 36                                     | 7.7                                 | 1130   | 830                             | 11.0  |
| Rosewood              | Dalbergia nigra          | variable with shades of brown, red, and violet streaked with black zones                    | 62                                     | 5.8                                 | 2110   | 2720                            | —   |
| Saman                 | Pithecellobium saman     | light brown with dark streaks   | 35                                     | 5.7                                 | 1280   | 850                             | 7.8   |
| Tulipwood             | Dalbergia variabilis     | light yellowish brown with pink or red pigment zones  | —                                      | —                                   | —  | —                               | —   |
| Wacapou               | Youacapoua americana     | dark olive to dark chocolate brown  | 59                                     | 10.4                                | 1890   | 1730                            | 17.0  |
| Yemerí                | Vochysia hondurensis     | pinkish brown   | 28                                     | 7.8                                 | 1070   | 550                             | 7.6   |
| <b>Domestic Woods</b> |                          |   |  |                                     |  |                                 |   |
| Oak, White            | Quercus alba             | grayish brown   | 48                                     | 12.6                                | 2000   | 1360                            | 14.8  |
| Walnut                | Juglans nigra            | chocolate brown   | 38                                     | 10.2                                | 1370   | 1010                            | 10.7  |
| Cherry                | Prunus serotina          | light to dark reddish brown   | 35                                     | 9.2                                 | 1700   | 950                             | 11.4  |

(<sup>1</sup>) At 12% moisture content (<sup>2</sup>) Green to 6% moisture content (<sup>3</sup>) Load required to embed a .444" ball to half its diameter  
 Data from: "Wood Handbook", U.S. Dept. of Agriculture Handbook No. 72 (1955), Forest Products Laboratory, Madison, Wis. "Properties of Imported Tropical Woods", U.S. Dept. of Agriculture Forest Service Research Paper FPL 125 (1970), by B. F. Kukachka, Forest Products Laboratory, Madison, Wis. "Present and Potential Commercial Timbers of the Caribbean", U.S. Dept. of Agriculture, Handbook No. 207 (1962), by F. R. Longwood, Forest Service, Washington, D.C.

## SOME DOMESTIC WOODS FOR GUNSTOCKS

| Nomenclature Common Name | Color of Heartwood       | Type of Figure |              | Specific <sup>(1)</sup> Gravity | Shear Parallel <sup>(1)</sup> to Grain <sup>(1)</sup><br>(p.s.i.) | Hardness-Side <sup>(1)(2)</sup> | Shock Resistant <sup>(1)</sup> Static Bending Work to Max. Load<br>Inch.-Lbs./cu.in. | Volume <sup>(3)</sup> Shrinkage | Machining <sup>(4)</sup> Characteristics |
|--------------------------|--------------------------|----------------|--------------|---------------------------------|---|---------------------------------|--|---------------------------------|--|
|                          |                          | Plain Sawn     | Quarter Sawn |                                 |   |                                 |  |                                 |  |
| Apple                    | light reddish brown      | (7)            | None         | .74                             | 1740  | 1730                            | 23.0   | 14.7                            | M  |
| Ash, white               | light grayish brown      | (9) (13)       | (12) (13)    | .60                             | 1950  | 1320                            | 17.6   | 10.7                            | D  |
| Beech                    | reddish brown            | (7)            | (10) (14)    | .64                             | 2010  | 1300                            | 15.1   | 13.0                            | M  |
| Birch, yellow            | reddish brown            | (8) (13)       | (13)         | .62                             | 1880  | 1260                            | 20.8   | 13.4                            | M  |
| Butternut                | light chestnut brown     | (7)            | (11)         | .38                             | 1170  | 490                             | 8.2  | 8.5                             | E  |
| Cherry                   | dark reddish brown       | (7) (13)       | (13)         | .50                             | 1700  | 950                             | 11.4   | 9.2                             | E  |
| Elm, slippery            | dark reddish brown       | (9)            | (11)         | .53                             | 1630  | 860                             | 16.9   | 11.0                            | M  |
| Madrone                  | light reddish brown      | (8)            | (10)         | .66                             | 1810  | 1460                            | 8.8  | 14.5                            | D  |
| Maple, hard              | light brown-A. nigrum    | (8) (7) (13)   | (8) (13)     | .57                             | 1820  | 1180                            | 12.5   | 11.2                            | M  |
|                          | light brown-A. saccharum | (8) (7) (13)   | (8) (13)     | .63                             | 2330  | 1450                            | 16.5   | 11.9                            | M  |
| Oregon myrtle            | light brown              | (7) (13) (15)  | (13) (15)    | .56                             | 1860  | 1270                            | 8.2  | 9.9                             | M  |
| Osage orange             | golden brown             | (8) (15)       | (11) (15)    | .76                             | 3300 <sup>(14)</sup>  | 2500 <sup>(14)</sup>            | —  | 7.4                             | D  |
| Persimmon                | light yellowish brown    | (5) (8)        | (11)         | .72                             | 2160  | 2300                            | 15.4   | 15.4                            | D  |
| Redwood                  | dark reddish brown       | (8) (13)       | (11) (13)    | .40                             | 940   | 480                             | 6.9  | 5.4                             | M  |
| Sycamore                 | light brown              | (7)            | (14)         | .49                             | 1470  | 770                             | 8.5  | 11.4                            | E  |
| Walnut, American         | chocolate brown          | (8) (13)       | (11) (13)    | .55                             | 1370  | 1010                            | 10.7   | 10.2                            | M  |

- (<sup>1</sup>) Values obtained at 12% moisture content  
 (<sup>2</sup>) Load in pounds to embed a 0.444-inch ball to 1/2 its diameter  
 (<sup>3</sup>) Green to 6% moisture content  
 (<sup>4</sup>) Easy, Moderate or Difficult to machine  
 (a) Predominately sapwood-color indicated for sapwood  
 (b) Birdseye figure  
 (7) Faint growth ring  
 (8) Distinct, not conspicuous growth ring  
 (9) Conspicuous growth ring  
 (10) Faint growth ring stripe  
 (11) Distinct, not conspicuous growth ring stripe  
 (12) Conspicuous growth ring stripe  
 (13) Occasionally having wavy and burl grain  
 (14) Numerous small ray flakes  
 (15) Darker streaks of pigment figure  
 (16) Values estimated from green strengths (above 30% M.C.)

Data from: "Wood Handbook" U.S. Dept. Agriculture Handbook No. 72 (1955), U.S. Dept. Agriculture Technical Bulletin No. 158, and Mr. B. A. Bendtsen of the Forest Products Laboratory, Madison, Wis.

TABLE 1 — Characteristics of Central, South American, and domestic hardwoods. (Courtesy National Rifle Association)





FIGURE 16 — Three distinctive domestic stock woods: top, screwbean mesquite; bottom left, black walnut, crotch; bottom right, black walnut, fiddleback. (Photos courtesy National Rifle Association)

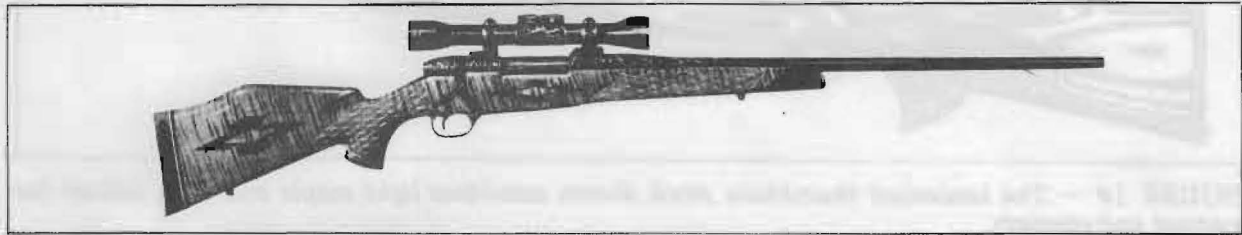


FIGURE 17 — Weatherby Mark V rifle with tiger-tail maple stock and contrasting inlays.

color contrast than the screwbean variety. Flat-pod mesquite is also very tough to work, but with fewer flaws, knots, etc. that require filling and inlays. 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.** Often used in Europe for military and commercial stocks, beech is an extremely sturdy wood suitable for utility-type stocks. The color is pale yellow or tan, without contrasting grain. It is now being used by some U.S. gun manufacturers for cheaper-grade arms — notably rim-fire .22's.

**Sycamore.** This is a common American wood that serves well for utility-type stocks on "working arms" 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.

#### Laminated Stocks

By epoxying thin layers of stock wood together and alternating grain direction, a

blank can be built up that is extremely strong, virtually waterproof, and free from potential warpage. Such laminated stocks are commonly used for benchrest and varmint rifles. Contrasting woods can be used to make attractive color combinations — such as results from gluing walnut and birch in alternate layers. Laminated stocks are seldom, if ever, checkered.

#### Woods Used for Forearm Tips and Pistol Grip Caps

There is a wide variety of exotic and colorful woods suitable for rifle forend tips and pistol grip caps, most of it grown in tropical and semi-tropical climates. With a few exceptions, these woods are too heavy and too dense to serve as stock wood. Some are so close-grained that they can be polished to a high luster using only elbow grease.

**Rosewood.** Brazilian rosewood is undoubtedly the most popular, as it has a beautiful grain and color ranging from dark red with lighter 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, of course, essential.

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

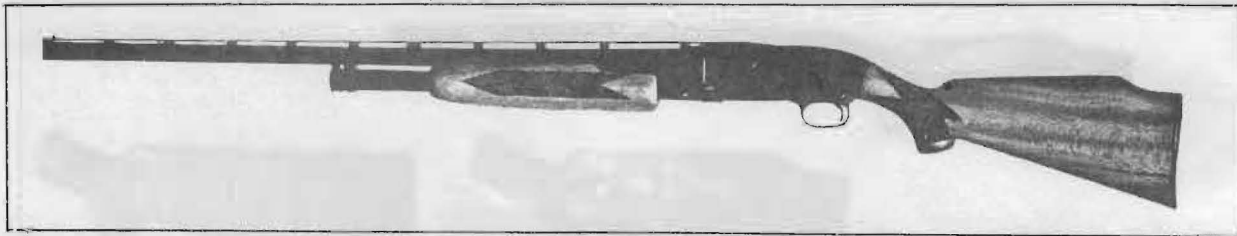


FIGURE 18 — Sycamore stocks are strong and easily checkered. When stained, they look quite a bit like walnut.



FIGURE 19 — The laminated thumbhole stock shown combines light maple and dark walnut for contrast and strength.

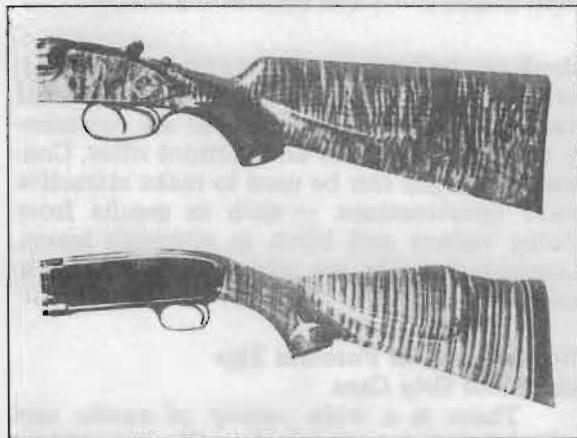


FIGURE 20 — Two striking examples of maple stocks. Gaudy, but nice! (Photo courtesy National Rifle Association)

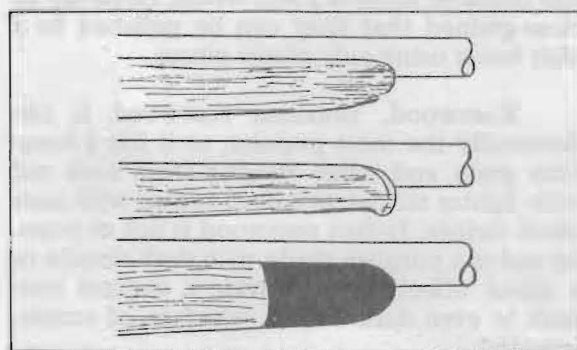


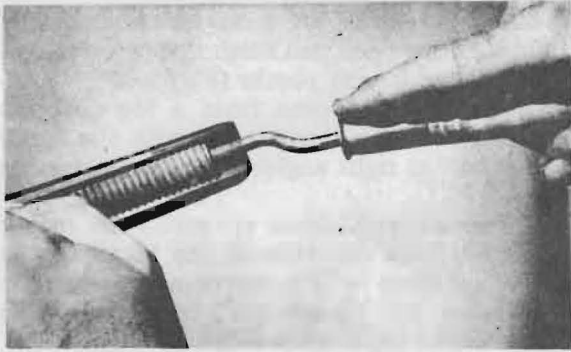
FIGURE 21 — Three types of forend tips, from top: conventional tapered; German schnabel (nose); and with classic ebony or other exotic wood tip. (Photo courtesy National Rifle Association)

**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.

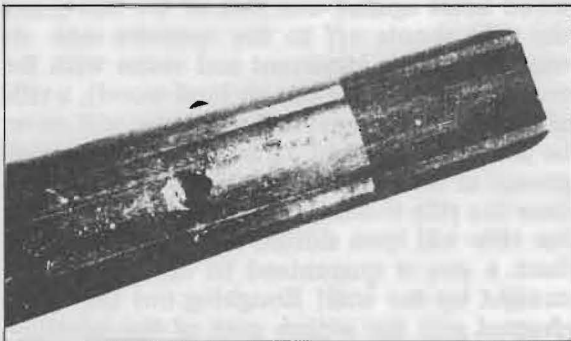
**Zebra Wood.** Zebra wood is also favored for handgun stocks. The wood is sometimes used for rifle stocks, but for show purposes only because of its extreme weight. Zebra wood is light yellow with dark brown “zebra-like” stripes about 1/8” wide. It is easily worked.

**Lignum Vitae.** This so-called “tree of life” is sometimes used for forend tips, as the dark greenish wood adds a distinctive contrast to light-colored stocks. It is most often combined with maple. Lignum vitae is among the hardest of woods, which probably has something to do with its use by men of some Far Eastern nations. The wood is considered an aid to sexual prowess when ground into a powder and taken internally.

**Ebony.** This wood has long been the traditional forearm tip on English big game rifles, often used with spacers of real ivory and a matching pistol grip cap (the inspiration for today’s plastic, white-line spacers). Ebony is seldom used now. Unfortunately, the real thing looks like plastic, which is anathema to the purist. Ebony from Africa is solid black in color. Madagascar ebony, once considered inferior, is making a comeback because it *doesn't* look like plastic. It shows a contrasting gray-streak pattern.



**FIGURE 22** — Forend tips are best held in place with a dowel, pins, and epoxy. After the glue has dried, the barrel channel must be cut into the tip with a barrel-inletting rasp. Pressure (or lack of it) here has everything to do with accuracy.



**FIGURE 23** — The finished tip, ready for final sanding and the application of the stock finish. The front sling swivel will be anchored in the recessed hole.

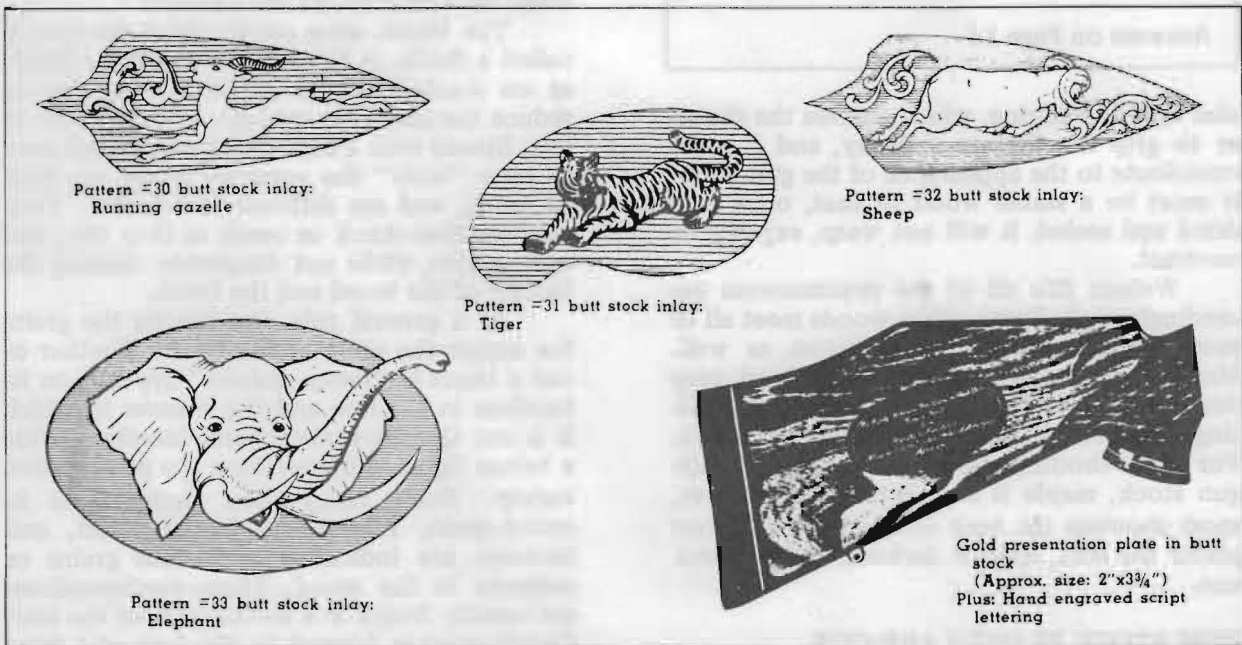
**Domestic Woods.** Some domestic woods, those that are extremely light or very dark and figured, are often used for tips, caps, and inlays. For example, a dark, fancy-figured piece of walnut, when inlaid into a light maple or apple stock, provides pleasing contrast. Holly and persimmon, which are nearly white, 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 matchlocks. 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 is caused by overly tight screws.

Before going on, please do Programmed Exercise 2. Make sure you write your answers on a separate sheet of paper before looking at the answers on the page specified.

### WHY WALNUT IS BEST

The reason walnut is such an acceptable and widely used wood for gun stocks is that it meets the requirements better than other woods. Gun stock wood must be workable. It has to be shaped on the outside. It must also be inlaid; 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. Gun stock wood must be hard so it will not easily dent, mar, or compress from recoil. It must



**FIGURE 24** — The custom Weatherbys, considered a bit flamboyant by some, are offered with a variety of inlays in a variety of materials, including ivory.



**PROGRAMMED  
EXERCISE**

2

1. True or false? Walnut trees grown where growth is rapid and the water supply abundant produce close-grained and harder woods suitable for gun stocks, and are preferred by stock makers over those grown in more arid regions.
2. True or false? Most often the English walnut imported from England and offered for sale in the United States is of superior quality and preferred over domestic walnut.
3. True or false? Screwbean mesquite is one of the most beautiful stock woods; it is heavier and stronger than walnut, but more difficult to work.
4. True or false? Mahogany is not usually preferred for gun stocks since it is comparatively soft and subject to dents.
5. True or false? When considering wood for gun stocks, you should remember that none of the fruitwoods should be used for guns of magnum caliber.

Answers on Page 14

also take checkering, which enables the shooter to grip the firearm securely, and it must contribute to the appearance of the gun. Also, it must be a stable wood in that, once it is dried and sealed, it will not warp, expand, or contract.

Walnut fills all of the requirements exceedingly well. Some other woods meet all or most of the requirements almost as well. 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 shooters desiring or liking a blonde gun stock, maple is a good choice. However, most shooters (at least in the United States) prefer the soft, mellow darkness of good walnut.

#### HOW STOCK BLANKS ARE CUT

Gun stocks are cut in one of two ways: they are either plank-sawed or quarter-sawed.

Plank-sawed blanks are those which are cut by running a log back and forth through the saw, thus cutting it into planks (Figure 26). Quarter-sawed blanks come from a log that has been sawed into "quarters," with the stock blanks cut at right angles to the annular rings (Figure 27).

Plank-sawed blanks are seldom as pretty in figure from one side of the blank to the other as those which are quarter-sawed — which are cut almost perpendicular to the radius of the log (Figure 28).

A big reason for quarter-sawing blanks is that the wood will warp in a vertical line rather than horizontally. Almost all wood will warp or bend with moisture; if the warping is in a vertical line, bearing against or away from the barrel, accuracy is affected the *least*. If, however, the warp is horizontal, the forearm wood bears against one side of the barrel and the rifle shoots off to the opposite side. As warping is not consistent and varies with the moisture content of the air (and wood), a rifle afflicted with horizontal warpage will never be accurate. It might be tuned to shoot small groups at one benchrest session, but the next time the rifle is fired, perhaps two weeks later, the rifle will have shifted its point of impact. Such a gun is guaranteed to drive its owner straight up the wall! Roughing out the barrel channel and the action part of the inletting, and glass-bedding, may help to some extent, but it will never correct the situation permanently. The wood will continue to warp (Figure 30).

#### WHY BLANKS MUST BE CURED

The blank, after cutting from the tree, is called a flitch. A large number of these flitches are stacked and kiln-dried at one time to reduce the moisture content, usually to 7% or less. Stocks with a high moisture content tend to later "walk" the accuracy levels, are hard to work, and are difficult to checker. They also weather-check or crack as they dry, and such cracks, while not dangerous, destroy the beauty of the wood and the finish.

As a general rule, the fancier the grain, the higher the price of the stock. Whether or not a blank is "fancy-grained" depends on its location in the tree and the manner in which it is cut. Quarter-sawed blanks usually provide a better figure and grain than the plank-sawed variety. Such fancy wood designations as crotch-grain, fiddleback, feather, burl, and birdseye are indicative of various grains or patterns in the wood. These configurations are usually found in a certain part of the tree. Crotch-grain is formed in the fork of a large limb, or in a fork of the trunk itself. Birdseye pattern is characteristic of maple and results

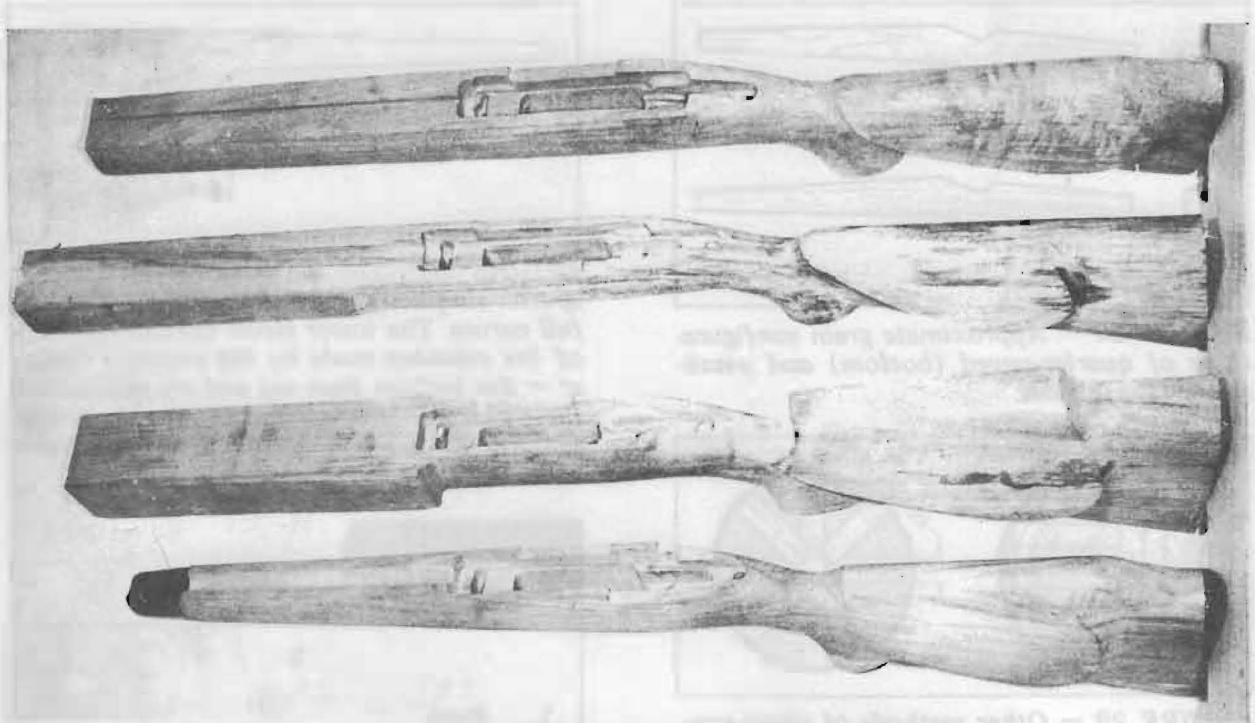


FIGURE 25 — Semi-inletted stock blanks. Some, like the one on the bottom, are of very close to “finished” appearance; others leave sufficient wood for considerable artistic and design leeway.

from tiny knots which have formed over the years by small twigs branching out and then dying and breaking off.

Fancy stock blanks are graded full-fancy, full-figure, and 3X grade, and run as high as \$200 for the blank alone. Needless to say, the

stock maker who has the courage to whittle, chip, and carve such a magnificent piece of walnut has to be a brave man indeed! Until you gain experience, leave the fancy wood alone. Even standard-grade walnut costs money these days.

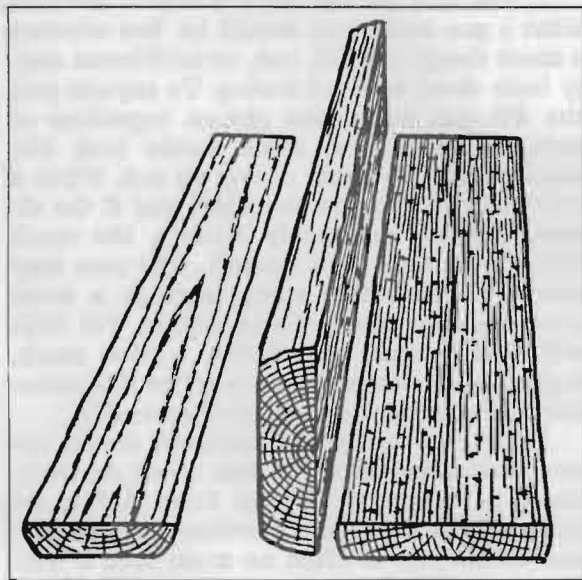


FIGURE 26 — A quarter-sawed blank (right) is cut nearly perpendicular to the radius of the log. The plank-sawed blank is cut nearly tangent to the annular rings. (Photo courtesy National Rifle Association)

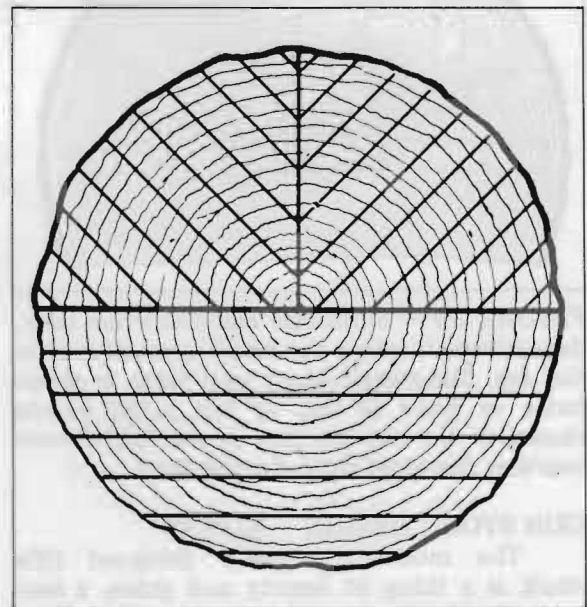


FIGURE 27 — Sectional view of a walnut log. The two upper sections are quarter-sawed; the bottom section is plank or “board” sawed. (Photo courtesy National Rifle Association)

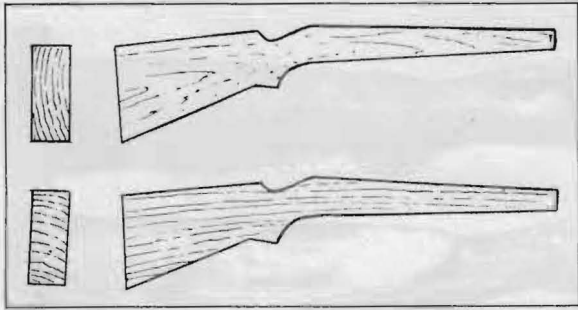


FIGURE 28 — Approximate grain configurations of quarter-sawed (bottom) and plank-sawed (top) stocks.

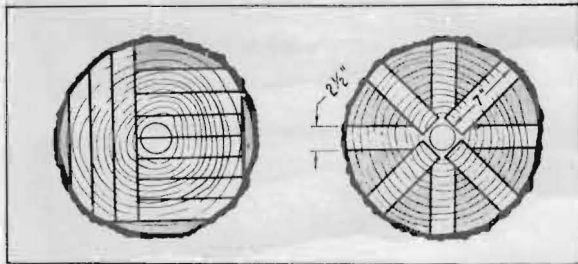


FIGURE 29 — Other methods of plank-sawing (left) and quarter-sawing (right) stock blanks. The shaded areas represent wasted wood. The pith at the center and the sapwood at the outer perimeter are not normally used. (Photo courtesy National Rifle Association)

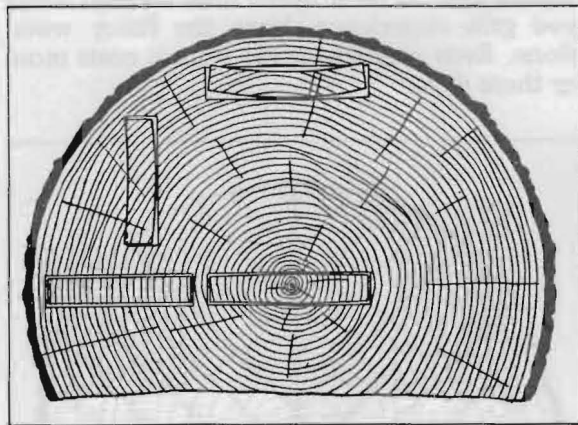


FIGURE 30 — Shrinkage and distortion vary, depending on where the blank is positioned in the log. Tangential blank shrinkage is about twice as great as that of the radial blanks shown in the top portion of the log. (Photo courtesy National Rifle Association)

#### GUN STOCK DESIGN — RIFLES

The modern, properly designed rifle stock is a thing of beauty and grace, a harmonious blend of wood to metal, achieved by flowing and tapered lines. Symmetry and purity of form must also complement function — providing strength, comfort, and ease of handling for the shooter (Figure 31).

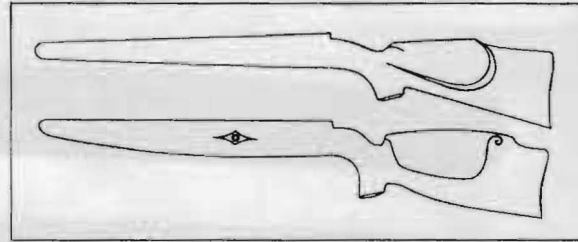


FIGURE 31 — The top design reflects classic sporter simplicity with good, straight lines and full curves. The lower stock exemplifies most of the mistakes made by the amateur designer — the bottom lines sag and are pot-bellied, the pistol grip droops, and the cheekpiece resembles a bassett hound's dewlaps. (Photo courtesy National Rifle Association)

#### ANSWERS

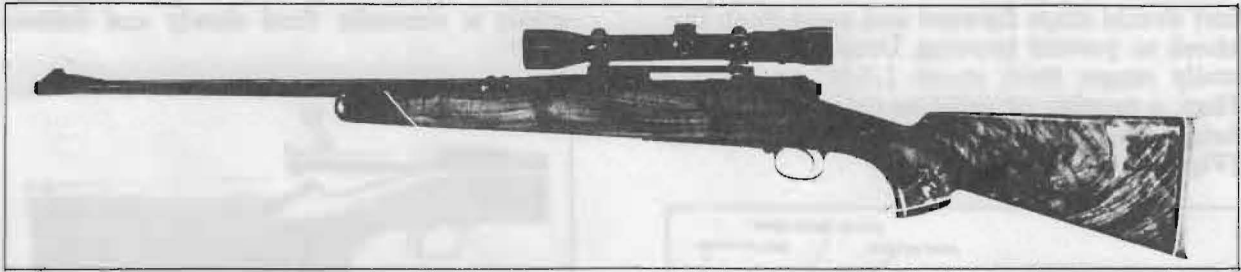
2

1. False
2. False
3. True
4. True
5. True

Yes, one can use fancy words to describe what a gun stock is or should be. But whether a stock design is good, bad, or indifferent really boils down to a gut feeling. To anyone past the BB gun stage, and almost regardless of personal preference, some stocks look like stocks *ought to look*; others do not. When a rifle is swung to the shoulder, and if the dimensions are reasonably correct, the stock either *feels right* or it doesn't. One man may prefer a classic-style stock, another a more contemporary Monte Carlo design. Yet both will usually agree on whether a given stock, regardless of design, looks *good* or like something swung over home plate (Figure 32).

Most of today's commercial stocks are acceptable, and more or less based on traditional or currently popular lines. A few are inspired. The difference between magnificence and mediocrity is often no more than a fraction of an inch in pistol grip diameter or placement. A few degrees difference in taper at the bottom of the forearm or buttstock, or in the curve or radius of the grip or forearm tip, can also determine whether the result is so-so or sensational.





**FIGURE 32** — The smooth, flowing lines of the traditional sporter stock haven't changed much in 50 years, proving the merit of the design. The only concession to "progress" in the modern stock shown is the forward "thrust" of the forend tip angle.

Probably the worst examples of contemporary stock design are by enthusiastic, if misguided, amateurs. After you've finished a few machine-shaped stocks, you may wish to design your own. But leave that project for later. The best custom stocks are those which are slightly modified versions of existing stocks. Gun buffs are traditionalists and suspicious of change. With few exceptions, like the thumbhole stock, an acclaimed "new" stock is generally an old one with slight but strategic changes that give the effect of a "brand-new" stock!

#### STOCK LAYOUT

There are a few rules to remember in cutting blanks (which amount to basic stock layout). Highly figured and/or curly-grained wood occurs near the ground or root portion of the trunk, or in a forked trunk or limb area. This type of grain or figure belongs in the butt portion of the stock only, and should not extend up near or into the pistol grip. Once you're past the root or ground part of the trunk, and assuming there are no large limbs or forks, the grain has a natural curve that can be used to advantage. Ideally, the grain in a rifle stock should follow the curve of the stock and then run up against the form of the rifle barrel. If and when the stock warps, the pressure is comparatively easy to correct. A stock that warps away from the barrel leaves an unsightly gap, although accuracy may be maintained in most instances by glass bedding.

When laying out stock blanks, a template (preferably of clear plastic) should be used, with the template shifted around until the most desirable grain layout is achieved (Figure 33). The wood that is left may often be used for forearms and for handgun stocks. Stock layout is an art in itself.

Let's assume that you're going to design your own rifle stock. Bear in mind that walnut is expensive and that the slabs are sawed as thin as possible, usually 2½" to 3" thick, adequate for a cheekpiece or Monte Carlo if

you're careful and don't goof. The length is usually 34" to 36", height 10" to 12", which is sufficient for all one-piece stocks except the full-barrel-length Mannlicher types.



**FIGURE 33** — When laying out a stock, shift the pattern until the grain flow is the most advantageous for strength. (Photo courtesy National Rifle Association)

Measurements are not as critical for rifles as for shotguns because the rifleman tends to adapt to his gun. Nevertheless, we must have a starting point (Figures 34 and 35). The first measurement to consider is trigger pull length — which for the average shooter is 13½". In any event, the stock should be of a length to position the thumb and nose from 1" to 1-1/8" apart when the rifle is in firing position. Pitch should be about 2". (Pitch, as you'll remember, is the distance of the muzzle from the wall when the butt of the gun is placed flat on the floor with its heel up against the wall.)

The distance between the front of the comb and the tang of the receiver is critical because this determines the length of the pistol grip and the ease with which the shooter can grip the gun and reach the trigger — with or without cramping. This distance varies from 2-3/4" for shooters with small hands to as much as 3-1/8" for basketball players.

#### DROP AT COMB AND HEEL

Drop at the front of the comb is another important dimension. The comb must be sufficiently low to permit the bolt to clear when it is drawn fully to the rear (Figure 36). The comb should be high enough to gently touch the cheek of the shooter and provide some support. A scope requires a higher comb than iron sights. A hard-kicking rifle is better equipped with a low rather than high comb,

and should slope forward and away from the cheek to prevent bruising. Drop at comb generally ranges from about 1-3/8" to 1-3/4". Here, a number of variables determine proper height, and the fit-and-try method is indicated (Figure 37).

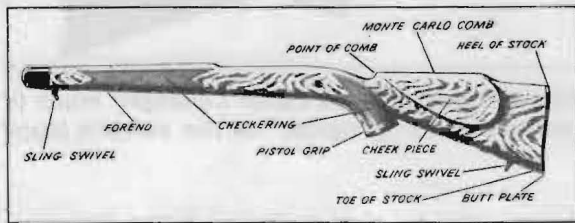


FIGURE 34 — Nomenclature of a modern rifle stock. (Photo courtesy Complete Book of Rifles and Shotguns by Jack O'Connor)

Drop at heel is usually just a bit more than the drop at the front of the comb. The less variation between the two measurements, the straighter the stock and the less the apparent recoil. Most stocks have a drop at heel of around 2" to 2-1/2".

Stocks with a generous drop at the heel, say 2-1/2" to 3", are quicker to mount to the shoulder and are most often used on the comparatively low-recoil lever-actions. The straight stock is the hallmark of the bolt-action rifle,

which is normally fired slowly and deliberately.



FIGURE 36 — The comb must be sufficiently low for the bolt to clear without scraping the wood. (Photo courtesy National Rifle Association)

Once the drop at the comb and the heel have been established, the top line of the buttstock (without Monte Carlo or roll-over cheek-piece) is firmed up. The angle of the bottom line of the buttstock is cut to establish the pitch of the stock. The desired length of the recoil pad (approximately 5") determines the distance between the heel and the toe of the butt.

Before going on, please do Programmed Exercise 3. Make sure you write your answers on a separate sheet of paper before looking at the answers on the page specified.

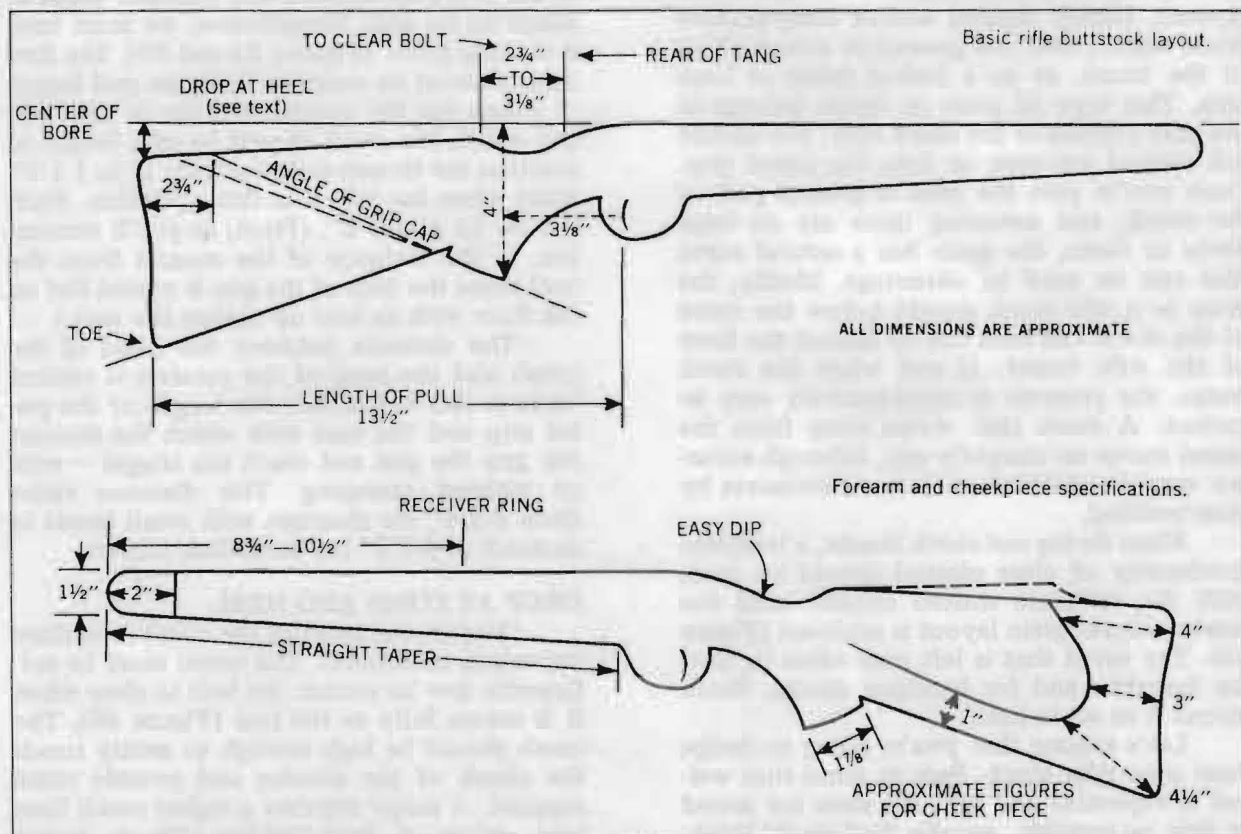


FIGURE 35 — Basic rifle stock layout. (Photo courtesy National Rifle Association)

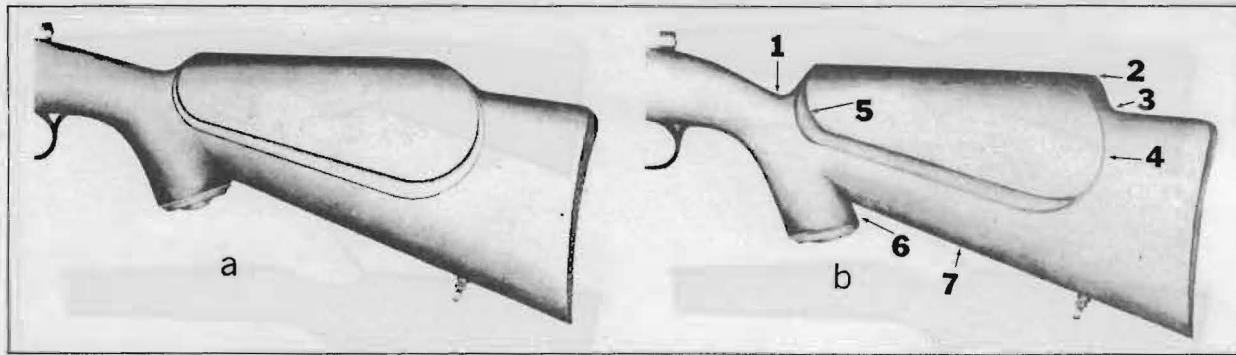


FIGURE 37 — (a) A nicely proportioned stock of heavy Monte Carlo design for a medium-heavy varmint rifle. (b) A few of the common faults in stock design: Grip cut too deeply (1) and rise to comb too sharp and straight. Rise to comb from stock line (2) ungracefully abrupt. Top line of stock (3) too low. This line should be straight from the top of the buttplate to the forward point of the comb. Cheekpiece poorly laid out (4-5). True arcs of a circle at the back and front of the cheekpiece would look better as in sketch "a." Grip (6) longer than necessary. Stock line (7) too low at grip. This line should be straight from the bottom of the buttplate to the rear of the trigger guard. Design errors are magnified to emphasize the effect they have on stock proportions. Even a hint of any of these faults is enough to ruin an otherwise good-looking stock. (Photo courtesy National Rifle Association)

### PROGRAMMED EXERCISE

3

1. True or false? Since the rifle is a long-distance, accuracy firearm, stock measurements are more critical in affecting accuracy and pointability than is true for shotguns.
2. True or false? Most stocks have a drop at the heel of from 2" to 2½" and this drop is generally less than the drop at the comb.

Answers on Page 18

### The Pistol Grip

The placement and shape of the pistol grip and the comb contour (Figure 38) have more to do with the beauty (or lack of it) of a stock than almost any other factor.

The pistol grip affords more opportunity for artistic excellence or brutal butchery than any other portion of the stock. Like a well-turned ankle, the grip should be as trim as possible without sacrificing strength. Grain placement has as much or more to do with strength here than the diameter of the grip. Most commercial stocks, made of wood of dubious quality, incorporate pistol grips that are a bit too thick to be artistically pleasing. The grip diameter measurement is usually taken at a point about 1/2" below the tang. While there is no set rule, trim pistol grips

measure about 4-5/8" to 4-3/4", the heavy-handed variety from around 4-7/8" to 5-1/4" in diameter (Figure 39).

Ideally, the front curve of the pistol grip should form part of a perfect circle. The distance from the center of the trigger to the bottom front edge of the pistol grip, for the average hand, should be about 3-1/2". A draftsman's compass can be used to scribe your arc, starting at a point directly to the rear of the trigger guard on the bottom of the stock. You adjust the radius of your circle until the curve and stopping point (the nearest point) of the pistol grip "look right" when that 3-1/2" spacing is maintained. This, and determining the angle of your pistol grip cap, is where the fun comes in. You can use any number of curves to get that 3-1/2" spacing (Figure 41).

Once you have established the bottom curve, the top curve of the pistol grip is relatively easy. You parallel the bottom curve until you break the downward sweep and curve up to meet the front of the comb. Just *where* you break the curve is another point that separates the amateur from the artisan. One simply proceeds on the basis of "feel" and experience. Other than the perfect circle axiom (and even this is subject to change, see Figure 40), there are no hard and fast rules for defining pistol grip specifications. If there were, stocks could be designed by computer.

### Undercutting the Comb

The pistol grip is part of the buttstock and should not be treated as a separate entity. It must flow into the butt area with no tapering or indentation at the sides (Figure 41).



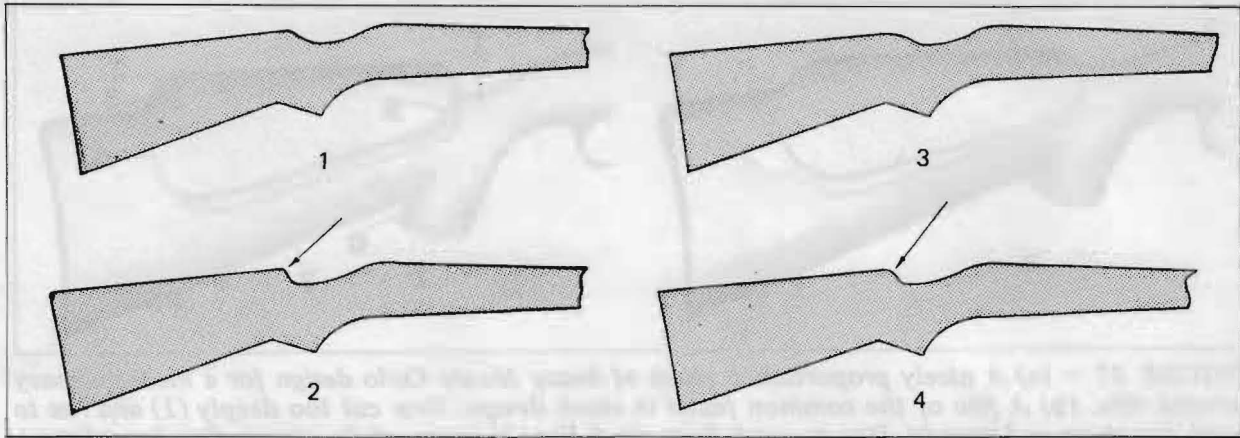


FIGURE 38 — Comb profiles: (1) A gradual curve is only suited for shooters who hold the thumb alongside the pistol grip; (2) permits the thumb to cross over and is better designed; (3) is hopeless, much too thick; (4), a double-radius curve, is the best of all.

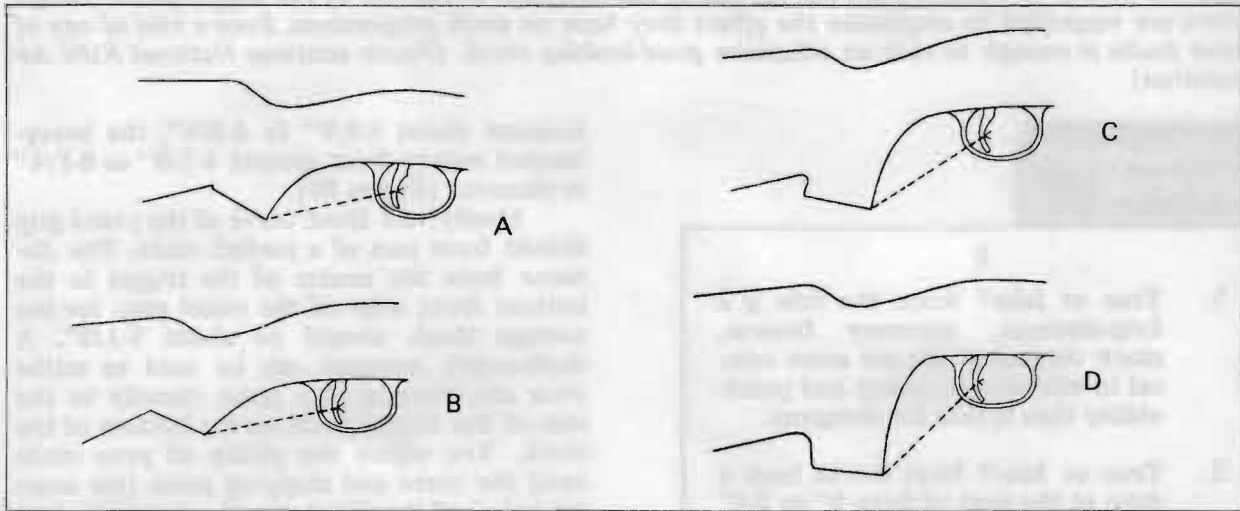


FIGURE 39 — When the curve is wrong, the 3½" distance from the grip to the trigger may be correct and the result a disaster. Only drawing A shows the correct curve and spacing.



FIGURE 40 — This flared pistol grip cap violates the "perfect circle" axiom, yet the result is pleasing to the eye. For every rule, there's an exception. (Photo courtesy National Rifle Association)

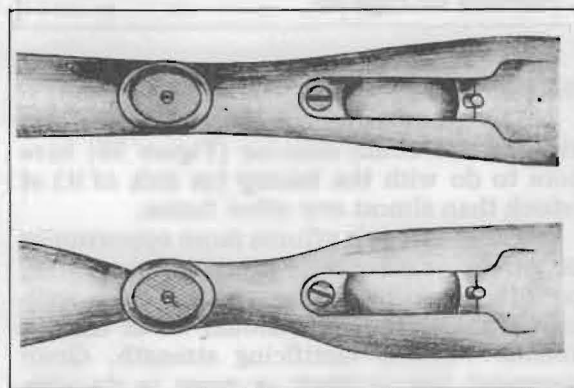


FIGURE 41 — The pistol grip must flow evenly into the buttstock, as shown in the top sketch. The cinched-in version is weak in a crucial area, and usually results from concentrating on the grip rather than on the stock as a whole. (Photo courtesy National Rifle Association)

| ANSWERS |       |
|---------|-------|
|         | 3     |
| 1.      | False |
| 2.      | False |

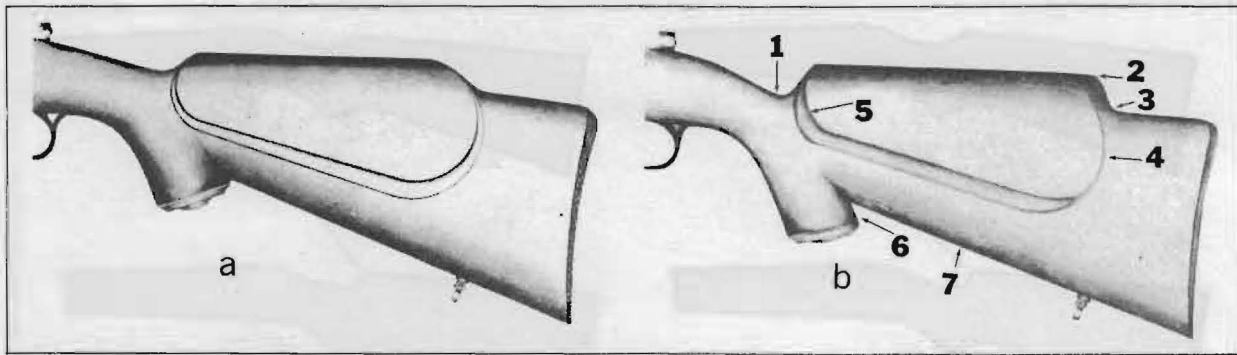


FIGURE 37 — (a) A nicely proportioned stock of heavy Monte Carlo design for a medium-heavy varmint rifle. (b) A few of the common faults in stock design: Grip cut too deeply (1) and rise to comb too sharp and straight. Rise to comb from stock line (2) ungracefully abrupt. Top line of stock (3) too low. This line should be straight from the top of the buttplate to the forward point of the comb. Cheekpiece poorly laid out (4-5). True arcs of a circle at the back and front of the cheekpiece would look better as in sketch "a." Grip (6) longer than necessary. Stock line (7) too low at grip. This line should be straight from the bottom of the buttplate to the rear of the trigger guard. Design errors are magnified to emphasize the effect they have on stock proportions. Even a hint of any of these faults is enough to ruin an otherwise good-looking stock. (Photo courtesy National Rifle Association)

### PROGRAMMED EXERCISE

3

1. True or false? Since the rifle is a long-distance, accuracy firearm, stock measurements are more critical in affecting accuracy and pointability than is true for shotguns.
2. True or false? Most stocks have a drop at the heel of from 2" to 2½" and this drop is generally less than the drop at the comb.

Answers on Page 18

### The Pistol Grip

The placement and shape of the pistol grip and the comb contour (Figure 38) have more to do with the beauty (or lack of it) of a stock than almost any other factor.

The pistol grip affords more opportunity for artistic excellence or brutal butchery than any other portion of the stock. Like a well-turned ankle, the grip should be as trim as possible without sacrificing strength. Grain placement has as much or more to do with strength here than the diameter of the grip. Most commercial stocks, made of wood of dubious quality, incorporate pistol grips that are a bit too thick to be artistically pleasing. The grip diameter measurement is usually taken at a point about 1/2" below the tang. While there is no set rule, trim pistol grips

measure about 4-5/8" to 4-3/4", the heavy-handed variety from around 4-7/8" to 5-1/4" in diameter (Figure 39).

Ideally, the front curve of the pistol grip should form part of a perfect circle. The distance from the center of the trigger to the bottom front edge of the pistol grip, for the average hand, should be about 3-1/2". A draftsman's compass can be used to scribe your arc, starting at a point directly to the rear of the trigger guard on the bottom of the stock. You adjust the radius of your circle until the curve and stopping point (the nearest point) of the pistol grip "look right" when that 3-1/2" spacing is maintained. This, and determining the angle of your pistol grip cap, is where the fun comes in. You can use any number of curves to get that 3-1/2" spacing (Figure 41).

Once you have established the bottom curve, the top curve of the pistol grip is relatively easy. You parallel the bottom curve until you break the downward sweep and curve up to meet the front of the comb. Just *where* you break the curve is another point that separates the amateur from the artisan. One simply proceeds on the basis of "feel" and experience. Other than the perfect circle axiom (and even this is subject to change, see Figure 40), there are no hard and fast rules for defining pistol grip specifications. If there were, stocks could be designed by computer.

### Undercutting the Comb

The pistol grip is part of the buttstock and should not be treated as a separate entity. It must flow into the butt area with no tapering or indentation at the sides (Figure 41).

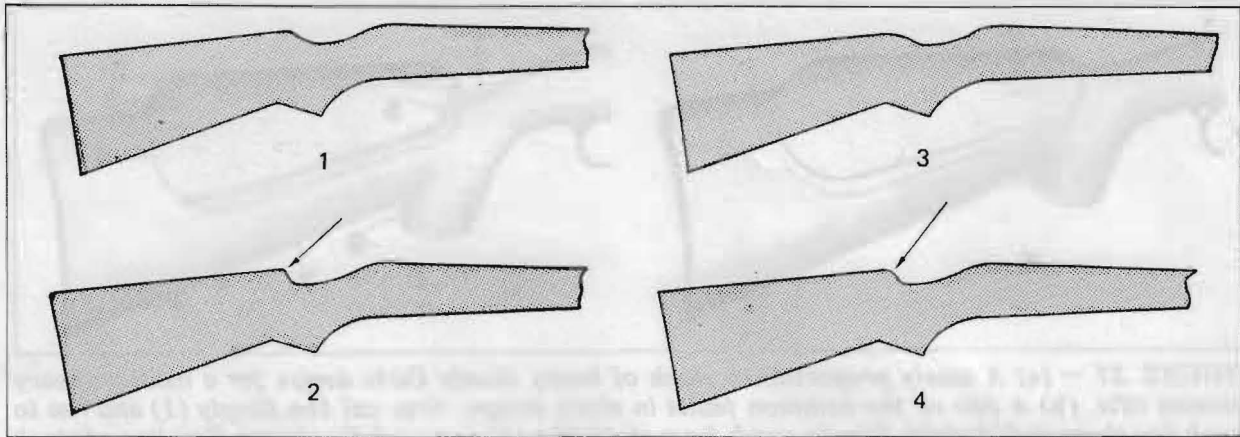


FIGURE 38 — Comb profiles: (1) A gradual curve is only suited for shooters who hold the thumb alongside the pistol grip; (2) permits the thumb to cross over and is better designed; (3) is hopeless, much too thick; (4), a double-radius curve, is the best of all.

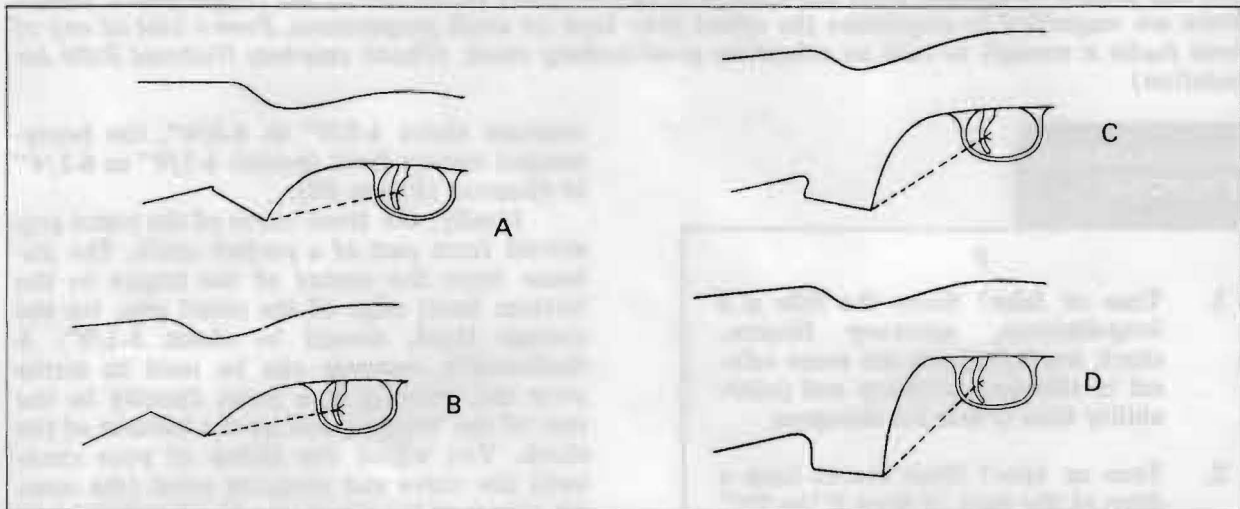


FIGURE 39 — When the curve is wrong, the 3½" distance from the grip to the trigger may be correct and the result a disaster. Only drawing A shows the correct curve and spacing.



FIGURE 40 — This flared pistol grip cap violates the "perfect circle" axiom, yet the result is pleasing to the eye. For every rule, there's an exception. (Photo courtesy National Rifle Association)

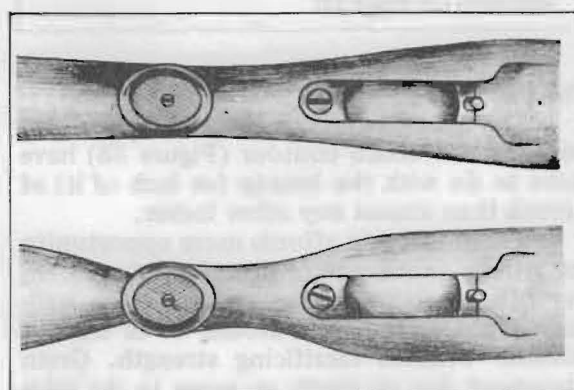


FIGURE 41 — The pistol grip must flow evenly into the buttstock, as shown in the top sketch. The cinched-in version is weak in a crucial area, and usually results from concentrating on the grip rather than on the stock as a whole. (Photo courtesy National Rifle Association)

**ANSWERS**

3

1. False

2. False



The comb may or may not be undercut. Generally, undercutting improves the appearance of a stock, providing it's done correctly. Here, too, artistry and "feel" are a must. The overhang (top edge of the undercut) should run approximately parallel to the top curve of the pistol grip, and should flow into the buttstock gradually. This work is best done with a round rasp. There is no excuse for the sharp drop-off so often seen. Figure 42 shows the right and wrong ways of making a comb undercut.

The buttstock should resemble a long oval in cross-section (Figure 43), as a slab-sided stock is no more attractive than a slab-sided human. The width and depth of the buttplate area, in fact the size and weight of the stock as a whole, should be relative to the caliber (and recoil) of the gun. Obviously, a thin, light stock doesn't belong on a magnum rifle. The more area that bears against your shoulder, the less the apparent recoil.

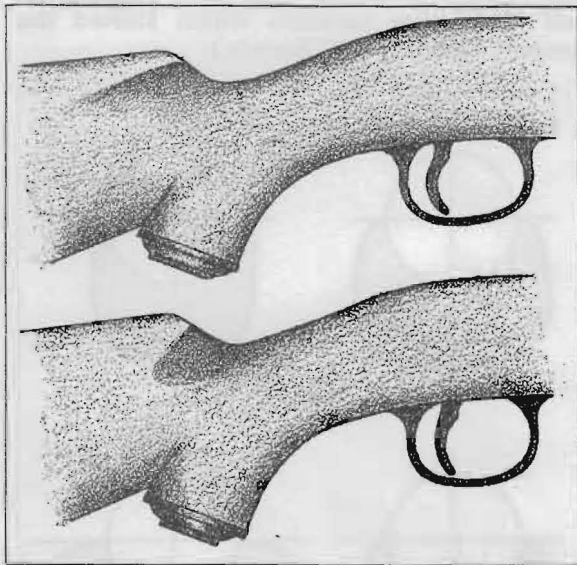


FIGURE 42 — Correct (top) and incorrect (bottom) methods of undercutting a comb. (Photo courtesy National Rifle Association)

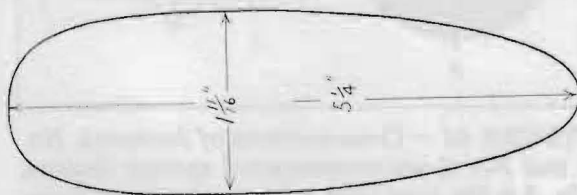


FIGURE 43 — Typical cross-section of a rifle butt without cheekpiece.

#### Cheekpieces and Monte Carlo Stocks

The cheekpiece has been around as long as the first guns. The purpose of a cheekpiece is, ostensibly, to cushion the cheek against recoil while providing facial support. As a

matter of practical fact, the cheekpiece is usually incorporated for decorative rather than functional purposes, especially on rifles. On shotguns there is more justification — that of positioning the stock in the same place relative to the face when the gun is thrown into position. (However, very few American shotguns, custom or factory, incorporate cheekpieces.)

Cheekpieces are most often found today on sporter rifles that will be equipped with scopes (or will be used with both scope and iron sights).

There are a variety of different-style cheekpieces (Figure 44), all of which are not available on commercial rifles. Modern gun makers such as Winchester and Remington offer plain stocks, or the Monte Carlo variety with or without cheekpieces. All custom stock makers offer cheekpieces. The shooter who is particular enough to want a custom stock as often as not wants one that is not commercially available. As a result, semi-inletted stocks with cheekpiece are available from Fajen, Bishop, and other manufacturers.

#### The Monte Carlo Stock

Cheekpieces sometimes change the line of the comb. On a Monte Carlo stock, the comb rises like the hump of a surfacing whale and is offset to slide by rather than jolt the shooter's face under recoil (Figure 45). This feature is designed to raise the rifleman's face, providing support (and comfort) while using scope sights. Unfortunately, the face is raised so high that iron sights aren't compatible with the design. Most Monte Carlo stocks are for scope-mounted rifles only.

The Monte Carlo stock has gained favor with trapshooters as it aligns the barrel for a rising target while providing a solid anchor point for the face.

The Monte Carlo rifle stock became popular in the 1950's largely because of Roy Weatherby, who at that time equipped his super-magnums with such stocks. Today Monte Carlos are enormously popular and come in various styles, some with roll-over cheekpieces.

#### Forearms

Forearm design is not nearly as critical as the design at the other end. Considerable latitude exists for expressing one's ideas without necessarily trampling on tradition. Certain general rules apply, of course. Classic stocks, with or without cheekpiece, should have a rounded-type forearm tip; Monte Carlo stocks usually have an angular forearm tip, jutting forward or backward. (These aren't rules, just accepted practice.)

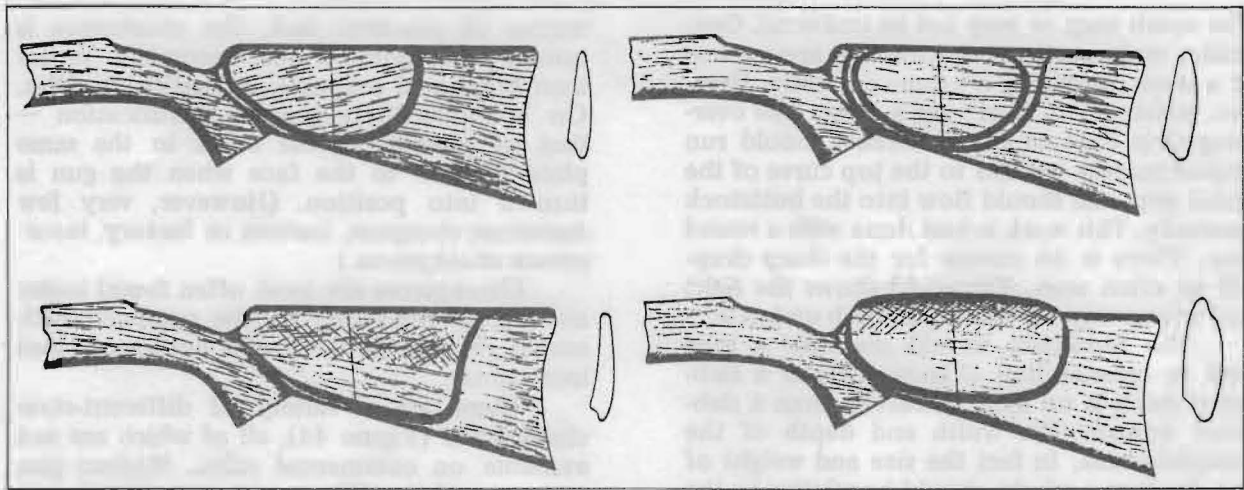


FIGURE 44 — Typical cheekpiece designs. Cross-sections of the cheekpieces where the vertical lines cross the stocks are shown to the right of the respective sketches. (Photo courtesy Gunsmithing by Dunlop, Stackpole Book Co.)

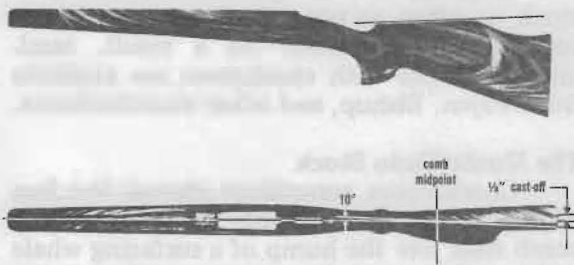


FIGURE 45 — The comb on a Monte Carlo stock (top) slopes down to lessen the tendency of the comb to chop the shooter's face. The comb has a cast-in at the rear and a cast-off at the front, which tends to make the comb slide by rather than into the shooter's face at recoil. (Photo courtesy National Rifle Association)

The length of a rifle's forearm should be sufficient to position the front sling swivel where it won't bang into the hand at recoil and to provide proper gun balance; it generally measures one-half the barrel length. Width depends on the caliber (and barrel diameter) and purpose of the rifle. If it's going to be used for mountain hunting, weight will be a factor and the forearm should be light and trim.

If the rifle will be used for varmints or for benchrest shooting, the stock may be wide and relatively flat. Regardless of design, however, the forearm should be pleasingly rounded at the sides (Figure 46).

While a stock blank of 34" to 36" is sufficient for a conventional sporter stock, a longer blank of at least 42" is required for the long Mannlicher-style stock which extends to the end of the barrel. If graceful lines are to be maintained, the barrel length with a Mann-

licher stock should not exceed 22". (The original Mannlicher carbines which started the concept had only 18" barrels.)

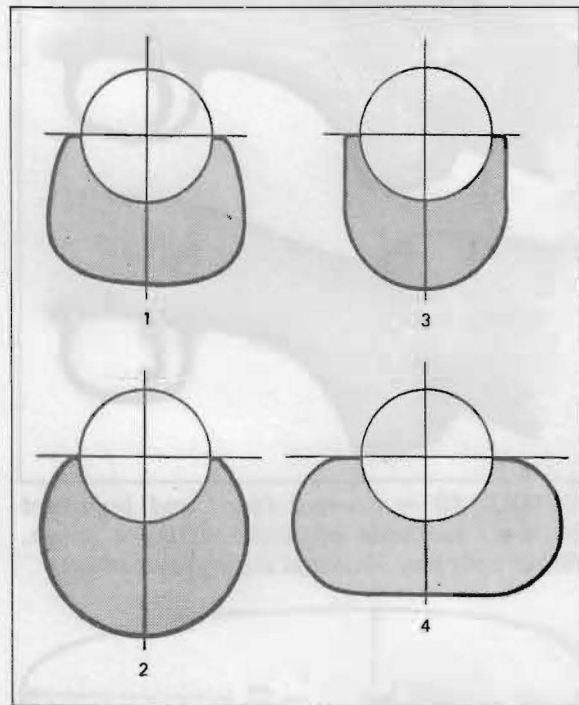


FIGURE 46 — Cross-sections of forearms. No. 1 and No. 2 are conventional sporter designs; No. 3 is the type used with most lever-actions; No. 4 is commonly found on target and varmint rifles.

A Mannlicher stock incorporates very little wood forward of the receiver ring, is not as "full" as a conventional sporter forearm, but provides pleasingly slim lines out to the metal stock cap at the muzzle. This type of

stock is not for the amateur. A good deal more work is required, and the full-length bedding required can be a king-size headache.

We urge you to finish a few stocks of the semi-inletted, roughed-out variety before designing your own from scratch. You'll not only save a lot of work and time, but you'll be gaining experience and a sense of what is right. Almost without exception, the commercial rough stocks are well designed and provide an excellent starting point. It's great to have original ideas — when they're based on sound knowledge. Forget for now that "different" stock that will revolutionize the industry. In firearms especially, innovations are slow to gain acceptance. Evolution, not revolution, is the key to successful stock design.

### Shotgun Stock Design

The most important aid to the accurate pointing and shooting of the shotgun is the stock. Other than the one-piece stocks used on bolt-action shotguns, scattergun wood always comes in two sections. The buttstock is the most important because the shotgun, except for a rudimentary bead, has no sights. The shooter's ability to point the gun and hit is largely dependent upon the design and fit of the stock (Figure 47).

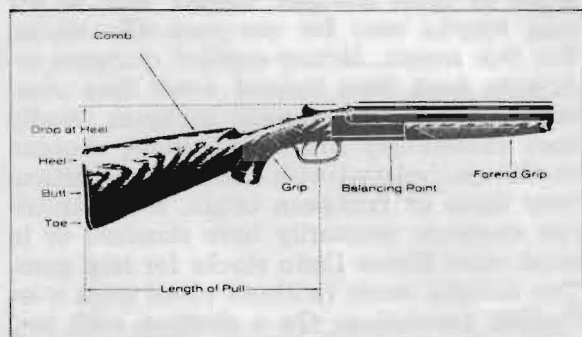


FIGURE 47 — Shotgun stock nomenclature. (Photo courtesy Complete Book of Shotguns and Rifles by Jack O'Connor)

### Comb Dimensions

The comb of a shotgun is generally believed to be its rear sight. Actually, a shotgunner's rear sight is his eye, and the position of his eye relative to the sighting plane of the barrel is determined by the height and thickness of the comb. If the comb is too low, the shooter's eye will be too low and he will shoot low. This is especially objectionable when hunting upland game birds. Normally, fast-moving birds are shot, as the British put it, "on the rise." And a rising bird, to be hit by a low-combed shotgun, has to be "covered" by the barrels (which involves a bit of guesswork).

On the other hand, a high comb places the shooter's eye higher above the barrels, thus foreshortening the tubes and throwing the shot pattern high. Most upland game hunters and trapshooters prefer a gun with a high comb. They just "touch" the barrel under the rising target and, with the shot charge angling higher than it looks, they center the bird when it is in full view (Figure 48).

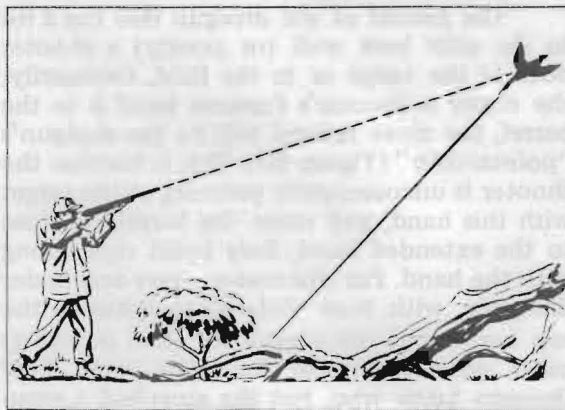


FIGURE 48 — On fast-rising birds, the barrels "cover" and blank out the target when the comb is too low. A high comb with a built-in lead is preferred. (Photo courtesy National Rifle Association)

### The Monte Carlo Shotgun Stock

The long, high Monte Carlo comb, originally a trapshooting innovation, helps the competitive shooter place his cheek at the same spot on the stock, shot after shot. In the course of a long day's shooting, recoil and weariness tend to make stock positioning sloppy. At times like this, a Monte Carlo comb often makes the difference between a powder and missed target (Figure 49).

Irrespective of comb height, comb thickness determines eye alignment relative to the centerline of the barrel. If the comb is too thick, particularly for shooters with heavy cheeks, it is impossible for the shooter to align his eye directly down-center. He will likely crossfire and miss his target. A too-wide comb can also badly bruise the face when the shooter "hunches into the stock" to bring his eye into alignment with the barrel.

A comb which is too thin at the top, particularly at the nose, can also cause facial injury when the sharp edge of the comb rises from recoil and slices into the shooter's cheek. A thin comb can allow the shooter to position his eye too far past the center axis of the barrel, causing him to crossfire. Many trap guns, including almost all custom stocks, have some cast-off to facilitate target alignment.





FIGURE 49 — Model 12 Winchester with Monte Carlo stock by Weatherby, Inc.

#### Forearm Stock Design

The forend of the shotgun also has a lot to do with how well (or poorly) a shooter does at the range or in the field. Ordinarily, the closer a shooter's forearm hand is to the barrel, the more natural will be the shotgun's "pointability" (Figure 50). This is because the shooter is unconsciously pointing at the target with this hand, and when the barrels lie close to the extended hand, they point right along with the hand. For this reason, over-and-under shotguns, with their wide space between the top barrel and the supporting (and pointing) hand, were unpopular for many years. Few shooters knew why, but the guns had a reputation for being lousy "pointers" (Figure 51).



FIGURE 50 — The classic side-by-side double with splinter forearm placed the hand close to the barrels, resulting in splendid "pointability."

Some of the semi-automatic and pump shotguns, with their necessarily large forearms, also point poorly, which is the reason a shooter who changes over to a side-by-side double often improves his hitting dramatically. He thinks his better scores are due to a better stock "fit." This may be so to some extent, but more often it's the pointability factor. The double places the pointing hand closer to the tube than does a pump or autoloader, with more hits per box of shells often the result.

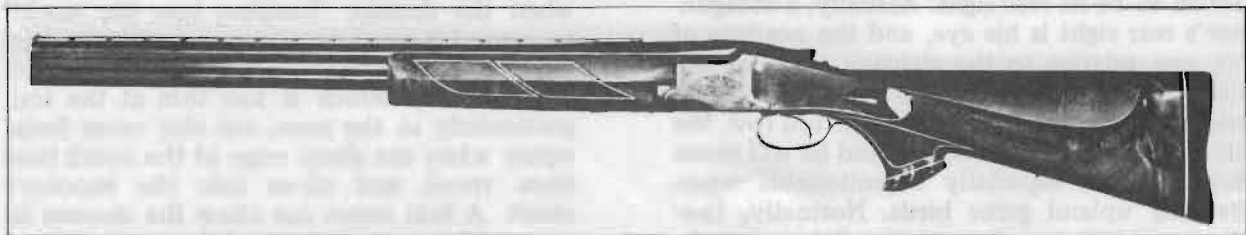


FIGURE 51 — Modern stacked-tube doubles have less separation between the pointing hand and barrels than earlier models. The gun shown has a custom thumbhole stock, of dubious value on seaterguns.

Many shooters prefer the wide beavertail or semi-beavertail forearm (Figure 52). This was originally a double-barreled shotgun development, affording greater protection to the hand from hot barrels than did the original splinter types. This flat forearm soon became popular for all types of shotguns, and the "beavertail" designation was used to describe any wide, hand-filling piece of forearm wood.

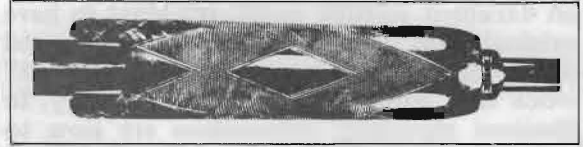


FIGURE 52 — The beavertail forearm, introduced with side-by-side doubles, replaced the splinter forearm. It is now used with all types of shotguns, including pumps.

Before going on, please do Programmed Exercise 4. Make sure you write your answers on a separate sheet of paper before looking at the answers on the page specified.

#### BETTER-GRADE WOODS ARE USUALLY USED FOR SHOTGUNS

It is usually easier to obtain finely figured wood in short shotgun lengths than in the long lengths used for one-piece rifle stocks. For this reason, factory-stocked shotguns ordinarily have finer figured wood than commercial rifles. Higher-grade shotguns usually have exceedingly fine wood. Some shotgun stocks are designed with cheekpieces, particularly those of European origin, while American shotguns ordinarily have standard or in most cases Monte Carlo stocks for trap guns. The straight stock (without pistol grip) is an English innovation. On a shotgun with two triggers, the straight grip allows one to shift the hand from one trigger to the other more easily than does the pistol grip.

With the exception of some of the finer double-barreled shotguns, most shotgun stocks today are turned on machines (pantographs) which have the capability of maintaining tol-

**PROGRAMMED EXERCISE**

4

1. True or false? Most Monte Carlo stocks are not suited for guns with iron sights, but are suitable for scope-mounted guns.
2. True or false? Actually, a shotgunner's rear sight is his eye.
3. True or false? Most upland game hunters and trapshooters prefer a gun with a low comb.
4. True or false? The high Monte Carlo comb on shotguns helps the shooter place his cheek at the same spot on the stock, shot after shot.
5. True or false? A comb which is too thin at the top can cause facial injury when the comb rises due to recoil.

Answers on Page 24



*FIGURE 53 — Top-grade shotguns, like the two Winchester Model 21's at the top, invariably boast superb wood. Comparatively inexpensive shotguns, like the Spanish double at the bottom, also incorporate far better than "average" stock wood. (Photo courtesy National Rifle Association)*

erances of .002" to .003". These machines can turn out one to a dozen gun stocks from walnut blanks, ready for finish-sanding, in less than four minutes. The double-barreled shotgun, particularly one with sideplates or sidelocks, is, of course, a different matter — as considerable hand-fitting is necessary to ensure proper joining of wood to metal.

**FIREARMS STOCKS — HANDGUNS**

As a general rule, a handgun stock is nothing more than the "handle" with which the shooter holds onto the gun. Handgun stocks are usually called grips, but the correct word is "stock." Stocks may be made of plastic, wood, or even hard rubber. Original handgun or pistol stocks were one-piece and are represented by the old and graceful flintlock dueling and military pistols (Figure 54).

With the advent of the repeating pistol and the handgun frame came the one and two-piece stocks common today. The original Colt revolvers had solid one-piece wood stocks which were inletted to receive the frame straps of the revolver (Figure 55). Later, and to eliminate the inletting, two-piece hard rubber stocks were used. Such two-piece stocks are laid against the frame on each side of the grip and secured by small screws which draw the pieces together. This style of handgun stocking is the most common today in all American and most foreign-made revolvers.



*FIGURE 54 — Early pistols, like the flintlock U.S. Army model of 1818, had one-piece stocks with inletted sideplates. (Photo courtesy Small Arms of the World, Stackpole Book Co.)*



*FIGURE 55 — Early Colts, like the Navy model of 1851, had a one-piece wood stock. (Photo courtesy Small Arms of the World, Stackpole Book Co.)*

## ANSWERS

4

1. True
2. True
3. False
4. True
5. True

### Revolver Stocks

Smith & Wesson stocks up through World War II were small, rather skimpy pieces of walnut with sometimes-checked panels affixed to the frame by means of a screw and escutcheon nut (a nut with serrated edges which is pressed into wood to keep it from turning) (Figure 56). These old-style stocks flared at the bottom of the grip, and in guns of heavy recoil were quite punishing to the hand (Figure 56). Over the years, several prominent shooters designed stocks to ease this punishment, and their ideas were reportedly incorporated by Smith & Wesson into their post-World War II handguns.

The design of factory-produced handgun stocks leaves much to be desired. The stocks usually follow the shape of the frame very closely and offer little support to the hand. While many single-action revolvers have unchecked stocks, all quality sidearms are checked. Special target stocks are available for target arms.



FIGURE 56 — Smith & Wesson Centennial Model hammerless. Grips were of wood; the design made accurate shooting difficult. (Photo courtesy Small Arms of the World, Stackpole Book Co.)

### FACTORIES DEVELOPED TARGET-STYLE STOCKS

In the late 1950's, the two major revolver manufacturers — Smith & Wesson and Colt — offered target-style stocks as extra-cost options.

The first new S&W stock was the “magna,” in which the wood was brought up close to the top of the frame. This, in effect, widened that portion of the frame that came into contact with the web of the shooter's hand and spread the recoil over a larger area. The result was less apparent recoil and less damage to the shooter's hand.

The second new S&W stock was the so-called “target” model, which maintained the same thickness at the top of the frame as the magna, but incorporated a wood filler below the bottom of the frame between the grip and trigger guard. This gave the gun a “resting place” on top of the shooter's middle finger and kept the gun from slipping back and down through his hand at recoil (Figure 57).



FIGURE 57 — Typical of the new breed of target grips are those mounted on this RG Industries .38 Special target revolver. Note the prominent thumbrest.

About this same time, Colt also redesigned and made a wider standard stock, and introduced a target-type stock with a filler between the frame and the trigger guard, similar to Smith & Wesson's.

Since shooters for many years were unhappy with the factory handgun stocks, quite a large custom stock business grew in the United States. One of the largest custom stock makers today is the Jay Scott Company, which through trial and error has developed its Armarc line of handgun stocks for almost every type of pistol and pistol shooting (Figure 58).

### AUTOMATIC PISTOL STOCKS

Automatic pistols have traditionally, and with few exceptions, been stocked with two rather plain, checkered, thin slabs of wood affixed to each side of a grip frame by one or more screws. A classic example of this particu-



lar type of stock is that of the Colt 1911 .45-caliber pistol. During World War II, when wood became scarce, the stocks were made of a bakelite-type plastic. They are currently made of a brown cast phenolic or bakelite plastic. Stocks for the higher-grade 1911 target handguns are again being manufactured of wood with a small gold seal of a rampant colt in the center (Figure 59).

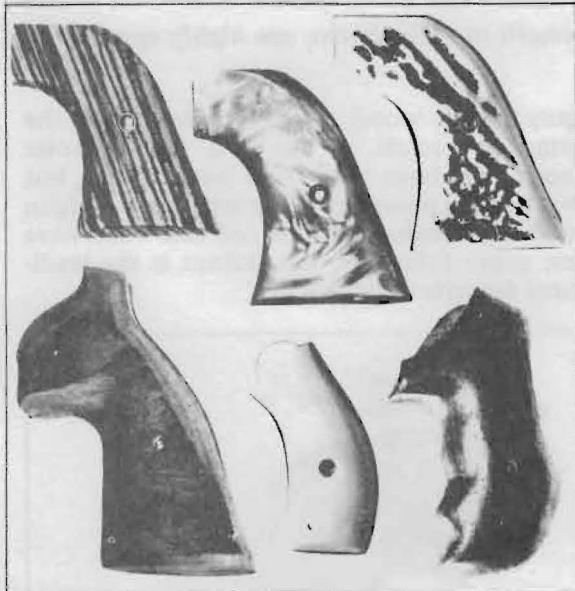


FIGURE 58 — A variety of custom and unfinished walnut grips are available from several suppliers. Above are a few of the stocks offered by Jay Scott.



FIGURE 59 — The Colt Model 1911A1 of World War II, a target-grade version with wood grips.

A different and more practical design for a semi-auto target handgun was recently introduced by Hi-Standard on their high-quality .22-caliber Citation target pistol (Figure 60). This particular stock is both attractive and functional.



FIGURE 60 — Hi-Standard's Citation target pistol with checkered walnut stock and thumbrest.

Most handgun stocks currently manufactured are still made from walnut, although Colt is utilizing a type of brown-colored plastic in some models. Smith & Wesson's higher-grade and magnum revolvers use a large, target-style stock made of imported exotic wood.

#### SPECIALIZED HANDGUN GRIPS

One of the more interesting custom handgun stock designs was developed by a Los Angeles policeman in the early 1950's. The so-called Starkey or L.A.P.D. stock is made for the gun and the shooter, and is based on the principle that a man's hand is narrower at the bottom than at the top as it closes. Factory handgun stocks are just the opposite, wide at the bottom and narrow toward the top. The theory of the tapered grip is that the shooter can hold the gun better and with less strain, and in the case of a policeman it's almost impossible to wrest the gun from his hand. The taper of the Starkey stock is achieved by grinding away a small corner of the forward bottom portion of the frame, thus allowing the stock to attain a smaller width at the bottom than would be possible if the frame were less full-size.

Target shooters, being a breed unto themselves, have created the greatest variations in handgun stock design. Most target shooters prefer a so-called thumbrest along the side of one stock so that they can lay the thumb on this rest where it is out of the way and won't squeeze the gun, which helps the shooter position his hand in the same place from one shot to the next. Other shooters like rough grips and use sandpaper reversed to achieve this effect.

The most extreme examples of handgun design are represented by the International Slow-Fire .22 target handguns (Figure 61). This grueling pistol match calls for 50 shots at 50 meters. Guns using set triggers, normally set so light that the weight of the trigger will



FIGURE 61 — Free-form match pistols, like the Haemmerli models shown, are highly specialized and are more properly worn than held.

fire the gun if the gun is lifted past horizontal, are commonplace. With this type of gun, grip is extremely important, and the stocks are literally worn like a glove. The shooter inserts his hand into, through, then around the stock. When he's ready to shoot, it's almost impossible for him to attain any variation in grip or finger position from one shot to the next.

#### MAKING CUSTOM STOCKS

For shooters making stocks for themselves, or gun pros making custom stocks for customers, it is a simple job to inlet the two halves of the stock blank so that they meet exactly halfway around the frame when the connecting spacer is added (Figure 62). The outside of the stock is then shaped, roughly at first, and then by removing smaller and smaller amounts of wood until it fits the specific shooter.

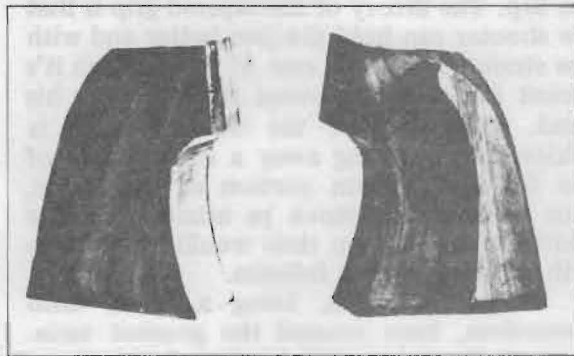


FIGURE 62 — Roughed-out grips for a single-action Colt. The connecting spacer, equal in thickness to the width of the frame, is glued to the segment at the right.

The wood used in custom handgun stocks has to be especially selected, as a handgun stock is much smaller than a rifle or shotgun stock. The figure that would appear to be full and pretty in a rifle stock could be almost non-existent in the small pistol stock (Figure 63). Consequently, wood selected for handgun stocks must be highly figured, almost to an extreme, to show a recognizable grain or

figure. Such wood usually comes from the stump or crotch of the tree. Some exotic woods have been tried from time to time, but have seldom proved popular with the handgun fraternity. Birdseye maple and rosewood have won some followers, but walnut is the traditional favorite (Figure 64).



FIGURE 63 — Checkering, carving, and stippling are more often used to fancy-up a handgun stock than are "exotic" grains.



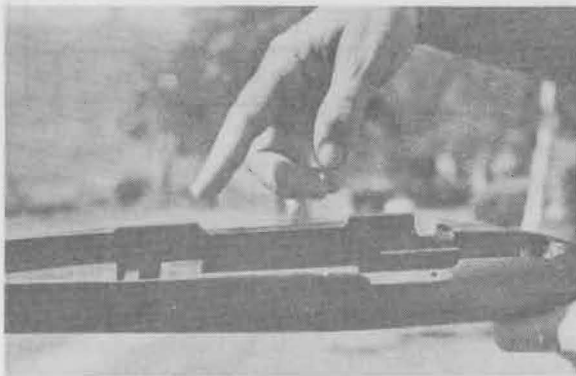
FIGURE 64 — Presentation Smith & Wesson 9mm autopistol. Handsomely grained walnut "belongs" on the finest guns and will never really be replaced by ivory or "far-out" woods.

## THE MACHINE-FORMED STOCK

A few stock makers still work from blanks or flitches, literally starting from scratch. Unless, however, a new stock design is being created, there is little justification for such a time-consuming procedure. A machine called a pantograph, which is widely used by commercial stock and furniture manufacturers, can often perform in minutes what requires hours to accomplish by hand.

The pantograph consists of a smooth tracing stylus and arm which are mechanically linked to from three to a dozen "slave" units. The operator presses and moves the stylus against a smooth aluminum or polished wood master stock, carefully following each contour and recess in a prescribed pattern. The slave units, each with a power-driven cutting head positioned against a stock blank, follow every movement of the tracing stylus. By the time the operator has completed his pass over the master stock, each slave cutter has produced an exact duplicate stock. (If mistakes are made in the tracing, they, too, are duplicated.) It is possible to use an old stock as a pattern and have it duplicated for a customer, but at extra expense, of course.

Such machines not only shape the outside contours; they also inlet to the stock's interior dimensions. Pantographs vary widely in capacity and in tolerance control. Some machines do 90% to 95% of the work; others maintain tolerances so precise that only minor sanding and touch-up inletting are required before final finishing (Figure 65).



*FIGURE 65 — Some modern pantograph machines do about 98% of the inletting required in the stock for a bolt-action rifle. (Photo courtesy Complete Book of Shotguns and Rifles by Jack O'Connor)*

The major manufacturers like Bishop and Fajen make semi-finished stocks, sometimes in several styles, for all popular military and commercial actions. When a new action which is available to gunsmiths comes on the market, it usually isn't long until the manu-

facturers modify existing master stocks to accommodate the new action.

## COMMERCIAL FIRMS DO CUSTOM WORK

Sometimes a customer will come in, lugging a particularly fancy flitch he got from his uncle in Ohio or found in an old barn. Unless you have considerable experience and a lot of time (for which your customer is willing to pay), you're better off sending the blank to a pantograph-equipped firm for rough-out than doing the job yourself. You can use one of the company's designs or have the firm duplicate your *own* design.

It is not uncommon for a gun pro to come up with a distinctive stock design that wins the enthusiasm of local shooters. When the orders come in, the gun pro often sends a finished, non-checked stock to the pantograph company as a master. Duplicates are then made, inletted for specific actions, or not inletted if the gun pro will be working with several different types of actions. Such semi-finished, original stocks cost a bit more than those mass-cut to the company's own design, but the savings in time (and the money you don't have to charge your customer for hours of work) are substantial.

A big step for gun pros who develop a real ability in stock design and custom stocking, and who find themselves in the custom rifle-making business, is to buy a used pantograph. Three-station units are sometimes available for around \$1,500 to \$2,000. Even comparatively inexpensive units in this price bracket will completely contour and inlet three stocks in less than an hour!

## CUTTING STOCK WOOD

You may occasionally have the opportunity to buy a valuable walnut, maple, cherry, or apple tree (or trunk) or get it for free just for carting it off location. A little work on your part may produce several hundred dollars worth of good stock wood. The clearing of land for new housing projects often affords opportunities of this type. Developers are seldom aware that toppled trees, particularly large walnut stumps, have any value other than for firewood, and often dump them in adjoining draws and canyons.

If possible, cut the tree yourself, as the wood closest to the ground usually has the most desirable figure. The root base should be dug free and the tree cut below the surface. A tree of less than eight inches in diameter can usually be used only for two-piece stocks due to the pith channel in the center. The larger the tree, the better, as large blanks provide more leeway in grain layout. If you want



to quarter-saw the blanks, the tree must be from 14" to 16" in diameter and there is considerable waste involved. Trunks and limbs of about four inches in diameter, when plank-sawed, can usually be used for forearms and certainly for handgun stocks.

Rifle blanks should be cut about 3" to 3½" thick by 36" long to allow for shrinkage. Forearm blanks vary, but usually run about 12" to 15" in length and from 2½" to 3½" in width (Figure 66). If you can find a sawmill or lumber yard that will do the cutting, fine, but be sure to check for any rocks in the root or ground portion of the trunk, and for nails, or you may wind up paying for a new saw blade. You can, of course, do the sawing yourself with a chain saw. Or get a buddy and use a two-man saw.

### CURING STOCK WOOD

A felled tree should be cut into stock blanks as soon as possible because insects, fungus, sprouts, and feeders growing from the "dead" tree can quickly cause damage. After sawing, the blanks must be cured, seasoned, and dried. If a blank is not of a low and uniform moisture content, it will warp, shrink, or crack shortly after being worked. An acceptable moisture content is from 6% to 8%.

If you have a lot of time, you can place your blanks in a dry shed or attic and separate them with 2" x 4" spacers to permit air circu-

lation. Seal the ends with paraffin to prevent moisture absorption and cracking. Your blanks should be dry enough to work in five to seven years, more or less, but preferably longer depending on the humidity in your part of the country.

A more practical method is to take your blanks to the local kiln (if one exists in your area). Here, because the drying is fast, the blanks should be coated with melted paraffin applied with a brush. If the blank is plank-sawed, the ends and sides should be coated; if the blank is quarter-sawed, all exposed areas should be coated. If you don't apply the paraffin, you can expect your blanks to develop cracks. Kiln-drying normally takes 30 days. It's often a good idea to put the blanks through for a second 30 days. The cost isn't too expensive; if it was, cured green lumber wouldn't be widely used by the construction industry.

A good way to determine whether a blank is ready for working is to draw a pencil line across the blank with a carpenter's square. Measure the length of the line to the nearest 1/64" and write that figure on the blank. Measure the width of the board every month or so, and jot down the length of the line on the blank. When the board (and the line) stops shrinking, you know the moisture content is around 6% to 8% and that the blank can be worked.

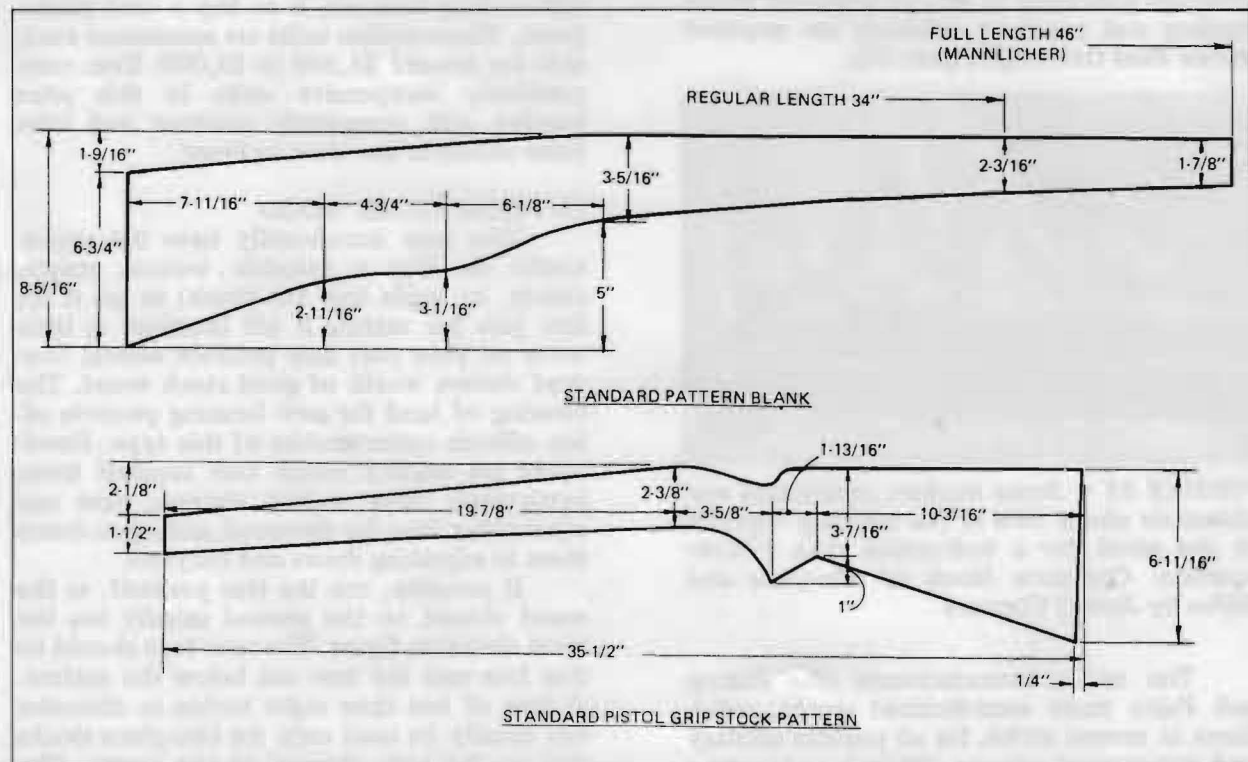


FIGURE 66— After blanks are cut, patterns or templates (made of thin plywood or preferably clear plastic) should be used to lay out the stock. Above are two standard rifle patterns.

A rather amusing, if foolish, procedure is to wait months or even years for a blank to dry, and then wet the surface with water to show off the grain. Do this a few times and you'll have restored the wood to its original high moisture content. A much better procedure is to apply a light coat of furniture polish, which will bring out the grain without harming the wood. This requires that the blank be planed or sanded smooth. The grain will not show up well otherwise. If you have choice wood to show, polish it with furniture wax. Also, gasoline or alcohol will bring out the grain without damaging the wood or changing the moisture content.

Now do Programmed Exercise 5. Make sure you write your answers on a separate sheet of paper before looking at the answers on the page specified.

PROGRAMMED  
EXERCISE "

5

1. Natural curing of stock blanks may take up to seven years. Kiln-drying goes a lot faster, taking only a month, but what precaution should you take in kiln-drying?
2. How can you determine that your stock blank is low enough in moisture content to be worked?
3. True or false? The best way to *bring out the grain* in a blank, to see how the blank will look when finished as a gun stock, is to wet the blank with water.

Answers on Page 30

ANSWERS

5

1. The blanks should be coated with melted paraffin applied with a brush or they will likely develop cracks.
2. Draw a line across the board. Measure it to the nearest  $1/64$ ". If the line (and the blank) has not shrunk after one month, the moisture content is low enough (6% to 8%) so that the blank can be worked.
3. False.



NOTES

NOTES

NOTES

STUDY UNIT 12 – PART 2

STUDY  
UNIT  
12  
PART  
2

BEDDING AND FINISHING THE MACHINE-INLETTED STOCK

**FINISHING STOCKS MUST  
BE LEARNED FROM THE  
BEST TEACHER**

Building a custom rifle is a labor of love for almost any gun pro. The barreled action comes from one manufacturer, the semi-inletted stock from another — and the gun is made for someone else. Yet that rifle is distinctively and uniquely *his* because of the time and care he has lavished on the stock.

There is something about transforming a raw or even semi-shaped chunk of wood into a warm and lustrous, eye and touch-pleasing gun stock that kindles the creative fever in any gun buff — professional or amateur (Figure 1). Advertising claims to the contrary, it takes a good deal more than a jackknife and a few hours work to produce enviable results, even from a 95% finished, and inletted product. You can get by with comparatively few tools; you *can't* get by without considerable patience and some know-how. Shaping, fitting, sanding, then more fitting and more sanding, all take time, and there are really no shortcuts.

The old saying about “experience being the best teacher” is particularly apropos to stock work. In the following pages you will learn how a semi-inletted stock can be turned into a thing of accuracy-boosting beauty. However, no words can substitute for the self-taught, trial-and-error knowledge you'll gain by completing your second, third, or even tenth stock. You may have a genuine feel for wood and the patience of a flea

trainer; yet, almost without exception, a first stock by anyone *looks* like a first stock to the knowing and critical eye. Chances are you'll be pleased with your first attempt at stock-making. And you probably should be. Look at it again, after finishing out four or five more stocks, and could be you'll wince! Lines that are just a bit out of place, a gouge that had to be filled with epoxy, a grain that wasn't sealed properly — all stand out like a lost filling in a front tooth.

The point is, don't start with an expensive blank, or plan on doing a job for profit, until you've got a few stocks under your (sanding) belt.

**NINETY-FIVE PERCENT  
FINISHED? THAT RE-  
MAINING FIVE PERCENT  
IS THE IMPORTANT PART!**

You can, of course, start with a blank and do all the “bull work” yourself (Figure 2). This proves that you have a lot of time and a lot of confidence. Almost regardless of the action you're working with, and unless it's some obscure and ancient military type, semi-inletted and appropriately carved blanks are available, often in different styles, from such firms as Herters, Bishop, Fajen, Richards, and Royal Arms.

You can often get such stocks with the barrel channel cut to the right contour for the standard barrel and action you're working with. Unless specified, the stock comes with a small pilot groove (about half an inch across)

BEDDING AND FINISHING THE MACHINE-INLETTED STOCK



FIGURE 1 — A vintage relic in new finery is this 1893 Argentine Mauser with a completed, semi-inletted stock of Mannlicher sporter design.





which serves as a start for cutting the proper channel depth and radius for a non-standard barrel.



*FIGURE 2 — Choice and costly blanks, or roughed-out stocks like the screwbean mesquite shown, are best left alone until you've sharpened your skills.*

The nice thing about these semi-inletted stocks is that most of the heavy, non-inspirational work has been done, yet there's plenty of meat left for you to work off, providing an opportunity to develop your skills with little chance of a serious goof (Figure 3). Complete a few of the semi-inletted variety and you'll have learned enough about stock proportions, contours, and inletting to work a blank from scratch — if you're so inclined. After all, if you cannot make a stock from a raw blank, you can hardly be termed a custom stockmaker!

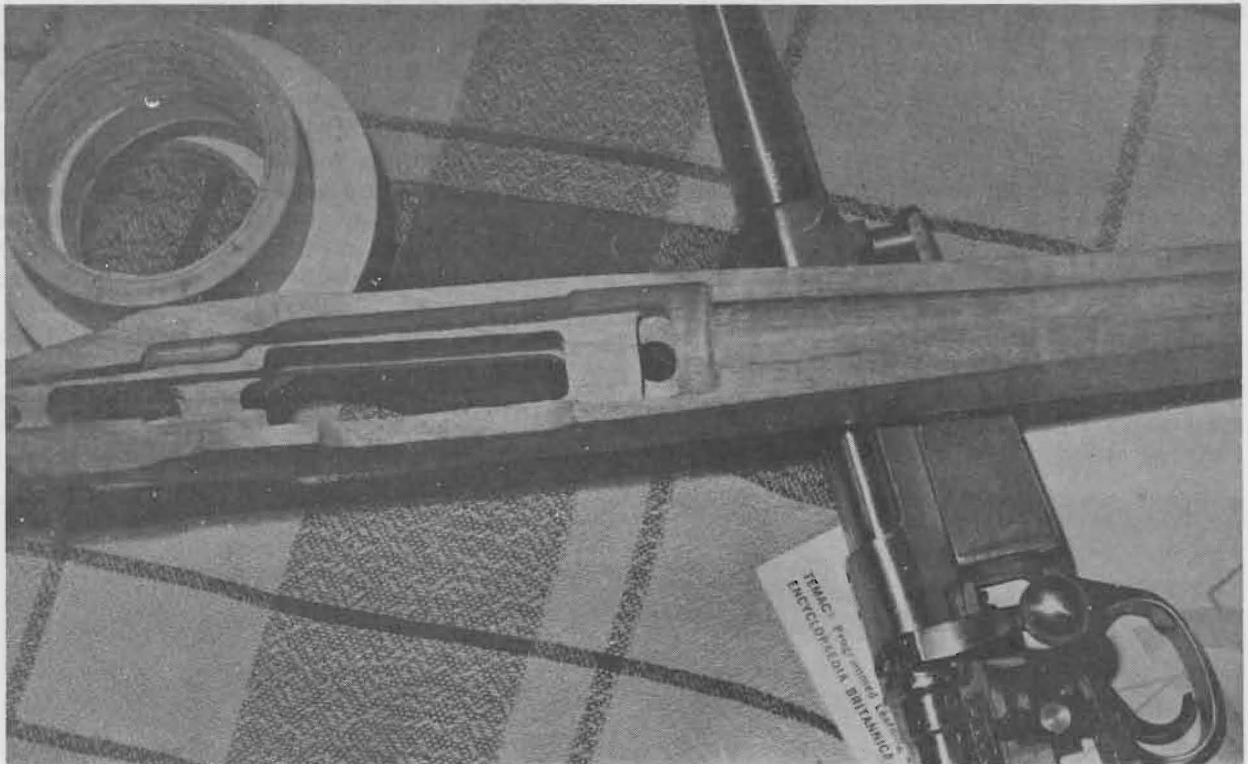
#### **TOOLS REQUIRED**

There are literally dozens of special chisels, gouges, rasps, and files available to the embryonic stockmaker which you'll even-

tually want in your shop to speed up the stock finishing procedure (Figure 4). However, for openers, you can get by with a lot less. Items that *are* required are rasps of the flat, half-round, and rattail patterns; gouges; a barrel-inletting rasp; and a sanding block with an assortment of papers from a coarse 50-grit on up through 80, 120, 220, and 320.

A Dremel Moto Tool (described in your Brownell's catalog) is also nice to have for many types of work, but it is not recommended particularly for stock work. The bits have a tendency to "walk" and remove wood that can only be "replaced" by filling with epoxy or wood dough. If you have a Moto Tool and know how to use it, fine. If you're going to buy such a tool (and it's expensive), that's also fine, but don't use it on gun stocks until you've had plenty of practice on scrap wood.

Also necessary for the first stock finishing procedures — touch-up inletting and glass bedding — are a spotting compound (such as Acraglas), a glass bedding kit and a releasing agent. The spotting compound can be commercially made Prussian blue, gunsmith's blacking, or ordinary lipstick melted in lanolin (which works fairly well). There are a number of glass bedding kits and release compounds on the market (see your Brownell's catalog). Various waxes such as Simonize and



*FIGURE 3 — The Roberts Wood Products stock above, inletted for the Sako action, is typical of the better 95% semi-inletted type.*

clear Kiwi shoe polish will serve as satisfactory release agents. Do not use Vaseline, as it can mix with the epoxy, thus weakening it.

#### INLETING THE TRIGGER GUARD

The touch-up inletting and bedding of the action and the barrel (if it's not going to be free-floated) are done before you even think about sanding or shaping the stock exterior. Spotting agents are messy, and the glass bedding material has a nasty habit of oozing out onto the stock. Such extraneous debris is removed when you're through messing around with the sticky stuff and ready to start the final exterior shaping.

The first step is to mount the stock, upside down, in a padded vise. Then carefully fit the trigger guard/magazine assembly into the wood (Figure 5). Drop the magazine into the stock as far as it will go, then run a sharp pencil or scribe around the outside perimeter of the floor plate and trigger guard base. The wood inside this scratch line must be removed to permit the plate to fit snugly (Figure 6).

When this is done, usually with a medium rasp, you apply lipstick or Prussian blue to the trigger guard and magazine walls (Figure 7), and reinsert the unit into its recess. When the metal is withdrawn, the wood will show light

color where the wood-to-metal contact is correct. Dark spots on the wood indicate high areas which must be removed with a rasp. When all high spots are eliminated, the floor plate should snug down so that it is slightly below (Figure 8). Later, when the stock is sanded down, there will be a flush-fit between the floor plate and the adjacent wood. Take care when fitting the trigger guard that the rear of the magazine doesn't bear against the wood.

#### PRELIMINARY INLETING OF THE RECEIVER AND BARREL CHANNEL

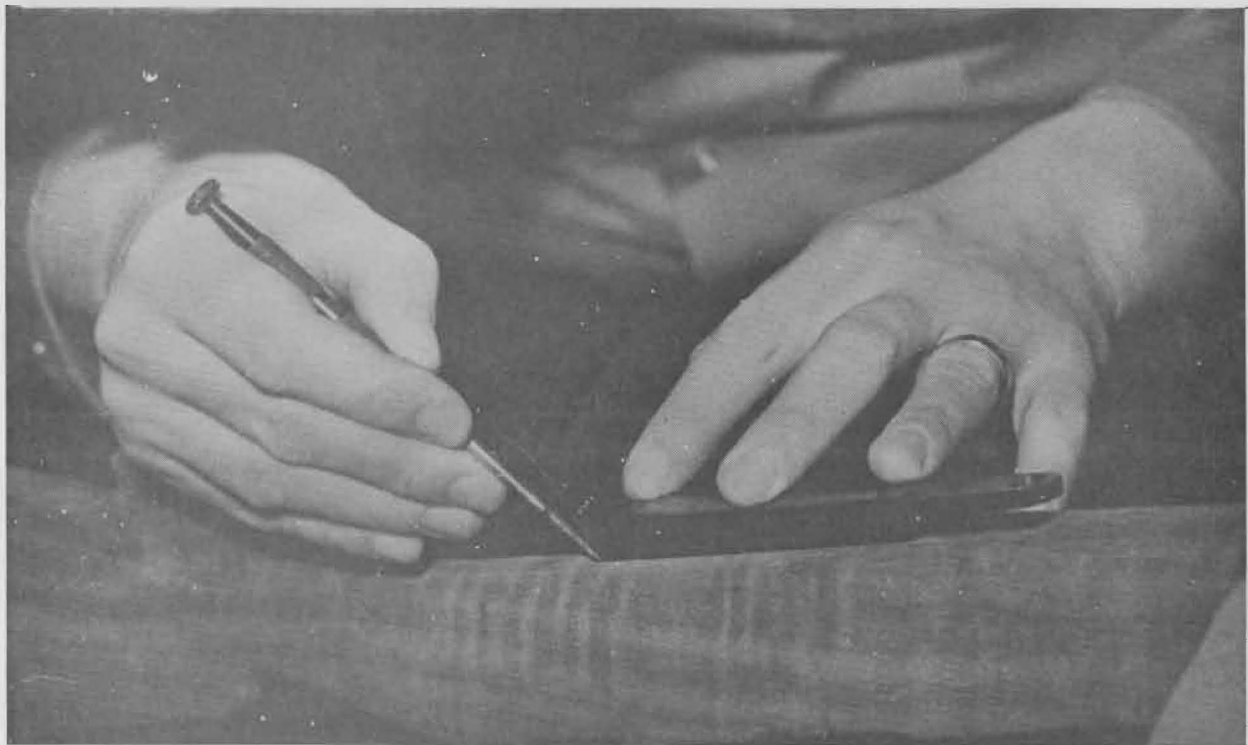
Next, the stock is inserted into the vise right side up, and the barreled action with the trigger assembly removed is dropped into place and tightened down with pilot screws for preliminary fitting (Figure 9). These pilot or stock maker's hand screws are made in different thread sizes for different actions, and speed up the frequent tightening and loosening of the action which is necessary in stock work. Also, they eliminate the chance of burring the slots, which can result from using regular guard screws (Figure 10). In any case, the regular screws are too short to engage the receiver threads until you are near the end of the job.



FIGURE 4 — The "Complete Stock Maker" usually has all the tools illustrated and more. You can get by with about half a dozen inexpensive tools.



*FIGURE 5 — Inletting of the trigger guard/floor plate is done first. Shown is a Royal Arms 95% in-letted stock for the Santa Barbara commercial Mauser action.*



*FIGURE 6 — To permit a perfect fit, some inleted areas, like the floor plate recess, are purposely cut small. Scribing contours as shown, indicates the wood that must be removed.*





FIGURE 7 — Lipstick works as well as Prussian blue for "spotting." Here, it's being applied to the sides of the magazine and the floor plate.

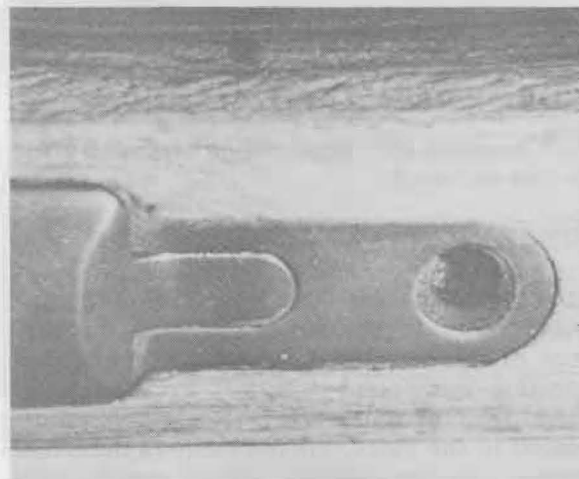


FIGURE 8 — When properly inlaid, the plate sinks a bit below the level of the adjoining wood.

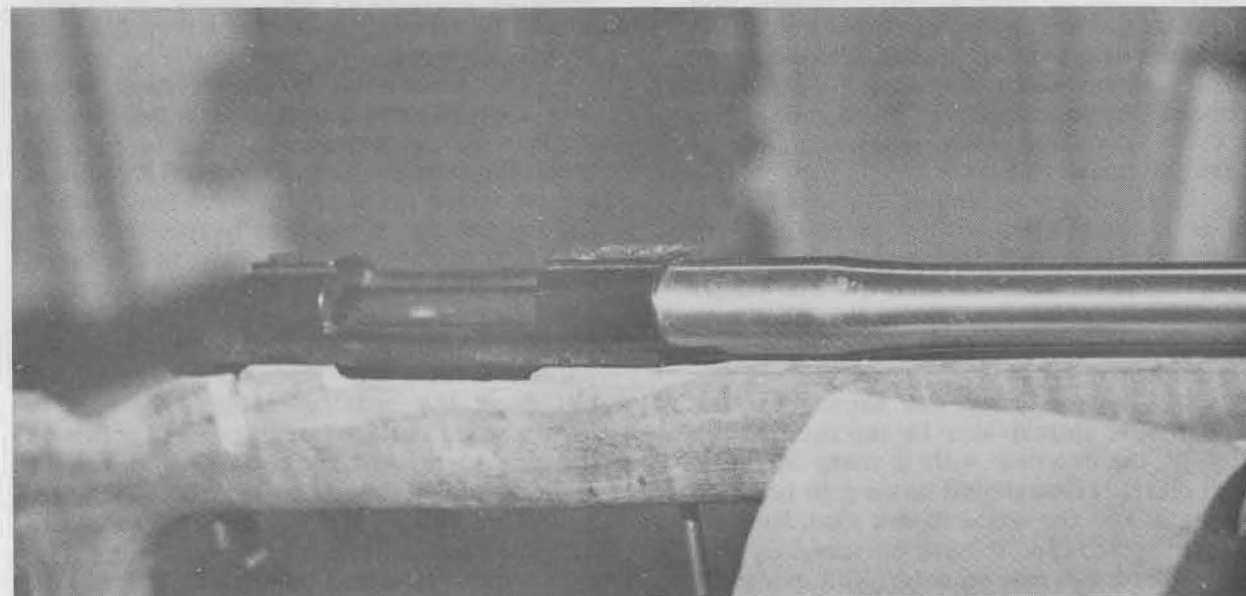


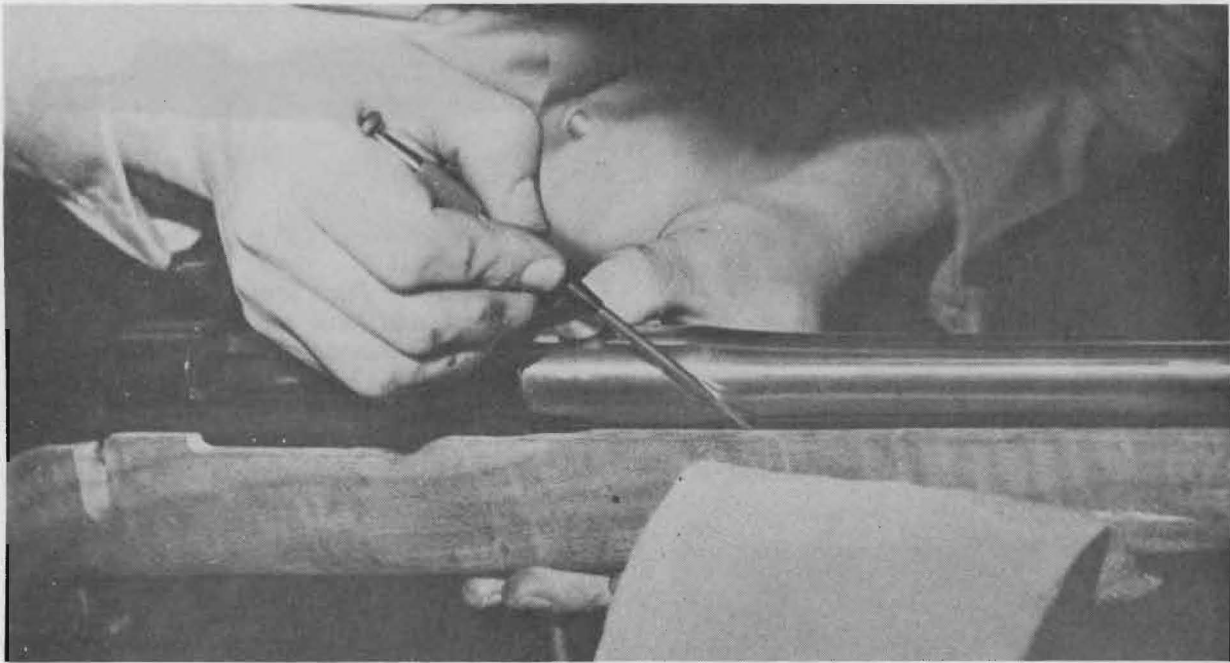
FIGURE 9 — The action is then tightened down into the stock. Because of the excess wood, it doesn't settle down very far.



FIGURE 10 — Pilot screws are available for all actions, and have the same diameter and thread as the guard screw. They keep the receiver and wood in alignment while inletting.

A sharp pencil or scribe is used to outline the outside contours of the barrel and receiver (Figure 11). Wood inside this scratch line must be removed. A gouge is used for preliminary shaping and deepening of the barrel channel. Take care not to cut out too much wood or get too close to the scratch line as you want only a thin hairline between the barrel and the stock.

It will be necessary to inlet the chamber area of the barrel before the final line can be established. This line must be perfectly straight, except where the barrel may be contoured in the 5" to 6" ahead of the chamber. An incising knife should be used to cut the final line. Part of the barrel, about two-thirds its length, will be perfectly straight. A steel straightedge can be clamped to the stock with two clamps, one side at a time. The barreled action is removed when the steel is in place. The knife, which should have a 45° angled blade tip, is then laid along the steel straightedge and lightly tapped. The knife must be held at a perfect 90° to the stock to assure



**FIGURE 11** — Scribing the receiver and barrel contours provides the “scratch line” necessary for removing just enough wood to allow the action to settle into the stock.

a perpendicular cut. The cut should be at least 1/8” deep. The curved or contoured portion of the barrel must then be followed with the blade held vertically against the barrel to complete the cut into the receiver area. If the knife is canted, the line will swing away from the barrel or more than likely undercut the barrel, resulting in a wavy line and gaps. The mark of the expert is a perfect straight line, nearly flush with the barrel and inletted to half the barrel depth.

Bear in mind that the barrel channel is tapered; thus, no rasp or barrel channel tool fits exactly. When exerting pressure with the tool, take care to keep the edges of the barrel channel sharp. Once the edge is rasped, or rounded off, your “perfect” job is gone. Glass or other corrective action won’t help, as any repair you make will show.

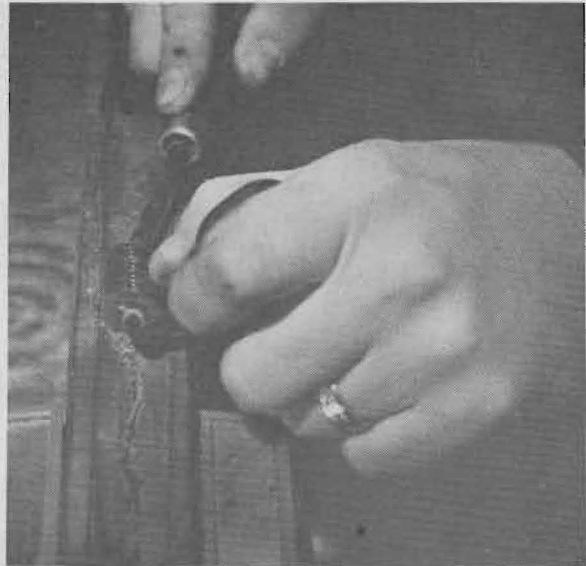
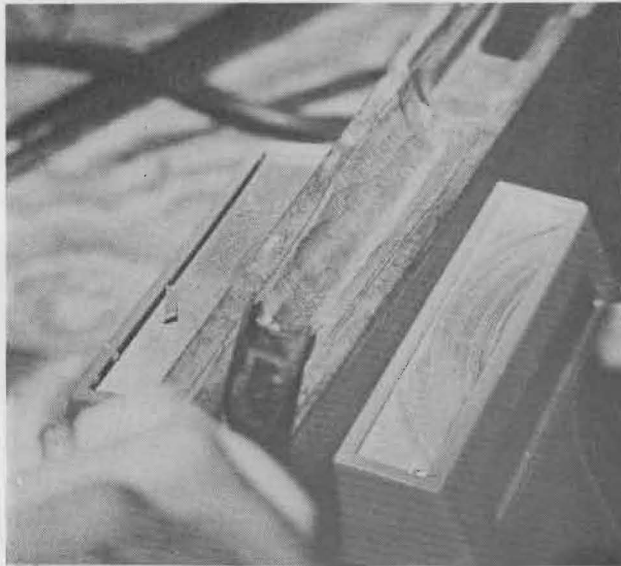
Final tool-smoothing of the barrel channel is accomplished with a barrel inletting rasp which is moved back and forth, providing a “rough-smooth” surface without danger of gouging. Final smoothing is done with sandpaper wrapped around the inletting rasp (Figure 12).

Any excess wood, as shown by the scratch line, should also be removed at the sides of the receiver with a sharp knife or small chisel. There should be no gaps between the metal and the wood in this area. Remove too much and you’ll have an unsightly gap that will permit rain to enter. This gap must be filled with epoxy — for looks, for proper seating of the action, and as a rain seal.

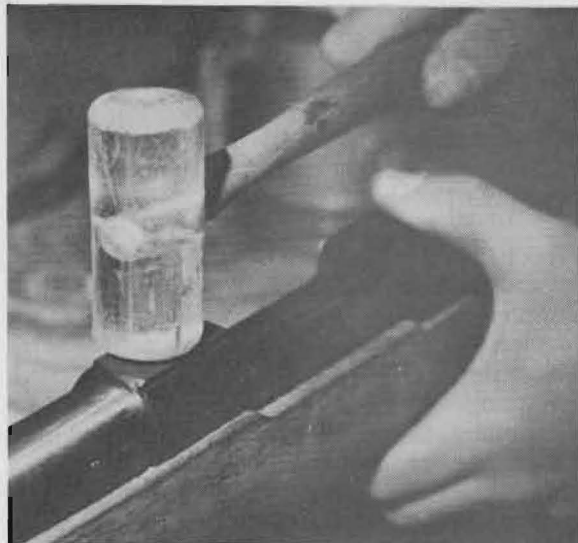
#### **FINAL INLETTING**

You are now ready for the final touch-up inletting. Make sure the trigger assembly has been removed from the action. Coat the bottom of the barrel and the receiver with your spotting compound (lipstick, Prussian blue, etc.). The barreled action is then carefully placed in the stock, the pilot screws tightened down, and the receiver tapped solidly into place with a plastic hammer (Figure 13). Carefully remove the action from the stock, lifting it *straight* up. Any irregularities or high spots, as indicated by the spotting compound, should be relieved so that the action fits snugly into the wood.

The three-point bedding system, which most experts agree is best, utilizes two bearing surfaces at the forearm tip (Figure 14), the recoil lug, and the tang. The barrel free-floats, except at the tip of the forearm (just back of the forearm tip, if any), so be sure to remove any high spots (pressure points) in the barrel channel. The recoil lug and tang areas must have enough wood removed to provide a base for an adequate amount of bedding compound, about a 1/8” layer, so that recoil will not crack the bedding material. Be sure to leave a wood “bridge” or suspension points on the side to prevent the receiver from casting or being pulled down too far when the guard screws are tightened. Plug the trigger slot and bolt openings in the stock with modeling clay. Next, apply releasing compound liberally to all metal surfaces that stand any chance of contacting the epoxy. This includes the barrel



**FIGURE 12** — After the scratch line has been scribed, the first cuts are made with a curved gouge (left). Final shaping is done with a barrel inletting rasp (right).



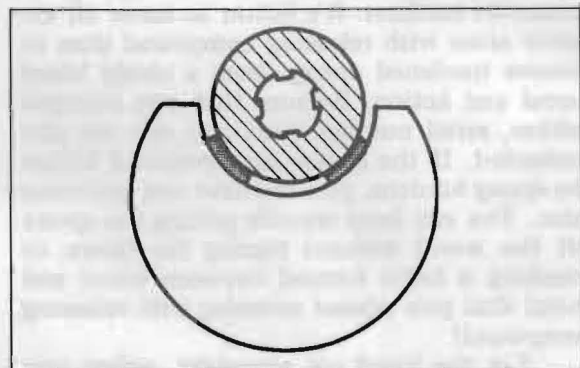
**FIGURE 13** — After the spotting compound has been applied to the bottom and sides of the barrel and receiver, the metal is tapped down for positive color-to-wood contact.

surfaces and the trigger guard. The floor plate should be removed.

Insert the trigger guard assembly into the stock. You need it to position and hold the guard screws. Now apply the bedding compound to the recoil lug and tang areas (Figure 15). There is no reason to apply the epoxy to the sides of the receiver area unless you've removed too much wood and have to build up the sides.

Now, making sure that all metal surfaces that will bear against or come close to the epoxy have been coated with releasing compound, set the barreled action into the stock

and tighten down the guard hand screws (Figure 16). Make sure the guard screws and their threaded sockets have also been smeared with releasing compound.

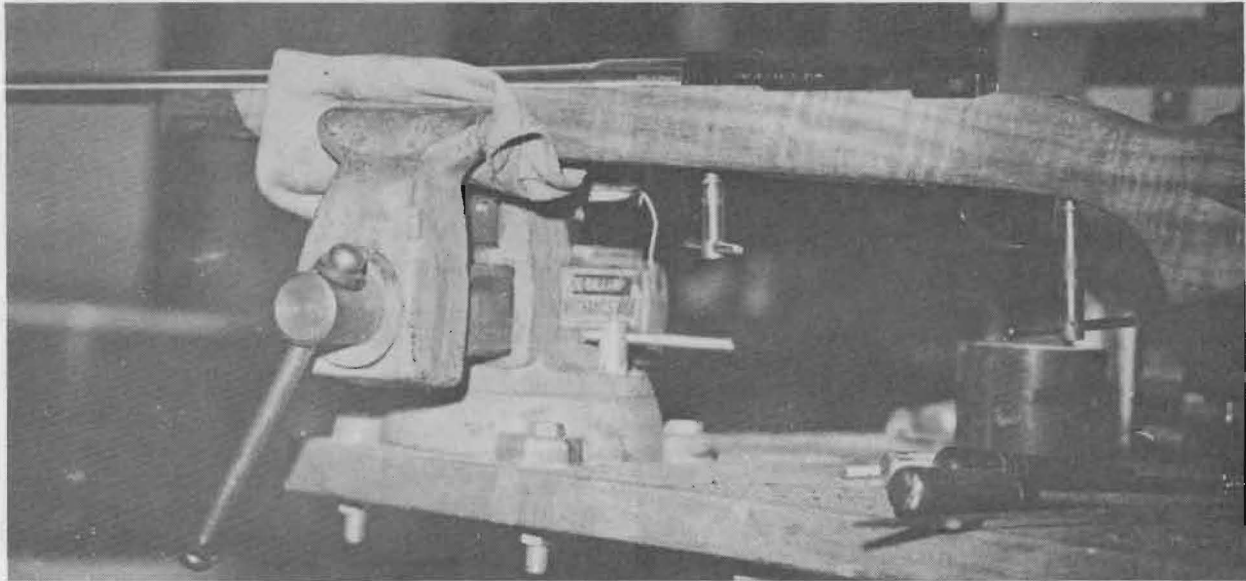


**FIGURE 14** — The pressure point on the forearm can be two strips of hardwood, about 1" long, glued to the barrel channel behind any add-on forend tip.



**FIGURE 15** — Lay in the epoxy (white) in the tang, recoil lug, and barrel-reinforce recesses. Use enough so that some will ooze out along the sides of the receiver and barrel.





**FIGURE 16** — It's a good idea to permit the bedding material to dry overnight, or longer. Follow the manufacturer's specifications.

Remove any excess epoxy oozing out of the side of the receiver and barrel with a dry rag and a sharp stick. Avoid smearing any unprotected surfaces. It's better to cover all exterior areas with releasing compound than to remove hardened epoxy from a nicely blued barrel and action. Be sure that any stamped caliber, serial number markings, etc. are also protected. If the excess isn't removed before the epoxy hardens, you can have real problems later. You can have trouble getting the epoxy off the wood without tearing the fibers, or breaking a bond formed between wood and metal that you missed covering with releasing compound!

Let the bond set overnight, unless you have run a preliminary drying time test and know the time required for your particular bedding compound to completely harden. Some set up in as little as two to three hours.

When the hand screws are removed and the action is tapped out of the barrel with a plastic hammer, the results should be perfect. The plastic "inletting" should be perfectly matched to the action, especially at the recoil lug area (Figure 17). Almost any rifle, particularly factory jobs and those with recoil shoulders pounded into shapelessness over years of firing, can be improved accuracy-wise by hogging-out the critical recoil shoulder area (Figures 18 and 19). Remember to leave a "bridge" or ledge at each side of the receiver to preclude pulling the guard screws past their proper distance, thus squeezing out the epoxy and defeating your purpose.

The tang area, while of secondary importance, also has a great influence on accuracy.

If there is any play or rocking back of the receiver at recoil, as can be caused by a disparity in front and rear guard screw tension (which can in turn be caused by not enough or too much wood or glass in the tang), vertical stringing of shots often results.

#### **TWO FINAL POINTS TO CHECK**

After the bedding operation has been completed, the receiver tang lines may need to be blended into the wood. If the action is in the white, the tang and the stock can be filed down together (Figure 20). If the action has been blued, then only the wood is rasped and a fit-and-try procedure is required.

A critical inletting area is the bolt recess (Figure 21). If sufficient clearance isn't provided, and the bolt bends even slightly, your gorgeous new stock may split wide as a witch's smile on your very first shot! If it doesn't split, you can be sure that accuracy isn't nearly as good as it could be. It's a simple matter to provide proper bolt clearance at this point with a few passes of a round or half-round rasp.

Now that we have discussed the internal and functional end of stock shaping, it's time to move on to the fun part — making a sleek sporter stock from that semi-ugly chunk of wood.

#### **STOCK SHAPING AND CONTOURING**

At this point you may be a bit confused over the terms "95% finished", "semi-inletted", etc. There are semi-inletted stocks and there are semi-inletted blanks. The blanks

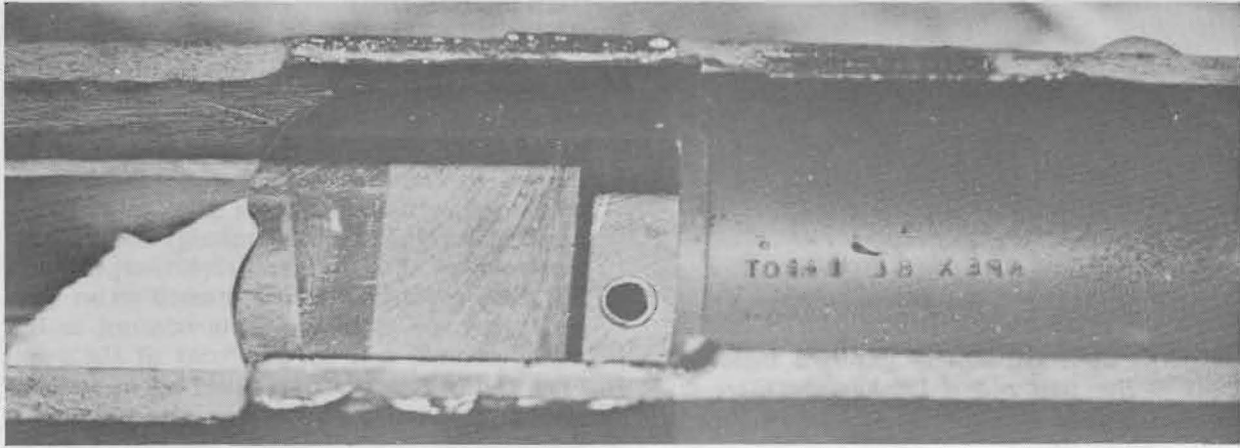


FIGURE 17 — A reverse “print” of the print receiver and barrel underside appear in the epoxy. (The paper napkin at the left protected the floor plate from excess epoxy.)

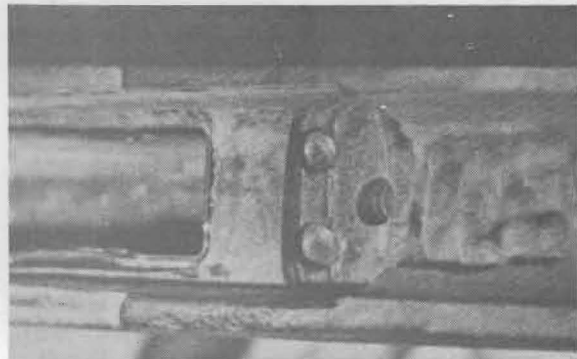
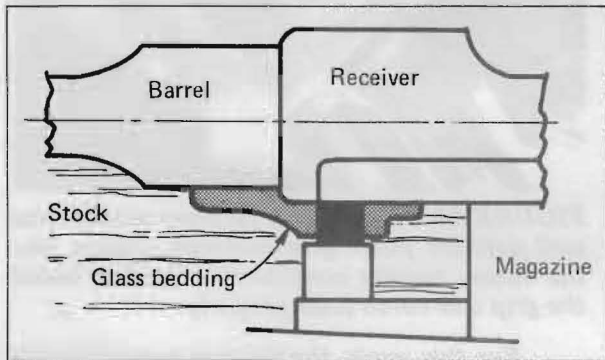


FIGURE 18 — The recoil lug/shoulder area is the most critical. Bedding compound must reinforce the recoil lug (shaded). The stock should be hogged-out to accommodate the bedding material, as shown at the right.



FIGURE 19 — The most critical bedding areas on round (top) and flat-bottom (bottom) receivers are at the tang and recoil lug areas, as shown by letters A through D. (Photo courtesy NRA)

enable the stock worker to achieve about any style stock for a given action that he may desire. The inletting may or may not be 95% complete, but most of the interior work has been done.

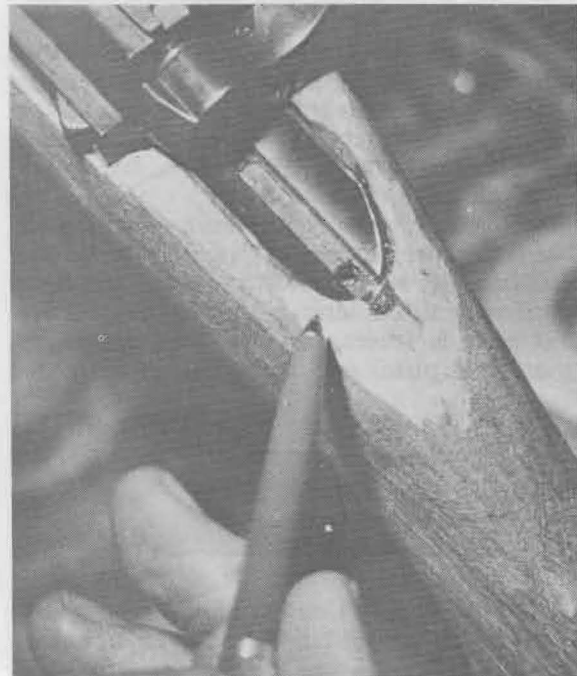
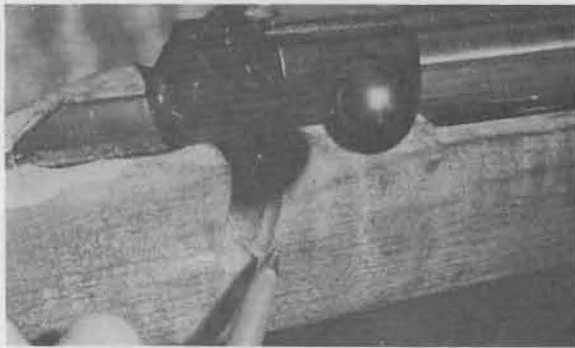


FIGURE 20 — The tang must blend smoothly into the stock, where the pointer indicates.



**FIGURE 21** — A critical external bedding point is the bolt recess. Make sure there is ample clearance.

We have been discussing the 95% finished stock, where the novice really has to work at it to do a *bum* job. The amount of finishing work that remains varies from one manufacturer to the next, but generally only minor shaping, sanding, and finishing are required once the inletting and bedding have been completed (with the exception of installing the pistol grip caps and forend tips).

A natural order of "evolution" exists for the beginning stock maker. He almost always starts out with a few stocks of the semi-inletted, 95% finished (inside and out) variety. From there he progresses to the semi-inletted *blank* where he concerns himself mostly with exterior stock design and shaping. Finally, after he's worked a few of these, he's ready to take a whack at the supreme challenge — starting from scratch with a blank that looks as big as a cello case. After he's mastered this formidable chore, he'll probably regress to the semi-inletted blank, which takes care of most of the tedious inletting, yet provides ample opportunity for originality in the design of the forearm, pistol grip, cheekpiece — you name it. Or he may order a combination, semi-inletted blank stock (Figure 22).

However, we're concerned here with your *first* stock, which should properly be of the 95% finished style, inside and out. You have completed the inletting and bedding. Your next step is truing up the lines, especially around the pistol grip, comb, and cheekpiece.



**FIGURE 22** — "Combination" stocks are available on special order. The above was semi-inletted and the forearm exterior was shaped. The butt stock was left "blank," awaiting the owner's inspiration.

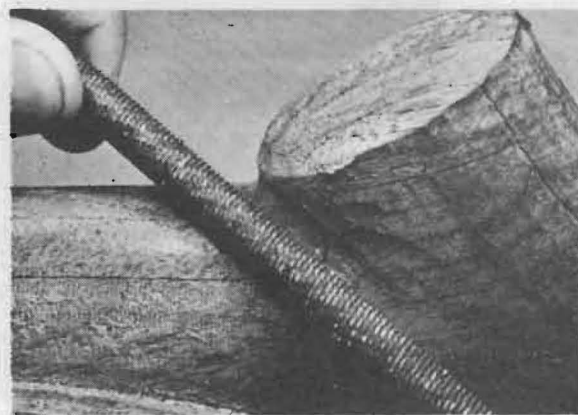
## THE PISTOL GRIP AND CHEEKPIECE

Some 95% finished stocks have nicely rounded pistol grips; others have little more than a spur extending out of the bottom line of the stock, which must be almost completely shaped to form an attractive and functional pistol grip. Fashioning this grip to an eye-pleasing configuration is probably the biggest headache of the novice stock artisan (Figure 23). The cap area must be dressed to an oval or pear shape, with the same contour maintained around and up the front of the grip. (The round pistol grip, popular at one time, is seldom used today.)



**FIGURE 23** — Most 95% finished stocks have well defined pistol grip contours. Others, like the above, require considerable work to blend the grip and comb lines properly.

For this work, the stock is best mounted in a padded vise with the grip up. After carefully rounding the grip with a rasp, a rattail or half-round rasp is used to undercut the grip at the point where it intersects the bottom line of the stock (Figure 24). Do not remove too much wood here or extend the undercut too far toward the center of the stock or you'll wind up with a wasp-waisted effect that looks fine on wasps, but weakens the stock where it should be the strongest. An undercut of about 1/8" to 1/4" is adequate.



**FIGURE 24** — After rounding the grip base, the wood must be undercut where the bottom line of the stock runs into the grip.



Faring the cheekpiece into the stock can also be troublesome to the initiate. The idea is to smooth the lines of the cheekpiece and blend them into the stock, without creating a dished-out or concave effect. (Check flat areas constantly with a straightedge.) Here, use a flat rasp with no teeth on the sides (which would gouge the stock where the cheekpiece starts), followed by coarse sandpaper (Figure 25). There are two basic cheekpieces: (1), the rollover that incorporates a rounded surface at right angles to the stock, and (2) the smaller cheekpiece that has a flat surface. The rollover must maintain a straight line, parallel to the basic stock line, from the comb to the rear of the Monte Carlo. The flat cheekpiece must not have any rounded effect. Form a straight edge both at right angles and parallel to the stock when rasping such contours.

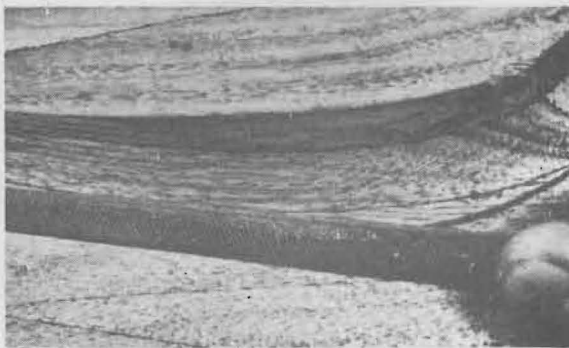


FIGURE 25 — The bottom of the cheekpiece where it comes into the butt stock. The deep base line is smoothed with a rasp, the edge of the cheekpiece with a flat file with no teeth on the sides.

#### UNDERCUTTING THE COMB AND DRESSING THE FOREARM

For a neat, trim appearance, the comb should be undercut as has been explained earlier. In some cases the undercut groove, which should curve slightly downward on a line almost but not quite parallel with the top curve of the pistol grip, has been cut or started by the stock manufacturer. It usually has to be deepened and extended a bit through use of a lightly drawn, small diameter, round rasp.

In working and smoothing the bottom of the forearm, you want the wood to blend evenly and smoothly with the floor plate. Remember, you recessed the plate in the inletting part of the job to allow for shaping and sanding. If the metal is in the white, you can leave the floor plate in position while working with your rasp, emery cloth, and/or paper (taking care not to score the metal). If the

plate is blued, leave it off and get the wood down to the proper level by repeated fitting and sanding.

Leaving the floor plate below the line of the stock contributes to less weight and a straight stock line. Bear in mind that all outside stock lines should be checked and maintained with a 24" straightedge. The forearm is a straight taper from the front receiver ring to the forend tip.

After completing the more or less rough work with your rasp, start sanding, using progressively finer papers and sanding blocks of appropriate size (Figure 26). Always sand *with* the grain, not at right angles to or even at "slightly off" angles to the grain. If you do, you'll find that the cross-grain markings are hard to remove without breaking the lines of the stock (Figure 26). Take care not to sand off too much, especially around the tang or floor plate. If you get too vigorous in these areas, the metal will rise like taxes above the bordering wood. What's worse, there's nothing much you can do about it. For this reason, never scrape off too much wood with your rasp. Leave a generous margin for sanding so you can work off any coarse rasp marks and get the wood smooth as a peeled onion *without* going down to or under the level of the adjacent metal.

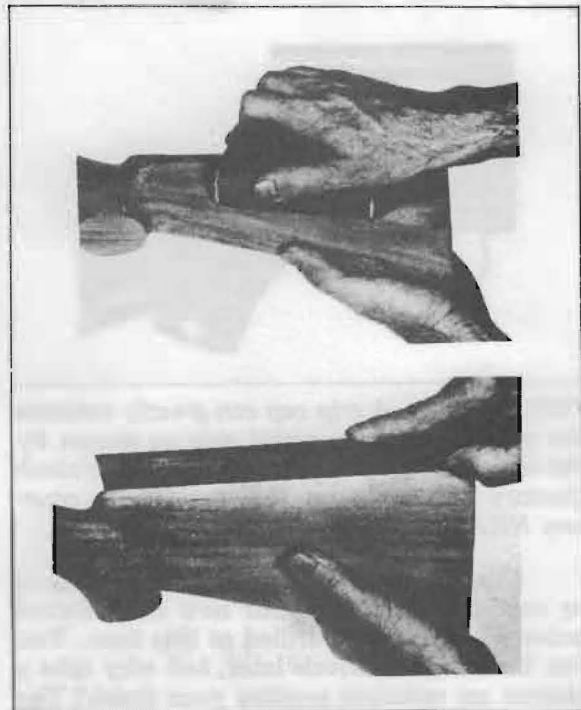


FIGURE 26 — Sanding and more sanding produces that pro-quality stock. Use increasingly finer grit papers and appropriate size blocks as you move along. Check alignment frequently with a straightedge. (Photo courtesy NRA)

## INSTALLING RECOIL PADS, SLING SWIVELS, ETC.

Now, in fact even *before* you do much sanding, is the time to install that recoil pad. When you still have a bit of wood to remove from the buttstock areas, you can easily blend the lines of the pad and the stock together. (Refer to Gun Shop 4, Part 2, for complete recoil pad instructions.)

If you're going to add a pistol grip cap of metal, plastic, or wood, it should be epoxied (or screwed) into place after preliminary shaping of the grip has been completed (Figure 27). The design and shape of some plastic and metal caps will help, once they're positioned, to achieve the correct contours for your grip. A contrasting wood cap should be treated as part of the pistol grip and shaped along with it. A slight flare adds to its appearance.



**FIGURE 27** — A grip cap can greatly enhance the appearance of a pistol grip as shown by the reworked stock (bottom). The same stock (factory original) is at the top. (Photo courtesy NRA)

Chances are you're going to want a sling or carrying strap for your new rifle. Swivel holes should also be drilled at this time. You can install sling swivels later, but why take a chance on splinters spoiling your finish? The front swivel should be mounted approximately 3" back from the forearm tip, the rear swivel about 2-7/8" forward of the butt. Measure carefully, then "start" the holes with a center punch. Make sure they are centered. Drill the holes at a 90° angle (right angle) to the stock.

The drill size and the drilling depth will naturally depend on the type of swivels and/or studs used. The rear swivel attaches to a tapered wood screw; a countersunk nut secures the forend swivel. The drilled holes should provide a snug fit for both screw nut, otherwise the latter will turn when tightened. The nut should be countersunk below the barrel groove so it does not touch the barrel. If necessary, and to retain all possible wood thickness, the nut can be contoured and fashioned into the barrel channel with a coarse rattail file. When drilling the forend hole, always drill from the outside in, to avoid splinters that are difficult to hide or fix (Figure 28).



**FIGURE 28** — Holes for sling swivels can be drilled after the stock is finished. It's better to do the job before the finish is applied, to prevent splintering around the holes.

When the stock is as smooth as you can get it with fine 220 and then 320 paper, wet it down with a damp rag and hold the stock over a low flame. "Whiskers" will rise which should be sanded off with 320 paper. Repeat this wetting, heating, and sanding three or four times until the grain will not raise and the stock is really smooth. You're then ready for the next and final stock-making procedure.

## STOCK FINISHING

The appearance of a completed gun stock often depends more on the quality of the finish and the skill of the finisher than on the wood itself. Cheap wood, like a plainfaced miss with artful makeup, can look awfully good. On the other hand, an expensive piece of lumber with the potential splendor of a time-mellowed violin can, with a botched finishing job, look like something dragged out of a swamp.

Today, many commercial-finished and unfinished stocks are made from near-white beech or birch, or of sycamore or inexpensive walnut with little grain or contrast. Such stocks are often improved by a walnut stain, or by a blend of walnut and cherry stains, which imparts the rich, red-brown tones so typical of good woods. Plain white or yellow stocks can, through creative skill (or a larcenous heart) be transformed into "valuable" tigerstriped "maple" (Figure 29) by scorching in the stripes with a propane torch, taking care not to burn too deeply. (Before you attempt this type of legal counterfeiting on a fairly good stock, practice on a scrap piece of the same wood.)

Two-piece stocks of a glaring difference in color can be "matched" by staining the lighter piece, by bleaching the darker, or by juggling the two processes. Grain and figure can be painted in by experts, with results worthy of a Rembrandt. Fine imported rifles

can sometimes surprise you. Recently, a North American faculty member stripped down the damaged stock of a friend's \$450 European rifle. The beautiful grain and burled figure washed away with the finish, revealing a plain beech stock as white as the face of the astonished and outraged owner! (Figure 30).

The worse the walnut shortage becomes, the greater the challenge to provide inferior woods with a traditional appearance.

## TYPES OF STOCK FINISHES

There are a number of different types of finishes available to the stock maker: linseed oil, epoxy (polyurethane), a combination of oil and varnish, and lacquer. Varnish hasn't been used for years. The old-style varnishes darkened with time, chipped like a cookie, and if they belonged anywhere at all it was on furniture. Modern spar varnishes aren't really varnishes (they're plastic-based) and don't do a thing that epoxy stock finishes can't do better. The quick-drying, spray-on lacquer finishes used by some manufacturers on cheap guns have scant wear or durability value, and have no place in the gun pro's bag of skills.

Modern stockmakers achieve that deep-down "custom" look with oil finishes, a glossy or restrained "satin finish" with polyurethane compounds. Almost without exception today's finishes look and wear better than the highly touted and nostalgic favorites of yesteryear. In this category are the legendary "French polish" and "London oil" finishes.



**FIGURE 29** — A scorching tale is behind some "tiger-tail" stocks. The stripes are burned with a torch and shield (above), producing the finished stock shown below. Colonists used this trick to camouflage white stocks from sharp Indian eyes. (Photo courtesy NRA)



“French polish” is a mixture of shellac and linseed oil, with the proportions varying according to the stockmakers’ ideas. Repeated thin coats and rubbing with the heel of the hand produce a lustrous, attractive sheen. However, the finish waterspots easily and is short on wearing quality.

A “London oil” finish, which some of the oldtimers would have you believe is brewed at midnight with the onlookers sworn to secrecy, is nothing but ordinary linseed oil (sometimes mixed with varnish) applied in thin coats over the months or years, and hand-rubbed as frequently as a miser’s genie lamp. The amount of luster or polish gained for the effort expended was ridiculous. The problem with linseed is that it never dries; it continues to penetrate, darkening the wood and clouding the grain. And, a finish that isn’t dry can’t really be polished.

#### MILITARY FINISHES WERE “LONDON OIL” TYPE

The only difference between the “London oil” and a military finish is that the former is applied over a period of time. Military stocks are dunked once in linseed hot enough to blister a brass monkey (Figure 31). However, many a bored, barracks-bound soldier has rubbed his military stock to “London oil” perfection. Proof that stocks impregnated with raw (or boiled) linseed never dry completely is evidenced by this simple test: Hold a military (or London oil-finished) stock close to a flame, and you’ll see the oil bubble out of the wood (Figure 32).



FIGURE 32 — An infrared lamp can be used to boil out the oil from blackened, oil saturated stocks. It never completely dries. (Photo courtesy NRA)

Linseed oil, in the opinion of many stock finishers, is about as desirable for gun stocks as oil from a crankcase.

Before going on, please do Programmed Exercise 1. Make sure you write your answers on a separate sheet of paper before looking at the answers on the page specified.



FIGURE 30 — All that glitters, etc. The figure in a few expensive European sporters is sometimes painted on the wood, then sealed in epoxy.



FIGURE 31 — Military rifles like the British SMLE got a “London oil” finish — but all at once.

## PROGRAMMED EXERCISE

1

Mark the statements below with true or false.

1. A critical inletting area is the bolt recess; if the bolt binds even slightly here, the stock may split when the gun is fired.
2. When using your rasp on the stock, around the tang and floor plate area, you should take wood off as close as possible to the final form, so that only very little remains to be sanded.
3. London oil is a preferred finish by stock makers because it is fast drying and polishes up nicely with little effort.

Answers on Page 16

### MODERN STOCK FINISHES

Contemporary oil finishes have a linseed oil base, but incorporate a number of hardening and drying agents. They don't penetrate as deeply and, because they don't darken or cloud the wood, they do a better job of defining color, grain, and figure. Modern oil finishes dry hard, providing a protective shell against wear and weather; yet scratches and mars are as easily spot-covered as with linseed oil, which is linseed's main virtue.

Oil finishes, when rubbed to a stain or "eggshell" luster with pumice, are traditional on classic-style stocks for rifles and double-barreled shotguns. The epoxy finishes are, however, gaining ground with some traditionalists. Each finish has its advantages and disadvantages.

An oil finish is easier to apply and makes minor and even major stock repairs relatively easy, from the standpoint that the finish is easy to sand down, apply, and polish out. It is not as durable or resistant to wear of the elements as an epoxy finish.

The various polyurethane or epoxy finishes require more time and work to apply correctly. Because of hardness when dry, checkering tools dull rapidly. Minor scratches and blemishes can be covered with a spot epoxy application, which is sanded with 400 to 600 wet-and-dry paper, then polished to blend

with the adjoining finish. Major dents and abrasions are a different story. Once hardened, epoxy defies all stripping agents with which we're familiar. The finish over the damaged area must be sanded or scraped off. Then it's a real trick to spot-in fresh epoxy and blend it properly into the surrounding areas. On the positive side, epoxy finishes are almost impervious to oil, grease, weather, and wear.

Actually, density of the wood has a lot to do with whether an epoxy finish should be used. When the wood is close-grained and hard, it "supports" the finish and resists dents and mars. In such instances, epoxy finishes work well. Conversely, it's never a good idea to use this type of finish over soft and open-grained wood. (Grain closeness is an index of wood density and hardness.)

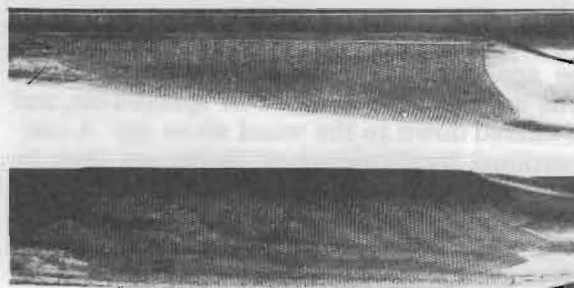


FIGURE 33 — Hard close-grained wood that accepts fine-line checkering, is also best suited for an epoxy-type finish.

### WOOD DENSITY DETERMINES THE TYPE OF FILLER

To protect the stock against water, grease, dirt, subsequent fiber breakdown, and warpage, the wood must be sealed. The finish does this to some extent, but the skin-like pores must be completely filled and sealed for protection as well as appearance.

Whether or not you will stain your stock should influence the type of filler/sealer you select. If the pores are large (open-grained) and you will stain your stock, we don't recommend commercial wood fillers. Such compounds, made largely of Fuller's Earth, are applied by rubbing the wood cross-grain with a rough rag. (Rub *with* the grain and you wipe out the filler.) When dry, the stock is sanded down to the bare wood, leaving the pores filled. Commercial paste fillers are available in white and in different "wood" colors. However, the possibility of a tinted or colored filler matching the wood and/or stain color, or of a white filler "taking" the stain the same as the wood, is remote. You're apt to wind up with a stock that looks like an advanced case of the measles. Anyway, there is no longer much justification for using a commercial

paste filler. Most knowledgeable stock makers simply use the finish material itself for sealing unless the grain is very open (Figure 34).

**STOCK SEALER & FILLER**

G-96 Gun Stock Wood Sealer & Filler is used on gun stocks after final sanding and before applying stock finish. Penetrates and seals pores. Application of several coats in/between sanding will give professionally smooth final finish. Dries in 15 minutes. Customer Recommended.




**GUN STOCK FILLER**

Excellent filler to prepare all open grained woods for final finishing. Has warm, walnut tone that helps bring out the beauty of the stock. Can be used on any wood. Dries to a clear, non-cloudy finish. Easy to apply.

FIGURE 34 — Two types of stock fillers.

Sometimes, even when an oil finish will be applied, epoxy is used to seal the pores. The compound is brushed or sprayed on, and is 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, plus the ease of finish and touch-up afforded by oil. Spar varnish is also used for sealing and filling, followed by an oil finish.

#### LET'S GET BACK TO YOUR SEMI-INLETTED STOCK

Now that we've talked about stock finishes in general, let's take up where we left off — with *your* stock. It has been inletted, bedded, and sanded as smooth as a baby's backside. Ready to start applying the finish? Maybe.

Let's say that your stock is a bit light and you have decided to darken it with stain, so you will use one of the better commercial oil finishes — GB Linseed or Birchwood Casey's Tru-Oil. First you mask off the recoil pad with masking tape to protect the rubber from stain and stock oil.


Next, you have to decide on the color and type of stain you will use. You can test for the desired shade by dabbing a bit of stain on the inletted portion where it won't show later. (Some stains have to dry to show the shade you will end up with.) You may wish to darken or lighten the color by blending the basic stain with other stains of the same base, or by diluting a stain with its base solvent. Stains are of an oil, alcohol, or water base. Alcohol stains are the most expensive, but no better for stock work than the cheap water-soluble type. Alcohol and water base stains penetrate deeply and are less apt to come off, leaving "bare spots" from final sanding or wear, than are oil base stains. Also,

they don't muddy up the grain. If you want to darken a light piece of wood possessing an attractive grain or figure, it is always best to use an alcohol or water-type stain (Figure 35).

After wiping on the stain and permitting it to dry thoroughly (according to the manufacturer's recommendations), give the stock a final light sanding. With an oil base stain, the final sanding must be very light or you'll go through the stain and have to start all over (Figure 36).

**duPONT WATER-SOLUBLE DYE**

Orange Concentrate II  
Resorcin Brown 5-C (in Acraglas Kit)  
Nigrosine WSB Conc. (very black)  
Scarlet NS Concentrate  
Tartrazine Concentrate (yellow)



Highly concentrated water soluble stains are easier to use and much more permanent than oil stains. Above stains can be used individually in water or blended to give a great variety of colors for water staining wood.

Label of each bottle gives instructions to mix stains to: 1) Darken Maple, 2) Lighten dark walnut, 3) to give richness, 4) Darken Light woods, 5) Deepening Light Woods, 6) for coloring cheap walnut. All instructions are worked out so that you can use your powder scales for weighing dyes used in each formula to give 8-ozs of dye. Each bottle contains enough for MANY formulae.

FIGURE 35 — Water-soluble dyes are the most popular with stock finishers.

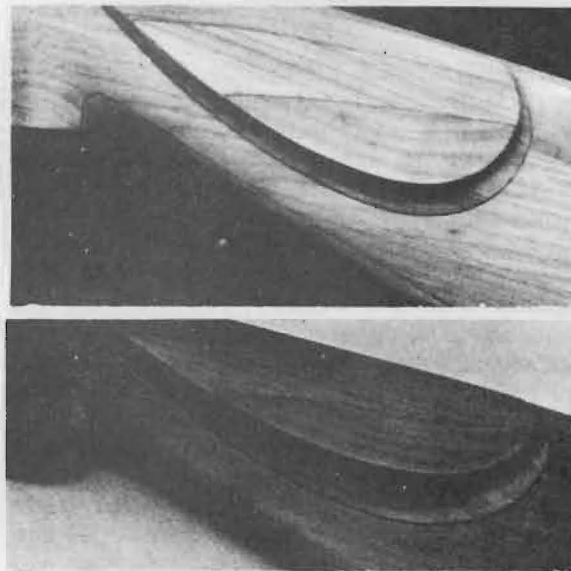


FIGURE 36 — The smoothly sanded stock at top is ready for staining. The oil stain used (bottom) all but obscured the grain. Water-soluble dyes are better.

**ANSWERS**

1

1. True    2. False    3. False



Before going on, please do Programmed Exercise 2. Make sure you write your answers on a separate sheet of paper before looking at the answers on the page specified.

### PROGRAMMED EXERCISE

2

Mark the statements below with true or false.

1. An oil finish is not as durable, or as resistant to wear as is an epoxy finish.
2. Present-day oil finishes for stocks have a linseed oil base, but incorporate a number of hardening agents which prevent deep penetration into the wood.
3. The big advantage of an epoxy finish on stocks is that dents and abrasions can be patched and re-finished easily, after a good stripping agent has been applied to the area.

Answers on Page 18

### FILLING AND SEALING THE STOCK

Let's assume you're working with Tru-Oil. To fill and seal the grain, even if the pores are large, apply a heavy coat of Tru-Oil evenly with a swab, eliminating any runs (which must be later sanded out). Let it dry overnight. If you're in a hurry, hang the stock outside where the sun and wind will speed drying. Then apply a heavy second and third coat (no sanding between), permitting each coat to dry thoroughly before laying on the next. Allow at least 24 hours between coats.

You then sand off the finish, right down to the wood, using a wet No. 400 carborundum paper, and finishing with a wet No. 600 paper (which does more polishing than sanding). The result should be a stock as hard and smooth as a con man's smile, with the pores completely filled and even with the wood.

Now we separate the boy stock finishers from the men stock finishers. To achieve that deep-down "custom" look and feel, additional coats of Tru-Oil must be applied. Apply the oil sparingly, with no more than a few drops at a time rubbed into the stock and always with the grain. Continue rubbing it in with

your fingertips, and then the heel of your hand, until each droplet is smoothed into the wood and the entire surface of the stock is covered.

The tacky stock must then be placed or hung in a dust-free cabinet or closet. Nothing is more irritating than finding a dog or cat hair, or a chunk of lint, embedded in your otherwise perfect finish. This first finish coat, as well as subsequent coats, must be allowed to dry *thoroughly*. The difference between an amateur and a professional finishing job is usually drying time.

### SUFFICIENT DRYING TIME IS A MUST

Each coat (regardless of what anyone says) should be permitted to dry for a minimum of 24 hours, preferably longer. It should then be wet-sanded lightly with No. 600 paper or rubbed lightly with super-fine 000 or 0000 grade steel wool. If the finish isn't *dry*, the emery paper will peel or scuff any soft areas (especially runs). The steel wool will create a grayish, fiber-imbedded mess. In these instances, unless you're the kind of person who'd paint a Cadillac with a mop, you have to strip the wood and start over. Attempt to spot-sand and touch up the blemishes, and presto — a perfect amateurish job!



FIGURE 37 — Factory stock (above) was clumsy and lacked luster. Altered stock with a commercial oil finish applied correctly is at the bottom. (Courtesy NRA)

Some stocks, depending on wood density and the skill of the finisher, look great after three or four coats (Figure 37). Others require as many as four or five coats. Generally, when you will rub down the stock later, six to eight coats are best.

The usual problem is that the stock starts looking so "purty" that the novice finisher can't keep his paws off his new creation. He rushes the job because he can't wait to see how it looks attached to the hardware, so he applies only three or four coats and ab-

breviates the between-coats drying time. Next time he'll know better!

If you're finishing several stocks at the same time (and it's easy to do as each finish coat takes only a few minutes), drying time can be accelerated by directing hot air from a hair dryer to the hard, but not cured finish. (Don't do this when the stock is still tacky or you may "flock it" with lint!)

Incidentally, when working with Tru-Oil or any commercial oil finish (Figure 38), always store the capped bottle upside down between usages. Once a bottle has been opened, an oil film forms at the top, or at the bottom when the bottle is positioned cap down. In the latter position, no harm is done. It's also a good idea to pour a small amount of oil into the bottle and you'll pick up small blobs of semi-hardened oil that are the devil to pry out of a wet finish.

## LIN-SPEED

THE REAL KETTLE BOILED  
OIL GUNSTOCK FINISH



APPLY, LET DRY!! It's as simple as that. But we could add to the instructions on the bottle and say that if you have to stain, do it before applying any finish - and use Bob's water soluble dyes. Do not steam and de-whisker. The dried oil will "freeze" these in place and the first sanding will take them off cleanly.

Leave the final sanding dust in the wood pores to help fill them. Be sure your hands are clean and dry, and then just apply finger-dunks of oil from the bottle, spread it over the surface with the fingers, giving the Lin-Speed a smoothing swipe with the heel of the hand, and then set the stock up to dry. Each coat will dry in 2-3 hours under normal conditions and it is not advisable to hand-rub the coats for it may cause balling under the heel of the hand.

Most people work too hard finishing a stock. Just devote care to the final sanding - then with GB Lin-Speed, it is just APPLY. LET DRY!!  
---George Brothers

---

## TRU-OIL STOCK FINISH

"THE FILLER IS IN THE FINISH."

Eliminates extra step of grain filling.  
Fast — completely finished stock in 1 day.  
Penetrates without rubbing.  
Finish is deep, rich, clear, easily maintained. High or low, medium lustre obtained easily.

A great deal of care and research went into TRU OIL Stock Finish to satisfy a long unfilled need for a really fast filler-type finish. One that will truly preserve the warm natural beauty and feel of the wood stock.

TRU OIL is a product of modern chemistry - a purified, triple-processed blend of all natural oils with the non-drying factons removed. The oil penetrates into the grain to seal out moisture and rot, yet the wood remains clear and even harder and tougher. Produces no grain clouding or yellowing. So fast drying - 30 to 90 minutes per coat for an average of 3 coats - that your Tru Oil finished stock can be filled and finished in one day!

New ultra-violet screening agents exclude the sun's damaging rays that discolor wood - and the wood, even stained or bleached, keeps its natural beauty indefinitely. Does not water spot or turn white. Mars repair in minutes with pad dampened in Tru Oil and rubbed over spot.



FIGURE 38 — Two of the most widely-used commercial oil finishes.

## ANSWERS

2

1. True    2. True    3. False

### RUBBING DOWN YOUR STOCK

After you have applied the final finish coat, let the stock dry for a few days (preferably a week). Then, for a really slick and super-custom finish, rub it down with rottenstone mixed with water. (Some pros prefer to mix the rottenstone with linseed; either solvent works well.) The mixture looks like mud and you'll probably wince at the idea of slopping it over that beautiful, gorgeous, one-of-a-kind creation. Relax, your stock is soon going to look even *better!*

Saturate a soft rag with the rottenstone mix and rub it with the grain, using firm, even strokes. A piece of heavy felt works better. You'll probably get scared working blind and wash off the mud too soon. However, the pumice-like grit is so fine that quite a bit of rubbing is required to get that soft satin or eggshell finish. You'll soon get the hang of it and produce stock finishes the equal of any — bar none! (See Figure 39.)

### STOCK RUBBING COMPOUND



Not only do we recommend Brownell's Stock Rubbing Compound for Acraglas finishing, we strongly urge you to use it for the rejuvenating of old gunstocks which have had good original finishes. When used for this purpose the results can only be described as dramatic! So simple to use but makes the old finish literally better than new. Also without equal for the master quality finishing of new stocks.

The compound has been used for many years by the highest paid craftsmen in our nation's leading "executive quality" furniture factories where cost of finished piece is no object. It is available to the gunsmith trade thru us, Brownell's Stock Rubbing Compound brings whatever type finish has been used - varnish, lacquer, oil, synthetic or plastic - to an ultra smooth, glass-like surface prior to final waxing. This is the only way in the world a piece of wood can have that ultra-deluxe, distinctive look so sought for on good gun stocks... a certain "sheen" that only craftsmanship and quality materials can produce.

To use, apply with a damp cloth pad. Polish by rubbing crosswise of the grain. If mild abrasive action is desired, dampen pad occasionally to keep compound moist. Complete by rubbing with grain. Clean up and bring to luster by using dry, clean cloth. Finish off by using any good stock wax.

FIGURE 39 — Commercial rubbing compounds utilize rottenstone or other fine pumices.

## EPOXY (POLYURETHANE) FINISHES

After the pores have been sealed and filled with a heavy coat of epoxy, the finish is then sanded down to the wood. An epoxy finish is applied in much the same manner as Tru-Oil. Thin coats are brushed or sprayed on (some epoxy finishing kits include an aerosol applicator), with each coat sanded and/or steel-wooled after hardening (Figure 40). Drying times and recommended application procedures vary among manufacturers. As you will be working with commercial products in such applications, the maker's specific instructions should be followed. Satin-finish epoxy finishes have recently been introduced. These are becoming increasingly popular because they eliminate one of epoxy's biggest drawbacks — the shiny, high-gloss finish many shooters consider objectionable and which in the past could only be toned down with rottenstone and plenty of elbow grease.



FIGURE 40 — Epoxy stock finishes are applied by brush, or by aerosol spray. Tuf-Sheen is made by the manufacturer of Tru-Oil.

### SEALING THE INLETTING

The final step in finishing any stock (which should actually be done early in the finishing procedure) is to apply a coat or two (no more than that) to the barrel channel and inletting as a moisture barrier. Some stock makers prefer to use spar varnish or a diluted coat of epoxy for this purpose since the water-proofing qualities are better than that of any commercial oil finish. The important thing is not to overdo it or get the sealing material on the glass bedding. Varnish, oil, or whatever, when built up on the inletting, will ruin a perfect wood or glass-to-metal fit. Don't wait until the stock is finished because you're bound to get some inletting sealer on that nice finish. Above all, don't use shellac. The alcohol content can damage an oil finish.

### STOCK REFINISHING

Much that has been said previously about stock finishing also applies to refinishing. An

added step is, of course, removing the old finish. Most oil, varnish, and lacquer finishes loosen and come away quite easily when a good grade commercial stripper is used and left on long enough to do its job.

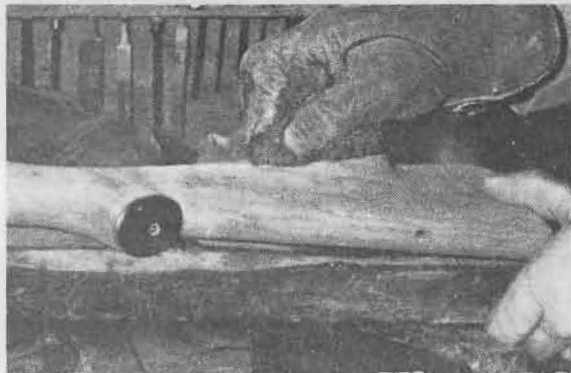
There are two basic types of strippers which work equally well and are equally caustic, requiring the use of rubber gloves. One is the water-wash type; the other can only be removed from the stock with acetone or lacquer thinner. The water-wash variety is the least expensive, and for most stock stripping purposes is superior. You can get down to the bare wood, with no specks of finish clinging here and there, in a very short time. A small fiber brush dipped in a detergent solution will quickly clean out the softened, gummy residue from checkering and small recesses. The stripper/detergent combination also effectively opens and cleans out the pores, which you'll want to refill and seal anyway. The only problem of a water-wash stripper is that it adds moisture and causes the wood to swell, which in checkering makes the points fuzzy. It must be completely dried before refinishing.

If you're going to recut and touch up the checkering, this swelling isn't important. If, however, the existing checkering is sharp and/or fine, and if you haven't yet developed the talent to recut the diamonds, then an acetone-wash stripper is indicated. Better yet, if the checkering is good, clean it up with a toothbrush and acetone *before* stripping, then mask off the checkered panels with tape. You can then use either type of stripping agent.

### THE STRIPPING PROCEDURE

First remove the butt plate or recoil pad, or mask off the pad. Actually, it's a better idea to leave it in place so it will blend into the new finish. Old and/or thick coats of oil and varnish are sometimes a bit stubborn, requiring careful use of a steel knife or scraper to skim off most of the softened scum. Take care not to gouge the wood, especially in and around the checkering panels. After the stock is fairly naked, work off the remaining residue with medium-coarse steel wool pads (Figure 41). When all of the obvious finish is gone except for a few streaks and dabs here and there, apply another coat of stripper and let it sit as long as possible before drying out. Remove as many of the finished remnants as you can with your scraper. Then, if you're working with a water-wash stripper, dunk a medium-soft brush (a laundry brush is fine) into a household detergent solution and go at it. The stock should be whistle-clean in short order.





**FIGURE 41** — After removing most of the softened finish with a scraper or putty knife, wipe off the remainder with clean steel wool. Move the pad in one direction only, as back-strokes will smear the residue back into the pores. (Photo courtesy NRA)

If you're using the acetone-wash type stripper, the detergent solution is out. Work with the acetone or lacquer thinner and a soft brush until you're satisfied that the stock is clean. Be sure to work in a well ventilated area, and take care that you don't splatter the solvent into your eyes (safety goggles are a good idea).

Military or London oil-finished stocks should then be heated to bring out the oil, which can be wiped away with a rag soaked in mineral spirits, or absorbed by a whiting compound. Repeat the heating process until the oil stops bubbling. It may take awhile.

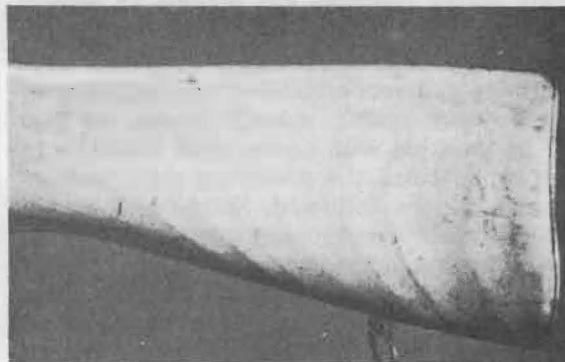
### BLEACHING THE STOCK

When the completely stripped and "de-oiled" stock has been sanded smooth, you're ready to start refinishing. However, you may wish to lighten the wood first. Old stocks, particularly those that previously wore a military or heavy oil finish, are sometimes overly dark, caused by linseed oil, gun oil, or a combination of both permeating the pores. The heating and/or whiting process (which we will explain a bit later) may get out most of the oil, but the dark color remains. Bleach often does wonders for such stocks (Figure 42). Commercial bleaches are stronger than necessary. Ordinary household chlorine bleach works fine. Apply it evenly with a saturated rag and let the bleach remain on the wood for a minute or two. Wash the stock with water, dry it, and the wood will appear nearly white, which is misleading. In order to determine the true color of your bleached wood, sand the surface lightly.

The degree of lightness is controlled by the strength of the bleach and by how long you leave it on (and, of course, the original stock color). Each stock is different, so take

it easy. Apply a little bleach, wait, then wash and dry. Then do it again, until you attain the desired shade.

As in anything else, you'll learn exactly how to bleach to any degree or lightness with a bit of experience.

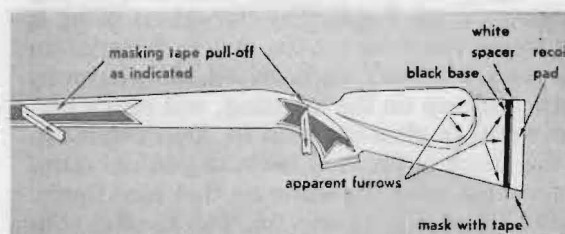


**FIGURE 42** — This military stock, after boiling-out the oil, was bleached nearly white. The worker overdid the bleaching — he had to stain the wood. (Photo courtesy NRA)

### PROTECTING THE CHECKERING

You then proceed with your refinishing exactly as described previously — sanding, sealing, filling the pores, etc. If the stock has been checkered, keep the filler and finish out the checkering and borders. To play it safe, mask off these areas (Figure 43). When the finish has been completed, remove the protective mask and brush a thin coat of diluted (50-50) Tru-Oil, and mineral spirits into the checkering. You want to protect the checkering against dirt and perspiration, but you don't want to gum up the lines. Use this light stock oil treatment even when the stock has been finished in epoxy.

It is for this reason (to keep the finish out of the checkering) that checkering on a new stock is normally cut *after* the stock has been finished. Diluted finish is then applied to the fresh checkering for protection.



**FIGURE 43** — The checkering and recoil pad should be masked off before stripping or finishing, if the checkering is in good shape. Furrows may form where indicated after the finish is applied. (Photo courtesy NRA)

## REFINISHING EPOXY STOCKS

A simple and one of the best epoxy finish removal procedures often overlooked is a steel scraper. This can be either a flat piece 2" or 3" long and 1-1/2" to 2" wide, or a 6" flexible steel rule. These will remove epoxy or any finish down to the base wood. A file is used as needed to maintain the scraping edge. The edge is filed square and "burnished" to a cupped edge that expedites scraping.

This procedure would appear to take a lot of time; but, to the contrary, the epoxy finish is removed rapidly and without the usual gummy mess from solvents, strippers, water, etc.

## COMMON STOCK REPAIRS

Varied indeed are the assorted ills and insults that befall the average gun stock during the lifetime of its owner (or owners). Dents and bruises in saddle guns or "car-trunk specials," usually low-cost lever-actions and pumps, disturb the owners not a whit, and are sometimes a source of inverse pride. ("Man, Ol' Betsy's ugly, but she sure shoots!") Such guns are seldom brought to the gun pro for cosmetic stock surgery. You see them only when the damage is sufficient to prevent normal function — like a bad split at the tang or a break across the pistol grip.

At the opposite pole you have shooters to whom a small dent in the forearm, or a banged-in bit of checkering is a disaster equal in enormity to the Hindenburg explosion. And, of course, there are many repair jobs of in-between importance — some functional, some cosmetic, and some a combination of both. Let's talk about a few of the more common problems you'll encounter in stock repair.

### Splits at the Tang

The combination of poor initial bedding (typical of many factory guns), moisture in the bedding and consequent swelling, and even improper tightening of the tang or guard screws, cause splitting of the wood at the tang in bolt and lever-action rifles. The remedy here is to dress out the wood where the action exerted the pressure, and apply bedding compound in the recess. The splinters, if any, can usually be laid back in place and held with the same epoxy compound, providing it is about the same color. It may be necessary to drill into a split and force epoxy into the cracked area. If you try to pry it open, you'll extend the split. (A small countersunk bolt hidden with a pair of inlays may be the only answer.) The action is then coated with a

releasing agent and tightened down for a perfect fit at the tang. If you're working on a bolt-action rifle, you might as well hog-out the recoil lug shoulder and bed this part of the action, too, as looseness here was probably the cause of the wood splitting. Spot refinishing of the tang area is then indicated (Figure 44). The wood just behind the tang should always be relieved slightly. Recoil can make the tang act as a moving wedge.

In bolt-actions, splitting just in back of the bolt recess often occurs at the same time the wood in back of the tang splits, caused by the action moving back against the wood at recoil. Relieve the groove with a round rasp, epoxy back any splinters, and spot refinish.

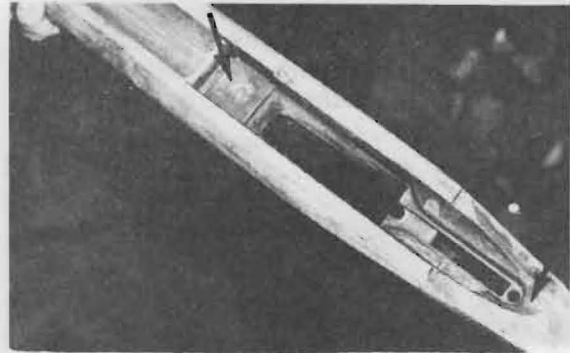


FIGURE 44 — This stock was split at the tang. The tang mortise (bottom arrow) and the worn recoil shoulder which caused the splitting (top arrow) were both glass-bedded.

Before going on, please do Programmed Exercise 3. Make sure you write your answers on a separate sheet of paper before looking at the answers on the page specified.

## PROGRAMMED EXERCISE

3

Mark the statements below with true or false.

1. One of the best ways to remove an epoxy finish is to scrape the finish off with a 6" flexible steel rule.
2. When stripping the finish from an old stock, it's better to leave the recoil pad in place and mask it than it is to remove it, so that it will blend in more naturally with the new finish.

Answers on Page 22

Gouges or deep gashes that cannot be removed by heat and steam can be filled with stick shellac of the proper color (Figure 47). However, the texture of shellac fill-ins often doesn't match that of the wood. A good trick is to mix walnut wood dust with glue or epoxy and use that as a filling. Many shades of shellac sticks are available, for a close match and toning. Sometimes, if the gash isn't too large, the raw wood is stained to match the surrounding wood and transparent shellac is applied. A small, spatula-shaped tool with a polished blade about 4" long, tapering from 3/4" at the base to about 1/2" at the tip, is heated over a sootless flame. When hot enough to melt the shellac stick, the tool is pressed against the stick, transferring a small amount of hot shellac to the blade. The blade is then "swiped" across the gash, pressing the soft shellac into the recess. Two or three passes may be necessary to build up the shellac to slightly higher than wood level. When hard, the shellac is sanded down to blend into the wood.

Shellac sticks are used to repair deep cracks, especially in highly figured wood, and to plug dowel and screw holes.



FIGURE 47 — Deep dents and gouges that can't be raised by heat are usually filled with a shellac stick of the proper color.

#### EASY-TO-MAKE INLAYS

Inexpensive (and counterfeit) "inlays" can be easily formed in light and dark woods with shellac of a sharply contrasting color. However, if you're going to use this shortcut on inlays, you're better off working with a pigmented epoxy, which is harder and requires no heat in the application (Figure 48). You inset the wood to the inlay shape about 1/4" deep, making sure the edges are sharp and clean. Mask off the edges and lay in the epoxy. When hard, sand and polish the epoxy surface down to the wood level. Better practice a time or two before trying this on a good stock. Remember, garish or other than perfect inlays will detract from the appearance of any stock.



## EPOXY-BLACK PIGMENT

Tremendous new jet-black Epoxy-Black Pigment mixes evenly into any epoxy, paint, plastic, ink or lacquer to give uniform, permanent, solid black color. Finest pigment available to blacken Acraglas or Twin-Weid when repairing those irreplaceable grip caps, butt plates, forends or pistol grips. Excellent for casting black Acraglas copies of fancy butt plates, grip caps, inlays, schnobbles, pistol grips and other fittings using RTV Silicone Molds. Makes beautiful, perfect-fit inlays when cast directly into the stock. Best way to really custom-fit the cocking knob relief insert in 110 Savage stocks, other stocking jobs.

True jet-black color...no "blue cast" even in very thin applications. Gives complete, even dispersal for uniformly solid black through entire thickness. Can be sanded, checkered, shaped or filed without loss or fading of color. Takes "just a pinch", to get extraordinary black color.

FIGURE 48 — Inlays can be cast into a recessed outline by using clear epoxy mixed with black pigment.

#### MENDING BROKEN PISTOL GRIPS

The weakest part of any stock is usually the pistol grip. A good *emergency* makeshift repair involves the use of a better brand of plumber's tape, wrapped tightly around the grip.

A more permanent and surprisingly satisfying approach, even for mangled stocks that seemingly belong in the nearest trash can, involves the use of a dowel (a birch dowel is probably the best), and by far the strongest repair for a broken pistol grip.

Select a 3/4" dowel, or the largest one that the receiver will logically accept. With a bit the same size as your dowel, drill straight through the cap of the pistol grip, and through the broken surface into the other side of the break for a perfect fit.

Of course, you'll have some reshaping and sanding to do in the cap area after you press fit your dowel, and it won't look that great unless you make your own walnut dowel as your connecting piece.

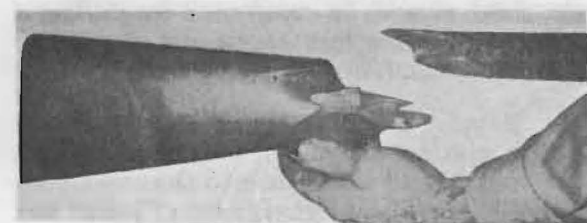
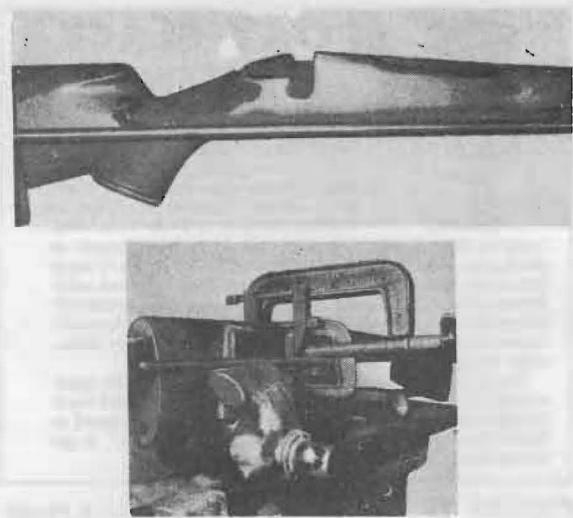


FIGURE 49 — It looks hopeless, but with a little know-how this stock will soon look as good as new. (Photo courtesy NRA)

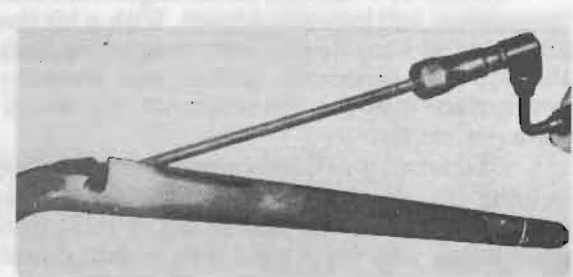
The opposing surfaces are liberally coated with epoxy before you face the challenge of bringing everything together. When you do, you will find the curved surfaces resisting C-clamps





**FIGURE 50** — The correct horizontal alignment is best maintained with a long “pipe clamp” bearing against the forend and the butt (top). A C clamp holds the broken pieces in vertical alignment (bottom). (Photo courtesy NRA)

Though quite strong, the glue joint should be reinforced (Figure 51). A good way to do this is by drilling a 3/8” hole in the upper tang recess, down through the pistol grip, and into the butt stock itself. A 3/8” dowel is then coated with epoxy and tapped into the hole. The excess is removed with a chisel and the tang mortise is cleaned up. If necessary, glass-bed this tang area.

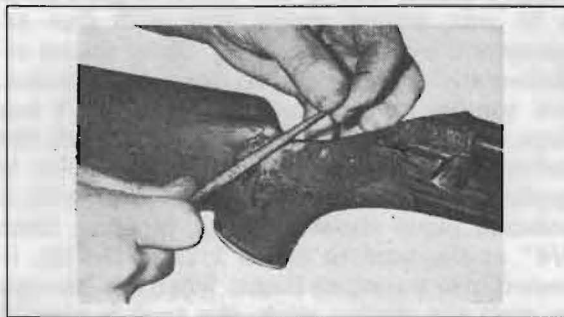


**FIGURE 51** — Epoxy bonds are strong, but the joint should be reinforced by drilling a hole through the tang recess and down into the butt stock. (Photo courtesy NRA)

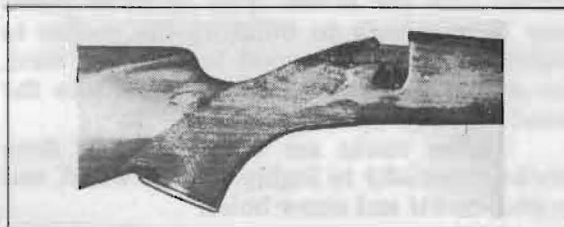
Remove any beads or runs of excess soft epoxy with a sharp chisel, then smooth down the epoxy until it blends into the stock contours (Figure 52). Any recesses or “holes” can be filled with dabs of epoxy, then smoothed with a damp rag after it thickens. Avoid getting glue into the checkering or marring the checkering with your tools or sandpaper.

When the joint area has been hardened, smoothly sanded, and the exposed wood stained to match, you’re ready to spot-finish (Figure 53). If the area is an abomination,

strip and redo the whole thing. But do the stripping and refinishing after the stock has been repaired (strip the wood beforehand and you’ll probably damage the bearing surfaces).



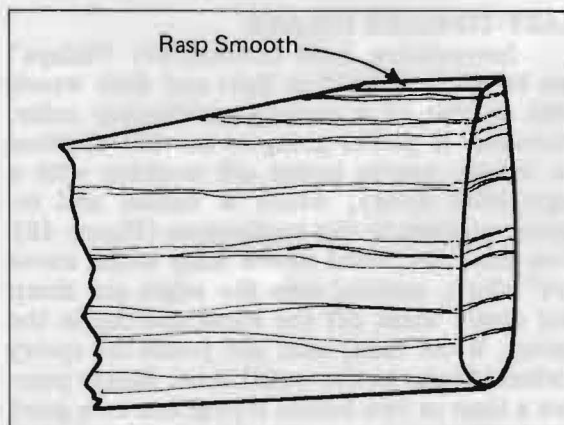
**FIGURE 52** — The joint is smoothed with a round rasp. Take care not to mar the checkering. (Photo courtesy NRA)



**FIGURE 53** — With the joint stained and sanded, the checkering touched up a bit, and the area spot-finished, the repair is nearly undetectable. (Photo courtesy NRA)

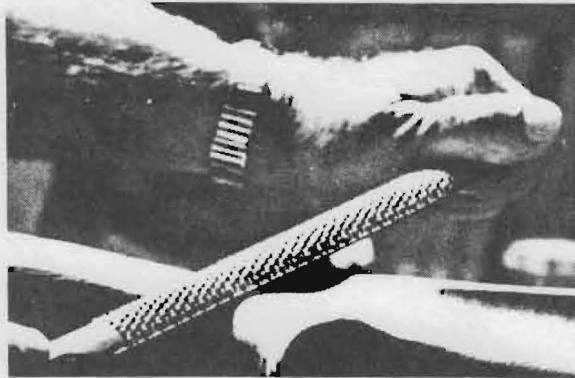
#### MENDING BROKEN TOES

Next to the pistol grip, the toe of a rifle or shotgun stock gets the most abuse. Shooters of the yoyo variety delight in banging this portion of their smokepole’s anatomy against rattlesnake heads, crippled game, and even Mother Earth when expressing pleasure or rage over a good or bad shot. In any event, fractured toes are commonplace and the missing piece is usually long gone (Figure 54).



**FIGURE 54** — Broken toes are more common among gun stocks than among ballet dancers.

The first step is to mount the stock in a vise and prepare the jagged edge to match up against a new piece of wood. A plane works best, but a rasp or a knife will do the job, providing the cut is level and at a right angle to the butt (Figure 55). These dimensions must be checked with a straightedge and any ripples or irregularities smoothed out.



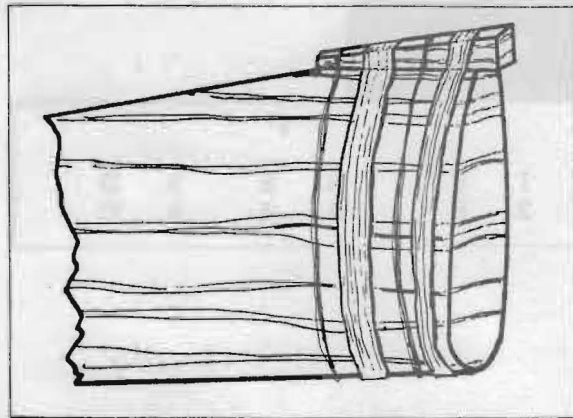
**FIGURE 55** — An inexpensive wood rasp is ideal for roughing out and shaping fairly large wood areas, like broken toe additions.

The next step is to find a small chunk of wood that closely matches the stock. Always hang onto irreparable or “junk” stocks. They often contain sections of splendid “patch” wood. Plane down the patch until the surface that will bear against the stock is perfectly flat and even. Cut your patch so that at least 1/4” of excess wood protrudes at all sides to allow for final shaping. When the piece is ready to affix, coat both the stock and patch evenly, then position the patch and wipe off the excess epoxy. Clamps can be used to hold the stock and patch together, but, because of the disparate angles, strong rubber bands are better (Figure 56).

When the epoxy is dry, a rasp is first used to trim the patch close to size. The final contouring is done with sandpaper, decreasing grit size when the patch is nearly flush with the stock. Make sure you maintain and extend the bottom line of the stock. A straightedge should be used in trueing up this line.

Following final and careful sanding, the patch can be stained if necessary to match the stock. The patch is then spot-finished, or, better yet, the entire stock is completely stripped and refinished, which really blends the new addition into the whole.

Now you *know* that you’re not going to remember *everything* we’ve said, unless you have a memory with computer storage banks. But it’s all right here when you need it, *when you do it*. In fact, you will probably want to read this lesson again to get many procedures firmly fixed in your mind now. Then, just be-



**FIGURE 56** — The section of closely matching wood is epoxied into place. Rubber bands and tape, rather than a C clamp, are used because of the stock angles.

fore you attack that stock, get it out again and give it a thorough going over.

Meanwhile, let’s get on with checkering, stippling, and carving . . .

But first do Programmed Exercise 4. Make sure you write your answers on a separate piece of paper before looking at the answers on the page specified.

### PROGRAMMED EXERCISE

4

Match the proper treatment to the problem it corrects by placing the letters from the bottom list in the blank spaces in the top list.

- |       |    |                        |
|-------|----|------------------------|
| _____ | 1. | Dents.                 |
| _____ | 2. | Heavy oil penetration. |
| _____ | 3. | Splits at the tang.    |
| _____ | 4. | Deep cracks.           |
| _____ | 5. | Broken pistol grip.    |
| _____ | 6. | Broken toes.           |
- 
- |    |   |
|----|---|
| A. | Shellac sticks and dowel plugs.   |
| B. | Dress out the wood where the action exerted the pressure, and apply bedding compound in the recess. |
| C. | Use a piece of “patch” wood.  |
| D. | Epoxy and vise clamp, and possibly use a connecting dowel.  |
| E. | Bleach out with chlorothene and whiting.  |
| F. | Apply steam iron or soldering iron through a damp cloth.  |

Answers on Page 26





NOTES



STUDY UNIT 12 – PART 3

STUDY  
UNIT  
12  
PART  
3

CHECKERING, STIPLING, AND CARVING THE GUN STOCK

**DIAMONDS ARE A RICH  
GUN'S BEST FRIEND**

Fine checkering, like sterling on silver, has traditionally been the hallmark of the top-grade custom rifle and shotgun, enhancing the beauty and value of the arm while providing a non-slip surface. Today, superb checkering is rare, except on most expensive arms.

You do occasionally encounter an example combining imaginative layout with tiny, needle-sharp diamonds and non-runover borders (Figure 1). More often the craftsmanship is about as inspired as that of a four-ply tire. (We're *not* talking about the apologetic impressed variety, which reflects a "craftsmanship" more at home in a waffle factory.)



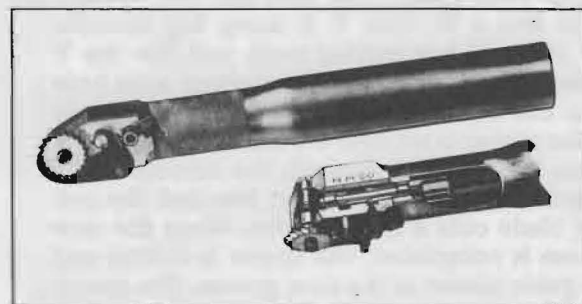
*FIGURE 1 — The art of fine checkering and carving, if not lost, has surely been misplaced. The sporterized Springfield (above) was stocked about 25 years ago.*

Comparatively few stocks are executed by master checkers who charge and earn upwards of \$150 per job. Some factory stocks are checkered in simple "standard" patterns by aproned housewives, students, and senior citizens, in this country and abroad, who received \$10 to \$15 for each job on a piece-

work basis. The majority of checkering, however, is cut by skilled factory workers with electric checkering tools, a daily quota, and probably ulcers. Many of the large gun makers are now going back to cut checkering, and to achieve any kind of production, electric cutting tools and/or homeworkers, are a must.

Some individuals with a flair for wood-working can completely hand-checker a simple forearm and pistol grip pattern in six to eight working hours. Others take longer. However, the work is painstaking and eyes and hands usually tire after an hour or so. Fatigue leads to runovers and wandering lines, which are difficult to correct. For this reason, it would be impossible to hire a hand-checkerer and expect him to work a full eight-hour shift. Most experienced checkers work no longer than an hour at a stretch, and may not go back to the work until the next day.

Electric checkering tools (Figure 2), in the hands of a skilled operator, can produce a completely checkered stock in as little as an hour or an hour and a half. These tools are expensive, costing from \$200 to \$300, and can't really be justified unless an individual or shop is turning out a great number of checkering jobs. The finished checkering, to all but the most critical eye, is indistinguishable from hand-cut checkering.



*FIGURE 2 — Electric checkering tools like the MCC model shown are lightweight and held like a pencil. Adjustments set depth of cut and lines-to-the-inch spacing.*

CHECKERING, STIPLING, AND CARVING THE GUN STOCK





## Tools and Equipment Required

You can't buy the prime ingredient of success in checkering — patience and a willingness to learn from mistakes. Try to rush a checkering job and the hours you spent shaping and finishing the stock will be wasted and the panels botched-up. When we speak of someone having a "feel for wood," we really mean that the person has patience. Checkering isn't difficult if you have patience. If you don't, you'll find the project impossible.

The tools required are simple and inexpensive. While commercial checkering sets contain anywhere from four to six or eight tools, only two are really required for basic checkering. (In the old days, when checkering tools were handmade, many artisans did beautiful work with only one tool.) Let's talk about the basic tools first and get to the others later.

The primary and most important tool is the "V cutter" (Figure 3), which has sharp cutting teeth on both sides of the V. This tool is used to cut the first or master lines. Later, after the checkering lines have been cut lightly with the spacer tool, the V cutter is used to bring the lines down to the proper depth. The V cutter is both a starting and finishing tool. It can also be used for cutting borders if you don't have a specialized border tool.

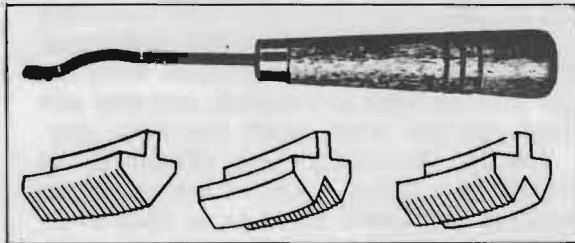


FIGURE 3 — Checkering tool with handle (above) and the basic cutting heads. V cutter is shown at the left; spacer heads, with right and left cutters, are at the right.

The second most important tool is the spacer with guide. This tool has two V's and looks like a W. One V is sharp but smooth; the other V has cutting teeth just like the V cutter. After the master or starting lines have been cut with the V cutter, the smooth blade of the spacer is set into the master line groove. When the spacer is pushed, the smooth blade or guide rides in the master line and the cutting blade cuts a fresh groove. When the new groove is completed, the spacer is shifted and the guide placed in the new groove. The spacer is again pushed, the cutting edge cuts a new groove, and so on. In effect, the spacer is like a truck moving down a country road riding the shoulder. The inside wheels (guide) are

following an established rut in the road, while the outside wheels (cutter) are making their own new furrow on the undisturbed shoulder.

## The Spacer Determines Lines Per Inch

The distance between the guide and cutter on the spacer determines the spacing of the lines in the checkering — 16, 18, 20, 22 lines to the inch, etc. A spacer is always designated by its spacing or lines-to-the-inch number. No. 18 and 20 are the most popular spacers.

Wood density, even more than the skill of the checker, governs which size spacer should be used. Coarse, open-grained woods require wide 16 to 18-line spacing. Try to cut such wood with a fine No. 24 or No. 28 spacer and the wood fibers will pull and tear, making fine diamonds impossible. Fine checkering is only possible on dense, close-grained wood (Table 1). You will occasionally see a gun with super-fine 28 to 32-line checkering. This is for appearance only, or to "prove" a checker's skill. The lines are too closely spaced to provide much of a non-slip surface.

Spacers are made with the guide on the left or on the right. When cutting the last line in a pattern and moving to the left, the guide must be to the right — and vice versa. This arrangement isn't really a must, but it does simplify matters.

In practice, after the master or starting lines have been cut with the V cutter (Figure 4), the spacer is used to *lightly* cut or space the pattern (Figure 5). Then, when the entire pattern has been spaced, the shallow lines etched by the spacer are deepened to about 1/16" by several passes in each groove with the V cutter. This tool *starts* and *finishes* the job.

| Kind of Wood          | Janka *<br>Hardness | Wt. per<br>Cu. Foot | Checkers<br>Well | Strength     |
|-----------------------|---------------------|---------------------|------------------|--------------|
| Redwood burl          | 500-600             | 24                  | no               | poor         |
| African mahogany      | 760                 | 31                  | fair             | questionable |
| Queenland maple       | 850                 | 34                  | no               | good         |
| Wild cherry           | 950                 | 35                  | yes              | good         |
| American black walnut | 1000                | 38                  | yes              | good         |
| New Zealand walnut    | 1000-1500           | 42                  | yes              | good +       |
| Blackwood             | 1150                | 40                  | yes              | good         |
| Mesquite              | (varies) 1250       | 52                  | yes              | good         |
| Texas mesquite        | about 1250          | 52                  | yes              | good         |
| Oregon myrtle         | 1270                | 39                  | yes              | good         |
| Yama                  | 1300-1580           | 30                  | yes              | good +       |
| Bird's-eye maple      | 1450                | 44                  | yes              | good +       |
| Plain maple           | (varies) 1450       | 44                  | yes              | good +       |
| Osage orange          | 1970                | 50                  | yes              | good +       |
| Jarrah                | (estimated) 2500    | 65                  | yes              | good +       |
| Amaranth              | 2500                | 50                  | yes              | good +       |
| Guboon ebony          | very hard           | heavy               | yes              | good         |
| Cocobolo              | .....               | 70                  | yes              | good +       |
| Teak                  | .....               | 50                  | yes              | good         |
| Zebra-wood            | .....               | .....               | yes              | good         |

\* Janka Hardness is the load in pounds required to embed 44" diameter ball to one half its diameter in wood.

TABLE 1 — Properties of some stocking woods. (Courtesy NRA)

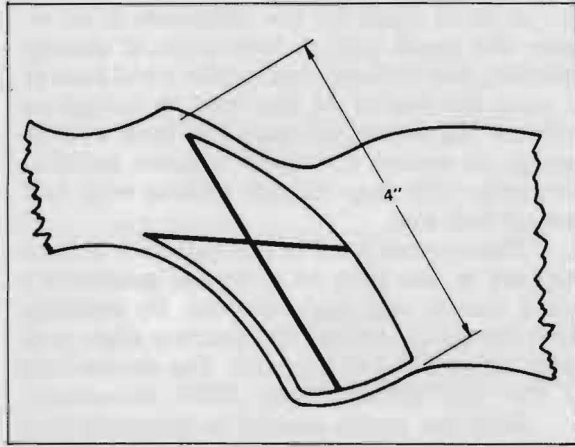


FIGURE 4 — Layout of a basic pistol grip showing master lines and borders. (Borders are crayoned-in.)

### Miscellaneous Checkering Tools and Equipment

In addition to the V cutter and spacer, two other tools are often used (Figure 6). The border bead cutter cuts a double-band border around the checkered panels. Its purpose is largely "defensive" in that it serves to cover the runovers resulting from the pattern lines extending a bit *past* the border. (The mark of the true pro is a pattern with no runovers at the border.) A single-line border can be cut with the V cutter.

The veiner is a sharp, V-shaped chisel designed for cutting tightly curved, single-line borders and for deepening grooves in areas that can't be conveniently reached with the V cutter.

There are also other specialized checkering tools (Figure 7). As in any phase of gun work, you can usually get by with a limited

tool inventory. Extra equipment is nice to have, but it is not absolutely necessary. Some checkering tools have detachable heads for quick replacement and/or sharpening. Others have one-piece heads that can be sharpened with a triangular India stone. The former are more costly and, for the checkerer who doesn't want to stop to sharpen a cutter, the most desirable.

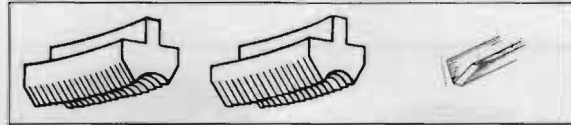


FIGURE 6 — Less commonly used tools are the wide and narrow border bead cutters at left and center, and the veiner, a tiny V shaped chisel (on the right).

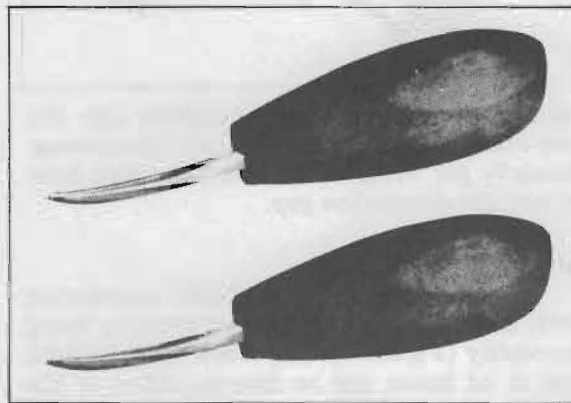


FIGURE 7 — Specialized cutting tools, like bent needle files and the Dem-Bart veiners illustrated, are curved to prevent the blade from tipping while in the groove. They are most often used for clean-up of diamonds at border junctions and in small, curved areas.

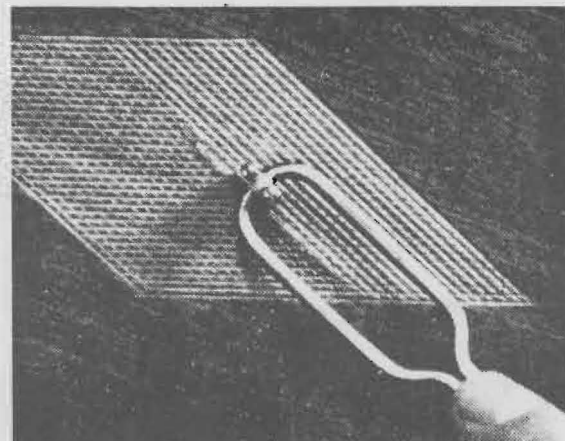
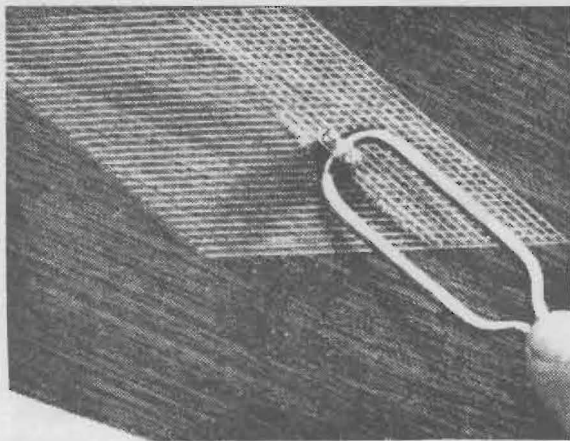
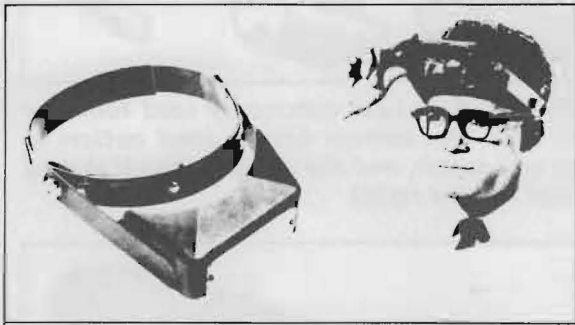


FIGURE 5 — In the photo at the left, shallow spacing lines are being incised diagonally across spacing cuts made previously in the opposite direction. When all spacing cuts have been completed, each groove is deepened individually, as shown at the right, with the V cutter. (The handle shown has interchangeable cutting heads.) (Courtesy NRA)

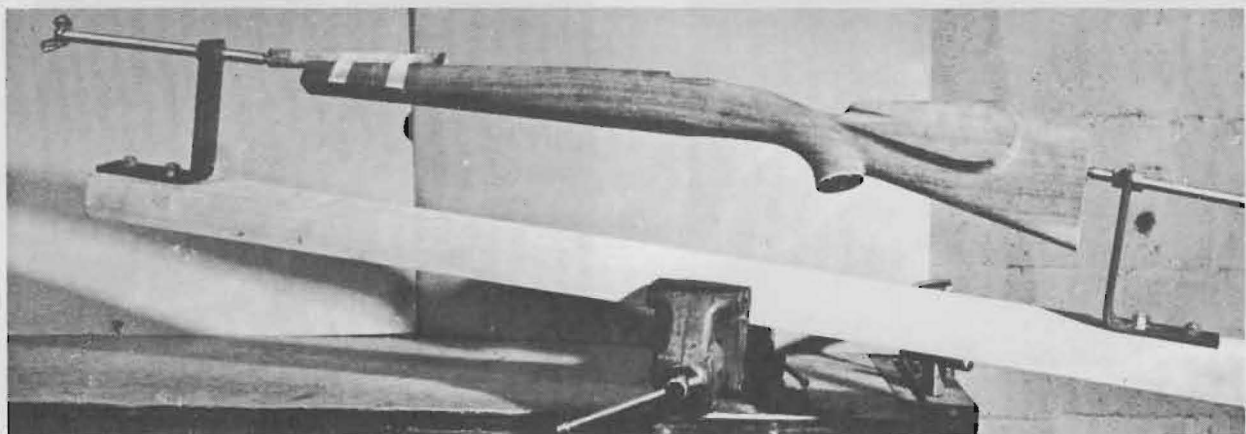
Good lighting is absolutely essential when checkering, and a gooseneck lamp which can be adjusted to throw the light at a 75° angle across the work is worth its weight in gold. Another essential is a binocular magnifier (Figure 8). Even when the dust and debris are cleaned out of the grooves frequently, it isn't easy to place cutting tools into the proper groove. Checkering places great strain on your eyes.



**FIGURE 8** — Binocular magnifiers like the Opti-Visor, are nearly a must for checkering, especially for those of us who have seen both sides of the generation gap.

#### The Checkering Cradle

In addition to your basic checkering tools, a checkering cradle comes close to being a necessity (Figure 9). The stock must be held rigid at all times, yet be free to adjust so the fixed light illuminates the curved surfaces. A cradle lets you rotate the wood under your eyes and hand. You concentrate on cutting rather than on holding the wood motionless, and one worry is enough. You can get by with a well padded vise for forearm checkering, but for a full-length stock it won't work. Checkering cradles are inexpensive and available from Brownell's. Or make your own for a couple dollars in hardware and scrap lumber.



**FIGURE 9** — A simple checkering cradle, vise-mounted, speeds up the work and greatly minimizes wandering lines. There are many different types of cradles. (Courtesy NRA)

A trick used by the oldtimers is to remove the recoil pad or butt plate, if already installed, and drill an appropriate-sized hole at or near the center of the butt to accept an ordinary lag screw. Be sure the hole is large enough to accept the screw without splitting the stock. This may require drilling with two sizes of drill bits.

The squared head of the lag screw is then clamped in the jaws of a regular machinist's swivel vise at any angle desired. By rotating the stock on the screw, the working angle is as easily adjusted as in a cradle. The swivel base of the vise permits near 360° movement.

Even the cradle should be mounted in a swivel vise for full movement. Remember, checkering requires a constant change of position as you work opposing lines of the checkering pattern. You cannot work from one position, unless the stock can be moved and rotated, especially when checkering curved surfaces.

Another shortcut for touch-up checkering or other stock work is to tape a dowel of appropriate size in the barrel channel and then clamp the dowel in the vise. For positive steadiness, a second clamp-on type vise can be used on the butt end with the lag screw. This, in effect, provides a cradle.

Also, a cradle is often used during stock finishing and for other stock work.

Before going on, please do Programmed Exercise 1. Make sure you write your answers on a separate sheet of paper before looking at the answers on the page specified.

#### Laying Out the Checkering Pattern

In the opinion of many checkerers, pattern layout is the worst part of the job. It takes time and it has to be right, or the finest checkering will be about as pleasing as an out-of-tilt picture frame.



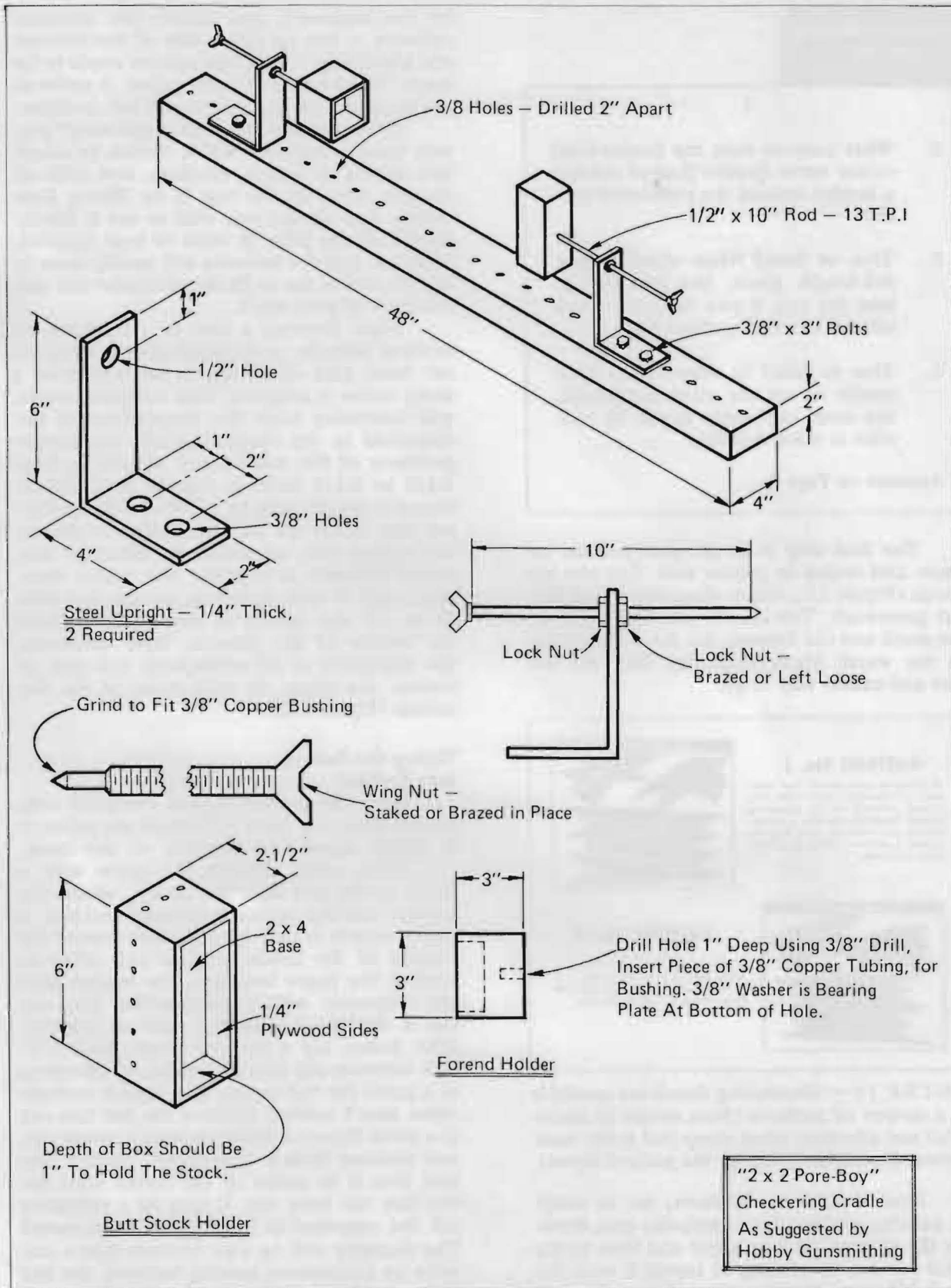


FIGURE 10 — Plans for making a simple checkering cradle.

## PROGRAMMED EXERCISE

1

1. What purpose does the border bead cutter serve *besides* that of cutting a border around the checkered panels?
2. True or false? When checkering a full-length stock, the job will go best for you if you keep the stock affixed in a well padded vise.
3. True or false? In determining what spacer to use for your checkering, the most important factor to consider is wood density.

Answers on Page 8

The first step is to get your pattern on paper and scaled to proper size. You can use decals (Figure 11), which eliminate all the layout guesswork. You simply position them on the stock and cut through the decal and down to the wood. Many beginners find this the best and easiest way to go.

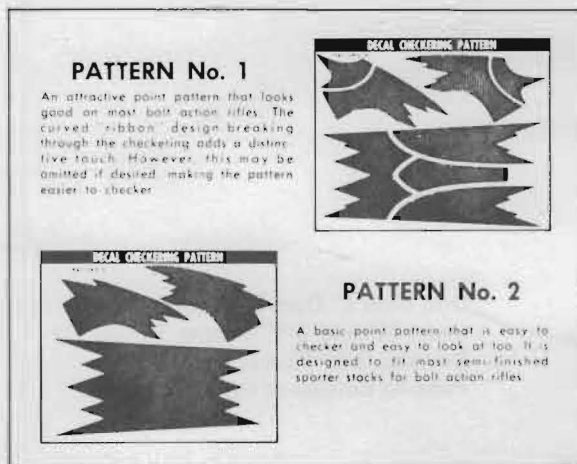


FIGURE 11 — Checkering decals are available in a variety of patterns (from simple to elaborate) and eliminate what many feel is the most tedious part of checkering, the pattern layout.

Most checkerers, however, use or adapt an existing pattern for a particular gun, drawing the pattern on thin paper and then trying it on for size by placing or taping it onto the stock (Figure 12). The pattern is corrected or redrawn as many times as is necessary until it's right. If the pattern *isn't* of the wrap-around variety (this shouldn't be attempted

by the beginner), and utilizes two identical patterns — one on either side of the forearm and pistol grip — only one pattern needs to be made. When cut out of the paper, it serves as the template for both right and left patterns.

There are a number of checkering "pattern books" available which furnish an excellent source of simple, medium, and difficult designs. (One of the best is by Monty Kennedy.) Any design you wish to use is simply traced off the page. It must be kept in mind, however, that the patterns will usually have to be adjusted in size to fit the particular size and contours of your stock.

When drawing a new or modifying an existing pattern, a diamond-shaped template cut from stiff cardboard or celluloid with a sharp scribe is required. This template, which will determine both the proportions of the diamonds in the checkering and the relative positions of the master lines, should be from 2-1/2 to 3-1/2 times as long as it is wide. A template 3-1/2" long by 1" wide is the preferred size. After the pattern outline is drawn, the master lines are drawn in, using the diamond template as a guide. The master lines, one going in each direction, are the first lines to be cut and should be positioned in about the middle of the pattern. They determine the alignment of all subsequent cuts and, of course, the shape or proportion of the diamonds (Figure 13).

### Taping the Pattern Into Position

When the pattern outline, complete with master lines, has been cut out of the paper, it is lightly taped into position on the stock.

Next, prick through the paper with a sharp scribe and into the wood, where the borders and the master lines begin and end. A grease crayon is then used to trace around the outside of the border (Figure 14). After removing the paper template, the master lines are connected with a sharp scribe. You can use a flexible transparent ruler as a guide. Even better, lay a strip of tough vinyl 1/4" tape between any two pin pricks, which serves as a guide for the scribe. The border outlines often aren't scribed because the last line cut in a given direction probably won't be the correct distance from a "prescribed" border. The best idea is to scribe in the border after the last line has been cut. It may be a smidgeon off the crayoned-in border, but who cares? The disparity will be a lot obvious than a too-wide or too-narrow spacing between the last line and the border.

For the pattern on the opposite side, you merely turn your paper template over and tape it in position. Before affixing the pat-

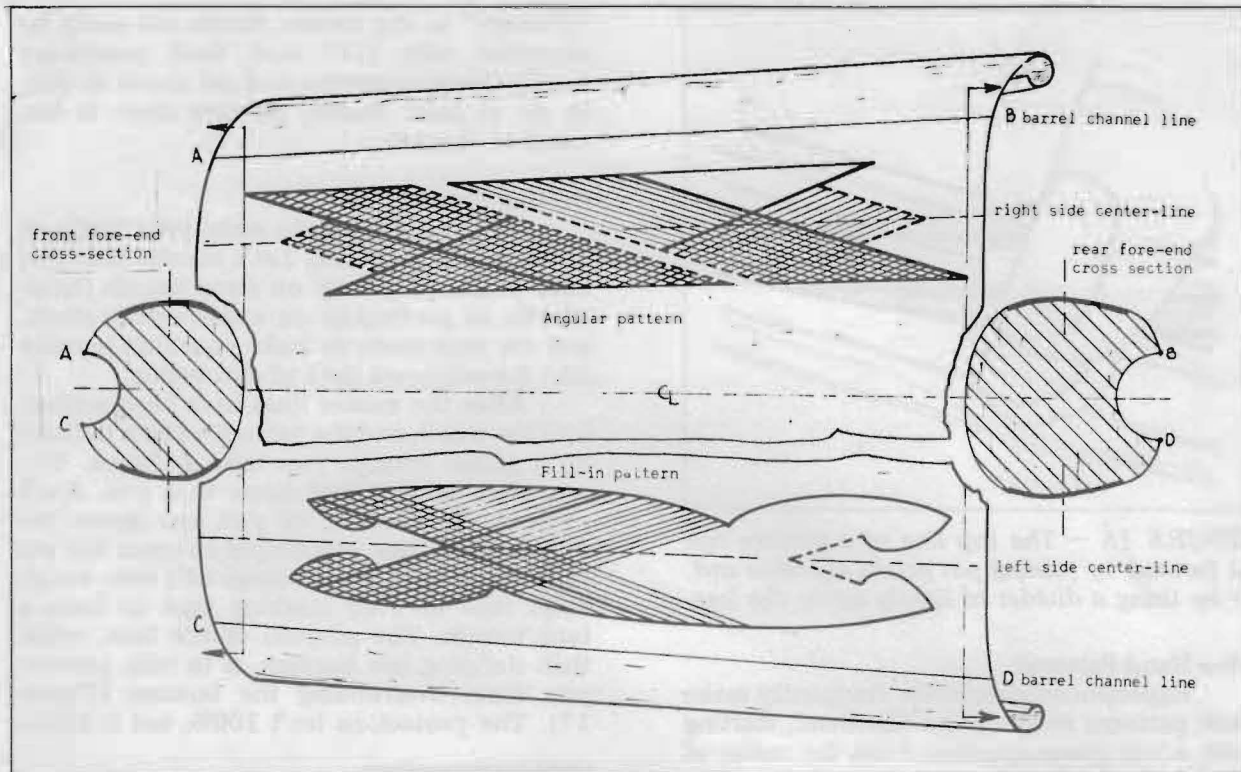


FIGURE 12 — Two checkering panel layouts, showing position relative to the cross-section of the forearm. The dark lines are the master lines, which are positioned with a diamond template. (Courtesy Lantz Checkering Tools)

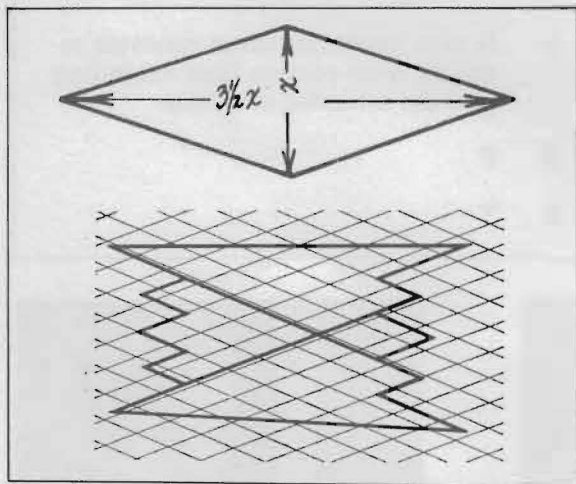


FIGURE 13 — Dimensions of a typical diamond template are shown at top. The pattern segment, drawn on a diamond-grid graph, incorporates master lines and borders which conform to the angles of the template. (Courtesy NRA)

tern, measure the distance from given points to the pin pricks on the pattern you've already transferred. On the forearm, this would be the distance from the top of the wood to the pin pricks representing the front and back of the pattern's top border. You then dupli-

cate these measurements on the other side, make appropriate pin pricks, and use them as a guide for positioning the template the second time. Or you can use a divider to position the top line of the forend pattern (Figure 15).

The same procedure is used on the pistol grip.

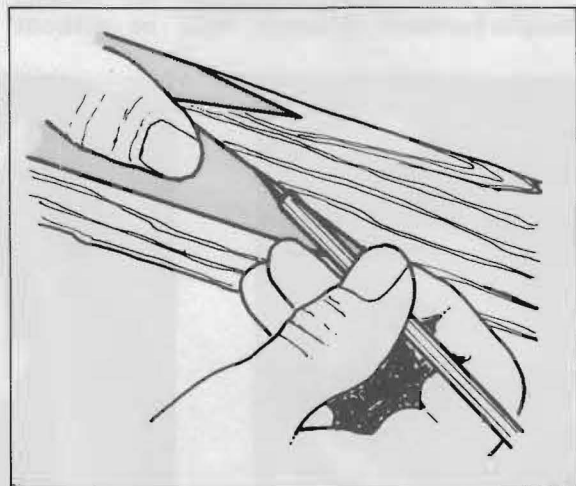


FIGURE 14 — After the pattern has been taped to the stock, the borders are defined with a scribe or a grease crayon. The latter affords flexibility in establishing the proper spacing between the last line and the border.



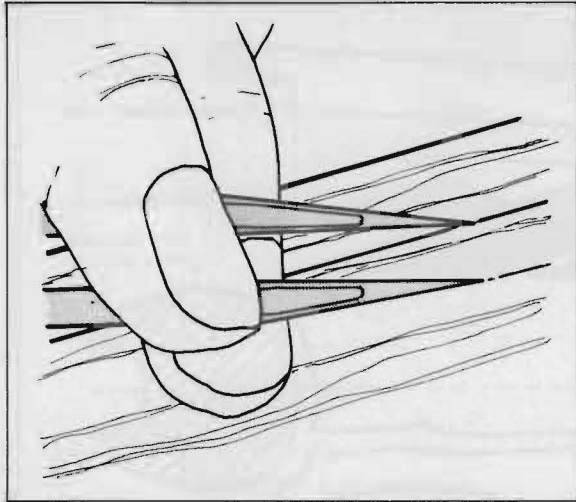


FIGURE 15 — The top line of a pattern can be formed by joining pin pricks at either end, or by using a divider to lightly scribe the line.

### Free-Hand Patterns

Experienced checkerers frequently make their patterns more or less free-hand, starting with a line grease-penciled down the center of the forearm or pistol grip. From there, they use the diamond template to establish the borders and master lines (Figure 16). We don't recommend that you try this before you gain a bit of experience, any more than we would suggest that you try a wrap-around design for openers. Following radius contours all the way around the stock, keeping the lines parallel and ending at a precise and predetermined location, requires real skill. There's nothing more difficult than cutting a long straight line, especially around a curved surface.

To begin with, stay with the simple, straight-bordered patterns with or without

“dividers” in the panels. Panels can easily be separated with 1/4” tape. Such panels are usually more attractive and are about as easy to do as solid panels, because there is less wood to checker.

### Getting Started

You're not going to make your first cuts on an actual gunstock. Let's assume that you have practiced plenty on scrap boards (hardwood), or preferably on a throwaway stock, and are now ready to make your first journey into the unknown field of checkering.

After the master lines have been scribed into the wood, and the pattern outline defined by a grease crayon, you have a choice. You can start cutting and hope that you don't overrun the borders, or you can ignore the drawn-in borders and simply connect the pin pricks with one or more strips of a thin, tough vinyl tape or even masking tape to form a tape border. The purpose of the tape, other than defining the borders, is to help prevent you from overrunning the borders (Figure 17). The protection isn't 100%, but it helps.

### ANSWERS

1

1. It also serves to cover runovers resulting from pattern lines extending past the intended end lines.
2. F
3. T

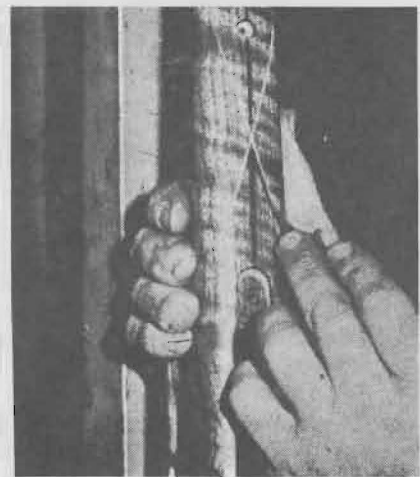
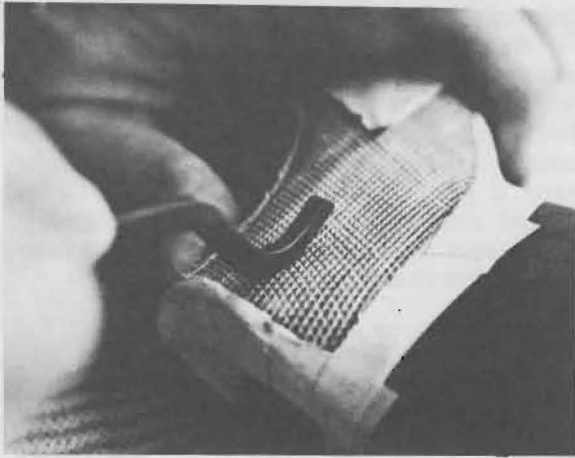


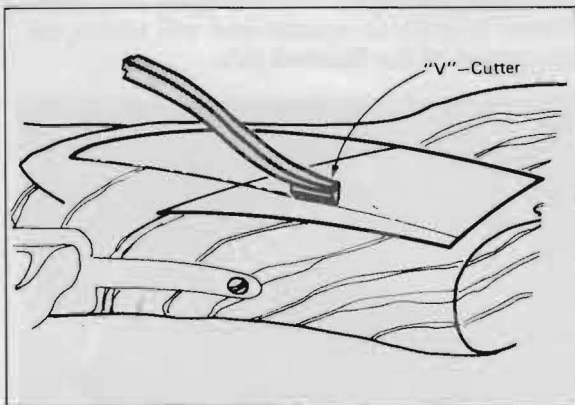
FIGURE 16 — Experienced checkerers sometimes cut patterns free-hand. After the center line is crayoned-in (left), the diamond template is used to mark the master lines and borders (center), which are then cut with a scribe (right) before using the V cutter. (Courtesy NRA)



**FIGURE 17** — *Beginners, especially, should use tape around the edges of the pattern to help eliminate runovers.*

(Crayon outlines are usually used by the pros, who frown on tape "barriers" as a crutch.) Okay, let's proceed.

You've scribed the master lines, meaning that they are relatively shallow, but they should be deep enough for the cutter to follow. They must be deepened to provide that all-important first groove for the spacer. Deepen the master line carefully with your V cutter (Figure 18). In cutting, and this is at least one of the secrets of a professional job, hold the tool firmly and move it forward in a shuffling motion. You cut on the forward stroke only, then withdraw the tool a bit for a fresh start before again shuffling on. Don't try to guide the tool, as conscious "steering" is the best way we know to make the tool wander off to the side. This principle applies when using either the V cutter or the spacer.



**FIGURE 18** — *After the master lines have been lightly scribed, they are deepened with the V cutter. For better "support" when making these all-important first cuts, lay a plastic ruler or tape alongside the shallow, scribed grooves.*

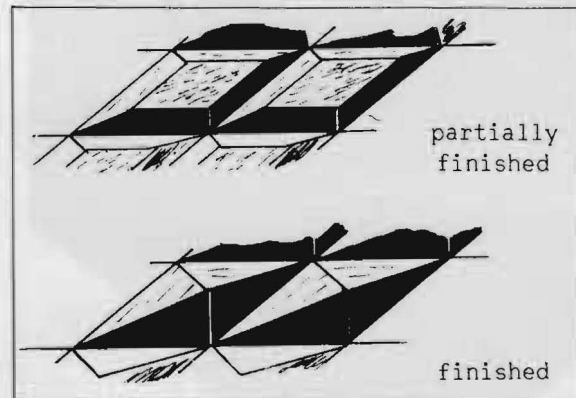
The second "secret" is to always cut *lightly*, without gouging the wood. After the master lines have been deepened, ride the guide blade of the spacer back and forth three or four times, concentrating on keeping the guide in its groove. The cutting edge will take care of itself. Press down only on the forward stroke. If the going is tough and the blade sharp, a hard or soft spot in the wood may be causing the problem. Sometimes, in these instances, cutting from the other direction permits smooth sailing.

Space all the lines for one section of the pattern, or the whole pattern, that go in one direction. Remember, you're not going to make them deep (you're spacing rather than cutting). Three or four passes with the spacer is usually sufficient. Make the lines deep and you'll have a lot of fun crossing them when you start cutting from the other direction. In effect, your tool will "fall into a hole" each time it encounters a deep groove!

After all lines have been cut with the spacer and your crisscross pattern is complete, deepen the lines with the V cutter. Here, two or three passes are usually necessary to cut the shallow grooves to the proper depth. When the proper groove depth is attained, move on to the next line and repeat the procedure. When all lines going in one direction are deepened, proceed the same with the diagonal lines.

Cutting the lines to proper depth is what forms the diamonds. When partially cut with the spacer, the "diamonds" are flat-topped. Only after the V cutter has done its work do the flat plateaus become diamond-shaped pyramids (Figure 19).

In both the spacing and cutting procedures, frequent cleaning of your work area with a toothbrush is a must to keep the lines in clear relief.



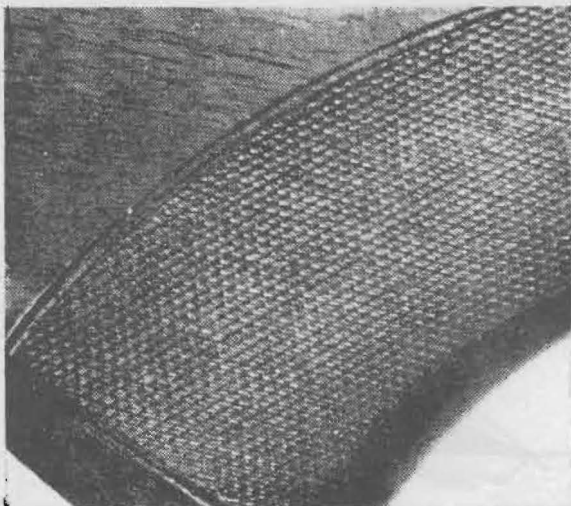
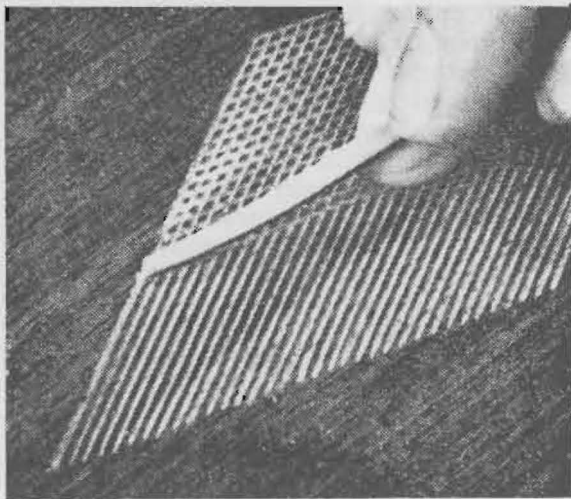
**FIGURE 19** — *Light spacing lines leave the diamonds flat-topped (top). Three or four passes with a V cutter form sharp, pyramid-shaped diamonds. (Courtesy Lantz Checkering Tools)*

### Cutting the Border

If you have overruns (and you probably will), widen the border with a border bead tool — which effectively removes all but the most glaring overruns (Figure 20).

If your pattern has rounded corners, deepen these areas with a veiner.

At this point, and before brushing in a light coat of stock oil over the checkering for protection, some workers like to “flash” the checkering with a propane torch to burn off the fuzz and leave the diamonds needle-sharp. Hold the torch too close, or let it stay in one place too long, and you’ll be sorry. Scorching one’s painfully executed checkering is enough to make a bishop kick a hole in a stained glass window! Use a toothbrush to clean off the fuzz and let it go at that.



**FIGURE 20** — Extreme care must be exercised in bringing lines to the pattern edge (top). If you go past the border, a border bead cutter will cover your mistakes, as shown at bottom. (Courtesy NRA)

### Staining the Panels

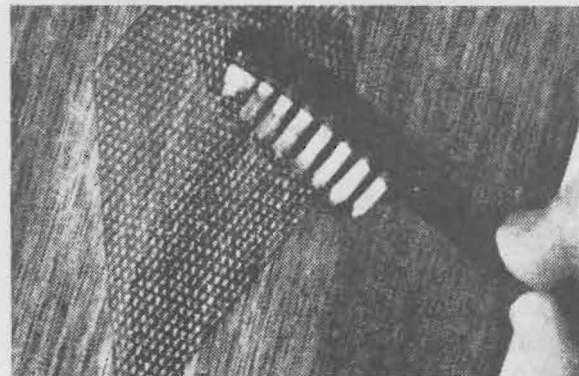
Scorched checkering brings to mind a decorative technique which some shooters like and others detest: that of staining the checkering panels an ebony black or dark brown (Figure 21). Such panels provide a sharp if garish contrast, especially on light-colored stocks. The stain used is ordinary draftsman’s India ink, carefully brushed into place with a camel hair brush.



**FIGURE 21** — Some custom sporters like the rifle shown have ebony-stained checkering for high contrast with light wood.

After drying, diluted stock oil is brushed on for protection. The India ink, being of an alcohol base, won’t run into the adjoining wood. Never use black pigment in stock oil for this purpose. To get the black deep enough, you have to use a lot of pigmented oil — which will clog the checkering. Also, the color may smear into the adjoining wood when touch-up oil is later rubbed into the stock.

If the stock you’re working on has been stained, your checkering will probably have cut under the stain, making the diamonds stand out in white contrast. Before applying the stock oil, the panels must be stained to match the rest of the stock (Figure 22). Some contrast is quite acceptable and will add to the appearance of the finished job.



**FIGURE 22** — After the checkering has been cut and brushed clean, a light coat of diluted stock oil is applied for protection. (Courtesy NRA)



Before going on, please do Programmed Exercise 2. Make sure you write your answers on a separate sheet of paper before looking at the answers on the page specified.

**PROGRAMMED EXERCISE**

2

1. True or false? It is best for beginning checkers to use a free-hand pattern for their first job.
2. True or false? In checkering, you should remember to *space lightly*, or it will be difficult to space the cross lines.
3. How can you remove overruns?
4. If your pattern has rounded corners, what tool would you use to deepen the rounded portion?
5. How can you "clean the fuzz off" and leave the diamond needle-sharp?

Answers on Page 13

**RECUTTING OLD CHECKERING**

We have put the proverbial horse before the hansom in that we are now discussing last that which probably should have been brought up at the beginning — the recutting or tracing (as it's called) of old checkering. Vintage guns with worn but well-defined checkering and borders afford a splendid way to get started, providing the checkering is compatible with the spacers you have on hand. If the stock is cut 22 or 24 lines to the inch, you're not going to cut it (in more ways than one) with an 18 or 20-line spacer. Brownell's makes an inexpensive measuring device (Figure 23) which "tells" in a moment the line spacing of any pattern. If the gun is valuable, and the checkering oddball, it is often worthwhile to send away for the spacer.

Checkering (the true term is checking, but common usage is "checkering") on old guns was performed with handmade tools. The chance that old-time checkering will match with a modern tool is remote. An "out" is to make your own tool — if you are proficient with a three-cornered file! (See Figure 24.) The spacing of any tool must be exact within .002"! A greater variance won't make any difference on the first few lines you cut, but you'll soon be cutting away the center of the diamonds and ruining the job.

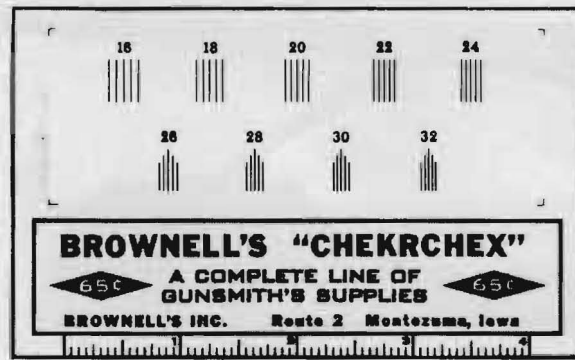


FIGURE 23 — This transparent plastic device, with lines representing from 16 to 32-line spacing, is placed over questionable checkering. You get the lines-per-inch answer in seconds.

The simplest procedure in recutting and restoring old checkering is to use a V cutter with only one cutting edge. The diamonds will be flat from "apparent" wear, but they may originally have been cut with the diamonds flat at the points.

Old finish will probably fill the lines, and extra care must be used as you will be cutting each line with nothing but the clogged line to guide you. Trying to use a plastic or steel straightedge on the pistol grip will merely end in a slip and an extra groove.

Two other procedures remain open to you. First, you can use a varnish solvent to soften and then brush-cut the lines. A better choice is to carefully scrape and sand away the existing checkering almost to the bare wood, but leaving joint marks of the original checkering lines and borders. You then re-checker just as you would on a new stock except that your pattern is already laid out.

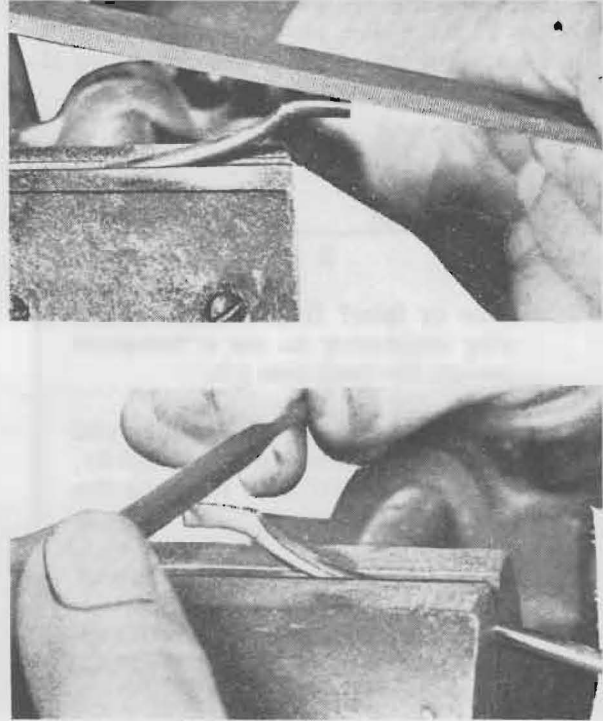
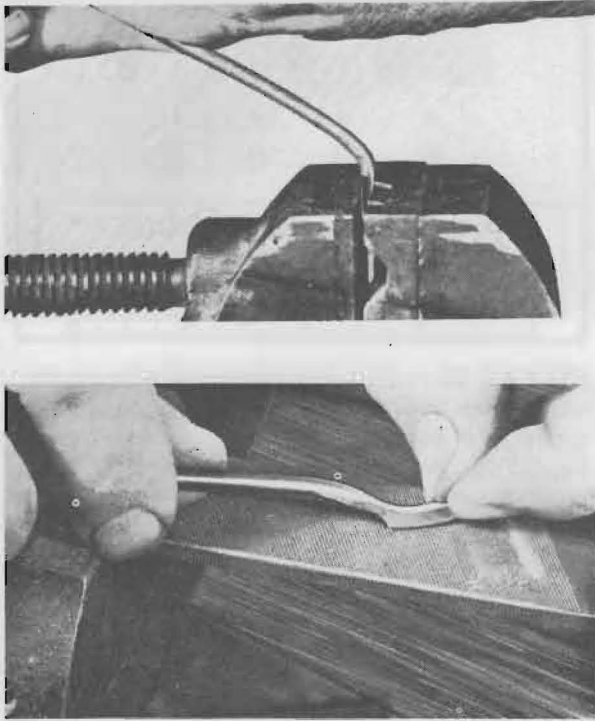
The new checkering, once cut, will "erase" the old lines; the new greater checkering depth will not really be noticeable.

This same procedure can be used to restore badly scarred or dented checkering. Again, don't take all of the old lines out, just to the point where the stock surface is smooth.

Trying to re-checker by deepening the lines over a bad dent will leave a very noticeable and "wavy" depression.

There is another factor involved in restoring checkering in even relatively new stocks cut with modern tools. Many European and other countries use the metric system — and the checkering doesn't match our cutting tools.

For all work of this type, a wood "riffler" is nearly ideal (available from Brownell's). A riffler is, in effect, a bent three-cornered file that is easier to control than the



**FIGURE 24** — Recutting worn checkering on old guns often requires the making of checking tools. (Courtesy NRA)

standard checkering tool in some areas. Brownell's No. 5 checkering riffler is well worth adding to your tool set.

Let's assume that the old stock is a conventional 20 lines to the inch, and that you have the proper tool. You simply form new master lines, near the center of the pattern if possible, by deepening the existing lines with a scribe and V cutter, using a plastic ruler as a guide. Once the "new" master lines have been established, you proceed as when cutting new checkering — except that the work goes much faster and smoother because the lines are already there to some extent. In such instances, you may wish to use a double or two-edge spacer (Figure 25). This tool serves the same function as the standard spacer, but both edges cut. As a matter of fact, tools with as many as four to six cutting edges are sometimes used, but these are only practical for pistol stocks (grips) and some forearms. They should be used only by those with plenty of know-how as they are beyond the need (and skill) of the average stock maker.

### RECUTTING IMPRESSED CHECKERING

The "beast" can often be made beautiful, providing the lines in the pressed-in or pressed-out checkering are straight. (Sometimes, for looks, the diamonds run in a semi-circle.) If the spacing is standard, a spacing tool can be

used after the new master lines are established with your V cutter. If the "checkering" is not of standard spacing, the job still isn't too difficult with a single V cutting tool. The lines are well defined and, if you take it easy, the chore isn't that formidable. It is really surprising how good a stock can look when the "awful waffle" checkering is transformed into the real thing with sharp, clean diamonds!

**GUNLINE CUTTERS with HANDLES**

 **TWO EDGE SPACER** - used to space one groove at a time on the checkering pattern. One edge cuts a new groove while the second rides in a previously cut groove. Available in 16, 18, 20, 22, 24 lines per inch.

 **THREE EDGE SPACER** - useful in spacing two grooves at a time, or spacing one groove at a time with two edges riding in previously cut grooves for greater accuracy. In 16, 18, 20, 22 and 24 lines per inch.

**FIGURE 25** — Spacers with two and sometimes three cutting edges are used by the experts at times.

### BUILDING A PAT- TERN LIBRARY

Occasionally you'll see a "knock-out" checkering pattern that you'd like to duplicate and that isn't in any checkering book. Or you'll see or get your hands on an old L.C. Smith or Parker double with distinctive old-type checkering that you'd like to have for

## ANSWERS

2

1. F
2. T
3. Widen the border with a border bead tool.
4. A veiner.
5. By *flashing* with a propane torch, *carefully*, or by using a toothbrush.

reference. Stock makers are often asked to restock old doubles and checker them in traditional patterns.

You could sit down and draw the pattern from sight or memory, but few of us are sufficiently gifted along these lines to produce anything even remotely accurate. Here's a better solution: Any pattern can be "lifted" in minutes without damage to the gun. You simply hold or tape a piece of ordinary typing paper over the checkering, then briskly rub a soft lead pencil over the paper. The pencil pressure forces the paper into the recesses, and the pattern emerges as dark diamonds against a white background.

Many stock makers have a complete "library" of lifted patterns, representing every interesting and old checkering pattern (and gun) they've had in their hands for a minute or two. Be sure to label them at the moment of lifting, or you'll never remember the source.

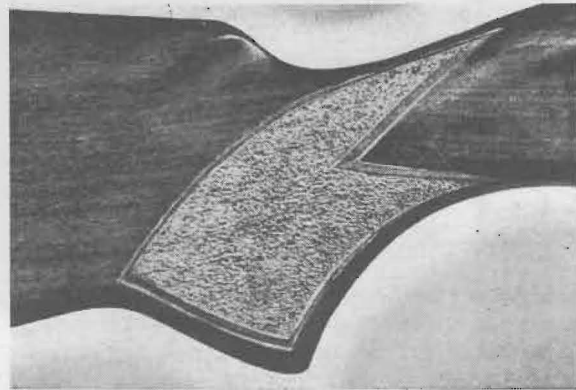
The foregoing pretty well covers the basics of checkering. One can't teach plastic surgery by text, and fine checkering is in about the same category. Get started, take it easy, and above all be patient. If housewives and kids can make good money at checkering, so can you. Spend a few hours practicing on an old walnut stock and that first checkering job will probably turn out a lot better than you expect. Start with a tool for 16 or 18 lines to the inch.

Even a comparatively simple pistol grip and forearm job sells for \$40 to \$75. When you can turn it out in six to eight hours, that isn't bad money. Also, more often than not, a checkering job is sold in connection with restocking and refinishing — which provides a better return for the time invested.

### STOCK STIPLING

Stippling, like tipping, can be an easy way of solving problems. The former, how-

ever, is a more positive and permanent solution, and doesn't require a bromide chaser the morning after. Stippling is just the ticket for adding a decorative touch to stocks that are too soft to checker. It also serves as an inexpensive but handsome substitute for checkering, lending itself to straight or rounded borders, and to large and small areas (Figure 26).



**FIGURE 26** — Stippling is as functional as checkering, and nearly as attractive. Once the borders are cut, the fun begins.

Before going on, please do Programmed Exercise 3. Make sure you write your answers on a separate sheet of paper before looking at the answers on the page specified.

## PROGRAMMED EXERCISE

3

1. True or false? Impressed checkering can be vastly improved by recutting it.
2. True or false? Stippling provides a fine method of decorating a stock that is too soft to checker.
3. When the going is tough, and your checkering tool will not push along the line (perhaps due to a hard spot in the wood), what solution would you suggest?
4. True or false? In checkering, cutting lines to the proper depth with your V cutter is what forms the diamonds.

Answers on Page 14

Stippling can be used in combination with checkering, and as a background for carving (Figure 27). Last but not least, the



3

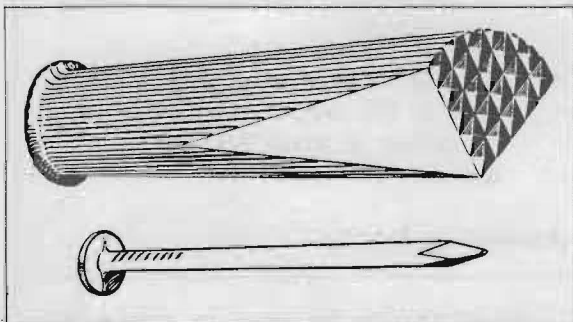
1. T
2. T
3. Try it from the other direction. This frequently solves the problem. Remember, however, that you do the cutting on the *push* stroke.
4. T

technique enables the heavy-handed gun pro, to whom checkering is as natural as breathing underwater, to get into the stock beautification business.

A six or eight-penny nail, rounded at the tip and with a 1/32" flat on the point (accomplished with a file), works splendidly in small areas. So does an ordinary center punch. A more professional tool, and one for larger areas, can be made by cutting a 5/16" steel rod and filing almost any type of "checkered" or multiple-point pattern with a steel checkering file (Figure 28). A half-round head and one cut as a triangle will permit reaching all odd corners and curves. This type of tool is much easier to use and assures an even pattern — as long as the tool is held at a true right angle.



**FIGURE 27** — Stippling is often used in combination with carving and checkering. In the above pattern, stippling was used to break the leaves away from the background.



**FIGURE 28** — Stippling tools are easy to make from nails and a steel rod.

The idea is to break down the fibers of the wood with the tool. If the fibers are merely dented, they're likely to spring back after a time. For this reason, the point of the single-point stippling tool must not be overly sharp.

The simplest and most practical way to obtain stippling tools is to purchase the smaller types used in leather carving and decorating. Sometimes a pattern will lend itself to two types of stipplers: A fine-tipped tool for the sky, one with a blunter top for foreground sand and pebbles, etc., used in connection with carving.

#### The Stippling Technique

The stock should be mounted in a checkering cradle or a well padded vise. If you're going to use stippling as a checkering substitute, first make a pattern and use a flexible plastic ruler to scribe the borders. If you wish, back off 1/16" or so from the first border cut and make a second line, using a border checkering tool. Deepen the border lines with your V cutter and you're ready to start stippling with your tool and plastic hammer, using light blows, until the entire area is slightly recessed by the stippling tool. The secret of attractive and well done stippling is to hold the tip of the tool an even distance from the work at all times, before striking the tool. The palm of the hand holding the tool rests on the wood for steadiness. Consistent resistance to the evenly tapping hammer permits a uniform "rebound" from each tap. When completed, the area should be covered with a light, diluted film of stock oil. Uneven hammer taps will result in high and low spots. Done properly, the surface is evenly matted over the entire area.

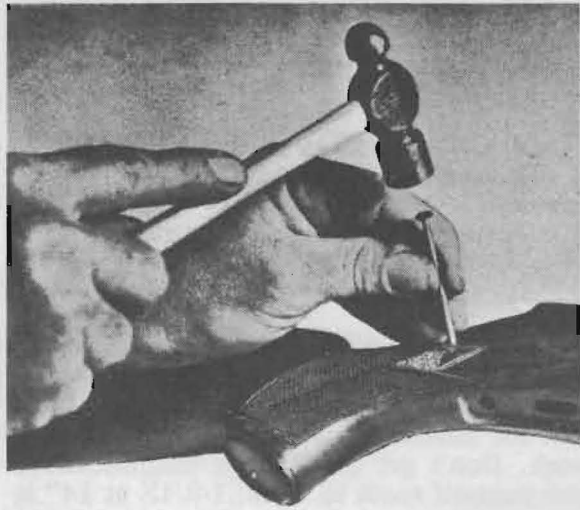
Once the border is cut, the job is easy and goes fast. Surprisingly, for the effort expended, the results are quite attractive!

Old guns with beat-up or nearly invisible checkering, that aren't worth the cost of re-cutting (to your customer) are likely candidates for stippling (Figure 29). Deepening the borders with a V cutter, then covering and recessing the old checkering with stippling, vastly improves the gun's appearance. Your customer's happy because his gun looks good for a fraction of the cost of checkering. You are happy because you've made a good profit on your time. And there is no law that says you have to reveal how *quickly* the job was done!

#### STOCK CARVING

The idea of carving a gun stock (Figure 30), even to a person who is far beyond the beginner's stage in checkering, is usually

enough to induce a severe state of palsy. He doesn't really believe he can do it and would rather ignore the whole thing! The hardest part of carving is making up one's mind to try it. When you're working with scrap wood behind locked doors, you have nothing to lose but a bit of time.



**FIGURE 29** — A flattened nail and a hammer, and presto! — beat-up checkering becomes a thing of (flattened) beauty. (Courtesy NRA)



**FIGURE 30** — Floral carving is often combined with checkering. The carving is always done first.

#### Selecting Wood

Remember to always select hard, close-grained walnut. It is ten times easier to work than soft woods and will take a surprising amount of abuse without splintering. Hard wood permits sharp detail, and it can be cut against the grain with sharp tools, if care is taken. This is necessary at times on any pattern design.

If it is necessary to use soft wood, carve larger figures with a minimum of detail.

#### Identify Your Work

It may be of interest that for "signature," one gun pro always uses a stump in one corner

of the scene with a capital "M" carved on its surface that at first glance appears as the lines of the bark. You can do some interesting, creative, and attractive things with your signature.

#### Border Patterns

A good starting pattern can use a tree trunk to frame one or both sides of the scene and join by two straight lines; one drawn parallel to the top of the stock and the other parallel to the bottom of the stock. Don't try to work in too much detail such as plants, trees, etc. Use considerable "sky" to provide contrast, rather than mountains, etc.

#### CARVING TOOLS

Assuming you have decided to start on a finished stock and have no tools at all, you should consider the following.

A sharp knife of the pocket-size variety is a must — or a model maker's knife with interchangeable blades. Next in importance is a small set of carving chisels and gouges ranging from 1/8" to about 1/2" in width. A V cutter and veiner, from your checkering set, are also useful, especially for working in the border areas (Figure 31). In addition, you'll require the stippling tools mentioned a few pages back. Other than this, you need plenty of patience.



**FIGURE 31** — Typical tools used by the advanced carver. However, a sharp knife and a few chisels are all you need to get started.

A checkering cradle (ideal) or vise is necessary. One of the wide-jaw, two-position vises can be used, but the jaws must be padded and care taken not to crush the wood as this vise must be clamped tightly or it will swivel just when you want it to stay put.

An old German trick is to simply remove the butt plate, bore an appropriate size hole in

the center, and screw in a large lag screw until snug. The head of the screw is then clamped in the iron jaws of a large swivel-base machinist's vise. The stock can then be turned to any angle or position desired.

One word of caution — if the stock is not held solidly, you can ruin the entire project with one slip. Make sure!

*Don't* buy a large set of carving tools. *Do* buy the best quality. You will end up using only a few, so buy on a *need* basis. Later you will probably select additional tools you can use to advantage. Buck Bros., as well as other manufacturers, produces fine tools.

*Don't* make the mistake of buying stock-*ing* tools, hoping to carve with them. They are too large for the purpose.

Brownell's has a large assortment of Henckel's tools, which are excellent. The suggested carving chisels, as listed in Brownell's catalog, are:

- 58- 5 — Front bent gouge
- 74- 4 — 5/32" straight chisel
- 74-10 — 7/16" straight chisel
- 75- 6 — 1/4" edge straight gouge
- 75-10 — 7/16" edge straight gouge
- 73- 3 — 1/8" veining tool
- 79 — 3/64" "U" veining tool

The palm handle bent veining tool is a most versatile tool and follows curved surfaces easily. You can almost free-hand the border of a checkering pattern for the pistol grip with it. Here are some other suggestions: a French curve for border design; spring dividers; incising knife (if you can obtain some surgeon's scalpels and/or dental tools, they can be used to great advantage).

You will need a stippling tool such as is used in leather carving. Buy this from a leather shop or you can make several of your own from drill rod and cross-hatch with a No. 000 metal checkering file. (This file can also be used on bolt handles, etc.) The stippling tool is used primarily for the "sky" to provide contrast to fields and hills in the foreground of your carving. A square face will do most of the work, but one of half-round and one of triangular shape are also needed to get into odd corners.

Hair on an animal can be reproduced with a coarse riffler. Rifflers in different sizes and shapes can be used as rasps in many hard-to-reach areas. Also, emery boards are very good for this.

A multi-purpose 1-1/8" blade bench knife is essential. Held vertically and tapped with a light plastic hammer, its sharp point can follow complex lines and is particularly

useful for cutting the outline of oak leaves, etc.

Electric tools such as the Handi-Grinder can be advantageous, primarily for roughing-out. Their use for this purpose alone may not justify buying a set. They are not as readily controlled as hand tools and can easily ruin a partially completed carving unless you are very careful.

Next to the cutting tools in importance are proper sharpening stones:

A soft Arkansas stone about 1½"x2"x6"

A hard Arkansas stone about 1½"x¼"x3"

A carving tool slip for sharpening veining tools, 2¼"

A gouge slip

To save your eyesight and to assure the quality of your work, obtain an optical-glass binocular magnifier. This is most desirable as well for insetting, checkering, or other close work. Don't get too great a magnification; give yourself room to work; 1-3/4X at 14" is about right.

You should also have a small plastic hammer, a flexible 6" steel rule, and a scribe or scratch awl.

## TYPES OF CARVING

Carving is divided into two main classes: incise and relief. Incise carving means that the background is cut away from the object whose surface is the finished plane of the stock. An example would be a letter or initial, flat on the top, with the background recessed and stippled. Such designs are easier to do than are the relief variety.

### Incise Carving

To gain confidence and get the feel of the tools, an incised initial in a pistol grip cap is a good first project (Figure 32). It's relatively easy to do, adds a nice custom touch, and can be performed on a stripped or finished stock. If you can't find an artsy or Gothic-style letter of suitable size in a book, you can pick up letter sheets at any art supply or stationery store. Sometimes individual letters in stiff cardboard or thin plastic are available. The latter can be taped or glued in position and used as a template. Otherwise, slip a piece of carbon paper between your initial and the grip cap and trace it with a sharp pencil.

First, however, you have to draw the border line — either directly on the wood, or on paper which is then carbon-transferred to the grip cap. Some basic drafting tools, such as a French curve, are helpful in forming the round or oval contours. Also, if you have a



draftsman's divider, the job is easier. Set it at about 1/4" and let one leg "ride" the edge of the grip. The other leg will scribe the border 1/4" in from the edge. If the grip is oval-shaped, you'll have to scribe the wood free-hand where the grip flows into the stock. Or cut a pattern from a folded piece of cardboard so that both sides will match.

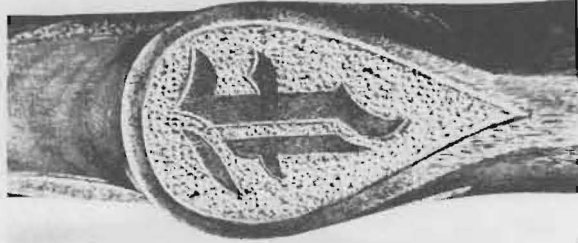


FIGURE 32 — Simple incised carving of an initial in the grip cap. The wood behind the letter has been relieved and stippled. (Courtesy NRA)

**Use of the Knife.** When the initial and border have been transferred and/or scribed into the grip cap, grasp your knife as you would a pencil and carefully cut straight down to a depth of about 1/16". Then insert your knife at a slight angle to each cut and press down firmly. Triangular-shaped chips will fall away, leaving a gap between the cut lines and the adjoining wood. Now you have to remove the untouched wood between the initial and border. This can be done with a sharp knife, but a small 1/8" chisel is better. Make your cuts either *with* or *across* the grain to minimize splinters, and try to maintain an even 1/16" depth. Absolute uniformity isn't necessary because your next step is stippling, which will even out the recessed area to some extent. Use a flattened nail, a centerpunch, or the tools described earlier, tapping lightly with a plastic hammer until the entire area is stippled.

The final step is to lightly round the edges of the initial and the border, then brush in a light coat of stock oil.

#### Relief Carving

Relief carving is three-dimensional, with the subject appearing to be molded on, and recessed and rounded to achieve life-like contours (Figure 33). The surrounding background is dropped away and stippled. Relief carving can be simple acorns, leaves, or animal figures, or elaborate tableaus with leaping bucks, prowling catamounts, or fighting boars. For openers, stick with the simple designs, preferably those of the incised variety.

Don't try relief carving except on scrap walnut or matching wood until you've done a few incised carvings. Your first attempts at

relief carving should be of simple subjects — tree trunks, acorns and oak leaves, side views of animals, etc., where a slight variation in form (spelled goof) isn't noticeable. Simple designs can be found in gun books, particularly in illustrations of older arms, or on leather hobby shop pattern sheets.

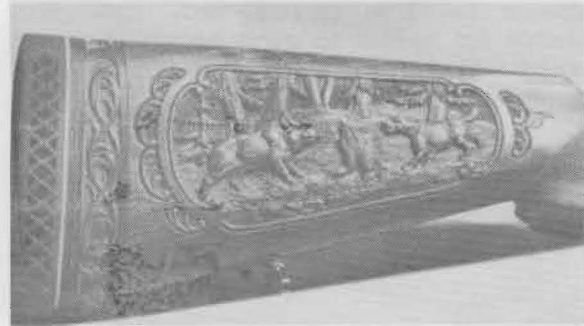
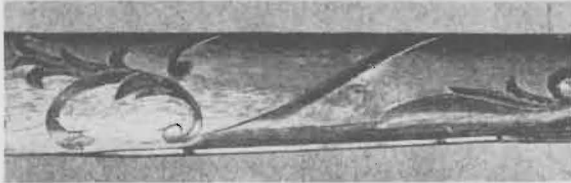


FIGURE 33 — Two examples of European relief carving, from the collection of Colonel Miller.

Acorns and leaves, especially, make nice adjuncts to checkered panels fore and aft. Until you become proficient, such carving should be executed before the checkering is cut. A slip of a knife or chisel could damage a checkered panel beyond repair.

Inspired artistry in stock work is often reflected in the elaborate scroll and floral checkering combinations executed by master craftsmen. Such designs should only be attempted after long experience. The pattern is sometimes created, but most often it is "lifted" or borrowed from antique furniture (Figure 34). It is traced or scribed onto the oil-finished wood; the detail is then cut or relieved by sharp gouges, veiners, and knives. After completion of the carving, checkering and/or stippling follows. The object of carving (and checkering) is to enhance, rather than detract from, the beauty of the wood. Therefore, the more ornate designs are reserved for plainer wood, the more conservative creations for woods of outstanding grain and figure. In line with this practice, highly figured butt

stocks should not be carved. The grain, running every direction and usually very hard, makes carving and tool control extremely difficult. When you pay big money for a gorgeous butt stock, let it stand on its own. Checkered panels, with perhaps a bit of scroll "embroidery," are sufficient with beautiful wood. Hard, dense-grained wood permits greater detail in carving. Soft, open-grain woods are harder to carve because the soft wood will not cut "clean" and won't accommodate elaborate, detailed cutting.



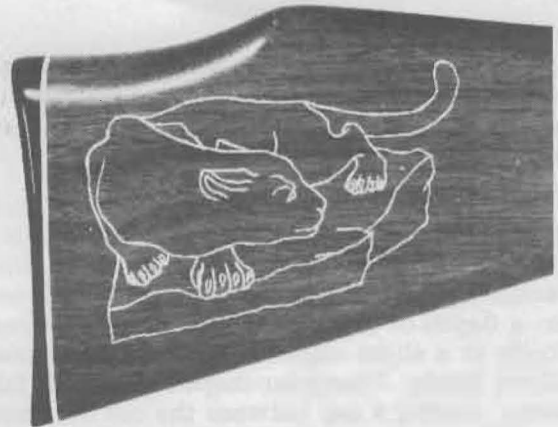
**FIGURE 34** — Fancy "furniture-type" designs are sometimes worked into forearms. After transferring the pattern, the wood adjoining the design is cut away to a depth of about 1/16". Checkering is often cut into the relieved areas. (Courtesy NRA)

Carvings done on smooth, relatively flat butt stocks are the easiest to do and can greatly enhance the beauty of the arm if professionally done. The first step is to select a subject which, when enclosed with a border, will blend with the taper of the butt stock (Figure 35). Illustrations in leather carving books, magazines, catalogs, and calendars are frequently suitable. Choose an animal or object with a minimum of detail. Shade in the hollows and contours on the drawing that, when carved, will produce a three-dimensional feeling. One procedure is to make a duplicate, or trace the original, complete with shading; you keep one copy for reference during the carving. The other is positioned and secured to the stock with rubber cement (which can later be easily removed) or with Scotch tape.



**FIGURE 35** — The figure and/or design selected must "flow" with the lines of the stock.

You then use a very sharp, thin-bladed knife to cut the outline of the figure through the paper. The exterior borders should be cut deeper than lines which represent "features" or are within the pattern, as they will be relatively shallow. When the outline and features have been cut, the paper pattern is removed (Figure 36). You must determine which areas are to be left at surface height. For example, a cat's body and paws should be higher than the slab, and the front of the animal's body a bit higher than the rear of his body. Preliminary cuts are made with a knife or chisel to bring the various elements to their proper levels in relation to each other (Figure 37).



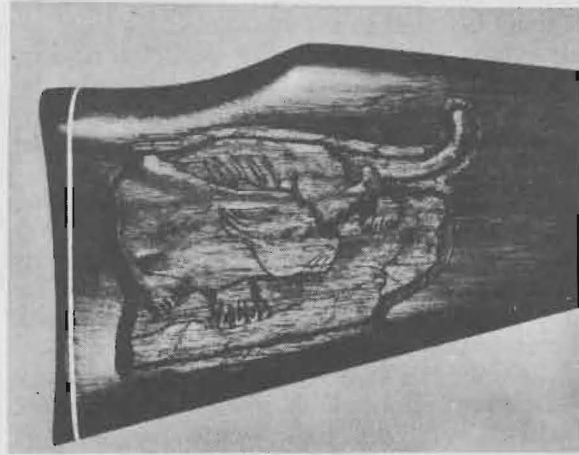
**FIGURE 36** — Here, a puma pattern was used. The border lines were incised deeper than were lines within the pattern. (Courtesy NRA)



**FIGURE 37** — The wood is removed carefully, a bit at a time, to bring the various planes of the animal and slab into proper relationship (height). (Courtesy NRA)

**Basic Sculpting.** Basic sculpting is next. Using a knife, veining tool, and gouge, the details of the animal are firmed up. Its body and tail are gently rounded; the details of its claws, inner ear, and eye are put in. Use a

single-point stippling tool for ears and eyes. The angle line of the ledge is formed by slightly recessing the bottom part of the slab. How much of a feel for wood, ledge sculpting, and perspective you possess will determine the quality of your finished project. By following these general directions, an acceptable carving should result (Figure 38). If you have genuine talent, your first carving may be striking. However, only the fundamentals of relief carving can be presented here. From now on, it's up to you.



**FIGURE 38** — After the design has been sculpted to life-like contours, a border is cut around the entire design. (Courtesy NRA)

Background fill-in can include shrubs, grass, toadstools, tree trunks (with knots and bark), stumps, rocks, cactus, fallen trees, rock ledges, clouds, and mountain ranges in the distance. Done properly, all blend well. (Don't try to put all of the above in one scene!)

An animal selected should not be too large. About 1-1/2" to 2" for the body is about right (Figure 39).

There is one major point to make: Any carving must be done in good taste, with great care and attention to detail. A poorly executed carving will detract from the finest



**FIGURE 39** — A fine example by a master craftsman: a Mauser sporter embodying a carved stag and background, floral design and scrollwork, and fine 28-line checkering. From the collection of Colonel Miller.

gun stock. It is therefore essential that sufficient practice be put in before you tackle a fine piece of stock wood.

It helps, of course, if you are already familiar with inletting, checkering and inlaying. If you are, an easy way to start is to use some simple carved design to enhance your regular checkering designs (Figure 40). If you have some good close-grained scrap walnut pieces, they will serve well to practice on. Don't try to use some other open-grained material, but use wood similar to that on which your final work will be performed.



**FIGURE 40** — An example of full relief carving that should not be attempted by the novice. A small electric hand tool created the foliage effect.

**Selecting Subjects.** Probably best for the beginner is to select a simple subject such as an animal for a rifle or a bird for a shotgun, carved without background or border.

A bear, coyote, cat, and boar are among the easier animals to execute. Horns require great care and, if done improperly or with dull tools, will break across the grain (Figure



41). As the grain always runs parallel to the stock, the horns will invariably have to be carved across the grain at some point.

An antelope is relatively easy to carve, but if you use a background, an appropriate one must be selected. Use a lot of sky and a cloud or two. A coiled rattlesnake is good to include, but again must be carved across the grain for the most part. Avoid carving an animal, at least at first, directly head on. It is hard to keep the proper perspective. You might try a side view with the head turned toward you if desired.

The secret of a realistic carving is the skilled use of shadows and light. The pupil of the deer's eye is really a small hole for example. Large objects (the animal, rocks, trees, etc.) are carved in high relief. Grass, hair, etc. are fine cuts with a veining tool (Figure 42). Sometimes the entire animal is done on a flat surface in depth; that is, below the line of the original surface.



**FIGURE 41** — A rather simple form of incise carving. Remember, however, that horns often cause problems.



**FIGURE 42** — Representative tools used by Colonel Miller for wood carving. Note surgeon's scalpel third from right.

It is better not to leave surplus thickness on a stock so that the carving is above the surface level, but to complete the stock including finish, checkering, and then the carving. This way the original finish is easier put on. If the carving is above the normal surface, it will also be subject to a great deal more damage and wear during use.

An elk or moose (Figure 43) is a good subject for a heavy-caliber rifle; a bobcat or coyote for the varmint rifle; an antelope, white-tail, or mule deer for the .243 or similar caliber. A mallard, honker, pheasant, grouse, or quail is suited to the shotgun.

Once you attain some skill, the bird or animal can be enclosed by a simple border design and a background of sky, hills, trees, grass, water, cattails, cactus, etc. can be added.

The subject itself, as well as trees, rocks, etc. in the foreground, must be brought out in deep relief. This is often the hardest thing to do at first: to gouge out 1/8" of wood! To simply outline the subject with shallow cuts is ineffectual.

Study one of the fine engraved Germany Drillings or shotguns as illustrated in Figure 44. You can "borrow" such a design from the owner, either by a photograph or by laying a piece of paper over it and rubbing the flat of a lead pencil back and forth. This, of course, can be used as well for checkering designs you wish to use again.

Sketches can be made on paper or a tracing from a picture and transferred to the relatively flat surface of the stock. On a rifle, the area back of the cheekpiece may be used as well as the opposite side.

When you're doing animals, you will want to simulate various "attitudes" or kinds of activity.

Pay particular attention to the position of the ears. They indicate alertness, alarm, anger (as with a cat or wolf), or a relaxed attitude. The tail will also help impart the desired activity of the animal.

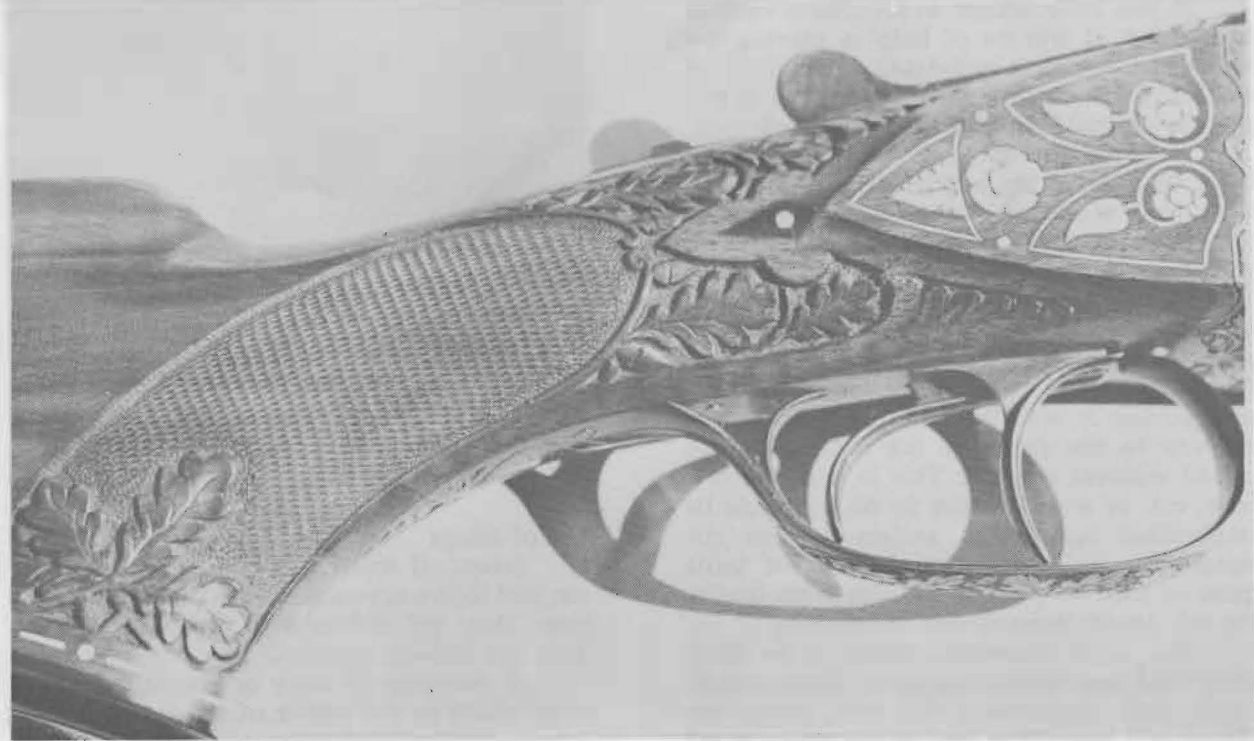
When the design is selected and transferred to paper, sand the general area to be carved to remove the finish and outline the subject with a pencil. Mark in rib, hip, and shoulder lines as well as eyes, nostrils, and other details. The wood should take indentations from the pencil, or carbon paper can be used.

The next step is to outline the subject with the veining tool or the incisor. Using a boar as the subject, for example, cut in about 1/16" initially, then cut away wood with a narrow chisel until the animal stands out in bold relief.

The deeper the cut to about 1/8" pro-



*FIGURE 43 — Inlaid and carved .30/06 rifle owned by Colonel Miller has appropriate big game motif.*



*FIGURE 44 — All elements of this elaborate design can easily be “lifted” and applied to your own stock.*

vides a true relief that even allows a bit of undercutting and rounding of the edges at the surface. This lends a very realistic appearance and allows more contouring of the features — ears, neck, and horns, and leaves room for the legs to stand clear of the background.

Use rifflers and an emery board to level off the cut-out areas and to remove chisel marks. If no background is to be used, use the stippler to outline the animal and the area extending between the feet. Hold the stippler about 1/8" above the wood and tap rapidly and evenly with a small plastic hammer. If care is taken, the stippled area will be level without high and low impact areas.

If you want to add a background, bring the animal to near completion, then draw the border outlines. Keep the first efforts to a simple design. Two straight lines joined at each end by a smooth curved line, tapering toward the pistol grip end, will complete a simple border.

Next go in deep for the sky area. This is the area from which the most wood is removed. Don't attempt full depth, however, until the mountains, trees, rocks, etc. are cut in. You can then deepen the sky area more if necessary. You must depend on the depth of the cut to give the dimensional effect that makes the rocks, grass, and trees appear in the foreground close to the animal, the hills overlapping in the far background, and finally the sky.

If you have access to an animal carving or figurine, it will be of help in carving the high and low points and detail of the body. It will just be in shallow perspective, but it will give the desired third-dimensional effect.

Probably the most difficult part is the facial features of the animal, which should be done from a side view or at a slight angle so that both eyes are in view for the first attempt.

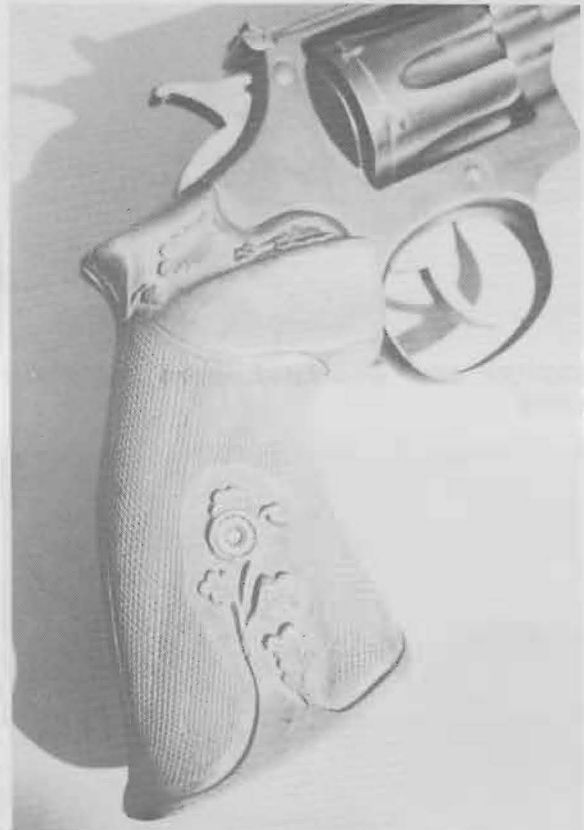
Using a deer or other antlered animal as an example, carving the overlaying individual antlers from a straight side view is difficult although the head is relatively easy. The best compromise is with the animal's head turned halfway to the front so the antlers can be carved without overlap. This is one reason a boar, cat, or wolf is easier to do. It should be emphasized again that antlers will be cut across the grain, and the sharpest of tools must be used to prevent the tips from breaking off. Avoid undercutting the antlers.

The most important detail is to keep every tool razor-sharp. Use good, tight-grained wood, lots of patience and care, and your efforts will pay off in one of the oldest of art forms.

When your carving is completed, use an

old toothbrush to clean out all wood dust and to work in one coat of good stock finish. Don't allow any build-up of finish or gloss to develop, except the animal may be buffed to a soft glow for contrast with the background.

Practice may not make perfect, but if you have even a modicum of talent or "feel" in this direction, you should soon be turning out work that will pleasantly surprise your family and friends (not to mention yourself!). Practice with scrap wood and junker stocks. As the animals and objects come to life under your hands, you may find that you are one of the very few who in a few years will become a master of "Old World" carving techniques (Figure 45). Few pursuits in the gun world pay as well!



*FIGURE 45 — Handguns, too, provide a challenge (and profit) for the skilled carver and checkerer.*

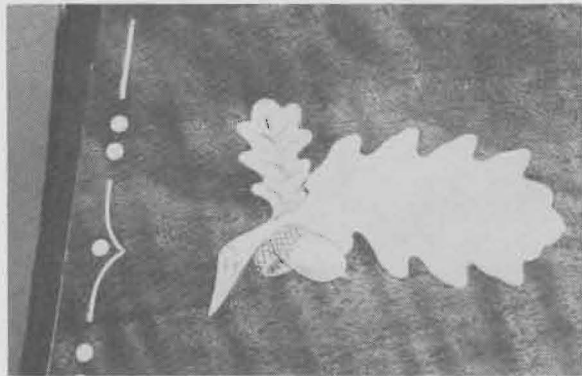
#### Use of Inlays

Inlays, if small and perfectly executed, can add to the appearance of a fine arm. If too large, they will only appear garish and detract from the finished project.

A diamond of ivory or ebony would be appropriate in the center of the forearm with the checkering conforming to the angles of the diamond; or it may be used with a sling swivel in its center or in the pistol grip cap.



An inlay may be of great help if a flaw or season crack shows up in a fine blank and cannot be disguised with a piece of the same wood. It will depend, of course, on the location whether or not an inlay is suitable. If near the toe of the stock or on the tang, a silver shield or oak leaf will do. Initials can be engraved on it if desired (Figure 46).



**FIGURE 46** — A gold-leaf inlay affords both custom decoration and personalization when the owner's name is engraved in the metal.

The simplest of all inlays that looks well if properly positioned is a small diamond-shaped piece of horn. After installing, a 1/16" hole may be drilled in the center and a small piece of ivory rounded to fit, then driven in, and dressed off flush.

Any inlay requires a perfect fit. Almost any of the excellent quick setting epoxies may be used. Scribe the desired size of the diamond or other pattern on the wood with an incisor, undercut slightly, and rough the undersurface of the inlay before seating. Use a fine rasp or file on the inlay to obtain the exact size of the cut. *Do not* leave oversize and force in with a clamp. This may help eliminate small gaps, but with any absorption of moisture the wood will eventually swell and force the inlay above the surface. Leave the inlay thicker than necessary, epoxy, clamp, and let set up 24 hours, then rasp and sand flush.

Most exotic woods or other inlay material will only require polishing and no stock finish.

Before going on, please do Programmed Exercise 4. Make sure you write your answers on a separate sheet of paper before looking at the answers on the page specified.

### PROGRAMMED EXERCISE

4

1. True or false? Relief carving refers to regular three-dimensional carving wherein each feature of the carved object appears life-like.
2. True or false? In stock carving, hair on an animal can be simulated with a coarse riffler.
3. True or false? Although an experienced carver may do the checkering first on a stock which has both checkering and carving, it is best for the beginner to do the carving before doing any checkering.

Answers on Page 24

### NOW, IT'S IN YOUR HANDS . . .

The thing about carving, and checkering too, is that you'll never know what you can do until you try it. Chances are that when you get up the nerve to finish off that first stock for yourself, you will not be willing to give it up for love or money. And you'll have a lot of fun in the process.

But first things first. Right now you should concentrate on completing and submitting Exam 12. Then, there'll be time for whistlin' and whittlin' . . .

ANSWERS

4

- 1. T
- 2. T
- 3. T