Rifle Making

in the

Great Smoky Mountains

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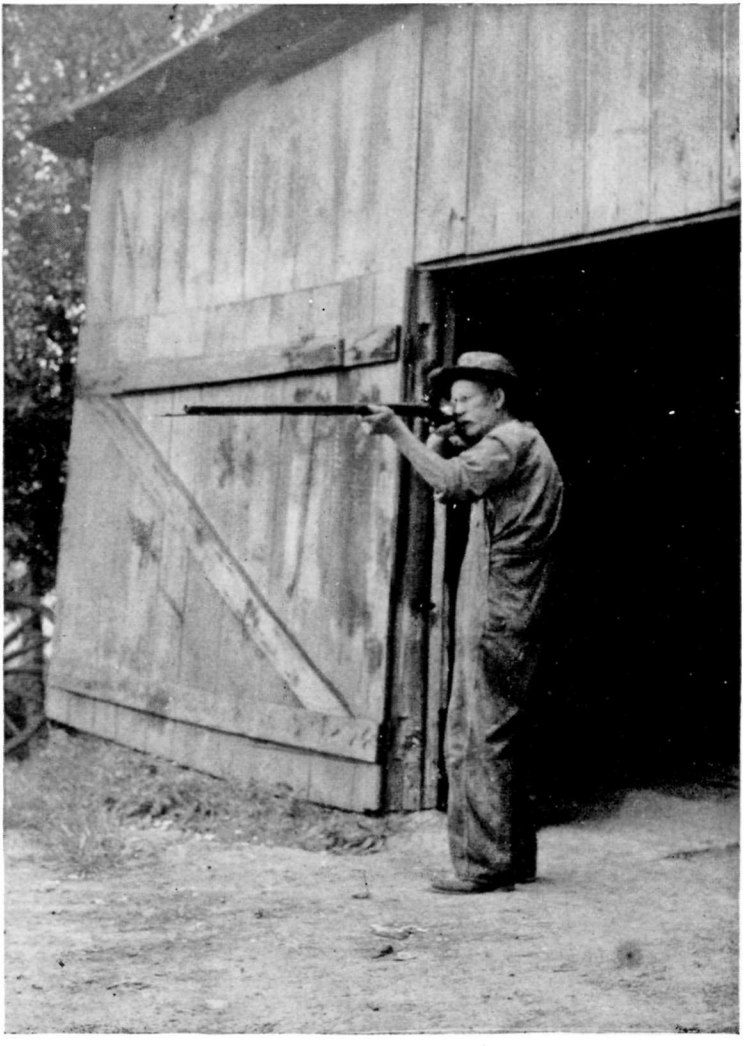

Firing a Smoky Mountain Squirrel Rifle

Rifle Making in the Great Smoky Mountains*

By Arthur I. Kendall, M. D.,
Professor Emeritus, Northwestern University Medical School

Eastern Frontier Riflemen

OVER 170 years ago, in 1767, Daniel Boone and a few intrepid pioneers crossed the Appalachian barrier to the West and penetrated deeply into the country that now comprises parts of the States of Kentucky and Tennessee. They remained some months and returned with accounts of a country richly wooded, with pasture lands, flowing streams, and teeming with game.

Soon the first settlers came—Scotch-Irish, English, and a few Huguenots—to establish themselves in the back country across the Appalachian range. They traveled with horses, for there were no roads or navigable streams, and brought with them their few belongings—a saw and axe, an auger bit, a hunting knife, a few blankets and coverlets, pots and pans, a gourd of salt, and last, but not least, that remarkable weapon, the American rifle.

When they came to a suitable spot, they camped, erected their one- or two-room log cabins, cleared land, and set up their communities. They were butchers, bakers, candle dippers, dyers, spinners and weavers, blacksmiths, tanners, and huntsmen. They made their own soap from ashes and fats, dyes from the bark of

* This study was prepared and presented to the National Park Service by Dr. Kendall, a pioneer private investigator of the folkways of the inhabitants of the Great Smoky Mountains. He has had a lifelong interest in mountain rifle making, which he regards as an integral part of the early life in this region.

trees, baskets of wythes split from oak trees, buckets and barrels, tanned their hides, and were self-sustaining except for steel, powder, and paper, although they had little use for the latter.

Soon they came in conflict with the Indians—the Creeks and Cherokees. The stealth, cunning, and ferocity of the savage, armed indifferently with weapons of the Stone Age—flint-tipped arrows, stone axes, and spears, together with a sprinkling of smooth-bore muskets—were pitted against the grim determination, resourcefulness, and courage of the pioneer armed with the rifled gun. The superior weapon of the settler more than offset the numerical superiority of the Indians, who were forced to give way. In this manner the country was settled.

Some of the pioneers stayed in the flat country. Gradually they established flourishing villages and schools and through contact with the outside world kept apace with the progress of events. Others remained isolated in the mountains where they built their log cabins in secluded and isolated valleys and coves cut off from commerce with the outside world. They retained their traditions, customs, and mode of living tenaciously; they are the progenitors of the mountain men of today.

The pioneer mountain men ordinarily were tall, gaunt, saturnine, somewhat indolent, but fully capable of sustained, severe activity. They were of strong will, adventurous, and highly individualistic, leaderless, resentful of discipline, but vigorous, sturdy, and thoroughly adaptable to the country in which they elected to make their homes. Even to this day the mountain people are stout individualists, independent in their thinking, and intensely loyal to their country. The introduction of schools, roads, and automobiles and the vast complexity of modern life have changed markedly their customs. They have passed in less than one generation from pre-Victorians, living in glorious simplicity, to the current age of speed. This pioneer stock, however, remains even today unmixed with foreign elements. They are, excepting the Indians, our purest-blooded Americans.

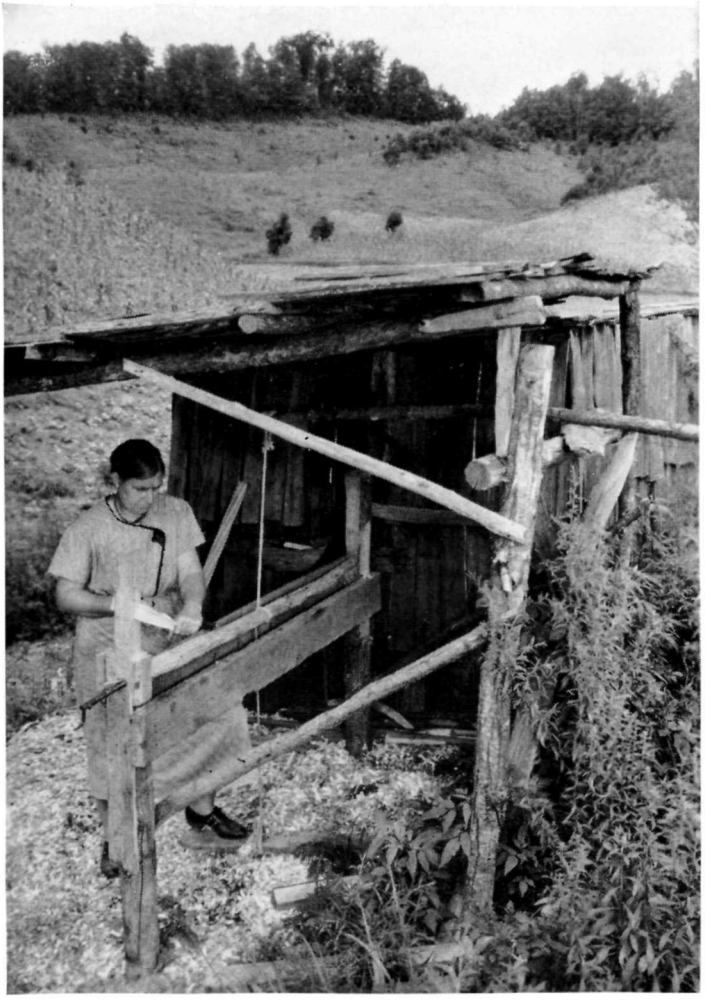

Figure 1. Turning a rifling guide on a primitive lathe

The Rifled Gun

The rifled gun, the American rifle,[1] or, as it is frequently called, the Kentucky rifle, which in the hands of the sturdy settlers turned the tide against the Indians, was very largely evolved in America.

The idea of rifling a barrel to make it shoot truer and harder, to be sure, was not new or novel. About 1550 one Gaspard Zeller, or Zollner, of Nuremberg, Germany, cut spiral grooves in the barrels of guns, but rifling, in its perfected state, is almost entirely an American development, a highly important step in the generation of the American rifle which was especially designed to meet the conditions that existed in the wilds of the east-central part of the United States. Indeed, this extraordinary arm evolved gradually to its highly perfected state very largely in response to the demands of the hunters who used it, and the chief credit for the mechanical perfection of the American rifle apparently should go to the highly skilled rifle makers of Lancaster County, Pa., who incorporated patiently, step by step, the suggestions of the pioneers who used it.

The several factors which a rifle, satisfactory for frontier use, should possess were: first, sturdiness, not too heavy or unwieldy; second, rapidity in loading; third, economy in the use of ammunition; fourth, accuracy and hard shooting for reasonable distances; fifth, smallness of report upon discharge.

Preceding the perfection of the rifle, several accessory factors, each important in itself, had to be developed. Even-burning, uniform-grained, high-grade powder had to be evolved. A patch to facilitate the loading of the rifle and accuracy of delivery of the bullet was necessary; a device to cut the precise rifling in the barrel to give to the spherical bullet its spinning flight had to be

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[1] The term "American" is objectionable as being too comprehensive. It obviously applies equally well to that vast stretch of continent between Canada and Tierra del Fuego. Possibly Colonial rifle or Frontier rifle would be preferable to an American rifle.

Figure 2. Wrapping the oak wythe symmetrically around the rifling guide

invented; and, finally, perfection of the firing mechanism, without which the rifled gun would be ineffective.

The primitive, original guns were merely tubes of iron closed at one end and fired by means of a burning stick applied to a touchhole. They were clumsy, inaccurate, and ineffective.

Next, the matchlock was invented. The essential feature of the matchlock was a movable arm capable of being raised and lowered, pivoted at one end on the side of the gun, and containing on the free end of a slow-burning fuse which, at the proper time, was lowered by a simple mechanism into a small pan of powder, connecting through the touchhole with the main charge in the barrel. The matchlock was portable, capable of being aimed, but very uncertain in wet or windy weather.

The next improvement in the development of the gun was the wheel lock. The "wheel" of the wheel-lock gun had its periphery serrated in a way comparable to saw teeth and was not of flint but of steel. The flint was held in a "serpentine" quite similar to the hammer of a flintlock gun. Pulling of the trigger released a device that rotated the wheel, and, at the same time, pushed the flint into contact with the notched periphery of the wheel, throwing a shower of sparks into the powder pan and thereby setting off the main charge in the barrel of the gun. The wheel lock was heavier than the matchlock but rather more certain in its firing ability.

Next came the snap haunce, a somewhat primitive progenitor of the flintlock, which was the method of ignition of the true early American rifle. The flintlock consists of three parts essentially—a hammer or cock, having in its jaws a sharp flint; a frizzen or steel, against which the flint is thrown when the trigger is pulled; and, immediately below the frizzen, a pan containing powder which is ignited by the sparks from the fall of the flint. The fire in the pan is communicated through a touchhole to the main charge of powder in the barrel of the gun.

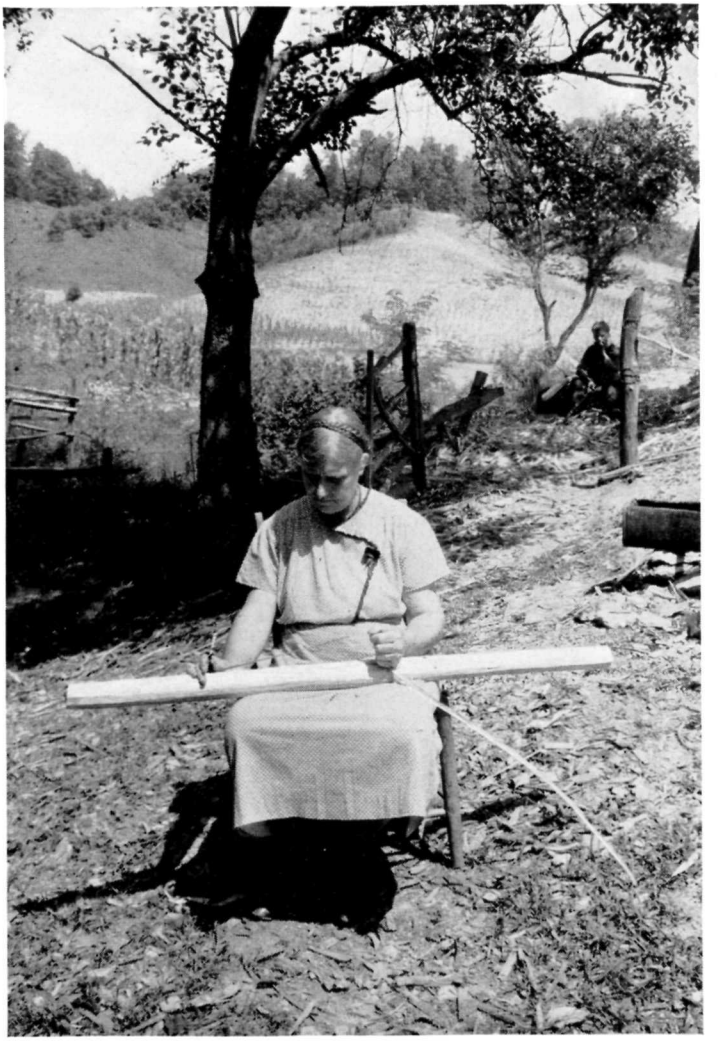

Figure 3. Marking the spirals on the rifling guide

The final improvement in the fabrication of muzzle-loading rifles was the introduction of the percussion cap. With the perfection of the percussion-lock guns, the art of rifle making in the Great Smoky Mountains came to an end. The machinery required to manufacture breech-loading rifles with steel barrels to withstand the high velocities attained by smokeless powder was beyond their simple tools and primitive equipment.

These several essential details of the American rifle were evolved and nearly perfected prior to the Revolution. The pioneer gunsmiths of the States of Kentucky and Tennessee, and many in the Carolinas and Virginia, brought the art of rifle making with them. This art was handed down from father to son, together with the tools and other equipment, secrets of tempering and case hardening, and certain accessory details which were jealously kept within the family. Certain of these details are of value both as a means of identification and as milestones in the ultimate development of the rifled gun.

The American rifle, as evolved in Lancaster County, was often ornamented in a variety of ways, with silver sights, silver inlays in the stock, and by beautifully tooled and engraved trigger guards and patch boxes. The rifles made by the gunsmiths of the Great Smoky Mountains, on the contrary, were usually devoid of ornamentation. The mountain people, cut off from communication with the outside, had to rely upon their own resources, and their hard lives were reflected in the simplicity and unostentation of the rifles which were made by them. But these rifles, in spite of their austere appearance and unostentation, possessed the essential characteristics of a satisfactory and formidable weapon.

Almost all the material necessary for the fabrication of rifles was ready at hand in the Smoky Mountains—pure iron from the Cumberland Mountains for barrels, locks, and triggers; seasoned curly maple or walnut from the forests for stocks; hickory for ramrods from the standing timber; and lead from local mines for bullets. The small amounts of steel required for springs were

Figure 4. Cutting the rifling guide

carefully retrieved from worn-out files, saws, or discarded and broken agricultural mechanical instruments.

Powder, as a rule, had to be imported from the outside world.[2] During the War between the States, attempts were made to manufacture powder from nitre obtained at the Alum Cave on the south side of Mount LeConte in the Great Smoky Mountains, but the crude, very corrosive, unreliable product was not only ineffective but it ruined many a splendid rifle barrel worthy of a better fate.

The Making of a Rifle

The essentials of a rifle are: first, the barrel; second, the lock and trigger, which in the American rifle are entirely separate mechanisms; third, the stock; and the smaller parts—the sights, butt plate, thimbles for the ramrod, and brass or iron for the patch box and trigger guard.

The barrel was made from pure iron in one of three ways. The first method: a solid bar of iron of the required length and diameter (usually 4 feet long, octagonal, and from an inch to an inch and one-quarter in diameter) was forged and shaped on anvil and grindstone.[3] The second method: two halves that would eventually be a barrel, each about 4 feet long, an inch to an inch and a quarter wide, and about half an inch thick, were channeled with a swage on one longitudinal side to produce a semicircular groove the entire length of the prospective barrel. Then the two halves were welded together, making a complete barrel with a hole through it. The third method: A strip of iron some 4 inches

[2] There is a well-established tradition that a powder mill was in existence prior to 1834 at the mouth of Couches' Creek on the Oconalufty River, a location well within the present area of the Great Smoky Mountains National Park. The owner of this powder mill was named Couch, and he sold and bartered his products to his neighbors, some of whom certainly were within the bounds of the park.

[3] The barrels of the rifles made in the Great Smoky Mountains were of pure iron—no steel barrels were ever manufactured. Indeed, the primitive tools of the rifle maker were incapable of shaping steel.

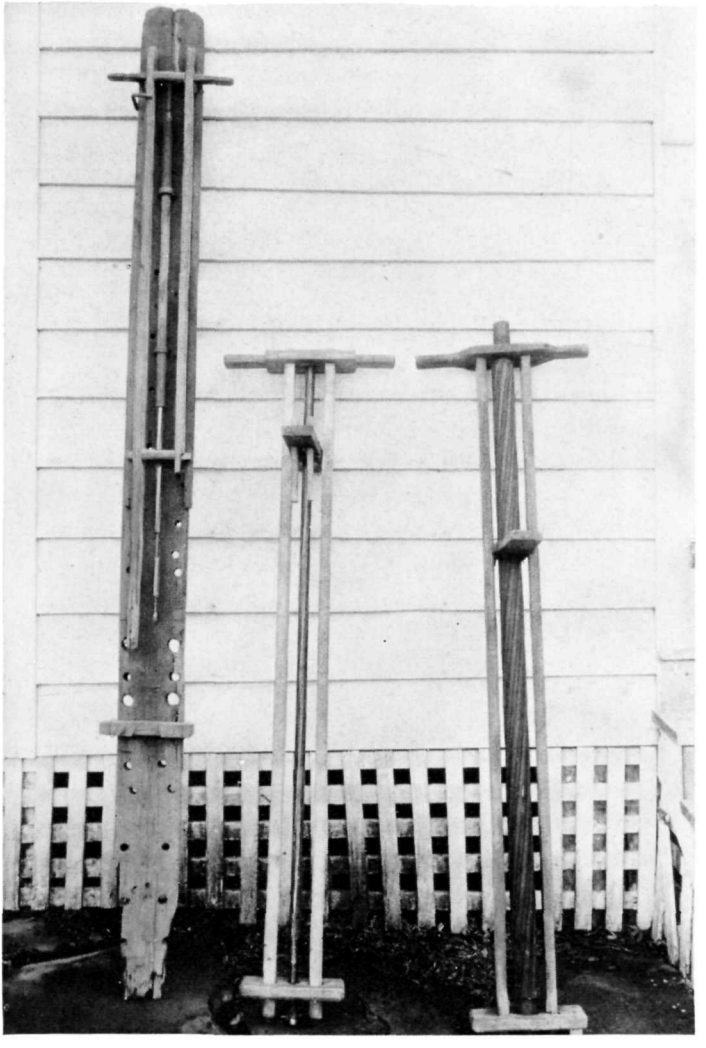

Figure 5. Types of rifling guides from the Great Smoky Mountains. (1) by W. H. Keller, Maryville, Tenn. The head block is a rifle barrel. The rifling guide is an iron rod with lead plugs cast on it, fitting the grooves of rifles of the barrel; (2) an iron rifling guide with its head block obtained from William Douglas, of Parrotsville, Tenn.; (3) a wooden rifling guide and its head block, also from William Douglas.

wide, of the proper length and the thickness of the barrel wall, was heated, a few inches at a time, and laboriously welded spirally about a steel mandril until the desired length of barrel was attained.

After the rifle barrel was made by any one of the three methods just described, the next step was to clean the bore and straighten the barrel. The bore was cleaned by means of a long bit. A long bit is a rod of iron some 4 feet long, having welded on one end a steel cutter, oblong in cross diameter, and with four sharp cutting edges, each some 10 inches in length. Ordinarily, the cutting surface of a long bit is about a quarter of an inch in the lesser diameter, and three-eighths of an inch in the greater, but the size depends very largely upon the diameter of the bore of the gun. Running the length of one cutting surface of the long bit, a thin piece of hickory was fastened on the narrower side in such manner that a thin shim could be placed underneath the middle of it. By so doing, the cutting edges of the long bit were kept in contact with the metal of the barrel. The slight offset produced by the hickory stick gave clearance for the shavings. The long bit was turned in the barrel by hand or with a bit brace and gradually worked the length of the barrel and back again until it would cut no more. Then the shim was made a bit thicker in order to make the cutting edges of the long bit press more heavily against the wall of the barrel, and the process repeated. The final result of dressing out with the long bit was a mirror-bright hole through the barrel of the rifle, isodiametric and true.

Next the barrel had to be straightened. Frequently during the several processes involved in the fabrication of the barrel as outlined it would become bent. A perfectly good optical principle was relied on to determine whether the barrel was straight. A fine linen thread, freed from "furze" (as one gunsmith expressed it), was threaded through the barrel and kept taut by a hickory rod, to which the projecting ends of the thread were tied. With the thread thus stretched inside the barrel, it was held up, prefer-

Figure 6. Rifling guide set up showing head block and part of rifling rod fastened to rifling guide and inserted into barrel of rifle

ably to the north, and pointed toward a white cloud. Looking through the barrel it readily could be seen if the string touched at every point. If not, a few blows of the hammer, skillfully applied at the proper place on the barrel, usually made it true. If this was not done on the first attempt, the process was repeated. Obviously, a crooked barrel would not make an accurately shooting rifle.

The next step was the rifling, the most important process of all. The rifling process, apparently complicated, is in reality simple. First, a "rifling guide" is prepared. Ordinarily this is made from a round stick of timber 2 to 3 inches in diameter and some 4½ feet long. This is carefully turned to the requisite size in a lathe (Figure 1) and then the circumference is divided accurately into five or seven equal parts.[4] A wythe of pliant oak about one-quarter of an inch wide and some 6 feet long is then prepared (Figure 2). One end of the wythe is fastened to the center of one end of the guide with a nail in such manner that it rotates freely. Starting at one of the seven divisions, the wythe is wrapped carefully around the wooden cylinder so that it makes exactly one symmetrical turn in the entire length; that is to say, one turn in approximately 48 inches.

A pencil mark is then made along the side of the wythe (Figure 3) and this process is repeated for each one of the remaining divisions.

When this step is complete, there will be seven spiral marks (or five), equally and symmetrically spaced around the wooden cylinder, and these indicate the twist or speed of the rifling. With each one of these seven symmetrical spiral marks successively as a guide, a second spiral line about a quarter of an inch away is drawn exactly parallel to each of the seven original sets of spiral markings. The wood between each of these seven

[4] Most of the rifle barrels made by the gunsmiths of the Great Smoky Mountains had seven rifles or grooves; some had five. With one exception, barrels with six rifles were never encountered.

Figure 7. Complete assembly for rifling a gun—rifling guide, head block, rifling rod, and barrel of rifle

paired parallel lines is carefully removed to a depth of perhaps a half inch, leaving as the final stage in the preparation of this rifle guide a wooden cylinder having a set of seven symmetrical spiral bands each turning once in about 48 inches (Figure 4). At this stage the wooden cylinder looks very much like a long wooden threaded bolt. If the spiral or twist of the rifles was much sharper than one turn in 48 inches, the weapon would be ineffective. The bullet, as the mountain men would say, "would strip its patch" at the higher speed of rotation. Consequently, the majority of the rifles, at least those in the Great Smoky Mountains, have on the average a spin or twist of approximately one turn in 48 inches.

After the rifling guide is made as described, a "head block" is prepared. The head block is a piece of hardwood about an inch thick and 5 or 6 inches wide, having cut in it a hole which is the exact reverse of a cross section of the rifling guide with its spiral bands. In other words, the head block bears the same relation to the rifle guide as a nut does to a bolt. Ordinarily the bearing surfaces in the head block were lined with leather which, when well greased, allowed the ridges of the rifle guide to slip through with ease (Figure 5).

The rifling guide and head block are mounted on a stout timber long enough to hold both the barrel of the rifle and the full length of the rifle guide is one straight line. This timber is firmly anchored so that it is immovable, and the head block is fastened permanently to it near one end in such a manner that when the rifle guide is threaded through it, the latter can be moved back and forth its full length without undue vibration, imparting meanwhile the proper rotation to the rifling tool (Figure 6). The rifle barrel is mounted in the exact axis of the rifling guide, so aligned that the rifling tool, which will be described immediately, will pass through the barrel in response to a back-and-forth motion of the rifling guide as it is moved back and forth. A twist corresponding to the twist of the guide

Figure 8. Dressing out the barrel of a rifle with a dressing stick

is imparted to the rifling tool, which in turn cuts the grooves or rifles in the barrel.

The rifling tool consists of a steel rod somewhat more than 4 feet in length and of a diameter somewhat less than the bore of the rifle. One end of this rod is fastened firmly to a chuck or slot in the end of the rifling guide so that it will turn coincidentally with the guide. The other end, for a distance of some 4 inches, has cast upon it a lead block of exactly the bore of the rifle. This is done very simply by winding a string about the end of the rifling rod to form a narrow band equal to the bore of the rifle. Then the rifling rod is inserted into the end of the rifling barrel for a distance of some 4 inches. Melted lead is poured around the rifling rod. The lead is kept from running down the barrel by the string barrier. When the lead is hard the rod is removed from the rifle. It will be seen that there is moulded on the end of the rifling rod a lead plug of exactly barrel diameter.

The next step is to seat the "saw" in the lead plug. The saw is perhaps most easily pictured by visualizing a small section of a hacksaw blade having some six or eight teeth. This saw is inserted in the lead plug in such a manner that the teeth project very slightly from the side. In other words, the teeth of the saws have a very slight clearance or cutting surface. It is necessary to have the long axis of the saw align precisely with the line of twist of the rifling. This is done very simply by first threading the rifle guide into the head block; then the rifling rod is fastened by the clamp to the rifle guide and the other end of the rifling rod with its lead plug is pushed through the barrel of the rifle until about 2 inches project on the far side. Then, by means of a steel tool, whose width is exactly that of the "saw," a longitudinal groove is cut in the lead plug. This is done by moving the lead plug back and forth by alternately pushing and pulling on the rifling guide for the proper length, and deep enough so that the saw will be inset far enough to give rigidity. Ordinarily this depth is about one-sixteenth of an inch.

Figure 9. Making the lock (hammer) mechanism of a rifle

After the groove to hold the saw has been cut in the lead plug, the saw is put into its groove, the teeth projecting but very little. It is then ready for use. The rifling guide is threaded through the head block, one end of the iron rod (or rifling rod) is inserted into the end of the rifling guide, and then the other end carrying the lead plug and its saw, well lubricated with unsalted tallow, is inserted into the end of the barrel. Drawing the rifling guide back and forth through the head block imparts the proper spin to the saw the entire length of the barrel, and a spiral groove is thereby cut, turning one in about 48 inches (Figure 7).

When the saw no longer cuts—in other words, when it has cut the groove as deeply as it can—the rifling guide is withdrawn from the head block and inserted again, one groove to the right, and the process repeated until all seven grooves successively have been cut out. It will be seen that by so doing seven parallel spiral cuts are made in the barrel. Then the saw is removed from the plug and raised up by putting a strip of paper at the bottom of the groove under the saw. Then the entire process is repeated. Eventually, when the rifles are cut "ten to fourteen papers deep," as the mountain rifle makers would say, there results a rifle barrel having on its inside seven spiral grooves or rifles, the counterpart of the rifling guide so far as twist is concerned, and deep enough to impart a spin to the bullet when the rifle is fired.

Next, the newly rifled barrel has to be "dressed out"; that is, to smooth the rifles or grooves, and the ridges between these grooves, called the "lands." To perform this operation, a "dressing stick" must be prepared. This is made upon a hickory rod somewhat less in diameter than the bore of the rifle. On one end of the hickory rod, a lead plug is run in precisely the same manner as the original lead plug previously described was run on the end of the rifling rod, the difference being, however, that this time the lead plug on the end of the dressing stick had the pattern of the rifles on it.

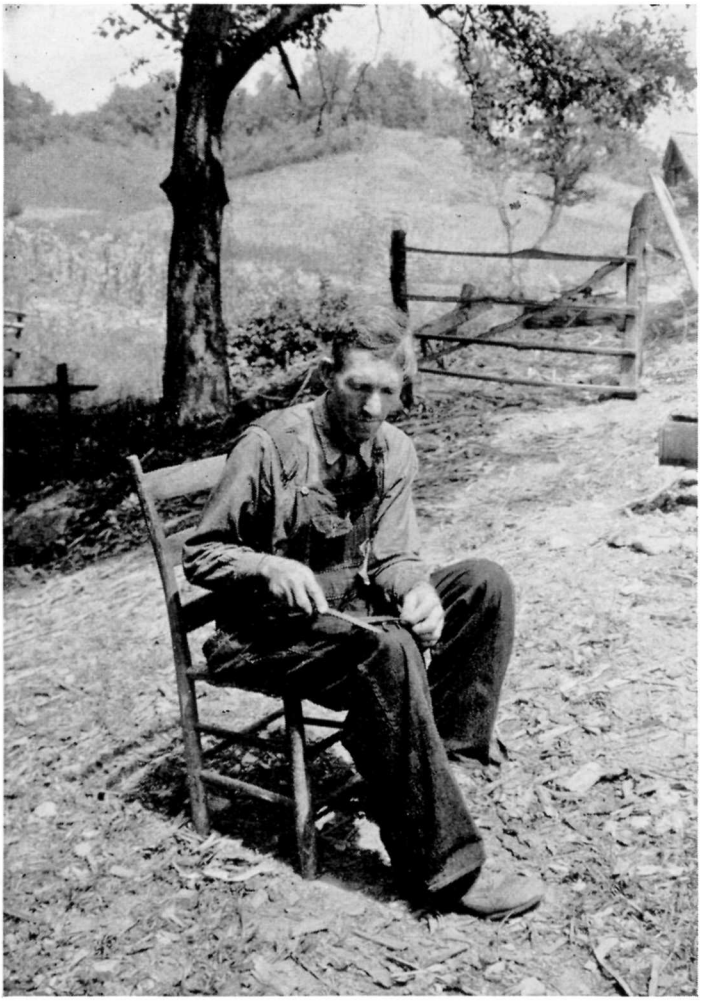

Figure 10. Making the double triggers for a rifle.

A saw corresponding to the original saw is inserted in the lead plug in exact alignment with one of the rifles and midway between the ends, and a second saw, the width of the lands, and in exact alignment with one of the lands, is inserted also. This dressing stick, well greased, is drawn back and forth through the barrel until the rifles are very smooth, evenly cut, and the lands between the rifles made smooth also (Figure 8). Usually from a full day to a day and a half was required to rifle and dress out a barrel in this manner.

The calibre of the mountain rifles deserves a word of mention. Strictly speaking, these rifles had no calibre in the ordinary sense of the word. Usually, however, four kinds of rifles were made: one of about .35 calibre (0.35 inch) which was called a squirrel gun; one about .40 calibre (0.40 inch) called a turkey rifle; one about .45 calibre (0.45 inch) called a deer rifle; and one of approximately .50 calibre (0.50 inch) called a bear gun.

After firing from 80 to 150 rounds, it was often necessary to redress a rifle; that is, to resharpen the edges of the rifles and clean the lands. The redressing was done in the manner indicated above by means of a dressing stick provided with both rifle and land saws, and naturally the bore of the rifle became a little larger thereby. Also, it was usually necessary to cut off an inch and a half, or thereabouts, from the breech of a rifle that had been fired this number of rounds, because at this point, just in front of the breech block where the powder actually burns, the iron gradually becomes eroded and an enlarged chamber forms which eventually would cause the bullet to shed its patch. Therefore, the shooting age of a mountain rifle can be approximately guessed at by the length of the barrel. It will be remembered that 48 inches was ordinarily the original length.

To finish the barrel after the rifling is complete, several more steps are necessary. First, a thread has to be cut in the breech and in this is screwed the iron breechblock which closes the rear end of the barrel. Usually the breechblock was made with a

Figure 11. Details of the lock (hammer) mechanism of a percussion-type rifle.

tang from 2 to 4 or 5 inches long. One or two holes, drilled in the tang, provide entrance for screws, which, passed through these holes, fasten the barrel securely to the stock. Next, if the rifle was a flintlock, a touchhole had to be bored in the side of the barrel about one-sixteenth of an inch in front of the breechblock. If the rifle was one of the percussion type, in place of the touchhole, a hole was drilled and threaded barely in front of the breechblock in which was fitted the side tube carrying the nipple for the percussion cap. Two or three metal tabs were also brazed lengthwise along the barrel through which holes were made. Metal pins were driven through these to fasten the barrel securely to the stock. The addition of front and rear sights completed the barrel.

The front sight was usually of the knife type and the notched, immovable rear sight set ahead of the breechblock some 6 or 7 inches. This gave a long sighting base which accounts in no small measure for the accuracy of these remarkable weapons.

The trigger and lock mechanisms (Figures 9 and 10) were then made. If the rifle was a flintlock, the hammer or cock had a screw clamp or vise in it to hold the flint, which, parenthetically, was always set in a piece of thin leather. A hinged frizzen was made of steel upon which the descending flint would strike a glancing blow, throwing the frizzen forward, allowing the sparks to fall in the small pan which was in front of and below the hammer and directly opposite the touchhole. The lock or hammer (Figure 11) for a percussion rifle was of the orthodox shape familiar to everyone. Usually the striking face of the lock was hollowed out a bit to fit over the cap and deflect any sparks.

Ordinarily the triggers were double (Figure 12); that is, there was both a set trigger and a hair trigger, the set trigger being behind, the hair trigger ahead of it. A small screw between the two regulated the tension, and therefore the lightness of pull of the hair trigger. To manipulate the firing mechanism of a percussion cap rifle, first the triggers were set; that is, the hind

Figure 12. Details of double (set) trigger for a rifle

trigger—"the hindmost one," as the mountain people would say—was pulled until it clicked. This set the hair trigger. Then the hammer was raised, and having previously put a cap on the nipple and loaded the gun, the arm was ready for firing. A very light touch sufficed to release the trigger.

The Stock

The pattern of the original Kentucky rifles was a little different from that adopted by the mountain people, although the amount of drop in each was quite conspicuous. The butt plate was deeply hollowed out, the curvature being relatively greater on the top side (Figure 13). The butt plate was made either of brass or of iron. The object of hollowing out the butt plate was said to be in order that the marksman could hook the butt of the rifle in the crook of his right elbow and shoot across his body, it being believed that in this manner the person, especially if he was behind a tree, offered a smaller target to an enemy than would be the case if the rifle was shot straight ahead from the shoulder.

Each mountain rifle maker had a pattern or template (Figure 14) from which he marked off the shape of the stock. The stock usually was made either from curly maple or from walnut, although other woods were sometimes used. The stock was either a half stock, in which case a wooden or an iron rib was fastened beneath the barrel from the tip of the stock to the muzzle, or a full stock, in which case the wood extended to the muzzle. The thimbles for the ramrod were next put in place, the ramrod extending through the stock parallel to the barrel. All of the mountain rifles had a check piece on the left side of the stock, the pattern of which varied in accordance with the design of the different rifle makers. Usually, however, the under side of the check piece was straight. This was used by the mountain people as a convenient storage place to carry a small amount of bees' wax, or tallow, as the case might be.

The pattern of the trigger guard was of individual design—some were quite ornate; others were very plain and simple.

Figure 13. Making the stock for a rifle

The stock was finished with a hinged patch box on the right side of the stock extending from the butt plate forwards, in some instances as much as 6 inches. The design and engraving of these patch boxes and workmanship of the hinged lid was often very carefully done. Patch boxes were omitted from the later rifles made in the Great Smoky Mountains. Many of the rifles had a six-pointed star of German silver or of iron on the top of the check piece.

Making the Bullets

Individual bullet moulds were made for the rifles. First the blanks for the two halves were beaten out of a piece of iron (Figure 15). They were hinged at the proper place with a rivet and then the spherical cavity was cut by means of a "cherry." A cherry consists essentially of a sphere of steel the size of the bore of the rifle mounted through a rather slender shank to a bar of iron with which to hold it. The temper was drawn from such a steel sphere and the cutting edges, exactly like those of a dentist drill, were laboriously filed out. Then the cherry was heated and dropped into tepid water (case hardened), which gave it an intensely hard surface. The cherry was used as follows: The halves of the bullet mould were opened and the cherry was rotated between the faces either by hand or by a bit brace. The cherry was turned, pressure being applied to keep the halves of the mould together and gradually a spherical cavity was ground out. As the cavity neared completion the narrow neck of the cherry would cut out a channel from the central spherical cavity to the outside and this was the channel or sprue through which melted lead was poured to make the bullet.

When a rifle was dressed out after a period of use, the bore became a trifle larger and it was, therefore, necessary to enlarge somewhat the bullet mould to fit the new condition. Usually a

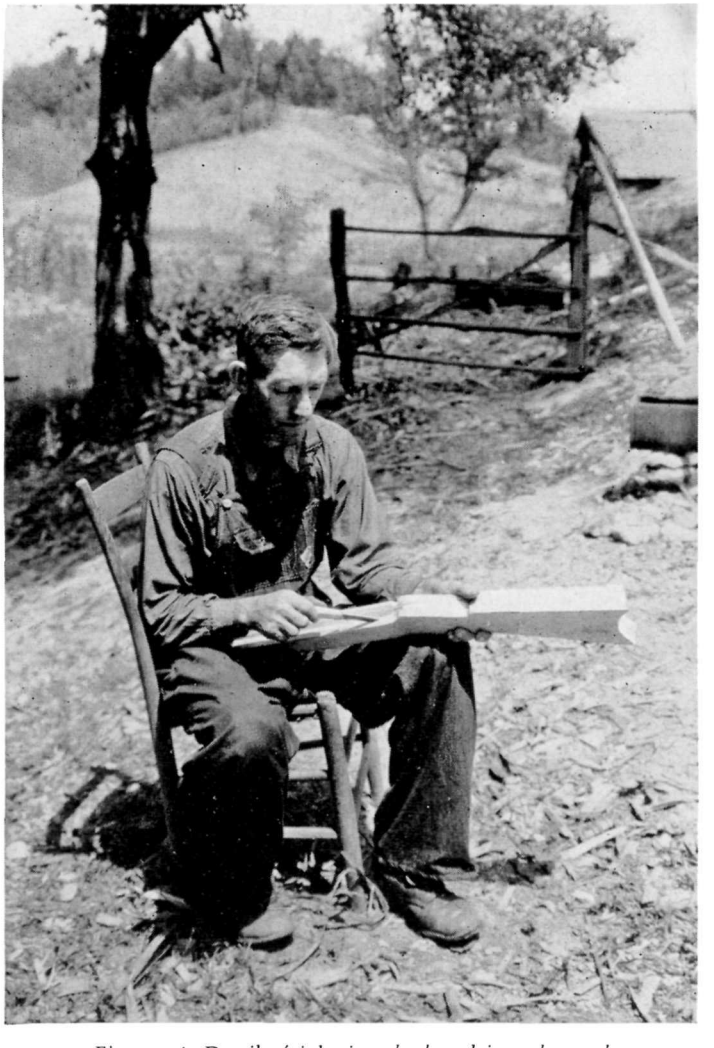

Figure 14. Detail of inletting the barrel into the stock

new cherry was required for this purpose. Time was a very secondary factor with the gunsmiths of the Great Smoky Mountains; to make a new cherry, a dressing stick, or, indeed, any of the multitudinous pieces of equipment for a mountain rifle, was all in a long day's work.

Shooting the Rifle

The charge of powder for these rifles deserves a word of mention. The formula one reads in the stories of old-time hunters was to put the round bullet in the palm of the hand and to pour out enough powder just to cover it. This was an extremely crude approximation and no good rifleman would ever rely upon such a primitive procedure. Ordinarily, the charge was arrived at by a method of trial and error.

One method was to spread a cloth sheet or several papers on the ground and then to mount the rifle in a horizontal position some 6 inches above the paper and parallel to it. Various charges of powder were tried until a charge was found which would leave only a few grains of unburned powder. Provided the bullet was always seated with the same pressure, this charge ordinarily was accurate within reasonable limits.

Another method was to set up a target the standard distance for the mountain rifles (60 steps or yards), and fire a series of test shots, varying carefully the amount of powder with each shot, until an amount was arrived at which would give the maximum accuracy. Then a powder charger was made, usually from a tip of a deer horn, with a slight lip on it, which, when leveled full, would hold the requisite amount of powder.

For very accurate shooting, however, the mountain men of the more modern times often took cartridge shells with bottle necks, especially those of approximately .32 calibre, since, by means of the constricted neck, they could get a somewhat more accurate measure of powder than could be had through the use of the wide-mouthed deer horn measure just described.

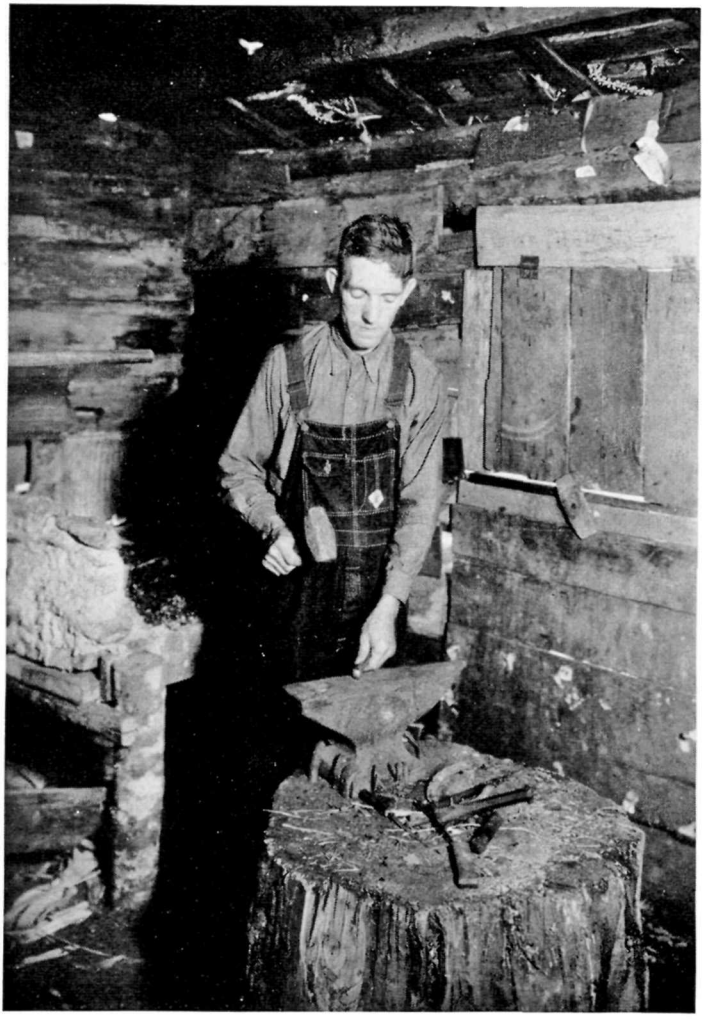

Figure 15. Forging the blank for a bullet mould

Usually rather fine powder, FFg, was preferred by the mountain men when it could be had for the smaller calibre rifles. For bear guns, FF was ordinarily used.

The sights on the mountain rifles were not adjustable and inasmuch as the rifles were ordinarily sighted for 60 yards, it was necessary to make some allowance in elevation for shots over and under this distance. In the target matches, which were very serious occasions, specially designed targets were used if the range was materially more or distinctively less than 60 yards. If the range was greater than 60 yards, obviously with a standard charge of powder the ball would drop somewhat at the point of impact. On the other hand, for distances materially under 60 yards, the ball would strike higher. In order to compensate for this the targets were made in the following manner: The distance was measured. If the range was over 60 yards, a diamond was cut in the paper about five-eighths of an inch on a side with the axis vertical. Beneath the diamond at the proper distance, a "V" shaped piece was cut, the point of the "V" being uppermost and in a true line with two points of the diamond above. The paper thus prepared was tacked over a piece of white, freshly planed board which had a blackened area corresponding approximately to the area covered by the diamond and the "V" shaped cut. If a board was moistened with saliva and some powder rubbed in it, a very satisfactory dull black smear could be made which showed up conspicuously against the white of the paper. In firing, the objective was to place the ball at the apex of the "V" shaped cut, and the rifle was sighted at the bottom of the diamond, the distance between the sighting point (the diamond) and the perspective hitting point (the "V") being determined from experience.

If, for example, at a range of 80 yards the ball dropped an inch below the striking point at 60 yards, then the aim point or diamond on the target would be an inch higher than the

"V" shaped point where it was hoped the bullet would strike. For distances under 60 yards the target was reversed, the "V" being above the sighting diamond.

The rifle was loaded in the following manner: The barrel being clean, first a charge of powder was carefully taken from the powder horn and poured into the charger. It is to be noted parenthetically that horn is a peculiarly good substance in which to store powder. It does not sweat as does metal, nor swell as does damp wood. It is waterproof and therefore the horns of cattle were much sought for this purpose. Inasmuch as the powder horns should curve around the body and not away from it, it was necessary to select the proper (left) horn of the animal to get this curvature. The stopper of the powder horn was always of leather; wood or metal would obviously be unsuitable.

After the charge of powder was removed from the powder horn, the stopper was carefully replaced and then the charge was poured into the vertically held barrel of the rifle. The rifle was then tipped so that the tube side was down and given a few vigorous taps with the hand to force the powder into the tube and nipple. It should be remarked that during this operation the hammer is raised in order that there may be no impediment to the free passage of the powder up into the nipple. Then the hammer is lowered. Next the ball is introduced. First a piece of cloth or patch of the right thickness is placed across the muzzle of the gun. Sometimes this cloth is lightly greased with unsalted tallow. Often it is moistened with saliva immediately before using. The bullet and the cloth are pressed into the bore of the rifle. Then the free ends of the cloth are gathered up in one hand and severed carefully with a knife. This leaves the ball in the barrel enclosed in a perfectly fitting cloth patch which enters and follows the grooves or rifles. The ball is pushed down the barrel onto the powder with the ramrod, being sure that the barrel is

vertical meanwhile so that the powder lies horizontally in the bottom until the ball is pressed firmly but not vigorously against the charge of powder.

One reads in some books that the bullet is seated by repeated heavy blows until the ramrod springs up from the ball some 4 or 5 inches. No intelligent rifleman would ever do this. If the ball is deformed by undue pressure of the ramrod it will not shoot true, of course. After the ball is in place the lock or hammer is raised and a cap inserted on a nipple, being first certain that a grain or two of powder can be seen at the tip of the nipple. It should be remembered here that the hole in the nipple should be only large enough to permit a grain of powder to come to the top. If the hole is larger, several things may happen. First, some of the powder may be lost during the loading operation. Second, when the cap explodes the enlarged hole of the nipple permits considerable back pressure of the powder and some of the force of the explosion is lost. And in the third place, if the hole in the nipple is too large and the spring actuating the hammer is weak, the hammer may be violently forced backwards with an explosion of burning powder from the nipple. On the other hand, if the hole in the nipple is too small, powder does not come to the tip of the nipple, and the piece misfires.

While it has been stated above that the majority of rifles made by the Great Smoky Mountains rifle makers and by rifle makers in general were sighted at 60 yards, these rifles were formidable up to 200 yards. The muzzle velocity of these rifles with ordinary charges of powder is said to have been from 1,000 to 1,200 feet a second. In expert hands, up to 100 yards they were remarkably accurate. And even today some of the mountain men, old in years, somewhat dimmed in sight, can make targets at 60 yards which would be creditable on any rifle range.

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