MODERN AMERICAN RIFLES

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WITH DESCRIPTIONS OF PROCESSES OF MANUFACTURING; APPLIANCES USED BY RIFLEMEN FOR HUNTING AND TARGET SHOOTING; DIRECTIONS FOR BULLET-MAKING AND RELOADING CARTRIDGES; POSITIONS ADOPTED IN VARIOUS STYLES OF SHOOTING; TRAJECTORIES OF RIFLES; AND A VERY FULL RECORD OF INVENTIONS, IMPROVEMENTS, AND WORK ACCOMPLISHED WITH AMERICAN RIFLES.

BY

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PREFACE.

DURING the years the author has been associated with sportsmen's publications, especially since establishing a journal devoted exclusively to the rifle, and editing its successor, which has been largely devoted to rifle shooting, he has noted the desire among devotees to the sport of rifle shooting for information on this subject. Those who have read *The Rifle* and its successor, *Shooting and Fishing*, must have noted that the Query and Reply column has been almost exclusively devoted to attempting to elucidate perplexed riflemen. Many of the questions have been repeated with such frequency, that it was considered advisable to publisha series of papers which would cover, as nearly as possible, the information called for. The papers appeared in the columns of *Shooting and Fishing*, and were so well received that certain editions were exhausted, and many applicants for back numbers could not be supplied. Besides this, it was found there was much matter which could not well be published in the columns of a paper, but advantageously connected with the matter previously published, as well as a great deal of new matter which developed after the series appeared; and responding to the requests of many, to present the result of my investigations in book form, I have collected, rewritten, and added new matter, and submit it in this volume.

No attempt has been made to produce a scientific treatise; on the contrary, the volume is the result of more than a quarter of a century's practical experience with American rifles, impelled by an irresistible attraction to investigate the mode of manufacturing, the art of shooting the rifle, and the various uses of the arm.

The author does not hesitate to state that after diligent study of the rifle for the period named, he recognizes there is much to learn of the idiosyncrasies of this most fascinating but perplexing arm.

I have been greatly aided in my work by favors from the Winchester Repeating Arms Company, the Colt's Patent Fire-Arms Company, the Ideal Manufacturing Company, the Union Metallic Cartridge Company, the Massachusetts Arms Company, the J. Stevens Arms and Tool Company, and the Malcolm Telescope Manufacturing Company. I also desire to acknowledge my indebtedness to Major Charles W. Hinman, Captain S. E. Blunt, Mr. H. V. Perry, Mr. N. S. Brockway, Mr. L. N. Walker, Mr. W. H. Devenport, and last, but not least, my faithful and untiring assistant, Mr. William Maynard, who has always stood ready to aid me in my work.

A. C. G.

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MODERN AMERICAN RIFLES.

CHAPTER I.

DISCOVERY AND PRINCIPLES OF A RIFLE. — RIFLES OF THE PRESENT. — MATERIAL FOR RIFLE BARRELS.

A RIFLE is a gun the inside of whose barrel is cut with spiral grooves or channels, the object of which is to cause a projectile of certain weight, which fits the barrel, to take a spinning motion when fired from the arm, and thereby increase the distance and accuracy of the projectile's flight. Rifles may be of any weight, from the heaviest piece of ordnance down to the compact pocket pistol, though other terms are applied to distinguish the different types of weapons.

From records of the past, there seems to be nothing to indicate positively who was the original inventor of the mechanical device which has given to the world a weapon from which power, pleasure, and profit have been derived. It is generally believed that, after fire-arms and gunpowder were invented, trouble was encountered, when firing, by fouling of the guns; and it was attempted to remedy this difficulty by grooving the inside of the barrels, at first it is said straight, and later with spirals, when the discovery was made that, by this means, range and accuracy were increased. The principle thus discovered formed the basis of the weapon which is, to a certain extent, forever to be a ruling power of nations.

Since the important discovery alluded to was made, there have been carried on, intermittingly, with and without system, innumerable experiments to solve the problem of the proper amount of spiral for the groovings and the best charges of powder, to spin various projectiles accurately. These experiments have been conducted the world over with heavy rifles or cannon, rifles shot from the shoulder, or those shot from the hand, the latter being classed as pistols and revolvers.

America has a world-wide reputation for producing superior rifles and excellent riflemen; and desiring to treat only of rifles with which the author has had practical experience, or privileged to inspect or observe the working of, no attempt will be made in this volume to describe any but American rifles and those of modern invention.

It has always seemed strange to the author that a nation of riflemen, as America can properly be called, should know so little about the mechanical construction of a rifle. Half a century ago many men who shot rifles were obliged to make them; a very intelligent class of mechanics they were, and they made very fine rifles. With the advent of the breech-loaders, which for the past decade have been turned out in such quantities, there seemed for a time to be little thought given to improving the rifle by manufacturers; the principal object of a majority seemed to be to learn how to make the most rapid firing rifle.

No doubt the rifles made by careful mechanics fifty years ago were superior in accuracy and durability to the early productions in modern machine-made breech-loading rifles. The manufacturing of arms by machinery reduced the number of hand rifle-makers, for hand skill could not compete with machinery. Each year since the commencement of the manufacture of machine-made rifles in America, these rifles have been improved, though slowly at first; and the better machinery has greatly lessened the cost of production, so that at the time of writing the manufacture of rifles by hand labor is almost wholly discontinued.

It is believed by most riflemen that modern American breech-loading rifles of to-day are equal in accuracy to those formerly made by hand, have the advantage of easier and more rapid manipulation, and can be purchased at much lower prices. It is not so difficult a task to manufacture a good rifle as is generally supposed: it is a simple mechanical problem, and does not demand the superior skill which is necessary in some other mechanical productions. For many years the impression prevailed that there were but few artisans competent to produce a rifle; but to-day there are scores of practical riflemen who have made as fine shooting rifles as can be found anywhere, and produced them by employing their leisure hours in this work, which was an entirely new field of labor for them. Some of the most popular calibres to-day are the results of such individual enterprise, and modern American rifles are as much the result of investigations of practical American riflemen as of manufacturers.

There are really but two component parts to a rifle: the forgings, which include all the metal parts, and the stock; but, as a rule, the forgings are known as the mechanism, receiver, trigger, trigger-guard, and such pieces.

The most important part of a rifle is the barrel. No matter how perfect is the mechanism of the arm, or faultless the stock and sights, the rifle is of little use with a poor barrel.

The materials used in the manufacture of rifle-barrels are iron and cast steel, but more commonly, at the present time, of a metal known as gun steel, barrel steel, or decarbonized steel: in fact, it may be said that at the present time nearly all first-class rifle barrels are made of steel, and generally of what is known to the trade as decarbonized steel. It is an American product, and manufactured at various localities in this country. The steel, as its name implies, has been largely deprived of its carbon and is soft; it is made specially for rifle barrels, and preferred by most manufacturers to a harder steel. The softer metal, it is claimed, has less tendency to crook when heated from rapid firing, which sometimes occurs where hard steel is used. Elaborate experiments have indicated that a steel of the degree of hardness used by most of the manufacturers of American rifles to-day gives the most uniform results.

For several years many of the match rifle barrels were made of cast steel; but now one quality of decarbonized steel is generally used for both match, hunting and military arms. I know of two rifle-makers who stand as high as any in the world, who have repeatedly demonstrated that they not only know their trade thoroughly, but are experts in shooting rifles. One writes: "I am not in favor of hard steel for target rifles, and would back the soft steel every time for uniform results." The other says: "I prefer plain cast steel for rifle barrels, and have used that kind of metal for my best rifles for the past thirty-five years. The cast steel barrels are quite hard. I think as fine shooting rifles can be made of decarbonized steel as of cast steel, but believe the latter will retain their fine shooting qualities much longer than the soft, decarbonized steel barrels."

There is a preference among some makers of muzzle-loading rifles for cast steel, but decarbonized steel is generally used by manufacturers of modern breech-loading rifles. There is an impression that iron is fit only for the cheap and unreliable rifles, but recently iron barrels have been fitted to first-class rifles in England, and the claim made that they possess superior shooting qualities, but wear out quicker than barrels of steel.

CHAPTER II.

MANUFACTURE OF RIFLE BARRELS. — BORING. — STRAIGHTENING. — RIFLING. — LEADING AND CHAMBERING.

The steel used in rifle barrels is supplied to American manufacturers by concerns making a business of manufacturing it. No firm nor company in America, manufacturing rifles, makes the steel used in their rifle barrels. When the steel is to be used for hunting and match rifles it is generally made and delivered in round bars, sometimes octagon, cut often one-half inch longer than barrels when finished, and again in bars twelve feet in length. These bars vary in weight according to the barrels intended to be made from them, — those for heavy Schützen barrels being thicker than those for light .22-calibre rifles. Small barrels are generally made from round, and large from octagon bars.

At the present time manufacturers of rifles are able to purchase the bars of steel for barrels more nearly in the shape of barrels than formerly. If a lot of light barrels are to be made the bars are purchased of size and shape best suited for such barrels, saving the manufacturer considerable labor.

There is a general opinion among rifle-makers and expert rifle shots that the quality of steel has its influence on the shooting qualities of a rifle : hence uniformity is considered an essential qualification for good rifle steel. Manufacturers have succeeded in producing a metal which, as a rule, is quite uniform, but at times it varies and causes no little trouble to the rifle-maker. In boring a barrel the bit will occasionally strike a hard, gritty substance which has been likened to a ploughshare striking a rock when ploughing; pockets and seams are encountered which are some of the obstacles which beset the path of the rifle-maker, and have not been overcome to such an extent that any one can tell positively that a particular bar of steel will make a superior rifle barrel.

If the barrels are to be made from the bars, as is generally the case, the first operation is to drill a small hole lengthwise through the centre of the bar. If the bars 12 feet in length are used, they are cut the desired length before drilling. After drilling the bar, comes the process of reaming, then straightening. The number of reamings depends upon the calibre. If the barrel is for a .22-calibre, one boring with a solid five-cornered reamer would be considered sufficient by some manufacturers; but, as it is difficult to secure a good hole by one boring, the plan followed with larger barrels is usually employed, omitting the nut-boring and quick-boring after drilling, and then finish by slow-boring or reaming. The operator is supplied with plugs or gauges, and the bar is reamed until the proper size has been secured. The turning down and grinding process is performed after boring or reaming. It is considered desirable by most manufacturers and many riflemen to secure a slight taper or choke to the bore toward the muzzle: a majority of American rifle-makers secure this by a process which will be alluded to later, and bore the barrels a true cylinder. One company informed the writer that 1-1000 inch taper was given in reaming, a process certainly not generally followed.

When the barrels are bored or reamed to nearly the desired size, the final work is done with a reamer cutting on one edge only, and with a piece of soft pine wood known as a spill, placed between the reamer and the wall of the barrel. This latter process gives a finer finish to the inside of barrels, and skill and care are necessary to perform this latter operation properly.

It is astonishing to note the variations in time consumed by different manufacturers in the reaming process, which will partially explain the low prices at which machine-made rifles are sold, and the superseding of large companies over the small concerns. A large establishment, equipped with the most approved machinery, will do in a few minutes what some of the old machines took hours to accomplish.

The bars, as before stated, are generally supplied slightly longer than the intended barrels. Sometimes, however, the metal is supplied in two-inch round bars of the same decarbonized steel; these are cut into bars of about ten inches in length. A ¾-inch hole is drilled through its entire length; this bar, or barrel-mould as it is sometimes called, is heated and drawn or rolled out to the desired length. This latter mode is largely confined to military rifles, but some of the long-range match rifle barrels have been made in this manner. When the desired length has been secured, the barrels are submitted to a straightening process, after which they are annealed again, straightened, and then submitted to the first and second boring.

A Springfield rifle-barrel, according to government reports, is "first-bored" with two twist bits of .37 and .42 inch diameter respectively, in a quick-boring machine, and "second-bored" with a quadrangular bit ribbed with splints to a calibre of .44-inch. In the first boring, the bits are drawn through the bore, rather than pushed. The additional borings are in both directions. The barrels at this stage are placed in a lathe and turned down by two turnings, then straightened, then a third turning down, after which the barrel is once more bored, bringing the calibre up to .4445; the barrel is then brought down to nearly its true size on a large grindstone. When the barrels have reached this stage, they are ready for rifling. At the government armories barrels are proved at this time, before rifling. Proving American match rifles, especially in the small bores, is, as a rule, omitted.

I have previously alluded to the rifle barrels being straightened during the process of boring or reaming. This is an important process, and has much to do with the shooting qualities of a rifle. The metal has its influence on the boring, and the operator at different stages of the work inspects the barrel to learn if the bore is perfectly straight. This is determined by placing the barrel on a rack; near by is a window, and in or near this window, where there is a strong, clear light, is a sheet of white tissue paper or a light of ground glass, in the centre of which is a horizontal line. The inspector, by looking through the barrel at the line, can at once tell by the lines of reflection whether the bore is straight or not. Long practice enables the barrel inspectors to quickly detect any deviation of the bore, locate it, and correct it. It may here be stated that after rifling, the crook in the bore is not readily detected.

If it is apparent that the bore is not true, it must be straightened; and the mode of doing it is by a blow with a steel hammer, the barrel being placed on a suitable block, with two pieces of hardened steel placed about two inches apart, on which the barrel is laid. A badly crooked barrel may be straightened, but it is not so likely to be a good shooting barrel as one which bores true, requiring little or no straightening. Experienced rifle-makers are inclined to believe that a barrel that shows a straight bore, requiring little or no straightening, possesses the first point in favor of its being a fine shooting barrel, though, of course, later processes, improperly executed, may injure it. A barrel requiring considerable straightening, as before intimated, is not likely to prove a good shooting one. In fact, I am inclined to take advantage, in the midst of my descriptions, of the opportunity to illustrate how delicate an instrument a rifle is, and how easily it may be injured. A bar of steel with a hole bored through the centre is delicate and easily affected by a blow. Therefore a rifleman should remember that it is desirable to avoid letting a rifle fall or receive a blow, as its shooting qualities are liable to be lost from such causes. I have seen barrels ruined from both of these causes.

I have observed shooters of long-range match rifles and military arms while waiting to shoot, straddle a rifle with the stock on the ground and the barrel in the hands, and sit on the rifle barrel; I have seen hunters carry the carcass of a deer or other game and luggage on rifle barrels, one at the breech, the other at the muzzle end, and then wonder that their rifles did not shoot straight. I have observed the antics of militia men who would fence with their rifles, striking one barrel against the other; and I know I have ruined the fine shooting qualities of a rifle by pounding the front sight in and out of the slot near the muzzle.

A rifle-barrel may be badly crooked after boring; an application of heat will perceptibly straighten it, but a barrel that has been straightened by much hammering is thought likely to bend by heat of firing; heavy blows on one side of a barrel, it is believed, weakens the metal and affects its expansion, as the metal is condensed by hammering, and consequently uneven expansion occurs when heated. The nearer straight a barrel is bored, and the less straightening required, the more likelihood there is of its being a superior shooting barrel.

When the boring and straightening processes are finished, the barrels are rifled.

Rifling consists of cutting grooves, always spiral in modern rifles, on the inside surface of the bore, the object of which has previously been described. By cutting the grooves or channels, a space is left between the grooves, which is called the lands. The grooves in modern rifles are helical, but the term "twist" is applied to the amount of pitch given to the grooves. The grooves are parallel to each other from end to end; and the twist generally uniform. Sometimes the grooves commence at the breech with a slow twist, increasing toward the muzzle; then it is said the arm has a gain twist. Most

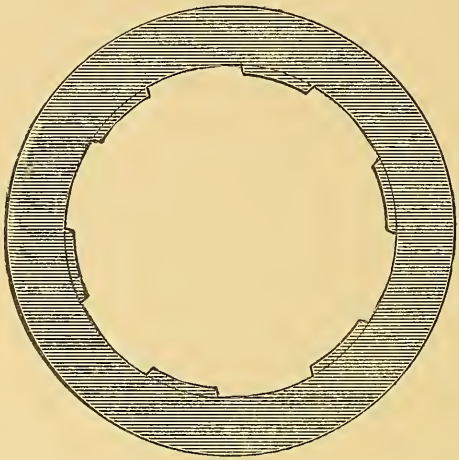


Fig. 1.—The Style of Rifling used in most American Rifles.

modern American rifles are made with a uniform twist, those manufactured with a gain twist being almost wholly rifles made to order.

Some years ago it was thought advantageous to have an increase or gain twist, and there are still advocates of this system; but judging from careful inquiries I have made of those expressing confidence in the gain twist, I find in almost every instance they have become converted to this belief by reading some of the works on rifle making published many years ago. Since that time, however, the most exhaustive experiments have been tried, and nearly all the manufacturers of modern American rifles believe there is no advantage in a gain twist, and give a uniform pitch to all their rifles manufactured in quantity.

The grooves and the lands combined are called the rifling. Many styles of rifling have been tried; but after exhaustive experiments, which include square and round edge, wide and narrow, deep and shallow grooves, a majority of American rifle-makers have adopted a style resembling what is shown in the illustration Fig. 1. Manufacturers vary slightly the style of their rifling; some giving much wider grooves than others, and some slightly bevelling one edge of the lands.

The style shown is a square and shallow groove, with the bottom of the grooves of the same circle as the bore, frequently a little wider than the lands, although the U. S. Springfield rifle has lands and grooves of equal width.

The style of rifling, like the twist, is a subject about which no end of argument has been indulged in; also, like the question of twist, it has been practically settled; but there always has been, and probably always will be persons who intermittingly will proclaim to the world that by a new system of rifling the accuracy of the arm is materially increased, or certain difficulties which have always been encountered since rifles were made have been overcome. There are some slight variations in the styles of rifling; but I have never seen any radical departures from the systems illustrated, which have demonstrated their superiority. I have, however, seen work done with the system of rifling here shown, which, I believe, is all that can ever be expected of a rifle with the present ammunition of ordinary black powder and a projectile of lead and tin; and most riflemen, who have given years to the study of this weapon, believe that the style of rifling in use by our manufacturers at the present time is about as near perfection as it is possible to get; and improvement in accuracy must come from ammunition rather than from a different style of rifling. Undoubtedly the metal-incased or jacketed bullet of the new small bores needs a different style of groove from the old styles used with leaden bullets, so as not to cut or break the jacket with which they are encased.

Rifling a barrel is a simple mechanical operation, about as follows: —

After the boring or reaming is finished, the barrel is placed in a rifling machine. A rod or spindle, at the end of which is one or more cutters of hardened steel, is moved automatically through the barrel; at the end of the stroke the motion is reversed and the rod or spindle is withdrawn, and the cutter operates on the groove, generally cutting one groove at a time, though sometimes more, a thin shaving of steel being brought out with each cut; the rod is moved through the barrel again, the machine automatically rotating the barrel, and thus the cutter is applied to a different groove at each withdrawal of the rod. The rifling machine is so constructed as to permit of rifling with various twists and adjusted to cut grooves of varying depths. The depths of grooves range from .001½ to .006 of an inch; generally .003 and .004 for small bores, and .005 and .006 of an inch for dirty shooting. An old rifle-maker of my acquaintance informs me that the cutting is done from muzzle to breech. He also always cut off from the muzzle, after rifling, from ¼ to ½ inch to insure the corners of the grooves being sharp and clean cut right up to the end. This is done for the reason that when the cutter first starts in, it is liable to, and usually does, cut slightly rough and irregular. In his system of rifling, the cutter rod is passed through the barrel from breech to muzzle, and the cutter is then placed in position. The rod is then drawn through, the shaving removed, the incline which supports the cutter is pushed back, allowing the cutter to drop below the surface of the cutter head (so as not to scratch on its passage back through the bore); it is then passed through to the muzzle again, the incline forced back, so the cutter will be the same height as before, and the barrel revolved to next groove, and so on until each groove is cut. Then with cutter head at muzzle end of barrel, the cutter is raised a trifle, by means of a suitable adjusting screw operating on the incline, and then each

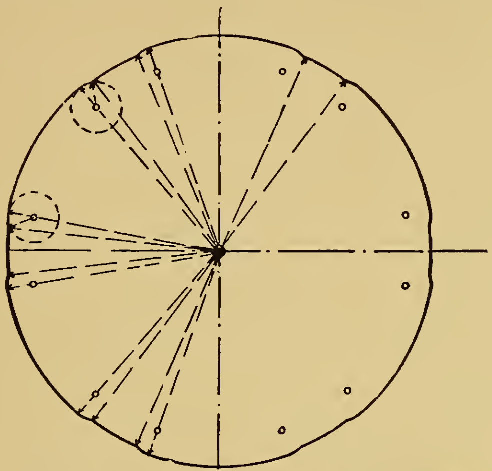


Fig. 2.—System of Rifling employed in the Colt's Rifles.

groove is cut again as before, and so on till the required depth is obtained. The style of rifling shown in Fig. 1 is about what is used in the Winchester, Remington, Maynard, Stevens, Ballard, and Hopkins & Allen rifles.

Figs. 2 and 3 show different styles of rifling. The rounding of the corners of the grooves is supposed to lessen the fouling. The well-known Colt's rifles are made with this style of rifling as well as some of the rifles made to order by individuals.

If a rifle is to be used for dirty shooting, or shooting without wiping the inside of the barrel after each shot, it is thought by some desirable to cut the grooves deeper than when the arm is intended to be shot with a bullet patched or jacketed with paper and the inside of barrel carefully cleaned after each shot. The shallow grooves are also thought best adapted to the character of projectiles used in target rifles.

The number of grooves in American rifles is from three upward. The U. S. Springfield rifle has three grooves, the majority of other rifles made in quantities

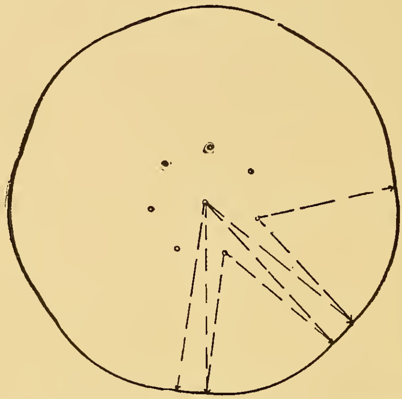


Fig. 3.—System of Rifling employed in the Colt's Rifles.

have from five to eight, according to size of bore, and a few rifles are made with a larger number. When over eight grooves are used they are generally in rifles made to order. It is usual to increase the number of grooves as the depth of grooves decreases. The number of cuts required to finish a groove varies according to the depths. By the hook method some manufacturers using power machines give five to eight, others six to twelve, the latter being on a hand-power machine. The width of groove and quality of stock also have their influence as well as the machine.

All the rifling machines used in this country are of American manufacture. The Pratt & Whitney Co. of Hartford, Conn., build rifling machines for domestic use as well as equipping foreign armories. Many of the larger companies, such as the Colts and Remingtons, build their own machines, which differ somewhat.

There are quite a number of hand-power rifling machines in existence, and used at the present time. The twist is governed in these machines by the spiral guide on the lead. Excellent work can be done with them; but they cannot rifle anything like the number of barrels a modern power machine can in a day, the latter machine being supplied with automatic force-pumps, feeding the oil, as well as other improvements.

The twist of a rifle is the amount of pitch given to the grooves. A uniform twist is where the grooves are regular from end to end; a gain twist is one that increases from breech to muzzle.

The twist of a rifle is known by the number of inches it takes to make one complete turn. A twelve-inch twist is where the groove goes once around in twelve inches; a sixteen-inch twist, one turn in that number of inches. The above twist might also be alluded to as one to twelve and one to sixteen.

The object of the twist is to spin the projectile, and this gives accuracy in its flight. The amount of twist is governed chiefly by the length, calibre, and density of the projectile. Where bullets are of similar shape and proportion, but having different diameters, the smaller calibres require a shorter twist. An examination of the following table will show the principles governing this question.

Twist in rifles can be computed on a theoretical basis, the density of a projectile affecting the calculation. I will treat only of the usual compounds of lead and tin. With this material mathematicians assert that a projectile of a certain length requires a twist of one turn in a given number of diameters to insure accurate flight. A table by Major Cundill, an English authority, has been published, from which the following figures, as applicable to American rifles, have been deduced :—

.25-Cal.		.35-Cal.		.40-Cal.	
Length of Bullet.	Twist.	Length of Bullet.	Twist.	Length of Bullet.	Twist.
.50	21.1	.70	29.5	.80	33.7
.62	15.8	.87	22.2	1.00	25.3
.75	12.7	1.05	17.7	1.20	20.3
.87	10.6	1.22	14.8	1.40	17.0
1.00	9.1	1.40	12.7	1.60	14.6
.30-Cal.[1]		.38-Cal.		.45-Cal.	
.60	25.3	.76	32.0	.90	37.4
.75	19.0	.95	24.0	1.12	28.4
.90	15.2	1.14	19.3	1.35	22.8
1.05	12.7	1.33	16.1	1.57	19.1
1.20	10.9	1.52	13.8	1.80	16.4
.50-Cal.					
1.00	42.1				
1.25	31.6				
1.50	25.4				

[1] Most American .32-cal. rifles are .30-calibre.

These figures show about the minimum twist required to keep the bullet flying true on its axis; and by testing them they will be found nearly correct, although the shape of a bullet will have its effect, and should be taken into consideration. Although it is not difficult to figure the theoretical twist required to spin a projectile, American manufacturers do not depend wholly upon it.

If one has made a rifle which shoots well it can be made a basis for future calculations, and many follow this plan.

Manufacturers of rifles generally decide upon a cartridge or charge, and make the twist that they think is best suited to it. A slow twist will shoot a light bullet accurately, but not one beyond a certain weight; therefore, if a heavier bullet is desired, the twist must generally be quickened, or the bullet will not receive sufficient spin to make it fly accurately, and, in place of spinning on its true axis, will tumble and take an erratic flight. Although a slow twist will spin only bullets of certain weight, a quick twist will spin a light bullet. Almost any bullet, however light, if of proper size and sufficient bearing, will shoot with greater or less accuracy, with a limited powder charge, in a rifle having the quickest twist used by American rifle manufacturers.

It will be seen by the table giving twists used in American rifles, that manufacturers do not agree on the question of twist; but fortunately there is a point in the twist which will permit of a projectile of greater or less weight being used, and although there may be a certain twist best adapted to a bullet of certain weight, it is a fact that different twists will spin the same bullet, or lighter and heavier bullets, with accuracy. There is an inclination by those who seek range and accuracy to shoot the heaviest bullet the twist will spin, and this is carried to such an extent that bullets will sometimes tip slightly, or, as riflemen say, stagger, and still shoot with great accuracy; but often when this is carried to an extreme, a series of bullets will shoot with surprising accuracy, followed by one which would not spin on its true axis and tumble wildly.

I can perhaps illustrate this by referring to the calibres and charges with which American riflemen are quite familiar. First, the .38-calibre, which is generally known as the .38-55, and is probably as popular a target calibre as any American rifle. The usual twist given is one turn in 18 inches. Manufacturers calculate this twist to spin a 255-grain bullet, and cartridges loaded for rifles with this twist have a lubricated or unjacketed bullet of this weight. Riflemen, however, who use this rifle for fine target shooting seldom think of using so light a bullet, one weighing 330 grains being usually preferred. The twist of 18 or 20 inches handles this bullet admirably; but it frequently tips a little, and occasionally, to use the vernacular of riflemen, a bullet will "tumble" and "key-hole," or fail to spin on its true axis, and not reach the target, or perhaps go through it sidewise. Yet with this tendency to tip, the bullets bunch together closer than with the 255-grain bullet which manufacturers advise using. Some rifle makers, knowing the inclination of riflemen to use the heaviest bullet the twist will spin, increase the twist to one turn in 16 inches; but where rifles are advertised to shoot the .38-55-255 factory-loaded cartridge, the producers usually decline to make a rifle with as quick a twist as 16 inches, holding that 18 or 20 inches is better. A number of cases have come under my observation where riflemen have endeavored to increase the weight of a bullet beyond 330 grains in a .38-calibre rifle with a 16-inch twist. I have never heard of increased accuracy being gained by so doing; but, on the contrary, the experiment in every case I know of proved a failure. I know of one rifleman who increased the depth of his bullet-mould a thirty-second of an inch. He found poorer shooting followed; and after changing the mould to cast a bullet as at first, or the regulation length, the accuracy was restored.

The .32-40 rifle is another popular target rifle; and although manufacturers recommend using the 165-grain bullet, riflemen incline to a heavier one. All riflemen interested in the recently introduced .25-calibre central-fire rifles, are probably aware of the prolonged discussion relative to the twist in this rifle, or the proper weight of bullet for the adopted twist. This is another similar case. The twist of 15 inches will undoubtedly spin a bullet weighing 86 grains, and astonishing accuracy be secured; but it is also certain that the bullets incline to tip.

I have seen ten shots fired into a group which could be enclosed in a four-inch circle, the shooting being done at a distance of 200 yards from a rest, and every one of the bullet-holes showed tipping. I have seen the original targets of the best off-hand scores made by a prominent rifleman : sent me to prove the bullets struck point on, but in nearly every instance the bullet hole indicated tipping. Some of the later experiments I tried with the .25-calibre central fire were at Walnut Hill ; and one of these was shooting through screens, to learn the trajectory of this cartridge. There were present a number of distinguished riflemen, as there was considerable speculation as to the curve of the bullets of different weights. The factory cartridge loaded with a bullet weighing 86 grains went through the centre of the screens at 25, 50, and 75 yards, making satisfactory holes. At 100 yards it showed a decided inclination to key-hole ; and at the 150-yard screen it turned, going through the frame on the right side, making a hole the length of the bullet. It may be said that the tissue paper turned the bullet ; but as similar key-holes have been observed when not shooting through screens, I formed the opinion, after what I had seen many times, that the 15-inch twist would spin the 86-grain bullet, shoot it accurately, but erratic shots would occasionally occur.

When the enterprising Stevens Arms and Tool Co., aided by the Union Metallic Cartridge Co., originated the .22 long-rifle cartridge, it was necessary to quicken the twist in the rifles in which this cartridge was shot, from one turn in 25 inches to one turn in 16 inches, to spin the extra ten grains of lead. By increasing the bullet from 30 to 40 grains, and shortening the twist from 25 to 16, the range and accuracy of the cartridge were wonderfully increased, so much so that shooting declared to be impossible with the old short cartridge was readily performed with the new.

As the increased accuracy secured by this change became known, calls came for other makes of rifles to take the new cartridge. One company made the inexcusable blunder of rechambering .22 calibre rifles with the old twist and placing them on the market; they would not spin the 40-grain bullet, and at 25 yards the bullets would key-hole badly. Several of these rifles came to my notice. It was simply a case of insufficient twist for the weight of the projectile, a mistake which has often been made, and rifle-makers have several times been compelled to withdraw lots of rifles from the market on account of this mistake.

I have alluded to rifles with quick twists shooting projectiles of various weights, and slow twists not shooting bullets beyond a certain weight. It was shown by a series of experiments I witnessed that a .22-calibre Ballard rifle with a twist which spun accurately the old short rim-fire cartridge (3-30) would not spin the long-rifle cartridge; but, changing the twist from 20 to 16, it was found that wonderful accuracy was secured by the heavy bullet, and it would also shoot the light bullet better than the old slower twist. The same was shown in my hunting rifle, a Winchester .45-70, taking the government shell. This rifle will shoot a charge of 70 grains of powder and a 500-grain bullet with great accuracy, and with satisfactory accuracy, under favorable weather conditions, the 405, 330, and even 300-grain bullets. The 500-grain bullet is too heavy for general hunting, and the 330 quite satisfactory to me.

Greater range is also secured by a heavier projectile; and as a quick twist is necessary to spin heavy bullets, modern military rifles are so rifled.

Following are the twists used in some of the most popular American rifles taking cartridges which are in general use: —

Calibre.	Powder Charge. Grains.	Weight of Bullet. Grains.	Twist.	Remarks.
.22 r.f.	3	30	20 to 25	Abandoned by some for 16 and 18 inch twist.
.22 r.f.	5	40	16 to 18	Long rifle for a .22 cal. r.f. rifle. Used by some manufacturers.
.22 c.f.	10	45	14 to 16	
.25 r.f.	11	67	17	
.25 c.f.	19 and 20	77 and 86	12 to 15	
.32 c.f.	13	90	20	Becoming obsolete for rifles.
.32 r.f.	9 and 13	82 and 90	20	
.32 c.f.	20	115	16 to 20	Winchester.
.32 "	20	100	24	Colt's and Marlin.
.32 "	35	165	16	Maynard and Stevens.
.32 "	40	165	16	
.35 "	40	240	16 to 18	
.38 "	40	180	28	Colt's and Winchester.
.38 "	55	255	16 to 20	
.38 "	56	255	20 to 25	
.38 "	90	217	26	
.40 "	40	265	18 to 20	
.40 "	45	265	18 to 20	
.40 "	50	265	18 to 20	
.40 "	60	210	40	
.40 "	62	210	40	
.40 "	60	260	25 to 26	
.40 "	65	260	25 to 26	
.40 "	82	260	28	
.40 "	90	370	18 to 20	
.40 "	110	260	28	
.44 "	40	200	28	
.45 "	60	300	25	
.45 "	70	405	18	Sporting.
.45 "	70	405	22	U. S. Government.
.45 "	70	500	22	" "
.45 "	85	295	25	Colt's.
.45 "	90	300	32	Winchester
.45 "	125	300	36	"
.50 "	95	300	60	'
.50 "	95	300	54	Colt's.
.50 "	110	300	60	
.50 "	115	300	72	Bullard.

The objection to a great excess of twist is the liability of a very light bullet, backed by a heavy powder charge, stripping or being driven across the lands, and not following the grooves; its tendency to drift is also undesirable.

In some instances, manufacturers have declined to state the twists used in their rifles, which perhaps they look upon as secrets of their trade. It is a very simple matter for any one desiring to know the twist of a rifle to learn it in the following manner: Place a rag in the slot of a stout cleaning-rod. There should be sufficient rag to make the wad formed by it fit snugly when pushed into the rifle barrel, — so snug a fit that some force is required to draw it through the barrel. Place the rod with rag in barrel, from the muzzle, and push it down near the chamber. A hole should be bored through the rod at a point near the muzzle, through which attach a pointer. A pointer may be attached to the rod by a clamp if preferred. Align this pointer with the rear sight, and mark the rod exactly opposite end of the barrel, then slowly draw the rod upward, and when the pointer has made one complete revolution, measure the distance from the muzzle to the mark on the rod. The distance will indicate the twist. If it is 18 inches, it will mean the rifle has one turn in 18 inches. The smaller the number or shorter the distance, the quicker the twist; the greater the distance, the slower the twist.

After a barrel is rifled, comes the process of leading the barrel. One of the objects of this process is to remove any burrs or rough places which may be left on the inside of a barrel after boring and rifling. It is usually the custom of manufacturers to lead after finishing rifling. The process is performed by hand or by machinery. It is a hard and difficult task to do by hand; and it can be done, it is claimed, more evenly and rapidly by power. A nice job can, however, be done by hand. The machine mostly used for this purpose is upright with a large balance-wheel, having an adjustable connecting-rod for regulating the length of the stroke. The leading-rod is fastened into a revolving holder, the barrel being held firmly in a fixture, breech end up. For a leading-rod a steel rod is used as large as can be used with safety and not come in contact with the inside surface of the barrel. The end of the rod for about two inches is drawn out and filed up square and slightly tapering, on the four edges of which V-shaped slots are filed about ½ inch apart, and in such a way that they do not come opposite each other on adjacent corners (this so to make a good holding-surface for the lead). A piece of cotton cloth is now wrapped around the end of the rod at the base of the square part spoken of, sufficiently large to fill the bore (a shallow groove having been previously made around the rod at this point to prevent the cloth from slipping while passing it through the bore), the rod passing through the bore to within about ¼ inch from the muzzle; the barrel is set upright in a suitable frame and the lead poured. This gives about 2¼ inches length of lead, say for .45-cal. (less length for smaller calibre). The rod is now drawn out far enough to remove the cotton cloth, the barrel placed in the machine, breech up, the rod fastened, the machine put in operation, and the emery and oil applied (oil first). The process of leading is considered by many to be a very important one. I cannot better illustrate the importance attached to this process than by quoting from a communication which I recently received from Mr. H. V. Perry, whose rifles have certainly performed enough excellent work to prove him master of his craft. Mr. Perry says: "I always lead or emery after rifling. To emery a barrel of the right shape inside, is a more delicate and finer job than rifling. No gun will shoot finely without being properly treated with emery or properly shaped, and in this particular many men fail in making really fine shooting-guns. I can spoil the finest shooting-gun in the world in just one-half minute with emery."

I have stated that one of the objects of leading or the use of emery is for the purpose of removing rough places or burrs. There are other things accomplished by this process. If the barrel is of less diameter in bore at any point, it can be freed by this process. Often the taper or choke, which is considered desirable by most intelligent riflemen, is secured in leading. Although it has been stated by some manufacturers that they secured a choke in boring, it is believed that most barrels are bored a true cylinder and the taper or choke secured by freeing the barrel toward the breech. Few riflemen care to purchase a rifle that is smaller at the breech than at or about the muzzle; and, upon inspecting a rifle before purchasing, the experienced rifleman will pay but little attention to the exterior of the arm, especially if it be a breech-loading target rifle, but will take a solid piece of lead, and, dropping it into the breech, push it through with a wooden or brass rod. To give satisfaction, the bullet should start with a moderate amount of pressure, and as it progresses require more force to push it, gradually fitting tighter as it approaches the muzzle. With such a barrel it is thought by experts that a great point is gained in securing a good shooting rifle. If, on the contrary, the plug requires considerable force to start it at the breech, and less as it approaches the muzzle; or if considerable force was required to start the plug, and it suddenly loosened for a few inches and then tightened, it would be rejected by many riflemen. Testing a barrel in this manner may be done with a bullet patched, but not so perfectly as with the leaden plug.

From testimony collected, it is evident that most manufacturers perform the operation of leading after rifling. Some believe it better to do this before rifling, and Mr. L. N. Walker, for many years connected with the Remington's, who is not only recognized as unusually well informed on the manufacture of rifles, but a practical rifleman, writes me in reference to leading as follows: "My experience teaches me that to secure the best results, the barrel should be leaded or freed to the proper shape before rifling, leaving the only work to be done with the lead (after the barrel has been rifled and properly freed in the grooves by the cutter), to just lay the grain or emery surface lengthwise, thus saving the wear of the corners of the lands, which occurs in leading after rifling, which is often greater than that caused by several thousand shots, thus prolonging the life of the gun, or at least its fine shooting qualities. Two or three strokes with a leading-rod is sufficient to spoil the gun for fine work, if not done exactly right; and right here lies the secret of steady elevation, as a gun which is all right everywhere else will often show scarcely any lateral deviation, but will string its shots up and down in a most exasperating way. I have often seen guns that, at a distance of 100 yards, would, in a 10-shot string, cut a slot several inches in length, extending up and down, caused by the first ½ inch of rifling at breech being a little dull, causing uneven friction in the passage of bullets through the barrel."

Many rifle barrels are practically worn out by the lead when they leave the shop, and will only shoot well as long as the sharp scoring of the emery lasts; and as soon as they become smooth or glazed they will vary greatly in elevation, caused by the riding of the bullets on the driving corner of the lands: this is easily remedied by a competent workman.

The process of leading is sometimes omitted, and the barrels polished by moving the cutter back and forth, or the leading process performed before rifling. The U. S. Springfield rifle was for a long time noted for its rough finish inside the barrels; and many of these rifles were leaded out by experts, and the shooting vastly improved. As Mr. Perry has stated, a rifle can be ruined by one unaccustomed to the work, and it should not be attempted except by an experienced person.

The process of chambering, which is necessary in all breech-loading rifles, generally follows leading.

This is an important process and in many instances improperly done. There is no excuse for poor chambering, for it is a simple, mechanical operation, and should be properly performed by any first-class mechanic. Chambering tools for each style of cartridge are necessary ; these are attached to a lathe, the barrel set in the lathe, and the chamber made. The most approved mode of chambering is to use a set of from two to four reamers, according to size, to make one chamber, the last one of which is used by hand to insure a smooth chamber of unvarying size, and the others in a machine. Improperly chambered rifles are the cause of much annoyance to riflemen. There is no doubt but that the shooting qualities of a rifle may be impaired by bad chambering. Perhaps the greatest mistake which can occur is in not chambering true in the centre of the bore, a fault which is often found in .22-calibre rifles. A chambering-tool may be permitted by a poor mechanic to slightly turn from its proper course, and upon discovery set right, but the chamber would probably be seriously injured. A faulty chamber may cause shells to burst, permitting gas to escape, endangering the eyes of the shooter, fouling the mechanism, and affecting the accuracy of the bullet. If the chamber is not true, the bullet, if seated in the shell, does not start right, and its accuracy is impaired. Poor chambering also causes shells to swell ; and if riflemen are able to use them again without swagging, they must be marked so as to be inserted in the chamber exactly the same as previously. It would be a great boon to riflemen, if American manufacturers would arrange for one concern to manufacture chambering-tools on a standard gauge for all. At the present time it is not uncommon for riflemen owning two rifles of different manufacture, but shooting the same shell or cartridge, to find that shells that have been once used could not be inserted in the chamber of the other rifle. I write feelingly of this ; for having once reloaded a lot of shells and travelled many miles to hunting grounds, I discovered that the reloaded ammunition could not be forced into the chamber of my rifle. This is no uncommon occurrence; and, having observed it a number of times, I use new shells when I go hunting. But carelessness in chambering has been the cause of many poor shooting rifles, and caused a great deal of annoyance to riflemen.

Besides a perfect chamber, the entrance to the rifling must be right; and Mr. Walker says of this: "In regard to chambering, I will only say that no matter how accurately it may be done, if the ball-seat or entrance to the rifling is not of the right shape or proper degree of sharpness, only ordinary work can be done with the gun.

CHAPTER III.

FORGINGS. — ADDITIONAL WORK ON BARRELS. — STOCKING.

ALTHOUGH the barrel would properly be included under the head of forgings, the term is usually applied to the small parts which make up the mechanism or action of a rifle, such as the receiver, trigger, breech block, hammer, extractor, springs, etc., the number of parts varying according to the rifle. American rifles differ much in mechanism, and a description of them will not be given at present.

I have already stated that no firm or company manufacturing rifles in the United States produces the steel used in the barrels. Only the larger concerns make barrels. The larger companies not only manufacture their own barrels, but often bore rifle barrels for smaller concerns. The smaller firms fit these barrels into their own actions. Often such companies as the Winchester, the Remington, or the Stevens supply barrels bored and reamed, and the small gunmakers rifle and finish the rifles by hand. Besides, there is a constant demand for new barrels bored and rifled, which are fitted into actions invented by ingenious mechanics for their own use or experimental work. The capital required for a plant which could produce all parts of a rifle is large, and in a number of instances it is far cheaper to purchase barrels than to manufacture them. This is also the case with forgings. The machinery necessary to manufacture drop-forgings would necessitate a very large and expensive plant, and such machinery would produce far more forgings than most of the companies would consume; therefore this expensive part of a plant would be unemployed much of the time, which would mean a large amount of capital idle. For these reasons it is customary in all the rifle factories to purchase certain parts, and in some places this plan is employed to a great extent.

The Billings & Spencer Co. of Hartford, Conn., have made the forgings for many years for rifles of different make, such as Ballard, Marlin, Bullard, Prussian Needle-gun, and others. With the object of learning how extensively drop-forgings were made, a letter was addressed to the above company, asking for such information, and the following communication was received: —

HARTFORD, CONN., Nov. 25.

DEAR SIR, — Yours of the 22d at hand, and we herewith submit the information requested. For the Bullard Repeating Arms Co. of Springfield Mass., we make drop-forgings for rifle parts as follows: Receivers, levers, lock-frames, carrier levers, main springs, trigger springs, extractors, guard lever latch, guard lever links, brace, breech block, gear link, brace link, racks, bolts, hammers, triggers, sliding-covers, side plates, loading-slides, stirrups, tips, front-tube studs, tube tenants.

For the Marlin Fire Arms Co. of New Haven, Conn.: Barrel catches, wind gauges, Ballard lock-plates, Ballard hammers, Ballard levers, Ballard links, Ballard front-sight slides, Ballard Creedmoor-sight slides, Ballard back-sight slides, buck-horn sights, Ballard receivers, knife-blade sights, Ballard extractors, frames, side plates, hammers, triggers, stirrups, stop bolts, pawls, breech bolts, main springs, small-sight levers.

THE BILLINGS & SPENCER CO.,
H. E. BILLINGS.

By this arrangement the smaller concerns are enabled to produce rifles in a less expensive plant, and at a price which would be impossible if they produced all the parts.

The drop-forging process is one known to mechanics, and, having no special interest to riflemen, I will not describe it, but state that owing to the development of this and other industries which produce these parts, and the perfection of machinery making interchangeable parts, an American rifle can be manufactured and sold to-day for less than fifteen dollars, which in every way is equal in shooting powers to those of foreign make costing over one hundred dollars.

After boring and rifling the barrels they usually pass to the hands of the mechanic who cuts the slots for front and rear sights, before browning or bluing. I believe many riflemen will approve my criticising the stubbornness with which some of the smaller American manufacturers persist in cutting the slots for sights different from the larger concerns. They not only vary in width, but in depth. There should be a standard width and depth to these slots. The Maynard, Stevens, Remington, Sharps and Whitney-Remington rifles were cut with about the same width of slot. The Winchester, Ballard, Marlin, Bullard, Wesson, and later models of Colt's rifles, were cut with another width of slot; and, to still further complicate matters, some of the makers of rifles have in their own rifles slots of varying sizes. The same variations exist in the screw-holes for rear Vernier sights, which are attached to the tangs. Riflemen and hunters have for years been annoyed by this want of uniformity. The gun-dealers are obliged to keep a larger assortment of sights than is necessary; and both distributers and sportsmen would be glad if all American rifles manufactured in the future were cut with slots of uniform width, and the screw-holes of same size and distance apart.

The Bullard Arms Co. endeavored to accommodate those using its rifles by boring a series of screw-holes in the tangs of its rifles that they might take any of the several varieties of rear tang sights. Mr. James W. Carver claims the invention of an elongated slot in the base of a tang sight that it might be fitted on various rifles.

Following are some of the measurements on American rifles measured by a Brown & Sharpe's steel caliper Rule :—

WIDTH OF REAR BARREL SLOTS.[1]

	Inches.
Colt, .22	21-64
Stevens	21-64
Wesson	21-64
Winchester	24-64
Colt, .32-38-44	22-64
Remington	21-64
Sharps	30-64
Hopkins & Allen, old	22-64
Hopkins & Allen, new	24-64
Remington, No. 4	24-64
Maynard	18-64
Winchester, model '90	24-64
Ballard & Marlin	24-64
Bullard	24-64

WIDTH OF FRONT SLOTS.[1]

	Inches.
Remington, old	30-64
Remington, No. 2, new	25-64
Marlin	24-64
Winchester	24-64
Colt, .32-38-44	23-64
Colt, .22	20-64
Stevens, .25-cal. regular	29-64
Colt, old model	20-64
Bullard	24-64
Maynard	30-64
Remington, No. 4	24-64
Sharps	27-64
Hopkins & Allen, old	22-64
Hopkins & Allen, new	24-64
Stevens, special	24.64

Although nearly all the factory-made rifles are made with slots cut for front and rear barrel sights, it is a question whether this is the best way to attach sights to rifles: many think not, and believe the inexpensiveness of the mode of attaching sights is the chief cause of its being

[1] Width of slots vary in rifles of same manufacture.

so generally adopted. One or two small screws, or one screw, in base of sight, would permit attaching and detaching or interchanging target and hunting sights much more expeditiously than by knocking sights from slots. I have previously alluded to rifles being injured by this operation, and am satisfied that many rifles have been ruined from this cause.

The case-hardening process, as well as the bluing and browning of barrels, generally follows.

Most of the stocks for military rifles, and plain stocks for rifles made in large quantities, are turned out by lathes. The blocks of wood are roughly sawed into the shape of stocks ; in fact, they are generally purchased in that shape by the rifle manufacturer. The blocks are attached to a lathe, and the cutter is regulated by a model or pattern of steel, having the form of a stock. When the stock has a cheek-piece, and generally when of finer quality of wood than on ordinary rifles, the principal part of the work is done by hand. The stocks on American rifles are perhaps acceptable to the majority of riflemen, but many alterations are made by individuals. Doubtless a length and bend is adopted which suits many, but each year sees an increased number of factory rifles restocked. A stock can be turned out by machinery in a few minutes : one machine known to the writer will do its work in about seven minutes. If made by hand, one or two days are often consumed. This will show how any deviation from the usual shape will at once increase rapidly the cost of the rifle. The cutting-away of the stock for the purpose of fitting the metal parts is known as "letting in," and the process is performed rapidly by machinery, or by hand ; when by hand, the same increase in time and cost of production results.

The sights are next attached, and, as a rule, the rifles are shot. In some factories it is evident that the sights are not tested, for it is not uncommon to find them attached to rifles which cannot be lowered enough to shoot accurately by aim at 25 or 50 yards ; and again, one may receive a rifle with sights which cannot be raised sufficiently to shoot with accuracy at an object beyond the above distance. Many riflemen have experienced this ; and cases are not rare where sportsmen have not discovered their confidence in manufacturers was misplaced until they had missed game, and later discovered that their rifles were incorrectly sighted. At the model factory of the Winchester's men are employed who devote all, or nearly all, their time to testing rifles, lining up and adjusting the sights. Rifles of .22-calibre are usually sighted from 10 to 50 yards, express rifles at 100 yards ; and target and hunting rifles from .32 to .45 calibre, not including the express rifles, are shot at 200 yards.

The mode of testing rifles for accuracy and aligning sights at the Winchester Company's factory is about as follows : A long gun-rack, holding perhaps fifty rifles, is filled with new rifles to which sights have been fitted. This rack is rolled to a place near by the tester, who is seated by a gun-rest. A boy loads the rifles, if they are repeaters, with several cartridges. The tester has by him files, a mallet, and such tools as he may require to adjust the sights. A marker is stationed at the 200-yards pit, where there is an eight-inch round bullseye on a paper target. There is no centre, inner, or outer to the target ; all that is required is a bullseye. The tester, sitting by the rest with ears plugged with cotton, commences his work by taking a rifle ; operating the lever so as to charge the rifle, he fires a shot ; resting the rifle, the marker indicates the location of the shot by placing the disk on it ; it may be to the left of the bullseye. Another shot is fired from the same rifle ; if it is in the same locality, the tester quickly takes the mallet, his trained eye tells him whether the front or rear sight needs moving, and he speedily taps one or the other, sometimes both. Down goes the rifle in the rest, another shot fired, which may be in the bullseye, another strikes in the black, still another finds its way there, and if three or four shots strike in the bullseye, the rifle is passed and another one taken. Often the front open sight is too thick or improperly shaped; a quick application of the file to either front or back sight generally remedies any defect. It is not unusual for a man to fire 300 shots in a day, and when heavily loaded cartridges are used, the effect of such work tells disastrously on the nerves. All rifles made by the Winchester Repeating Arms Co. are shot for testing the arrangement of the sights, and the open-sighted rifles which come from this factory are better sighted than any others I have used.

CHAPTER IV.

RIFLE SIGHTS. — FRONT OPEN SIGHTS.

Rifles are fitted with sights to aid one in pointing the arm in such a manner as to hit with a bullet a desired object. There being but one projectile fired from a rifle, it is essential that the aim be accurate, and to aid in this a guide or sight is affixed at the muzzle and another at some point on rear of barrel or tang; thus, if there is no allowance to be made for wind or drift, the front and rear guides or sights being in the centre of the barrel, the two are aligned, and the rifleman is aided in pointing or aiming the rifle on a point he desires the bullet to strike. A very slight error in pointing or sighting a rifle, unless the object sighted on be quite near or very large, is likely to cause the bullet to strike wide of the mark.

There is an endless variety of sights, from the simplest forms to the most complicated — sights so coarse and crude that tremors caused by unsteady holding can scarcely be perceived; while others are so fine and delicate that the pulsation of a person in normal condition will cause the sights to dance about in a most confusing manner. Even if shooting from an apparently solid rest, at times one may experience great trouble in holding a rifle still if sights are very fine or magnifying.

The simplest forms of rifle sights are known as plain open sights. They consist of a thin, upright piece of metal or other substance affixed to the centre of the barrel directly over the centre of the bore, near the muzzle, with an edge, generally not over ⅛ inch in thickness, toward the breech, and a rear sight, generally set in the barrel at a point toward the breech, which in its simplest form would be a thin, solid piece of metal affixed crosswise, generally by a slot in the barrel. The centre of the rear sight should also be directly over the centre of the bore of the rifle, and that point indicated by a V-shaped notch, a semicircular notch, an aperture or a line, in order that the rifleman, when aiming, may bring the centre of the bore at rear end of barrel in line with centre of bore at muzzle, and finally in a line with the object desired to hit with the bullet.

Undoubtedly, sights have much to do with the shooting qualities of a rifle, and I believe a majority of riflemen think improvements can be made over rifle sights now in use. Probably such is the case, but individually I believe that an immense amount of mechanical ingenuity has been wasted in trying to overcome difficulties which are physical, vary in individuals, and change in the same individuals. I have briefly mentioned the simplest forms of rifle sights, and do not hesitate to state that, with the front and rear sights placed the proper distance apart to suit individuals, with perhaps shaping these plain sights as desired, fine shooting can be done with a rifle fitted with the plainest sights.

Front sights may be made of any suitable material sufficiently strong. Iron, steel, brass, and German silver are the usual materials employed. Those of iron or steel are usually black, and brass and German silver their natural color, the bases of the latter two being of iron. I should consider the essential points in a plain front open sight to be about as follows: 1, strength; 2, stability; 3, shape; 4, color. I have seen fine shooting done with an open front sight improvised from a piece of wire twisted around the barrel and a point used for a sight; but it was neither strong nor fixed, and useless for reliable or rough work.

The usual way of affixing a plain front open sight to a rifle is by a slot cut in the barrel near the muzzle, into which is set a base, which has a piece of metal set parallel with the barrel with a narrow edge toward the breech. Such sights, if properly made and set in a slot, are stable. If the front sight is strong and secure, the shape may next be considered. The first two points would provoke no controversy among riflemen, but the latter two will probably always cause an endless amount of discussion. It is generally known, however, if a front sight is of the same height, front and rear, or a thin square piece of metal set in the base, it could not be seen with the desired clearness, and to remedy this the sights are cut away at the end toward the muzzle. The sharp corners of sights are often rounded off to prevent cutting or tearing anything it is brought in contact with, but this process often diminishes the distinctness of the sight.

Some of the most common forms of open front sights are illustrated:—

Fig. 4 shows a plain front open sight of German silver.

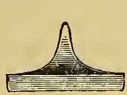


Fig. 4.—Winchester Open Front Sight.

Figs. 5 and 6.—Rocky Mountain Front Sight.

Figs. 5 and 6 represent a Rocky Mountain front sight. It is composed of steel, and is blue-black with a platina line.

Fig. 7 is known as a Knife-Blade front sight, and is composed of German silver, or, if preferred, of ivory.

Fig. 8 shows another form of open front sights.

Besides the forms illustrated are others corresponding to individual ideas of riflemen, which are composed of gold, silver, copper, and other materials.

There is a front open sight which is favored by certain riflemen, which is generally called an open bead. It is made to resemble the pin-head target sight; but, as it is used largely on hunting rifles, it is of necessity much

Fig. 7.
Knife-Blade Front Sight.

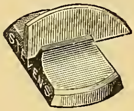


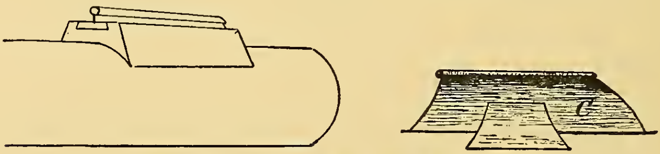
Fig. 8.
Stevens Front Sight.

Fig. 9. — Winchester
Express Front Sight.

stronger and is made somewhat similar in shape to the knife-blade front sight, but by cutting a line on each side, when on the rifle and sighted on, it has the appearance of a pin-head sight. It is generally used on express rifles, where a quick and not necessarily fine sight is taken.

The Winchester Co. manufacture a sight somewhat like the one described, which is known as a front express sight and is shown in Fig. 9. The tip toward the shooter is of a light metal, while the balance of the sight is black.

Front open sights are generally used for hunting and on military rifles, as it is believed that such a sight is sufficiently fine for game shooting or in warfare. It is desirable to have a front sight which is strong, simple, can be quickly and clearly seen for such purposes, and a front



Figs. 10 and 11. — Open Pin-Head Sights.

open sight would undoubtedly be chosen for such work. But it has been found that, under certain conditions, the black or blue steel sight, or the brass, German silver, or platina sights are not clearly seen, and to remedy this, tips of platina or gold and other devices have been added in order that the sight may be distinctly seen in an uncertain light or when the sun is shining. After years of experimenting, I think it can be safely stated that no substance has been found equal to ivory. The tipping of front open sights with ivory, bone, or horn, to avoid glitter or to illuminate it in uncertain light, is no modern invention; but great improvements have been made within a few years, and almost perfect ivory-tipped sights are now supplied at very low prices.

The uncertain definement and glittering of the front sight has always been annoying to those who hunt with a rifle, and many individuals have improvised open front sights with suitable tips to overcome this difficulty. The first person I heard of manufacturing ivory-tipped sights in quantity in America was Mr. Walter Cooper of Bozeman, Montana, a practical rifle manufacturer and sportsman, who devised a front and rear sight of considerable merit. In a letter which I received from Mr. Cooper, he so graphically recites the difficulties encountered with the old metallic sights, and which prompted the invention of the Cooper sights, I extract from his communication. On this subject he writes under a recent date:—

"Your letter to Mr. Benham, requesting electrotypes of my rifle sights, was handed me by that gentleman, and I take pleasure in sending you the cuts wanted; and as the subject of rifle sights is a very important one to sportsmen, particularly to those who have had experience on the plains, I have taken the liberty to add, by way of explanation, that the sights illustrated by the enclosed cuts were produced after many years' practical experience on the plains, and, in my opinion, reach as near perfection for open sights as any that will be produced in the near future. It may be well to add here that I am not, and have not been, engaged in the manufacture of sights, am not in any way connected with the gun business, receive no profits therefrom, and have no interest in the advertisement of these sights, some of which cannot now be made owing to the fact the machinery for their production has been destroyed.

"I have from earliest boyhood taken a lively interest in hunting and shooting matters, and have observed from my first experience on the plains, that rifle sights were more complained of than any other article or implement used by the hunter or sportsman — by the hunter most because the rifle, being his means of support, becomes his constant companion and dearest treasure. He uses it constantly, and in all sorts of weather and every stage of atmosphere. In the early morning, when the faculties are most acute and the rays of the sun are least dazzling, his aim is unerring: he thinks his rifle a perfect weapon, has no difficulty with his sights, his every want is supplied, he is happy. We next find him on the plains in search of food in mid-day. The earth is hot, the grass crisp and dry, the sun glaring with all its brilliancy. He has toiled for hours to approach a band of antelope; he is in the act of selecting from the herd a good specimen; he takes aim. Ah! he takes down his gun, examines the sight, rubs the front sight with his greasy coat-sleeve, wipes the rear sight carefully, aims again. Does not shoot; again examines his sights, wipes the gun barrel, aims again; mutters to himself, 'That front sight is four feet high, no notch in the rear.' He now prepares to shade the front sight with his hat; no go; game becomes restive, he must shoot; shoots, misses; shoulders his gun, goes to camp empty handed, cursing the gun, its sights; and you will find him tinkering at those sights the first opportunity that presents itself.

"Having cast my lot on the plains west of the Missouri River in 1858, I was for eighteen years almost constantly in camp; knew personally all the noted hunters, scouts, and mountain men from Mexico to Great Salt Lake. Kit Carson, Maxwell, Marianna, and Bridger, were among my early acquaintances, and often companions, on plains and mountains. I soon found by practical experience that the double-barrelled muzzle-loading rifle I considered a perfect weapon in the back woods of Michigan, with sights regulated for 80 to 100 yards, a bright silver bead in front, and a fine clean notch in the rear sight, arranged expressly for the keen eye of a young hunter of sixteen, must, to be useful, undergo important changes. I first took it from its case for use in the Platte River Valley near Fort Kearney. The whole plain was covered with antelope. To my surprise I missed my game; this, of course, was partly due to my underestimating the distance, and partly to the fact that during mid-day I found the greatest difficulty drawing an accurate bead on the side of the antelope, with its mixture of white and reddish color. This was the case, more or less, with all sorts of game; but the greatest trouble was always experienced in hunting antelope, in early morning and late in the evenings. In cloudy weather no difficulty was experienced. In the spring of 1860 I was at Bent's Fort, where a large number of trappers and hunters had congregated, having come from all directions to dispose of their furs and skins, spend their hard-earned money, get a new supply of tobacco, powder, and other necessaries, and have a general good time before going to the mountains for another hunting and trapping excursion.

"The Hawkins and Demmick rifles, made at St. Louis, were used almost exclusively by frontier and mountain men; these guns generally being half stock rib, single barrel, muzzle loaders, half-ounce ball, sighted usually for 200 yards point-blank, no raised sights were used. My sojourn of six weeks at this place, in the companionship of these hardy Western men, many of whom had spent their lives on the plains, convinced me that none had yet discovered a perfect rifle sight. All complained and agreed that during certain conditions of the atmosphere the rifle was almost a useless weapon. I was constantly experimenting with my sights. As early as 1863 I made many styles of bone sights, but they were always frail, easily broken, and not reliable. I finally, in the year of 1869, established a sporting-goods house at Bozeman, Montana, and shortly after produced my improved front sight (Fig. 12), the blade of which was made of solid steel,

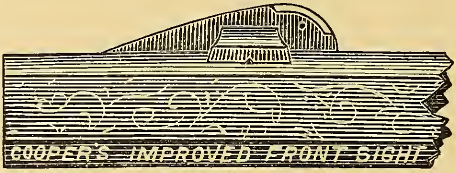


Fig 12 — Cooper's Improved Front Sight.

the top being milled out with a milling tool ½-inch in diameter; in this groove was fitted very carefully a thin piece of good ivory, secured by a pin; the sight was finished and polished, the ivory removed, the steel case nicely blued, and the ivory placed in position; the blade was then firmly fastened in the slide or chair, and was ready to be placed in the gun; it was intended to have this ivory reach down the blade to within 1-16 of an inch of the barrel to enable the shooter to draw close to the barrel for long shots when without raised sights in the rear. The sight was so constructed that when the gun was set up, or rested against any hard substance, the steel would always first touch and support the weight of the gun; by this means a very durable sight was made, — more durable than any soft metal. With this ivory tip no difficulty was experienced in any state of atmosphere."

Later, Mr. William Lyman commenced the manufacture of ivory-tipped sights, and has produced them in a variety of styles, well made and cheap enough to be within the reach of all desiring to use them. The illustrations (Figs. 13 and 14) show the different styles produced at Mr. Lyman's factory. It is likely that the ivory-tipped open sight would not be selected by a majority of riflemen for target shooting; but it is astonishing what good results can be obtained at this work when one becomes accustomed to them. But for hunting, in my opinion, they are

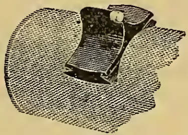


Fig. 13.
Lyman Front Sight on Rifle.

Fig. 14.
Lyman Ivory-tipped Front Sight with Square Corner.

superior to all others, and one who has once used them will rarely abandon them.

Illustrations 15 and 16 show styles of front open sights which are preferred by some, and certainly very fine shooting can be done with them.

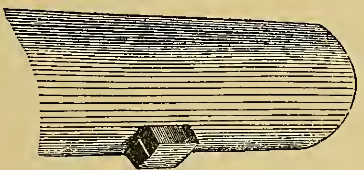


Fig. 15.—Front Open Sight.

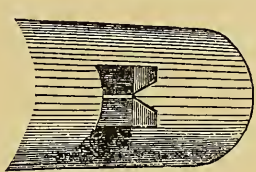


Fig. 16.—Front Open Sight.

It seems evident, however, from their limited use, that they are not preferred by a majority of riflemen.

Illustrations 17 and 18 show the open front military sights as formerly used. There is a tendency at the pres-

Fig 17.
Open Front Military Sight.

Fig. 18.
Open Front Military Sight.

ent time to make the later patterns of front military sights finer, which I consider a mistake. From close observation I have formed an opinion that many riflemen are handicapped by a fine open front sight; those with a certain degree of fineness are so sharp as to make them liable to cut the rifleman. When front sights are very fine they are not likely to be sufficiently strong; they are liable to bend and cannot be seen so readily when taking quick shots, and rapid firing is often necessary, and practised by those using open-sighted rifles.

I think there is a popular impression that the finer the front sight the better shooting can be done. It has been repeatedly shown that this is not so. As you decrease the thickness of the front sight you increase the tremor or motion and multiply the blur. Some of the finest shooting known to the writer, with open front sight, was with one one-eighth of an inch thick. Mr. George C. Thaxter of Carson City, Nevada, is an advocate of a wide front sight, and has done some wonderfully fine shooting at the target with a sight an eighth of an inch in thickness.

The effectiveness of a front open sight depends much upon its shape; by this I mean that with a certain shape there is want of clear definement or a blur exists. Often with such an unsatisfactory sight, a few touches with a file will transform the sight into a very satisfactory one. For me, there is no front sight for hunting equal to an open one with a square corner. I have tried to persuade myself that a bead on the front sight was the proper thing, but in time I find a file and square the edges of the sights, which always results in an improvement in my shooting.

I always have the front open sight lower at the muzzle-end and the sides chamfered off, commencing gradually at the end toward the breech and increasing toward the muzzle-end.

CHAPTER V.

RIFLE SIGHTS. — REAR OPEN SIGHTS AND REAR PEEP SIGHTS.

In connection with the front open sight are various forms of rear open sights, the plain V or the circular notch perhaps being the most common and the simplest form, as shown in Fig. 19, and which is affixed to the barrel in a slot. With such a sight there is no arrangement for elevation, and one must secure it by drawing a medium or coarse sight, i. e., seeing through the notch little or more of the tip of the front open sight. This mode of sighting is considered undesirable by many, unless obliged to take a quick sight, and the elevation is secured by raising the rear sight. A common sight for this purpose is

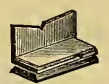


Fig 19. — Plain Rear Open Sight.

Fig 20. — Winchester Rear Step Sight.

shown in Fig. 20, and is known as a rear step sight. Another rear open sight is known as the leaf sight, or folding sight, and is shown folded and raised in Figs. 21 and 22. Besides these sights, are the express sights, which have several leaves which fold down close to the barrel. Fig. 24 is the Winchester express sight, used with the one shown in Fig. 8; and that shown in Fig. 25, is used in connection with Figs. 6 and 7. The above sights, with the exception of the express sights, are manufactured in America, by quantity, and are supplied with American rifles at a low price. The folding express sights are more expensive

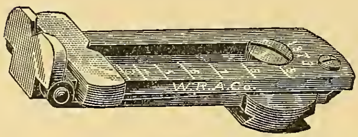


Fig. 21. — Winchester Leaf Sight Folded.

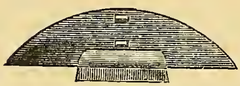


Fig. 23. — Cooper Open Front Sight with gauge.

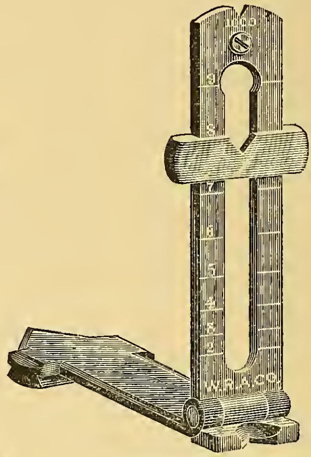


Fig. 22. — Winchester Leaf Sight Raised.

sights, because they are usually imported or made by hand to order. Figs. 26, 27, and 28, show the rear Cooper sight, front and rear view, with sight raised in Figs. 26 and 28, and down on 27. This is used with the front ivory-tipped Cooper sight, Fig. 12. Mr. Cooper says of these sights:

Fig. 24. — Winchester Express Rear Sight.

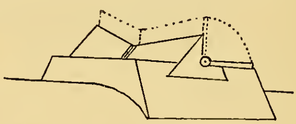


Fig. 25. — Rear Express Sight.

"The three cuts marked Figs. 26, 27, and 28 show my improved rear sight in three positions; Fig. 27, down, shows it as the ordinary buckhorn sight, made carefully with milling-tools, the purpose being to produce a raised sight, effective for distances up to 500 yards, that could be adjusted to a nicety by thumb and forefinger, with the gun in firing position, and at the same time the operator could shoot through the same notch. These sights were made with a white platinum line next the eye, either with or without a notch, and by using with the ivory tip front sight, Fig. 12, the rifleman could draw a *perfect* bead on the *sun*, without the least glimmer, if the eye had the strength to withstand its glare. This was a test that never failed to decide the purchaser in favor of these sights. In place of ivory in front sight, Fig. 12, I often used gold, platinum, and phosphor bronze, the latter being the best-known metal for front sights. The set of rifle sights above described enjoyed a wide-spread popularity among buffalo hunters, who used very heavy guns, nine-tenths of the game being killed with open sights at from 200 to 500 yards' range, using from 90 to 100 and 120 grains of powder. Experience will teach any sportsman, that if he hopes for success, he cannot count upon fancy rifle sights: he must select sights that will serve him best under all circumstances and conditions of weather, as well as those least liable to become disarranged. If he hunts in the Michigan backwoods, he will meet game at short range; if on the plains or in the Rocky Mountains, he must be prepared for either long or short ranges."

Mr. Cooper also made a front open sight which was so constructed as to permit gauging the amount of front sight taken. An illustration of this sight is shown in Fig. 23.

There is a plain open rear sight, favored by some, which consists of a plain bar, either fixed like Fig. 19, or like the Winchester leaf sight, Figs. 21 and 22; but in place of the V is a plain bar with a white line down its centre. The front sight is brought in line with the line on rear sight, and when one becomes accustomed to it, it is claimed as good shooting can be done with it as with any open sight. One reason the advocates of this sight favor it, is on account of freedom from blurring, so annoying to many who use the plain open sights. The sights thus described are the simplest in use. The front sight is generally fixed fast in a slot in the barrel. All the rear sights but the first give

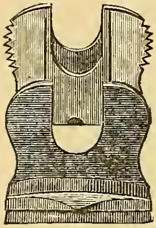


Fig. 26.
Cooper Sight Raised.

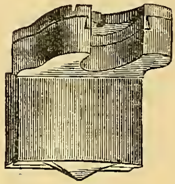


Fig. 27.
Cooper Sight Down.

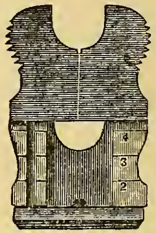


Fig. 28.
Cooper Sight Raised.

elevation by arrangements for raising or lowering the cross-bar or flaps.

Mr. William Lyman of Middlefield, Conn., manufactures such sights, and they are shown in Figs. 29 and 30.

There is a drift to a bullet fired from a rifle, increased by distance and the wind, therefore one must often either aim to right or left of the object desired to hit. To avoid this, a wind-gauge is often used, a simple form being a sliding bar, largely in use on military rifles, and to some extent on hunting rifles, especially if the arm is shot much at the target. Fig. 31 shows an excellent one made by the Winchester Company. There are also quite similar

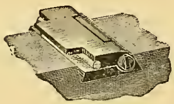


Fig. 29.

Fig. 30.

The Lyman Bar Leaf Sight.

arrangements for the buckhorn sight, the Sharps rear open military sight, and others. Front open sights are sometimes operated by a screw, but this mode does not find favor with many riflemen. The sliding bar on the rear sight has its objections. Many hunters would not use such a device, for it is liable to be knocked out of place, and the rifle fired with several points of windage the wrong way, which might result, if shot at one or two hundred yards, in the bullet striking wide of the object shot at. The same result would be likely to occur if a sliding-bar rear sight were used on a military rifle. Most intelligent

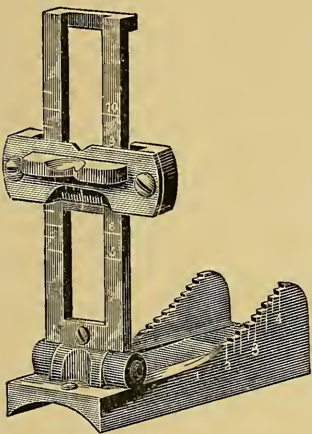


Fig. 31.
Winchester Wind-Gauge Open Sight.

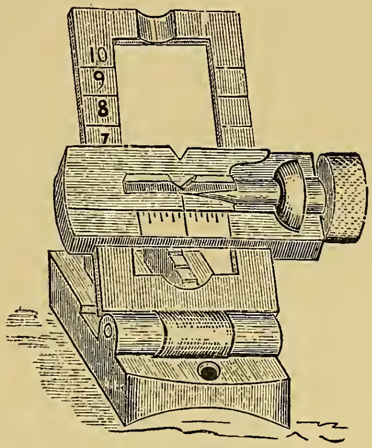


Fig. 32.
Barnes Rear Open Sight.

American riflemen have long since expressed their disapproval of a rear wind-gauge with a sliding bar on hunting or military rifles. A very effective device has been applied by the writer to a Winchester open wind-gauge sight, which prevented accidental slipping of the bar and yet permitted its use for windage. Holes were bored in each end of the sliding bar, and a small screw fitted to each; when the windage required was obtained, the bar was set fast by the screws. If a change was desired in the windage, one screw was loosened and the other screwed in. When hunting, the sight was set fast.

The screw movement has been applied in various devices to open rear sights with wind-gauges. One excellent device was worked out by Mr. F. M. Barnes, of Michigan, who applied it to the Sharps military rifle, and it probably would have become popular had not the manufacture of that arm been discontinued about the time it was perfected. This sight is illustrated in Fig. 32.

The foregoing represents the most common forms of open front and rear sights. There are many combination and odd sights which might properly be classed with open sights, but I will allude to them later.

As before stated, front open sights are used and preferred by a majority of riflemen on hunting and military rifles. The accuracy of a rifle depends largely upon correct sighting, and to accomplish this the sights must be clearly and distinctly seen. The rear open sight fails to satisfy many, as blurring and an uncertain vision are experienced. But others who use the rifle express a preference for open sights, and a lengthy and prolonged discussion on the merits of open rear sights and the rear peep sight has been carried on in the columns of *Shooting and Fishing*, and other sportsmen's papers. The advocates of the rear open sight claim that there will be no blurring, if the rear sight is affixed at the proper position on rifle barrel, and is the right shape. This is doubtless true to a great extent: but as most American rifles are machine-made, a point is selected which is likely to suit a majority of riflemen, the slot cut and open sight attached; as a result, some persons find it difficult, if not impossible, to do satisfactory shooting with a rear open sight.

It is generally known that one of the causes of the trouble experienced in seeing distinctly with plain open front and rear sights, is on account of the position of the rear sight on the barrel, and a few attempts have been made to remedy this by an arrangement for adjusting the rear sight to a desired point. These arrangements were only applied to a few rifles made to order, and not to factory-made rifles.

The expense of such arrangements did not permit of their being applied to machine-made rifles, and consequently they have never become well known.

Rifles used for game shooting are generally fitted with an open front sight. I have formed an opinion, based on my experience, that the front sight is least important of all. A plain open sight of almost any material, if sufficiently strong and firmly attached in the proper place, will answer for target or game shooting. I believe a more correct sight can be taken with a front open sight, shaped so as to bring the apex nearest the eye instead of semicircular, and prefer a square edge like this, I, to any pinhead or other shaped sights. But this is a point individual preference must govern.

From the time rifles were first made, to the present, there have been complaints of imperfect sights. In fact, before the introduction of the rifle the same trouble was experienced by those who shot the cross-bow. The chief cause of the trouble is the variation in the human eye. It is presumed that the ancient bowmen learned to affix to their cross-bows a plain open front sight; many such can be seen in European museums. It was then discovered that a rear sight or guide was necessary to direct the aim, and relics of the past show these bows with rear open sights attached. Then it was discovered that one person required the rear sight in a different position from another; but even then it was found that if a person tried to sight over a rear sight on the front sight, and on an object desired to hit, there was an uncertainty of vision. Sooner or later it was discovered that the eye was a human self-adjusting lens, varying with individuals, which could be focused on but one object at once.

A very simple experiment will illustrate the focusing power of the eye. Look at an object one foot from the eye steadily for a half minute, then suddenly transfer the gaze to an object three feet away, and there will be an uncertain vision until the eyes are focused; when the vision is clear, look at letters a foot away from you, after which at an object a hundred yards away. All this will show that it is impossible to focus the eye on three objects at different distances at one time with satisfactory certainty of vision. The rear open sight is intended to guide the eye correctly to the front sight; but the optic focuses on it, unless trained not to, which I shall refer to later, and hence the blur so much complained of. The earliest attempts I know of to remedy this trouble was by the ancient cross-bowmen. There is in the Tower of London a cross-bow made early in the 17th century, with a combined elevating and rear wind-gauge sight with an aperture. I have seen several ancient English flint-locks with rear peep sights, all of which prove that past generations sought to overcome the difficulty we experience to-day, by dispensing with the rear open sight; for the reason that most persons shooting a rifle will attempt to focus the eye on the front and rear sights. It was found centuries ago that by employing an aperture, the vision was more certain because the shooter looked through the hole and avoided focusing the eye on it (Fig. 33). The peep sight can be used advantageously with a front open sight; and while some prefer front and rear open sights, and it is known that good shooting can be done when the shape and position of the open sights are suited to individuals, and the eye trained to the use of such sights, it is generally admitted that superior shooting can be done with rear peep and front open sights.

For many years American rifles fitted with rear peep sights had them attached either in the slot made for the open sight or on the tang of the rifle. Those attached at the tang were, as a rule, on rifles used solely for target shooting, and often those affixed in the slot on the barrel were combinations of open and peep sights. I believe the most potent argument in favor of rear open sights has always been, it enables the rifleman to take a quick sight. It is undoubtedly true that a quicker sight can be taken with a rear open sight than with a rear peep sight, if the latter is placed on the barrel where the rear open sight is generally affixed, but it seems equally true that a more accurate sight can be taken with the rear peep sight if sufficient time is permitted. The average person cannot use a peep sight which is beyond a certain distance from the

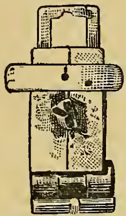


Fig. 33.—Sight on an ancient cross-bow in Tower of London, showing Peep Sight and Lateral Sliding-bar Wind Gauge.

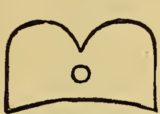


Fig. 34.—Rear Peep-Sight in ancient flint-lock Rifle.

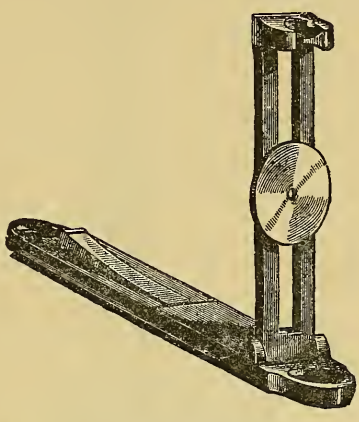


Fig. 35.—Combined Open and Peep Sight for attaching to barrel of rifle.

eye, or an open rear sight nearer than a certain point. In other words, most shooters must bring the peep sight near the eye to use it to best advantage, and the open sight must be placed a certain distance from the eye. There is no one point where the open and peep sights can be affixed and be seen and used to the best advantage. Quickness in sighting is essential in rifles used for hunting, hence the peep sights on barrels have never been popular on arms for this purpose, and open front and rear sights have been preferred the world over, until Mr. William Lyman invented his rear sight. The Lyman sight is undoubtedly one of the greatest inventions connected with rifle sights for hunting-rifles. In writing of this sight I am aware that there are advocates of open sights who, in their zeal have put forth magnified statements evincing a strong prejudice against the Lyman sight. I believe also that some writers, who have strongly indorsed the Lyman sights, have claimed for the sight more advantages than it possesses. Riflemen are inclined to draw hasty conclusions, basing claims on their own suc-

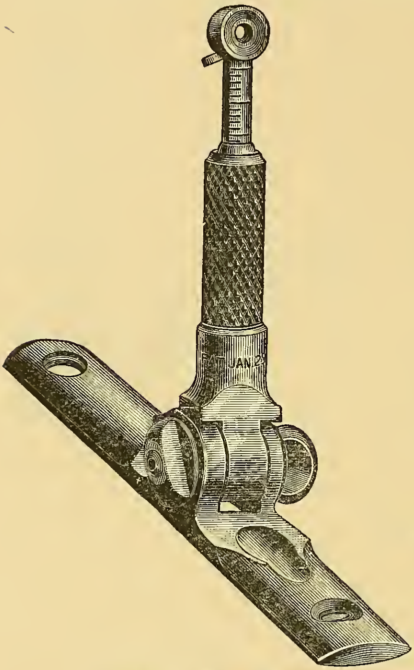


Fig. 36.—The Lyman Sight.

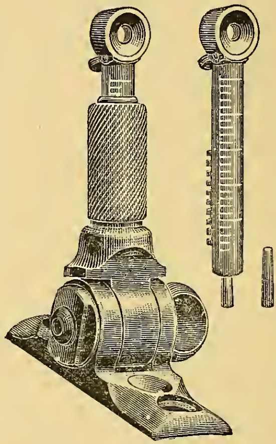


Fig. 37.—The Lyman Sight, showing construction.

cess with rifles and sights, ignoring others' experience and struggling frantically to prove their judgment superior. Scores of men form opinions of rifles or sights on one or two successful shots, hence much testimony recorded in sportsmen's papers indicate hasty utterances based on slight experience.

The Lyman sight accomplishes what any peep sight does: it prevents focusing the eye on the rear sight, leaving the front sight to be aligned on the object desired to hit; and as all objects beyond a certain distance are in focus, the uncertain vision is largely overcome. The peephole or aperture is larger than in ordinary peep sights with but little margin, is near the eye, and thus a more certain and far quicker sight can be taken than with an ordinary rear target peep or an open rear sight. Elevations can be controlled and secured quicker than by raising the open sight. However necessary a small aperture in the rear sight may be for some, it has been shown that fine shooting can be done with the largest aperture on the Lyman sight. A very small peep hole is thought to be necessary for fine target-shooting, and would undoubtedly be chosen by a majority of shooters for such work, but a small peep hole prevents quick sighting, and therefore is not popular on a hunting-rifle. Mr. Lyman provides for those desiring a small peep hole by giving two sizes of apertures, the smaller one fitting inside the larger one, attached by a hinge, which can be easily changed from one to the other.

Most sportsmen who hunt with a rifle have experienced the difficulty of drawing the front sight down into the notch of the rear open sight, when taking a quick aim, and when following with the sight a moving object. This difficulty Mr. Lyman has endeavored to show in the illustrations, Figs. 38 and 39. But with such a rear open sight as he shows in this illustration, the sportsman often loses sight of the game entirely, and is obliged to raise his eyes above the sight to find the game, and then endeavor to draw the front sight into the notch of the rear sight with the chances much in favor of again losing sight of the game.

By use of the Lyman rear sight, besides the absence of blurring, is the ability to see moving objects when taking a quick sight, or sighting ahead when aiming to hit a moving object.

The combined open and peep sights which are attached to the barrel are intended to be used as follows: the open sight for hunting or quick shooting, the peep sight for long

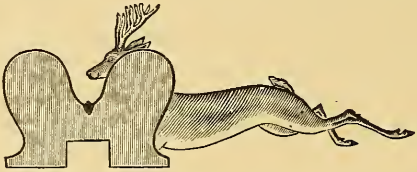


Fig. 38. — Illustration showing the dfficulty of sighting on a running deer with some rear open sights.

shots when hunting, and at stationary objects or target-shooting. Such sights, including the Buffington military sight attached to the late issues of the U.S. Springfield rifle, and which I shall allude to later, are, to me, unsatisfactory; and from the testimony of others, I cannot help believing that my impressions are shared by many riflemen. I never yet saw a combined open and peep rear

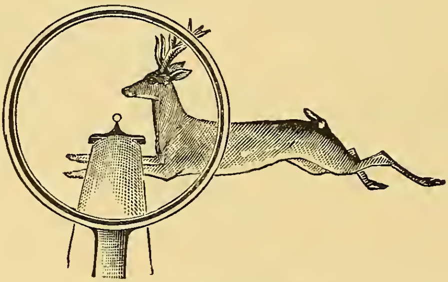


Fig. 39.—Illustration showing the advantage of the Lyman Rear Sight on moving game.

sight affixed to a barrel, or sighted through at the same position on the barrel, that gave complete satisfaction, or was as good as either a regular open or a peep sight attached at the proper places.

I think a majority of riflemen believe a rear peep sight is more reliable than an open rear sight, especially in a good light and with deliberate and careful aim. The arguments between the advocates of open rear sights and peep sights have, it is thought, not differed except on the questions of the danger of the Lyman rear sight striking the eye, and whether it was superior in a bad light. It is

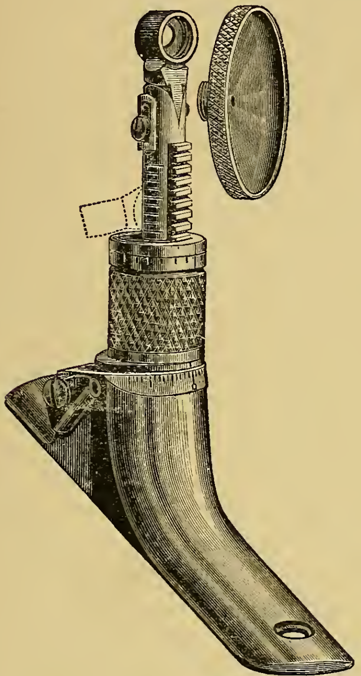


Fig. 40. — Lyman Wind-Gauge Sight.

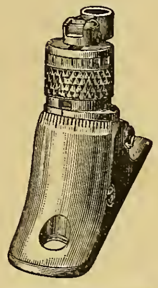


Fig. 41. — Lyman Wind-Gauge Sight for Express Rifles.

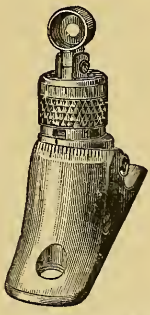


Fig. 42 — Lyman Wind-Gauge Sight for Express Rifles — Upright.

pretty generally admitted that a rear peep sight overcomes the blurring so likely to be found in a rear open sight, and if placed on the grip of a rifle, the increased distance between the front and rear sight is generally conceded to be an advantage. The Lyman rear sights are much in favor at home and abroad, and a volume of testimonials, expressing satisfaction with the sight, could be obtained. It has been repeatedly shown that very accurate shooting can be done with a Lyman rear and a front open sight, All that any reasonable rifleman could desire from hunting sights, so far as accuracy is concerned, has been accomplished with these sights; and cases are not rare where those who have given them a fair test at the target have equalled their work with Vernier, aperture, and pin-head target sights.

The controversy in *Shooting and Fishing* on the Lyman sights brought out, it is thought, about all the good and bad points of these popular sights, and a careful summarizing of the opinions of the numerous correspondents showed a large majority in favor of the sights. The points argued against these sights were: danger in striking the eye by the recoil, the clogging of the aperture with frost and snow, inability to see through the aperture in a bad light, danger from falling on the sight when in an upright position. The chief points of superiority claimed almost wholly by practical sportsmen were: increased quickness in sighting, absence of blurring, increased accuracy gained by clear sight and increased distance between front and rear sight, better control of elevations, quickness in elevating sight. It was shown that accidents had happened by the sight striking the eye, when used on a Winchester repeating rifle, model 1886, which necessitates setting the sight nearer the eye than in other models, as well as when on a heavily charged rifle giving considerable recoil. It was shown that frost did clog the aperture; but testimony was not wanting to show that both of these mishaps could be avoided with care, and the charge of inability to see in a poor light seemed to bring forth testimony showing that at such times the Lyman sights possessed advantages over the open sight.

CHAPTER VI.

COMBINATION RIFLE SIGHTS.

As rifles are used for so many purposes, and under so many different conditions, it is thought desirable by some to have them fitted with combination sights. Doubtless there are varying conditions which make a certain style of sight much more desirable than another, such as a black front sight for target shooting and a white one for game shooting. In my opinion many of the combination sights, though quite ingenious, are likely to prove delusive to the rifleman; and attempts to combine one or more

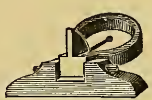


Fig. 43.—Beach Open Sight.

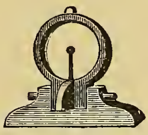


Fig. 44.—Beach Pin-head Sight.

styles of sights in one are often failures. Combination sights are much in favor, and probably always will be, and some of them possess merit. Perhaps the best-known front combination sight is the Beach sight. Fig. 43 shows it as open. It is generally used in connection with a rear open sight attached to barrel, though it may be used as shown, in connection with a Lyman rear or any peep sight. Fig. 44 shows the sight converted into a pin-head or globe sight. The Beach sight is designed to use as follows: As shown in Fig. 43 with the open rear sight, and as in Fig. 44 with a rear tang peep sight. I will illustrate how this sight has proved delusive. The open and pin-head sights, on all the sights of this style I have ever used, were of different heights. Riflemen seldom know this, and I have repeatedly observed sportsmen, while using either the open or peep, change the front sight from one style to the other, and be puzzled at the varying elevation, finally concluding they could shoot best with one or the other, and knowing nothing about the difference in height. There is a little knob on top of the loop which I never could see any good use for, and I long ago made up my mind that the average person could do much better shooting with a plain open front sight. Sometimes an aperture is used in place of the pin-head, giving a combination open and aperture. They seldom agree in height, and as there is a strong inclination on the part of those using a combination front sight to change, they frequently cause disappointment.

But certain combinations in sights seem desirable and popular among riflemen. I often shoot a hunting rifle at the target, and as I have ivory-tipped front sights on all my hunting rifles in preference to any others, I have concluded that, however excellent an ivory-tipped sight was for hunting, a black sight pleased me best for target shooting. I once made a sight, which proved to be an excellent one, which would come under the head of combination sights. It was constructed as follows : Taking a Beach combination sight, I removed the combined open and pin-head, as well as the loop, and substituted two open beads of the same height, one black, the other with an ivory tip. The black tip I use when target shooting, and the ivory tip when game shooting. It gives perfect satisfaction, and I think it is one of the best front sights for such a rifle I ever saw.

It is apparent that many riflemen have recognized the convenience of a combination sight showing either a black or white front tip, for within a short time several have been produced with more or less merit. I recently received one from Mr. James W. Carver, of Pawlet, Vt., which possesses merit. It is a reversible sight, one edge being fitted with an ivory and the other with a black bead; a loop or shade is attached, which can be used to shade the sight or turned down as preferred. This sight is different in principle from the Beach. The Carver sight is fitted in a base and reverses on a post; the Beach, having a spring underneath, tips over.

There are sights operating the same as the Beach combination which set low on the barrel, are without a loop, and can be quickly changed from an open to an aperture sight. There are several designs of open sights which

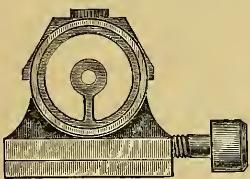


Fig. 45.

Fig. 46.

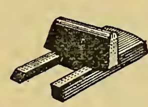


Fig. 47.

Fig. 48.

Combination Front Sights.

permit of target sights being attached by a screw. Figs. 45 and 46 shows one patented by William Maynard. Fig. 47 shows an open sight which is fitted into the base of a wind-gauge sight. This permits of a wind-gauge sight being used for target shooting, and an open sight easily applied to base, to be used in connection with a rear open or peep sight.

I have alluded to the difficulty of seeing satisfactorily with a combined open and peep sight affixed at one point on the barrel, for the reason an open sight should be placed farther away from the eye than a peep sight, to satisfy most riflemen. A very ingenious and effective combination rear open and peep sight has been devised by Major C. W. Hinman, who uses it on a Stevens' pocket-rifle, in connection with the sight in Fig. 48, which would also be classed as a combination front sight. Fig. 49 shows this sight used as a peep sight in connection with the pin-head in Fig. 48, and Fig. 50 shows it turned over forward, which brings the open sight the correct distance from the eye for the designer of the sight, and which is used in connection with the open top sight shown in Fig. 48.

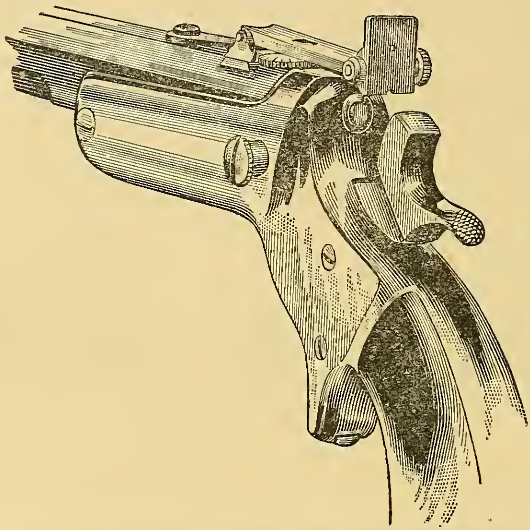


Fig. 49.—Major Hinman's Combination Rear Sight—as a Peep Sight.

Nearly all sights for special military rifles would be classed as combination sights, prominent among them being the Remington special military rifle sight, which, when folded lengthwise of the rifle, can be used as an open sight. But its merits are best shown when used as a peep sight, and it was chiefly used as such. Elevations and windage can be finely adjusted with this sight, as it has a Vernier and elevating screw, a screw wind-gauge and a spirit-level. In the opinion of the writer, it is a poor open sight, a good target sight; but gives much better satisfaction used solely at the target. It is a military sight only in name, and is best suited for target shooting.

Fig. 51 shows the Stevens' rear combination open and peep sight, which is affixed to the rear part of the barrel of rifles and generally used in connection with the sight shown in Fig. 48.

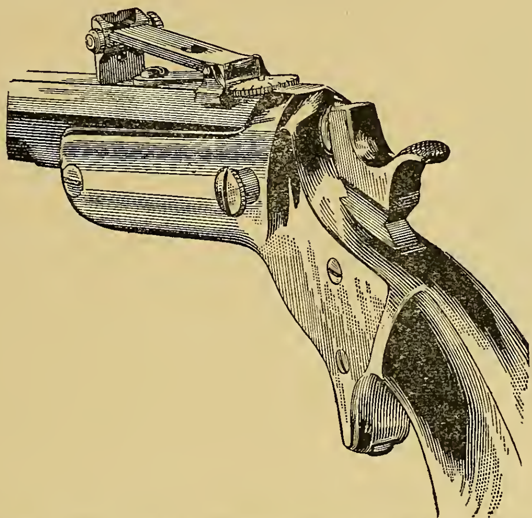


Fig. 50. — Major Hinman's Combination Rear Sight — as an Open Sight.

Perhaps no combination military rifle sight is better known in America than the Buffington sight. This sight has been adopted by the United States Government, and is attached to the national arm, the Springfield rifle. It enjoys considerable popularity, because fine target shooting can be done with it. It seems to be the outgrowth of that absurd and useless arm, the special military rifle introduced a few years ago, which was a disguised match rifle. The Buffington sight is a good target sight, but I think a bad one for a military rifle. The sight is so well known I will not attempt a description. Its merits and demerits are quite well known at the present time. A few things can be said in its favor. It certainly has demonstrated that a rear peep sight is greatly superior to an open rear sight for fine shooting, especially at ranges beyond 200 yards. The Buffington sights will not stand the ordinary uses military rifles are subjected to. The folding of the sight but one way is absurd in any military sight, as they are easily broken off. The sight quickly works loose, and it is no uncommon thing to see soldiers equipped with a hand-vice or plyers to move the screws operating the wind-gauge or elevating slide, for if these screws can be operated by hand they work loose, and if set tight enough to prevent such mishaps, the average man finds it difficult to operate the corrugated screw-heads without lacerating the fingers. As an army officer recently wrote, "It is a sight for peace and not for war, which meant it is fit for target shooting and not for battle."

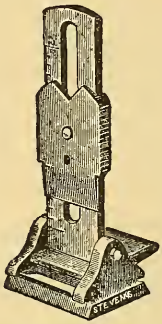


Fig. 51.—Stevens' Rear Combination Sight.

The rifle sights I have written of thus far are the plain open and combination front and rear sights, and such sights as are used chiefly on rifles for hunting or warfare. I think most sportsmen believe it desirable to have three sights on such rifles—a front sight, a mid sight on barrel, and a tang sight. Were one to use a rifle sòlely for hunting, a front ivory tip would satisfy most. If used at the target a portion of the time, a sight which could be changed from an ivory tip to a black would probably suit a majority. A rear open sight is preferred by many; but this sight should be arranged to fold down close to the barrel when not in use, if a third or tang sight is included. The tang sight should be chosen according to the ideas of the sportsman.

I think all military rifles should be equipped with a plain open front sight, a set of leaf sights on barrel, and rear peep sight attached to tang, the latter so sunk into the tang as not to be easily injured, and out of the way when rapid firing is resorted to. The rear peep sight would then be placed at the proper position on the rifle, and could be used for target shooting, or picket firing and folded down out of the way when drilling, marching, riding, or in rapid firing.

CHAPTER VII.

TARGET SIGHTS FOR RIFLES.

Rifles for target shooting exclusively, are supplied with various styles of sights to aid the marksmen in securing fine shooting. As a rule, rifles used in this style of shooting are not the best, or even suitable for hunting or warfare.

There are many devotees to rifle-shooting who have no desire to kill game or participate in warfare; they recognize rifle-shooting as a clean out-door sport, and seek only for an instrument which is capable of the finest work, or one which will make the best target, and, therefore, the question of practicability is not considered. They are indifferent to the trajectory of the bullet; are willing to exert any amount of labor in loading, cleaning or sighting the rifle; and desire every known appliance to aid them in making fine targets.

The sights for such rifles are numerous, and the great variety of forms are the result of the diversity of opinion in regard to the best style to secure superior results. It is usual, with target sights, to provide for fine adjustments for elevation and windage, and employ such forms of sights as will permit pointing or aiming the rifle with the greatest accuracy.

There is less difference of opinion in regard to the rear than the front target sight. Without doubt, a majority of riflemen recognize an advantage in target shooting by securing as great a distance as possible between the front and rear sights. Were shooting to be done with the marksman lying on his back or side, the sight would probably be placed near the heel of the rifle, as practised by most of the long-range shooters; but most of the target rifle-shooting at the present time is done off-hand, therefore the popular mode of attaching the sight is on the tang at the grip of the rifle. Fig. 52 shows the Winchester rear Vernier peep sight. This fairly represents the style of sight used by a majority of American target shooters for a rear sight. There are other rear sights, some without the screw for raising and lowering the peep hole, making it less expensive; and various forms, slightly different; but most of these sights are nearly alike and accomplish the same object.

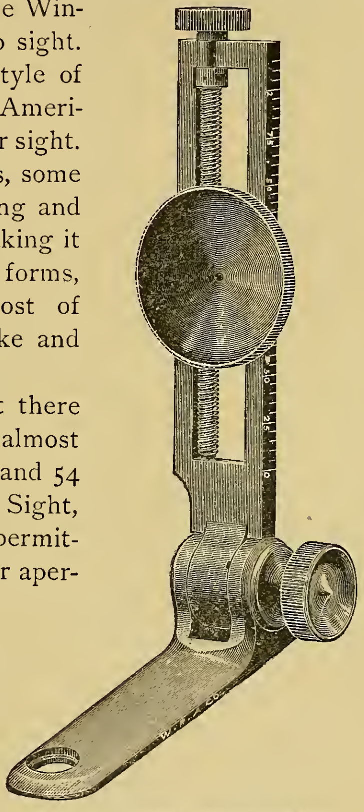
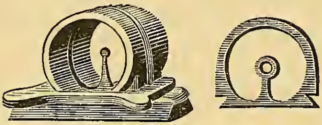


Fig. 52.—Winchester Rear Vernier Sight.

For a front target sight there are two forms which are almost universally used. Figs. 53 and 54 show the Winchester Globe Sight, with interchangeable disk, permitting the use of a pin-head or aperture sight. This sight is used on rifles where it is not necessary to provide for windage, or when a wind-gauge is combined with the rear Vernier sight. Fig. 55 shows the Winchester front target and wind-gauge sight, and such a style of front sight of different makes is, perhaps, the most generally used of any front target sight. Aperture or pin-head sights can be used, and nice adjustments for wind secured.

The sights named fairly represent the styles of target sights used to-day by most marksmen. As they are made in large quantities, the prices are astonishingly low, and



Figs. 53 and 54.—Winchester Globe Sight.

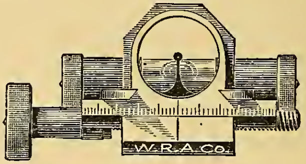


Fig. 55.—Winchester Front Wind-Gauge Target Sight.

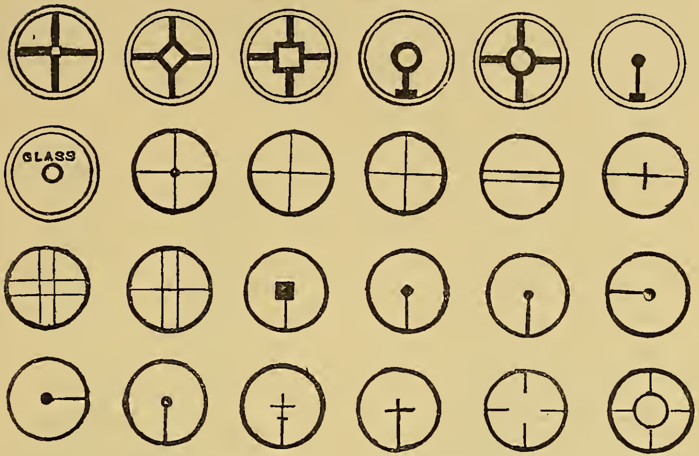
so much so that it forbids competition by inventive riflemen or mechanics, who can only supply a limited class at a much higher price. Many riflemen are ever ready to experiment, produce, or investigate new sights, prompted by the desire to procure the best instruments for fine shooting. I think if the testimony of all American riflemen could be secured, it would show that a great majority believe that for non-magnifying sights for target shooting, there is nothing better than a plain open sight, a pin-head or an aperture front sight. I have seen many forms of disks for front target sights, and present some in the accompanying illustrations which have been tried with a varying amount of satisfaction.

Most of these disks are made of metal, some of glass; the fragility of the latter makes it less desirable than the former. Sights which hide any part of the targets, so as to make them dangerous, are forbidden by most rifle associations, and should not be used. It is usual to prohibit the use of a bar or rim of over 8-100ths of an inch, on aperture or similar sights.

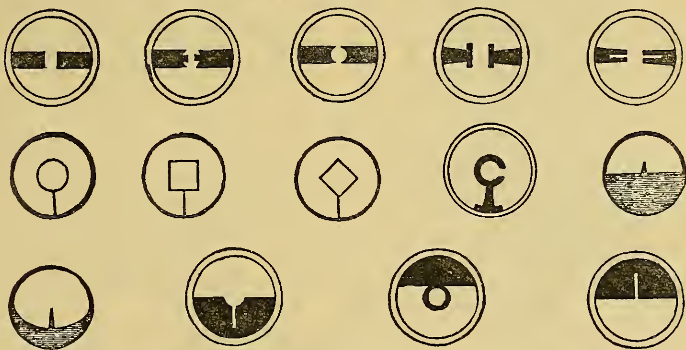
Although the many styles of front target sights shown have been tried, there is no doubt that the great mass of target shooters prefer either an aperture, a pin-head or a plain sight.

The oldest target rifles known were in many cases

COMPOSED OF GLASS OR METAL.



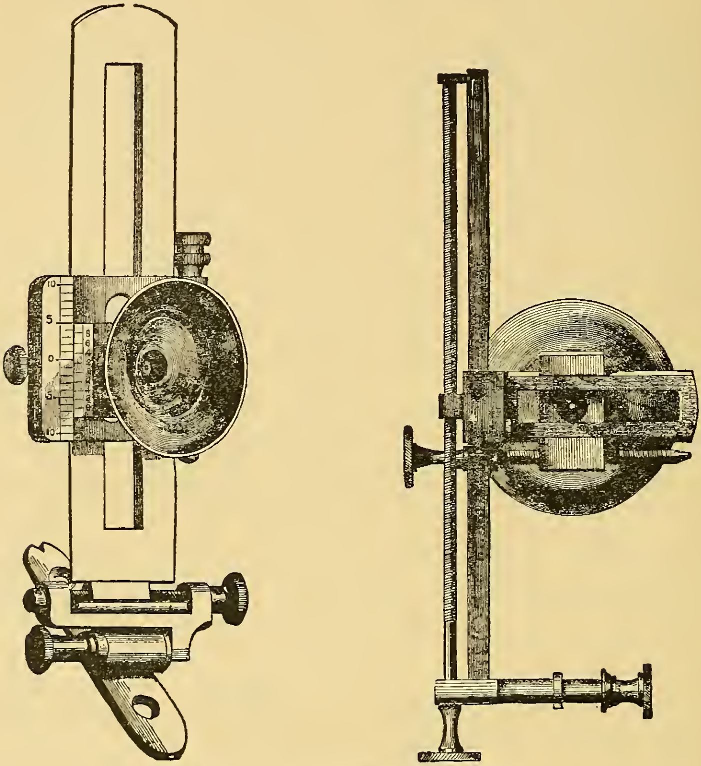
Front Sights Generally Permitted.



Front Sights Generally Disallowed when Arranged as Shown.

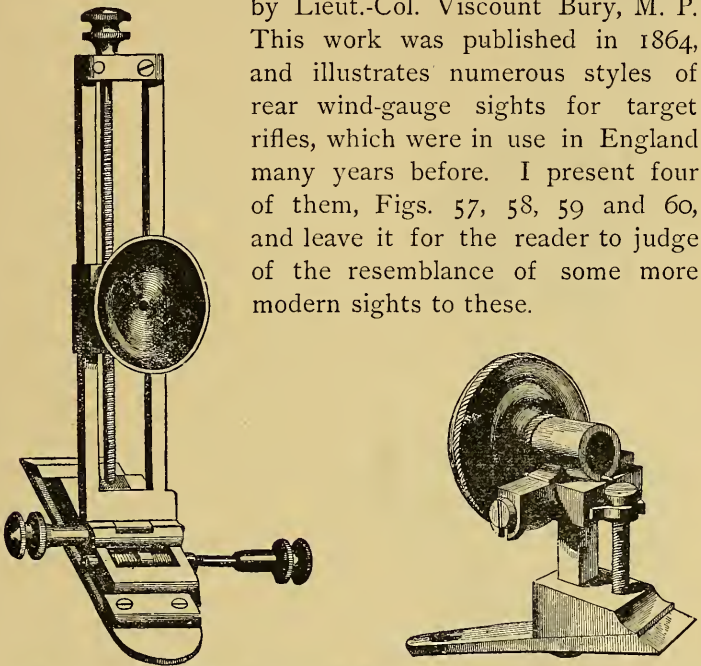
Fig. 56.—Various Forms of Front Target Sights.

fitted with rear wind-gauge sights, and many of them were equal if not superior, to modern productions. The great majority of American target rifles have for many



Figs. 57 and 58. — Old English Target Sights.

years had the wind-gauge at the muzzle end of the rifle ; but recently many riflemen have expressed a preference for a rear wind-gauge sight on a target rifle. It is claimed by some that the tang of the rifle is the best place for a wind-gauge sight, both for safety and convenience ; and so much has been claimed for such sights, that mechanical ingenuity has been inspired, and several meritorious combined rear wind-gauge and Vernier sights have been produced. It cannot be claimed, however, that all of these modern productions are wholly original. I have in my library an English work entitled "Manual of Rifling and Rifle Sights," edited by Lieut.-Col. Viscount Bury, M. P. This work was published in 1864, and illustrates numerous styles of rear wind-gauge sights for target rifles, which were in use in England many years before. I present four of them, Figs. 57, 58, 59 and 60, and leave it for the reader to judge of the resemblance of some more modern sights to these.



Figs. 59 and 60.—Old English Combined Elevating and Wind-Gauge Target Sight.

The Remingtons, at one time, made a few rear wind-gauge sights for long-range rifles; they were excellent sights, but expensive. Practical riflemen have in several instances, exercised their ingenuity, which has resulted in several meritorious productions. The Soule sight is very popular with the expert target shooters at Walnut Hill. It is the invention of Mr. J. W. Soule, a fine mechanic and rifleman. It is shown in Fig. 61. This sight has, besides many merits, a number of original points.

I never knew of the micrometer being applied to a rifle wind-gauge sight before Mr. Soule employed it. The Carver sights have lately been introduced; most of the rear sights of this manufacture have a wind-gauge in connection with the elevating arrangement.

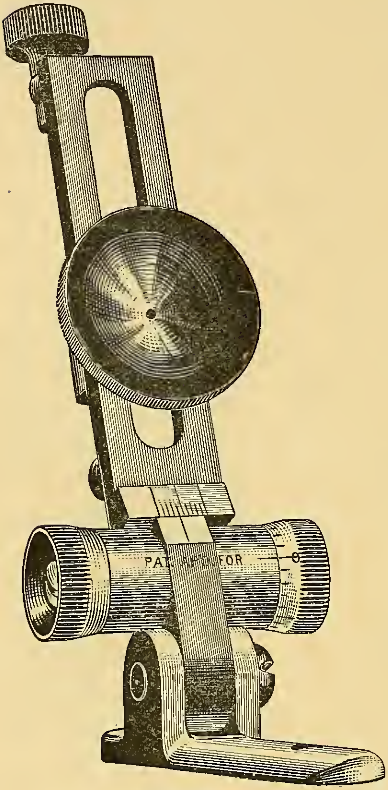


Fig. 61.—The Soule Rear Target Sight.

Mr. W. Milton Farrow, the well-known rifleman, produced a rear sight which gives elevation and windage. It is favored by some riflemen. Mr. D. L. F. Chase and Mr. Albert Law, of the Massachusetts Rifle Association, two practical riflemen possessing superior mechanical skill, have perfected such sights, and use them on their own rifles. It is the opinion of many that some of the obsolete target sights, and those of recent invention, in use by the designers, are superior to a number of those manufactured in quantity. The greatest fault with many of the combination sights is the want of compactness.

CHAPTER VIII.

TELESCOPE RIFLE SIGHTS.

For many years telescopic sights have been popular among a class of rifle-shooters; their chief use being confined to target shooting. A number of years ago much of the target shooting was done with telescope sights; but on the formation of the National Rifle Association of America, the use of all magnifying sights was prohibited, and consequently all local rifle clubs affiliating or adopting the rules of the National Association forbid the use of such sights.

Telescope sights have their uses, and, although the action of the N. R. A. caused an unpopularity of telescope sights, there are among the great body of American riflemen, many who recognize not only the merits but advantages of such sights under certain conditions, and a number of rifle clubs formerly forbidding their use now permit them. The National Rifle Club, an old organization which usually holds its semi-annual competitions at Vernon, Vt., has recognized the telescopic-sighted rifle as necessary for securing the best results in its style of rifle-shooting, and but few rifles shot by members of this club have been without such sights.

The telescope sight also finds favor among a certain class of hunters, some of whom from defective vision are permitted to continue the sport of game shooting with a rifle which could not be indulged in without these magnifying sights.

The use of telescopic sights is even recommended for military arms to be used for picket work. There is no doubt an increased number of advocates of the telescopic sight each year, and, although most riflemen will admit that the use of such sights will be limited, those who have investigated the different departments of rifle-shooting generally recognize the advantages of such sights under certain conditions and their legitimate place in the various departments of rifle-shooting.

There is a popular impression that the application of a telescope to a rifle immediately overcomes much of the uncertainty in sighting. This is fallacious; for as you magnify your vision you increase your errors in holding, so much so that few can use the telescopic-sighted rifle advantageously in off-hand shooting.

A poor telescope is a detriment rather than an advantage, and undoubtedly a plain open-sighted rifle would do better work than a rifle fitted with a poor telescope or a good telescope improperly attached to a rifle.

From my observations, I have formed an opinion that no one in America has done more to perfect the rifle telescope than the late Wm. Malcolm, of Syracuse, N. Y.

Mr. Malcolm in a short history of rifle telescopes, which he prepared to reply to the many letters of inquiry he constantly received, said: —

"Of all the arts and sciences, there is none perhaps so little understood, or of which so many are profoundly ignorant, as that of optics. In the majority of cases and more especially by manufacturers of gun telescopes, it is simply understood that a transparent medium (glass or pebble), made round and thicker in the centre, placed at certain distances from each other, magnify the object; but should the glass be made more dense than usual, they are utterly at sea, must either make new lenses or manufacture indifferent instruments. Had they a scientific knowledge of optics this would not occur.

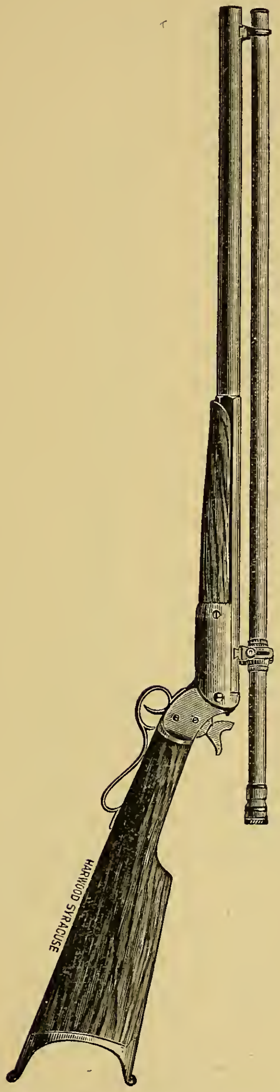


Fig. 62.—Stevens' Rifle with Malcolm Telescope.

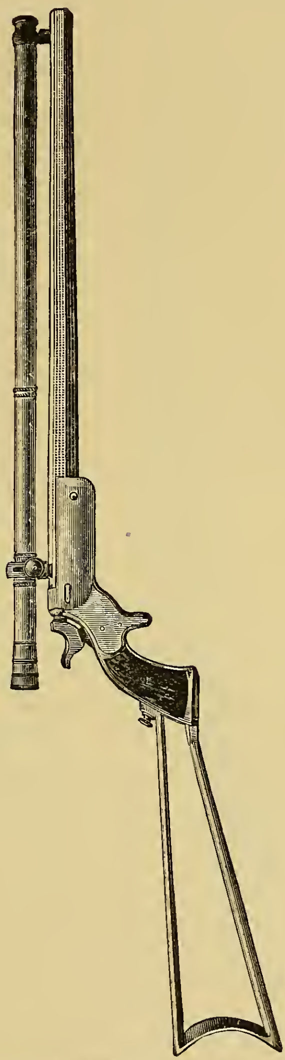


Fig. 63.—Stevens' Hunter's Pet Rifle with Malcolm Telescope.

"Short telescopes were used many years ago by turkey shooters, but the results were not satisfactory. A number of years ago the sharpshooters and riflemen of the country conceived the idea, that a telescope made light and of small diameter would greatly improve the accuracy of the rifle. The rifle at that time was supposed to be accurate, and if properly sighted and held, to be capable of putting one ball after another in the centre of a target, or in hunter parlance, 'to shoot straight.'

"J. R. Chapman, an eminent English civil engineer, then residing at Oneida Lake, Morgan James, Chas. A. Spencer, the late celebrated optician, of Canastota, together with some others and myself, began experimenting in the production of an accurate telescopic sight for rifles; each one following and working out his own ideas, often conferring with each other, comparing notes, and from time to time working together.

"We found first that much of the poor shooting must be attributed to the rifle itself. That long telescopes, extending the whole length of the rifle barrel, were less damaging in their errors than those of one-half the length; that a small error in the telescope would be increased, by magnifying power, at the target about twenty times. We found that the utmost accuracy must attend the making of curves of lenses, and that the polish of the lens was not so essential as correct curves. Incorrect curves distorted the target and located the ball hole where it was not, when seen through the telescope. (I often have sent to me now to be repaired, modern rifle telescopes that have damaging distortion attending them.) We found that each lens setting and cross-hair must be well fitted to tube, made permanent by two screws threaded in the setting and not in outer tube. We found that all this would not produce good shooting unless the attachments were properly made, in fact, we were two or three years perfecting this part of the telescope. I made the discovery of the intermediate lens in 1870, since which time better shooting has been done by my customers, as it corrects almost entirely the errors of distortion.

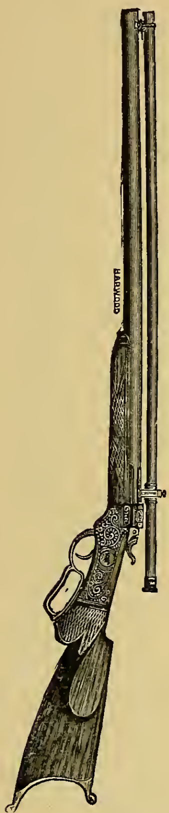


Fig. 64. — Ballard Rifle with Mogg Telescope.

Fig. 65. — Stevens' New Model Pocket Rifle with Mogg Telescope.

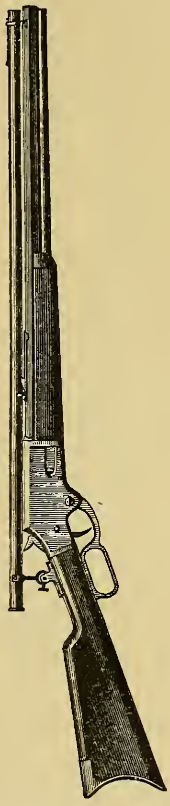


Fig. 66. — Marlin Rifle with Pierce Telescope.

"The late Wm. Billinghurst would not receive from me a telescope without this addition, so well was he convinced of its superiority. Soon after we perfected the telescopic sight, so that it was reliable, numerous gun-makers all over the country began to make rifle telescopes, making two or three a year. They were full of errors, and only about one in ten could be relied upon for accuracy. The consequence was, they brought discredit upon telescopic sights in general. A great error might lurk unobserved in a fair-looking telescope. I began to improve the optical part of my telescope by means of an achromatic and pebble lens of peculiar curves — my own conception — producing thereby a rifle telescope with large field, correct image and accurate in its performance, far superior to any then made, and for less money than the gun-maker could. The consequence was, I made all the telescopes used by these gun-makers for a number of years and only for the last few years have I had any competitors. If they, my present competitors, make good and accurate telescopic sights, I hope they will succeed; if on the other hand, they make poor work, they will not, and do not deserve to. I am firmly convinced that a poor, inaccurate telescopic sight is much more detrimental than a globe and peep sight, aforesaid, as it increases the actual error of the rifle twenty times at target. Rifle makers themselves should caution their customers against poor telescopes which might destroy the reputation of a really good shooting rifle. I deem these remarks important as there are so many shooters who think that any telescope that looks well ought to direct the ball accurately, and condemn the rifle through ignorance of the errors in the telescope. Up to 1870 the general opinion was, that although the telescope was all right for target, it could not be depended upon for hunting in the woods where the light was feeble. After my discovery of the intermediate lens, the concentration of light was accomplished, so that the objects seen inside of telescope were lighter than those outside. I made several of this class of telescopes for Western riflemen. Among the number was W. S. Burnham, the eminent astronomer of Chicago; also H. W. S. Cleveland. In 1880 I made for the President of the Lick Fund, at the Observatory at Mt. Hamilton, Cal., one of

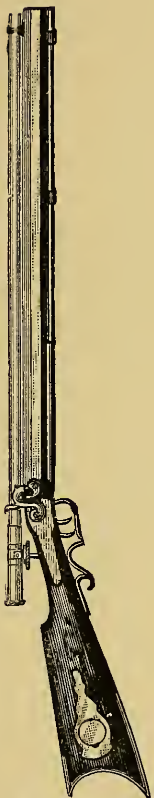


Fig. 67.—Muzzle-Loading Rifle with Pierce Telescope.

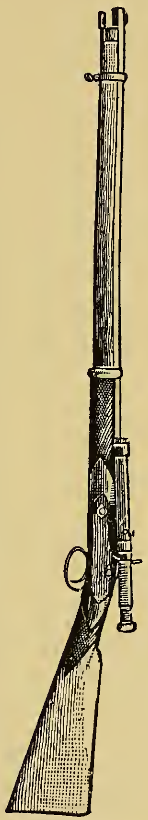


Fig. 68.

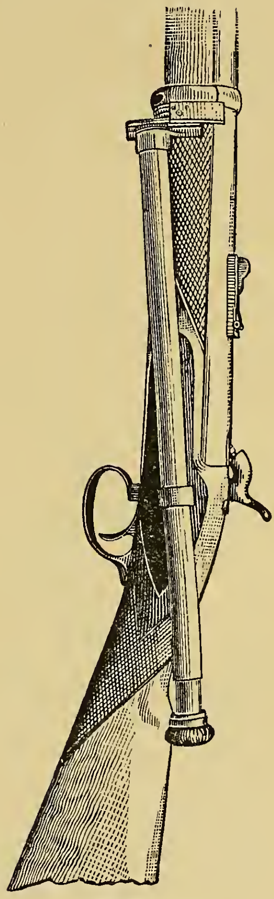


Fig. 69.

Whitworth Military Rifle with Davidson Telescope.

this class of telescopes, of one inch in diameter. He used it in the dusk of evening with success. Mr. Schoonwald of Monterey, Cal., has three of 9-16 inch diameter. Perhaps the best rifle telescope that ever left my shop, (taking its small dimensions into consideration) was one made for Dr. Perry of N. Y. City in 1884. It was 12 inches in length, by ½ inch in diameter; and was so absolutely free from error, that after passing the scrutiny of several Astronomers and opticians, was pronounced "perfect" and a marvel of optical achievement. Chas. Slotterbek of Cal., has in the last ten years bought of me, for his cus-

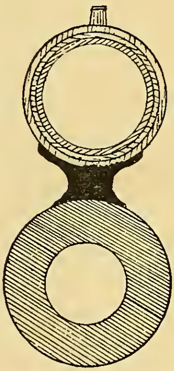


Fig. 70.—Muzzle View on long-range rifle showing rib, telescope tube and cells holding object lens and deflecting prism.

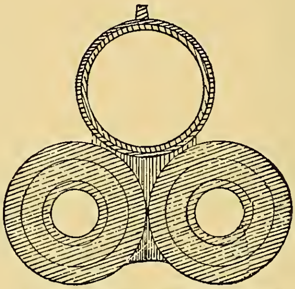


Fig 71.—End, Muzzle View, Double Rifles.

Fig. 72.—Rock Crystal Disk cross-hairs, showing elevation and wind-gauge.

tomers, more than 150 of these hunting telescopes. Mr. McFarland of S. Australia uses on horseback one of this kind of telescope, for kangaroo hunting. I am explicit in regard to this class of rifle telescope as it is generally supposed that a telescopic sight is not appropriate for hunting purposes. The reason is, they have never seen anything except the dark and small field, always a characteristic of inferior telescopes.

"Great care should be taken to have the fastenings solid, with no lost motion, so as to prevent the recoil of rifle from jarring telescope loose.

"It will not surprise any one to be informed that the focus of eyes varies in many persons. Some from old age, others from an abnormal fulness of the crystalline lens. These conditions of far and near sightedness would prevent objects as well as the cross-hair from being seen by all unless the focus of telescope was changed to compensate for this irregularity. I have a simple arrangement connected with all of my telescopes that makes this adjustment complete for all conditions of eyes. Without this arrangement a telescope may be good for a few persons whose eyes are like the makers of the telescope, but there would be others who could not derive any benefit whatever from it. Many of the cheap telescopes made nowadays are of this last kind, although they are the old-fashioned kind of twenty years ago, when riflemen were satisfied with keeping their shots at 40 rods in a ten-inch ring; but for fine target shooting of the present day, the telescope must be finely adjusted as for a cross-hair and distance, and be able to quarter a ball hole with the hairs at 40 rods."

During the Civil War in America a number of Whitworth rifles were shipped from England for the use of Confederate sharpshooters; an illustration of these rifles with telescopic sights is shown in Figs. 68 and 69.

The use of telescopic sights for hunting is well illustrated in a communication to the author, which was published in *Shooting and Fishing*. It was from a very intelligent rifleman living in Cerro Gordo, California, who had used telescopic sights on hunting rifles. Of these he says: —

"The discussion in *Shooting and Fishing* in regard to the use, value, and advantages of the telescopic sight, as usually attached to game and target rifles, has induced me to give a little of my experience in the use of the telescopic sight as applied to game and target rifles.

"In the year 1865—after the war—I crossed the plains to the Rockies, carrying with me a Sharps rifle, .52-calibre linen cartridge, government caps. The rifle was fitted with a fine Malcolm telescopic sight. The following year found me, with this rifle, camped with a band of hunters and trappers in the Wind River Mountains, at that time a paradise for large game, and scalping Indians. The rifle itself, as well as the telescope, was something of a novelty in that region in those days, and much was the discussion as to the merits and demerits of the telescopic sight. Within a year from the time I joined the band, every one of that little company of hunters and trappers procured, and had fitted, the best Malcolm telescopic sights to their muzzle-loading rifles. Years afterward I met two members of that little band of hunters. They had discarded their muzzle-loaders and were equipped with Sharps rifles, model 1874, fitted with the best procurable telescopic sight. They declared that they would just about as soon not have a rifle at all as to have one without a telescopic-sight attachment. All hunters, prospectors, trappers, and scouts, that I have ever met, having once used a telescopic sight and become accustomed to it, will never afterward willingly use any other.

"The telescopic sight, as generally attached to the rifle, has its disadvantages as well as its advantages. Among its disadvantages may be enumerated: its high cost and its liability at all times to become disabled from rough usage. The fittings become loose, or the tube becomes sprung or bent. The projecting eye-end offers at all times a standing menace to become entangled in the clothes or bridle-rein or tie-rope. Bushes and small limbs have a faculty of clinging to it,—any one of which may cause such an injury as for the time being to render the telescope useless.

"Appreciating from long use the superior advantages to be derived from a telescopic sight as attached to the game rifle, I, some years ago, after considerable experimenting and the expenditure of a considerable sum of money, devised a method of attaching the telescope to the hunting and target rifle, which overcame the faults of construction as generally applied. My method of attaching the telescope to the rifle makes it perfectly solid and secure from injury in the ordinary vicissitudes to which it may be subjected in rough mountain and forest life.

"At the present time I have four rifles fitted with this improved telescopic-sight attachment.

"No. 1 is a Sharps rifle, model 1874; weight, 9 lbs., 30-in. barrel, automatic shell ejector, .40-calibre, 3¼-in. taper shell; its regular charge being 100 grains Curtis's & Harvey's No. 6 powder, and a 300-grain express bullet.

"No. 2 is a Sharps-Borchardt long-range target rifle, .45-100-550.

"No. 3 is a hammerless, self-ejecting, double express, made by the prince of double-express rifle makers. Length of barrels, 26 in.; weight, 7 lbs. 5 ozs.; calibre, .400; cartridge same as No. 1.

"No. 4 is my latest and newest acquisition. It is a little gem and a beautiful work of art. In design it is like No. 3; has 26-in. barrels, weighs 5 lbs. 5 ozs., and is adapted to the .25-20-77 cartridge.

"I will first describe the telescope, as attached to No. 1 Sharps rifle.

"A rib of steel, in cross section, similar in form to a T rail, is brazed on top of the rifle barrel, and extending the whole length of barrel from the receiver to the muzzle, presenting an appearance much like the rib on the barrel of a Smith & Wesson revolver. The top of rib is a little higher than the top of receiver, and is about 11-16 in. wide. In top of rib and extending its whole length is milled a concave groove, in form a perfect segment of a circle, having a radius of ⅜ in. Into this groove is fitted a steel tube ¾ in. in outer diameter and brazed fast. This forms the tube of the telescope, being practically as rigid and solid as the rifle barrel itself.

"The achromatic object-lens is first fastened to the inner end of the object-lens cell, which is about 1½ in.

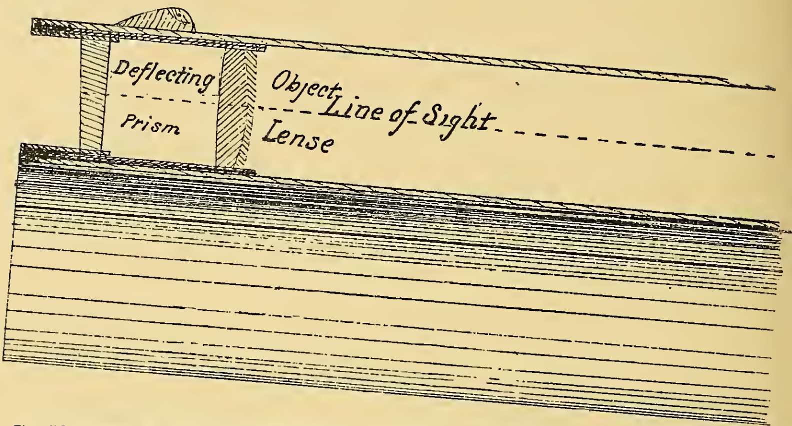


Fig. 73.—Side View, showing telescope tube in section as attached to rib and barrel with object-lens and deflecting prism of rock crystal, with ivory-tipped front sight on top of tube.

long, which in turn is screwed into the telescope tube in the usual manner. The end of tube projecting beyond the object-lens serves both as a sun-shade and rain-protector. At the eye-end of tube, and also at a point about eight inches from the end, is inserted and soldered fast, two thin rings, about ½ in. wide, made of hard phosphor bronze. Through these rings the adapter or phosphor bronze eye-piece tube slides; operating in effect just like the single draw in a navy telescope. The adapter, carrying the eye-piece and cross-hair diaphragm, is about 16 in. long, and is so arranged that when pulled out to a focus it comes to a stop, the telescope eye-piece being then in correct position and focus for sighting. When the adapter is closed into the telescope tube, about one inch of the eye end projects from the main tube, fitting close and resting on top of the receiver. Detachable water-tight caps are fitted to both eye- and object-ends of the telescope, serving, when the telescope is not in use, as a protection from both dust and moisture.

"In place of the usual cross-hairs attached to a diaphragm, is a thin, translucent disk of rock crystal fastened to the usual cross-hair diaphragm. Upon this disk is etched a vertical and horizontal line, the intersection of the lines being so adjusted as to be a little below the centre of field, the telescope tube itself being laid at a slight angle with the axis of the bore. These adjustments are so arranged as to give a point-blank range of 125 yards.

"Below the horizontal cross-hair line is placed a short line, which answers for 75 yards. Above the horizontal line is placed two other short lines, which answer respectively for 160 and 200 yards. On either side of the vertical line are two short vertical lines which serve as a wind-gauge.

"There are times and places when it is not desirable to use the telescopic sight. To allow for such times, fixed open sights are attached on top of the telescope tube. These consist of an ivory front sight and a bar with platinum line back sight, the corners of the back sight being rounded and both sights set low on the tube.

"It will be readily seen that from this construction of the telescope and its solid attachment to the barrel, all danger of injury to the telescope is reduced to a minimum. Another advantage is, that, should the eye-piece, from recoil, or any other cause, strike the eye, it would cause no injury to the eye, as the adapter will, with a slight pressure, push forward into the telescope tube, the phosphor bronze adapter and rings in telescope tube preventing any sticking from rust. When carrying the rifle the adapter is always closed up into the telescope tube, being entirely out of the way, as well as being protected from all harm or injury. When it is desired to shoot, it requires but an instant to pull out the adapter to a focus. After firing, the adapter can be instantly closed, leaving the tang and grip free from all bungling contrivances; such as peep, Vernier, and Lyman sights and bases.

"No. 2 rifle has the telescopic sight attached in precisely the same manner as No. 1; but, as this is a long-range rifle, some method for securing elevation must be obtained. This is accomplished in a very simple manner. Several wedge-shaped prisms of rock crystal or flint glass (preferably rock crystal) are ground to an angle on the two plane surfaces, i. e., the two plane surfaces make an angle with one another. The amount of the angle is proportionate to the distance to be shot. These prisms are made circular and set in cells, which, in turn, are screwed into the outer end of the object-lens cell, the prism being so adjusted that the thin end of the wedge is downward, or next to the barrel. The inner plane surface being set so as to be cathetus to a line drawn through the centre of the object-lens and the centre of the field lens, the beauty of this arrangement is apparent. The rays of light coming from the target to the prism, in passing through the prism are bent and deflected downward into the object-lens, corresponding in amount to the angle that the two plane surfaces of the prism make with each other. To illustrate: supposing that the rifle is to be shot at a 1,000 yard target, and the angle between the line of sight and the axis of the bore is $3° \ 30' \ 30''$; simply insert a prism in front of the object-lens, the plane surfaces of the prism being ground to that angle, the fine adjustment for terrestrial refraction, change of light, and humidity and density of the atmosphere being gauged and instantly allowed for by the extra vertical and horizontal lines etched on the cross-hair crystal. When shooting at the longer ranges there is no craning of the neck to reach up to the Vernier cup, neither is there any spirit-level required. In fact, the rifle is held just the same, whether the distance shot is 100, 1,000, or 2,000 yards, the only difference being in the elevation of the muzzle.

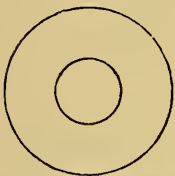


Fig. 74.— Eye-Piece.

"Rifles No. 3 and 4 have the telescope attached to the rib similar to No. 1, the rifles presenting an appearance very much like a three-barrel gun, with the third barrel on top, the three forming a triangle. The telescope, when closed up, is just the length of the barrels, and may be packed away, with the barrels in its case, without any fear of injury.

"No. 3 rifle has, for several years, been my favorite large game-hunting rifle. No rifle that I have ever used has given me so much pleasure and genuine satisfaction as has this combination of telescope and rifle. In rapidity of firing it is not quite the equal of the Winchester 1886 model repeater, which, by the way, is the only large bore repeating rifle that I have ever seen that I would use in preference to the best single-shot rifle. Double shots from the double rifle can be fired quicker than with the repeaters; besides, it has the advantage of equal, if not superior, accuracy up to its range — 200 to 250 yards; has a flatter trajectory and greater smashing power than has the repeater of the same calibre, besides being about 1½ lbs. lighter in weight, which is quite an item in climbing around the mountains in a long day's tramp. Were the Winchester 1886 model so constructed as to eject the shells on the side, similar to the Marlin 1889 model, a telescopic sight after this pattern could then be attached, and would be nearly perfect for a large-game rifle. A telescopic-sight attachment of this kind applied to the Marlin 1889 or 1891 model, and adapted to the .25-20-86 cartridges, the barrel and magazine being so constructed as to be easily detached from the receiver, would be a perfect rifle for small game, and is just the kind of small-bore rifle that I am looking for. Thousands of users of the large-bore rifle — hunters, trappers, settlers, prospectors, miners, and sportsmen everywhere — would hail with delight just such a rifle, to use as an auxiliary to the large-bore rifle.

"For the benefit of the large army of both large-bore and small-bore enthusiasts, and the target and game shooters, I will say that this application of the telescopic sight to the rifle is about as near perfect as may be desired. The only obstacle to its very general use by target and game shooters is its necessarily high cost. To all those who can afford it, I say give it a trial. The system is not patented, and may be used by any one ; but it requires first-class workmanship in optician, telescope-maker, and gunsmith, to obtain fine results."

Mr. William Malcolm was succeeded in the manufacture of telescopes by The Malcolm Telescope Manufacturing Co., Syracuse. Besides this company is Mr. L. M. Mogg at Marcellus, N. Y., and others doing business on a smaller scale.

CHAPTER IX.

HUNTING RIFLES. — SINGLE-SHOT AND REPEATING RIFLES.

In America, it is usual to class as hunting rifles, all rifles which are light enough to be carried comfortably; sighted so as to be readily and effectively used, and charged with ammunition which will kill game. The smallest rifle used in hunting is .22-calibre, and those above .50-calibre are rare. The lightest rifle known to the writer is the Stevens' pocket rifle, weighing less than 1 lb.; and it is an exception to the rule to find American rifles to-day, in the hands of hunters, weighing over 10 lbs. In the days of bison hunting, the old Sharps buffalo rifles, which would weigh 16 or 18 lbs., were sold in large numbers to skin-hunters, who practically exterminated this animal. These rifles are now largely in the hands of walrus-hunters. Among the modern American rifles, manufactured to-day, there are comparatively few exceeding .50-calibre and 10 lbs. in weight.

American rifles for hunting are manufactured in immense quantities by machinery and sold at astonishingly low prices. In order to sell at such low figures, they must be produced in large quantities, and by machinery; this compels manufacturers to model a length and bend of stock likely to suit the majority. By perfecting machinery for this manufacture, they are able to turn out rifles which are generally remarkably accurate, but not always satisfactory in regard to weight, model, and sights.

For many years most of the game hunted in America was in the East, and not dangerous; was exceedingly plentiful, and was shot at very short range; the smooth-bore being used quite as much as the rifle. As the rifle came more into use, — the game continuing abundant, — the skill of the hunters increased, and a small bullet rightly placed was all that was necessary to kill the game. As the hunter pushed westward, the character of the country greatly changed. In place of heavily timbered districts, with hills, valleys, rivers, and lakes, were almost boundless prairies, timberless, and without rocks, hills, or anything to permit as near an approach to game as in the East. Larger and more dangerous game was found; and the game of the plains, always more timid than that found in timbered regions, became scarcer and wilder, which made it more difficult to approach. Then it was found that the lightly charged small-bore rifles were not the proper arms for that country; and, as sportsmen became educated in this matter, their views were expressed through sportsmen's papers, and, in time, manufacturers responded with more powerful rifles. The line of small-bores was also much increased, until it would seem that a rifle for every style of hunting to be found in America could be procured.

It is astonishing how erroneous are the views of many as to the desirable features in a hunting rifle. Many find it difficult to understand why a rifle that shoots accurately at a distance of a thousand yards, is not superior for hunting to one whose accuracy is confined to perhaps less than half that range. They entertain a belief that a long-range rifle would enable a sportsman to kill game readily at the extreme accurate range of the rifle. Strange as this may seem to many, it is a fact, that nearly every week there come to the editors of sportsmen's journals, letters from apparently intelligent persons, which indicate that they entertain such fallacious ideas. The rapidity of fire is another delusive feature to many. As a fact, there are

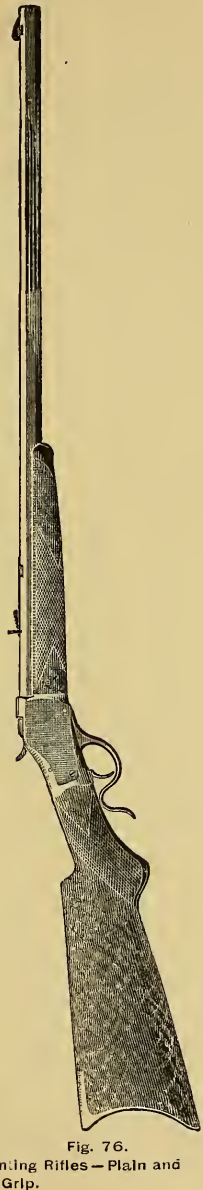
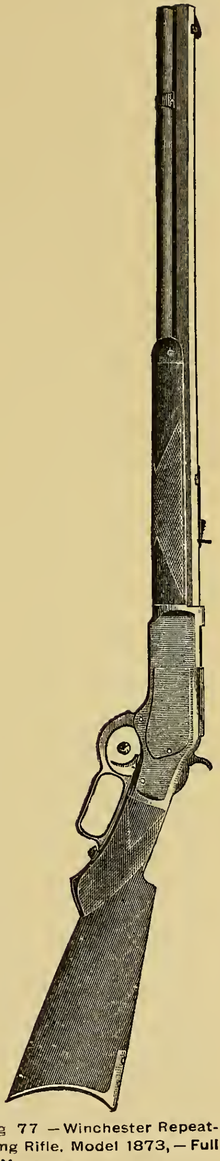




Fig. 75. Fig. 76.
Winchester Single shot Hunting Rifles — Plain and Pistol Grip.

Fig 77 — Winchester Repeating Rifle, Model 1873, — Full Magazine.

other points more essential than long range and rapidity of fire in a hunting rifle.

There are many opinions as to the best rifle for hunting, and when it comes to recommending a certain calibre or style of sights, I hesitate, for whatever would be recommended would be sure to provoke controversy. It must also be admitted that no one rifle can be found best suited for every kind of game shooting. A few successful shots (sometimes a single one) with a certain rifle and charge, making a convert to it and a firm advocate; perhaps this is a natural sequence, but it often proves delusive. I have known of cases where guides or woodsmen have made successful shots at unusually long distances, which so aroused the enthusiasm of a tyro, he would purchase at a big price the rifles used, much to the satisfaction of the fortunate marksmen. I know of men who have unbounded faith in the capabilities of a rifle of small calibre for large game, because of one fortunate, fatal shot ; and I have seen persons who have great confidence in the accuracy of a rifle because a deer was killed on the run with it.

A hunting rifle should be sufficiently strong to stand any charge which the owner would be likely to ever use in it, and reasonable use it would be put to. It should be as light as possible if it is to be carried by a person afoot, but not so light as to make the recoil excessive. Few men however strong can carry a rifle weighing over eight pounds for any great distance without its being burdensome and detracting from the pleasure of a hunting trip. Over weight, unnecessary weight, has long been a conspicuous cause of complaint against American rifles. There seems no good reason why a .32 or .38-calibre rifle, shooting 40 grains of powder or even less, and a light bullet, should weigh nine or ten pounds, when six or seven pounds is sufficient weight. This, however, is one of the results of manufacturing rifles in quantity by machinery. A weight calculated to suit a majority of rifle-shooters (and that would probably mean target shooters) has generally been selected by manufacturers, and the rifles in that model would be of standard weight. As target shooters, as a rule, prefer a heavier rifle than game shooters, and as there are more target shooters than hunters, it has often been difficult to find rifles light enough to satisfy those who hunt with a rifle. Recently several have been put on the market which are light, but it is a question if they are not as objectionable as the excessively heavy ones; for in order to avoid unpleasant recoil they are charged with pistol cartridges, and the bullets made to fit the barrels so loosely as to almost drop through the barrel. By use of such ammunition the recoil is reduced; but, certain desirable features are sacrificed, which will be alluded to later.

If a hunter were to travel by canoe or mounted, the heavy rifle would be no disadvantage, and perhaps for several reasons desirable. The question of weight of a rifle is an important one; and besides the reasons stated, is the varying strength of individuals. I should say a person should select a rifle heavy enough to avoid unpleasant recoil, which causes flinching; but, at the same time, remember, a hunting rifle is not usually shot so frequently as a target rifle, and recoil is not so much noticed when shooting at game. With the exception of the .22- and .25-calibre rifles, I think a majority of hunters would prefer a rifle from seven to eight pounds in weight, but have to content themselves with those weighing eight to nine pounds.

The question of calibre is one upon which exists a diversity of opinion, and of course depends upon the game hunted. It is not so generally known as should be, that there is a point where each calibre and charge will do the best work; but sportsmen have various ideas about perfection. One person considers the greatest amount of accuracy paramount to all other features; another seeks the flattest trajectory, disregarding everything else; still another seeks killing power alone; and many can talk of nothing but rapidity of fire. I hazard little in stating that any unusual amount of any one of these features is secured at the expense of another if ordinary powder and lead are used.

By way of illustration I will refer to two well-known calibres; viz., the .38 and the .45. The .38-calibre central-fire, with 55 grains of powder, and a 330-grain bullet, and the .45-calibre government cartridge, which has 70 grains of powder, and a bullet of 500 grains, are well known to possess great accuracy when the rifles using them have the correct twist and the ammunition is properly prepared. If you lighten the bullet or increase your powder charge you flatten your trajectory, but you sacrifice accuracy; but there is a point where you can gain a great deal in trajectory and still keep sufficient accuracy within hunting range. Take the .38-calibre rifle with 55 grains of powder and 330 grains of lead. This charge is probably the most popular of any among the rest shooters who use the modern breech-loading target rifle, and it is a common occurrence to place ten shots with rest at 200 yards within a 3-inch circle. Even when the factory cartridge with a bullet of 255 grains is shot, the accuracy is noticeable, but the trajectory high. Take the .38-90, with the 255-grain bullet, and you flatten your curve, but you would probably have to be satisfied with placing the shots in an 8-inch circle at 200 yards; but with the 217-grain bullet you will secure a still flatter curve, though you are quite likely to require a 10-inch circle to enclose 10 shots. You could go back to 500 and likely to 800 yards with the .38-55-330, and keep in the regulation bullseye, shooting with a rest and with favorable weather conditions. With the .38-90-217 you would not be likely to keep the shots on the target for many shots at the mid-ranges. Again, take the .45-70-500 government cartridge. Good shooting can be done with it at 800 yards; the .45-90-300 you would find quite unreliable at that range, but it would shoot

Fig. 78.—Winchester Repeating Hunting Rifle, Model 1873. Half Magazine.

Fig. 79.—Winchester Repeating Hunting Rifle, Model 1886. Half Magazine.

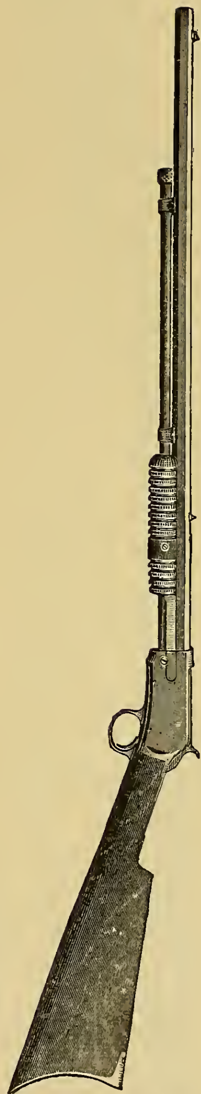


Fig. 80.—Winchester Repeating Hunting Rifle, Model 1890. 22 calibre.

well at 300 yards; the .45-125-300 would be unreliable at 300 yards and not to be relied on much beyond 150 or 200 yards.

Taking the latter three cartridges the .45-125-300 would undoubtedly be the best cartridges for certain kinds of large and dangerous game, and a majority of well-informed sportsmen would unhesitatingly select the .45-90-300 in preference to the .45-70-500 for hunting. The latter cartridge, however useful for target and military work, is not a cartridge *par excellence* for game shooting, although it has killed much game; and by discarding the 500-grain bullet and substituting a lighter one, of 300 or 350 grains, and with 75 grains of ducking powder, a powerful enough cartridge for game found in the United States will be secured. A heavy bullet will give long and accurate range and great penetration; a light bullet with heavy powder charge will give a low curve and quick flight up to the limit of accuracy, and by the spreading of the bullet is likely to make a more fatal wound. There are times when the heavy bullet is preferred at short range, when penetration is desired or, as old hunters have remarked, there are times when they want a "bone smasher:" the heavy and hard bullet accomplishes that. When a light, soft bullet is used on thick-skinned animals, or those with heavy matted hair, it is likely to make more of a surface wound and not penetrate the vital parts.

Some years ago, in the early history of breech-loading rifles and metallic cartridges, the cartridges contained light loads of powder and heavy bullets, consequently had high trajectories, but possessed accuracy. As game was killed at short range, it was some time before sportsmen recognized the value of reducing the curve; but shooting on the plains, and the game in the East becoming wilder and more difficult to approach, longer shots were taken, and the liability to err in elevation became apparent.

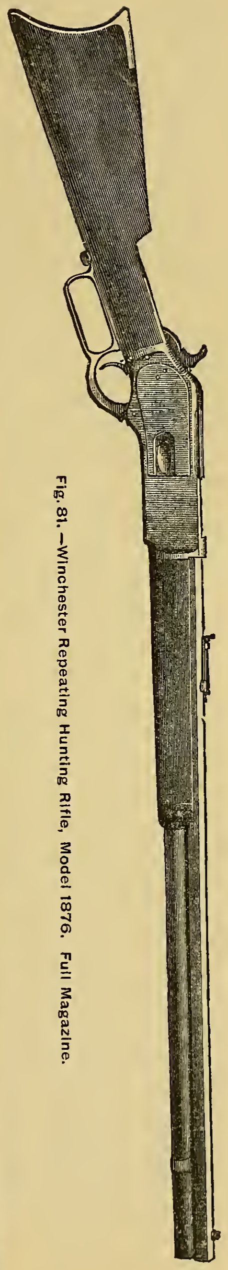


Fig. 81.—Winchester Repeating Hunting Rifle, Model 1876. Full Magazine.

Fig. 82.—Colt's New Lightning Magazine Hunting Rifle Octagon Barrel. Full Magazine.

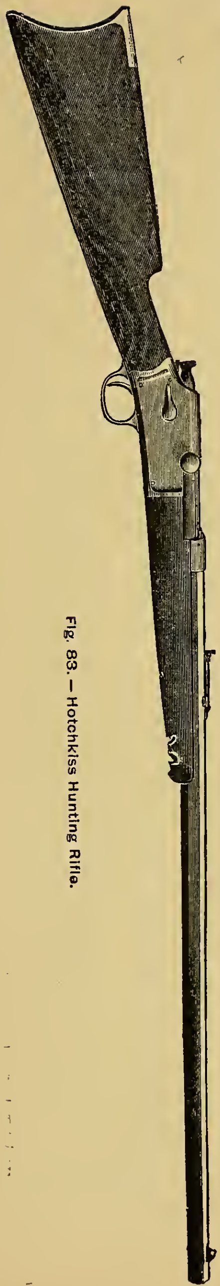


Fig. 83.—Hotchkiss Hunting Rifle.

Some of the cartridges for the Sharps rifles showed their great superiority as hunting cartridges over those lightly charged.

From the time the modern American breech-loading rifle was introduced, up to about 1876, a majority of the hunting rifles used lightly charged metallic cartridges; the powder charges being particularly light, in fact they often shot pistol cartridges. An exception to this was in the Sharps rifles, above referred to, which took proper hunting charges and consequently were very popular among hunters in the West. During the following ten or twelve years the demand, especially from the West, was for rifles with range, and it was a decade before it was generally realized that although the long-range rifle would kill at several hundred yards, the chances of shooting over or under were fully as great as missing from other causes. The sportsman and manufacturer became educated as to the proper rifle for hunting in certain sections, and as a result better rifles were made; for they shot cartridges which combined the requisite amount of accuracy for hunting with a lower trajectory, although some of the apparently extremely powerful express cartridges are delusive on account of the slow burning powder used in loading, increasing the accuracy, reducing the recoil, but alas! not lowering the trajectory to any such extent as is supposed. The shells of such cartridges however, can be reloaded with stronger powder and the trajectory greatly flattened.

I have alluded to the introduction of new rifles, in response to calls from sportsmen. Most of the later models are superior to the older ones, but they do not drive the old arms into disuse. There are thousands of rifles in the hands of hunters to-day which would be considered obsolete, and have long ago ceased to be manufactured; but there is a demand for cartridges for these rifles, and consequently ammunition is still manufactured; even paper cartridges used in rifles requiring a cap are supplied, and there is quite a little demand for cartridges for Spencer, Sharps & Hankins, Joslyn, and Peabody rifles. In fact, rifles which are used for hunting in America take almost every cartridge made, which include about all the pistol cartridges; but this should not be taken as evidence that all of the cartridges are the best or proper ones for such work. Rim-fire cartridges, with a few exceptions, are not esteemed for hunting, and therefore rifles taking these cartridges, with the exception of the .22 short- .22 long-rifle and .25 Stevens special, are considered undesirable for hunting. Nearly all the centre-fire cartridges are used in American hunting rifles.

I have made some general statements of my ideas of a hunting rifle, which I will repeat in the following summary: In my opinion, the hunting rifle should be sufficiently strong to stand any charge ever fired from it, or any reasonable use the arm is put to.

Light enough to be carried a long distance without great fatigue, but heavy enough to prevent excessive recoil.

Of such shape that it may be brought quickly to the shoulder. Butt should be similar to a shot-gun, and the Swiss butt-plate never used.

The sights should be so arranged and of such pattern that they can be quickly caught by the eye and clearly defined when placed on game; firmly attached to the rifles so as to permit of no sliding or movement. Very fine sights are undesirable, as they cannot be seen so readily as coarser ones, especially when taking quick snap shots, or at moving game. If you prefer a rear open sight, do not have a deep notch; have it flat and shallow with no ears or projections on each side.

Shot-gun butt and a corrugated or rubber heel-plate. Avoid smooth butt-plates, as they are liable to slip when placed to the shoulder. A long stock is preferable, especially when shooting heavy charges; see that the stock is long enough to prevent collision between the hand that grips rifle and the nose.

Have trigger checked, and so set that when the rifle is grasped it is not necessary to stretch or reach with the fore or trigger finger. Have trigger-pull strong enough to prevent accidental discharges, but easy enough to press lightly without yanking it, which disturbs the aim. Do not have the trigger-pull less than 2½ or over 3½ pounds. Hair or set triggers are not recommended.

Select a rifle shooting a cartridge with a bullet sufficiently large to kill the game hunted, and shooting as large a powder charge as will shoot the bullet accurately and not disturb the aim by the recoil. There are a few exceptions to this which I will allude to later. Cannelured bullets are generally preferred to patched bullets for hunting.

In selecting a rifle for hunting do not look for, or expect to secure, the accuracy found in target rifles. Most rifle clubs have a 200 yards' range; it is at that distance many of the hunting rifles are tested. Dissatisfaction is often expressed because the shooter is unable to keep the shots in the regulation bullseye when shooting with a rest. I think nearly all rifles used in America for hunting, with the exception of the express rifles, are capable of placing ten successive shots in an eight-inch circle at 200 yards; but I feel certain that owing to the particular skill required to shoot a rifle at rest; to the special knowledge necessary to use hunting sights to the best advantage; to the uncertainty of much of the factory ammunition, largely on account of deterioration after leaving the factory, comparatively few riflemen can select a rifle and ammunition from a gun-store, and with hunting rifle and sights place ten shots at 200 yards in the regulation eight-inch bullseye. I say this advisedly, and after twenty years' experimenting with hunting rifles and intercourse with experts at the factories and from many sections. I think, however, an expert rifleman is reasonable in expecting as

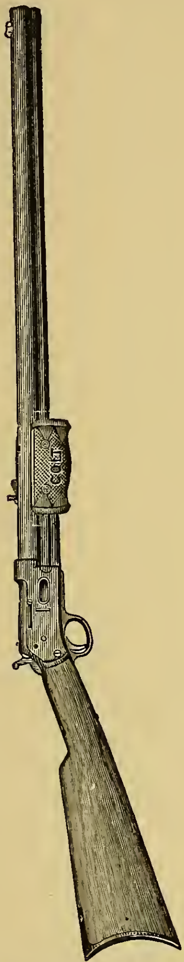


Fig. 84.—Colt's New Lightning Magazine Hunting Rifle round Barrel. Full Magazine.

Fig. 85.—Colt's New Lightning Magazine Rifle, Half-Magazine, 22 calibre.

Fig. 86.—Colt's New Lightning Magazine Rifle, Baby Carbine.

much accuracy as often placing ten consecutive shots in an eight-inch bullseye, shooting from rest with hunting rifle. I do not hesitate to say that persons are rare who can do it with any certainty or regularity, and the great majority will do it only occasionally. I consider it among the impossibilities to place 100 consecutive shots in an eight-inch bullseye at 200 yards, shooting from a rest and using a rifle properly sighted for hunting, weighing under ten pounds, and charged with factory ammunition. Express rifles are tested at 100 yards, and few of them can be depended on to do much better work than placing ten shots in an eight-inch bullseye at 150 yards.

Riflemen are inclined to compare the shooting of a hunting rifle with that of a match rifle. Many of the so-called hunting rifles are chambered for target cartridges, and when tested for accuracy, show finer shooting than can be done with a cartridge which is superior for hunting, but the tyro is likely to select the one for hunting which makes the best target. There seems to be an irresistible inclination on the part of manufacturers of rifles and ammunition to produce arms and cartridges which will do the most accurate shooting, and, as the great majority of shooters demand this, the intelligent hunter is often forced to prepare his own ammunition.

Many metallic cartridges do not contain the charges they are stated to hold; others are charged with slow-burning, weak powder, which sometimes reduces fouling, lessens recoil, adds to accuracy, but increases trajectory.

With the great variety of rifles and cartridges to select from, and the testimony offered by sportsmen, the tyro, and even the man of experience, are often dazed by the conflicting statements, and hesitate which rifle to select.

I am aware that he who is bold enough to state his opinion of the various American rifle cartridges is treading upon dangerous ground; and I would not be rash enough to state the amount of accuracy or killing power possessed by each, for any such statement would be sure to elicit many protests and contradictions. There are a great number of cartridges to be found in the American market,

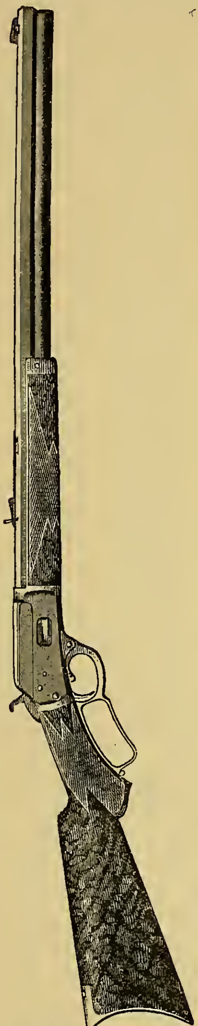


Fig. 87. — Marlin Repeating Hunting Rifle, with pistol-grip.

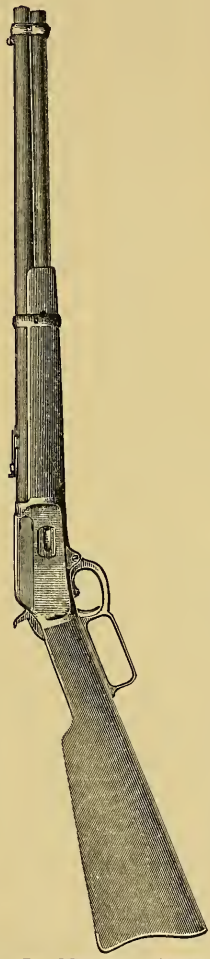


Fig. 88.— Marlin Repeating Carbine.

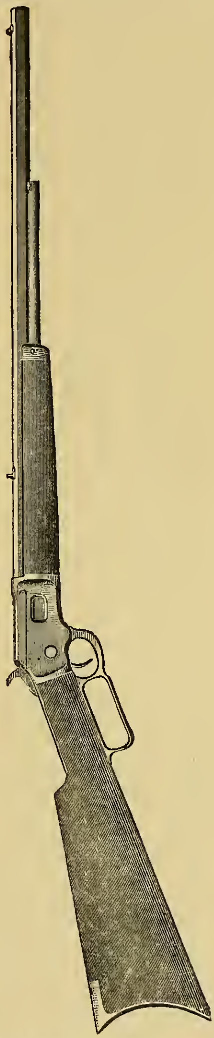


Fig. 89. — Marlin 22 calibre Repeating Hunting Rifle.

good, bad and indifferent, and American rifles of various makes are rifled and chambered for most of them, so reference will be made to some of the cartridges in general use to-day, for, if the different makes of rifles are properly made, a cartridge will shoot as well in one as another.

From my own experience and the testimony of others, I have formed the opinion recorded below, of the merits of the following factory-made cartridges used in American hunting rifles: —

The .22 short is good for small game, such as birds and squirrels. Has been known to kill a deer, but should not be used on such game; will kill animals as large as a woodchuck, but is considered unreliable on animals larger than a squirrel. The .22 long-rifle is much more accurate and possesses greater power than the .22 short. Will kill quite large game, but its use should be confined to small game, such as the .22 short is used on, the long-rifle being better. None of the other .22-calibre rim-fire cartridges now on the market are considered reliable. The .25 rim-fire Stevens special possesses great merit; is extremely accurate up to 200 yards. It has a high trajectory when shot at long range; has inside lubrication. Is thought to be the most accurate rim-fire cartridge made; has no rival so far as accuracy is concerned, unless it be the .22 long-rifle cartridge. Greater killing power than the .22, but much more expensive. There are a great variety of rim-fire cartridges beyond the sizes mentioned, manufactured, but they are for rifles not much esteemed for hunting at the present time; they have short bullets, light powder charges, and, while they shoot accurately when freshly made, at short range, they quickly deteriorate, and are unreliable at ranges beyond 100 yards.

There are two central-fire .22-calibre cartridges, the .22 Winchester, containing 13 grains of powder and a 45-grain bullet, and the .22 Maynard, holding 8 grains of powder and a bullet of 45 grains. The former has the flatter trajectory and shoots well at a distance of

100 yards, but the latter is immeasurably its superior in accuracy at 200 yards, but its flight shows a high curve.

There is but one .25-calibre central-fire factory cartridge, and that is known generally as the .25-20. Ten years ago the writer became interested in this calibre by the experiments of Mr. F. J. Rabbeth, and several barrels were made to take different charges. The .25-20 met the ideas of the writer, but was discarded by Mr. Rabbeth, who sought the extreme express system in this calibre, and, I think I may add, secured it.

The writer was greatly impressed with the work of the .25-20 in 1880, and communicated his ideas to most of the rifle manufacturers, but they all declined to manufacture it; ten years later the rifle went the rounds of rifle and ammunition makers, who were eager to produce rifles and cartridges. When the .25-20 rifle was originated, it was believed by the writer that it possessed superior merit for small game hunting; as the light bullet and large powder charge in this calibre gave a low trajectory, and satisfactory accuracy was maintained. When manufacturers of rifles and cartridges commenced producing these rifles and the cartridges for it, they disregarded the essential points in a hunting cartridge by increasing the weight of the bullet. Thus a superior hunting cartridge was transformed into an indifferent target cartridge; but happily the shells of this cartridge can be reloaded, and a light bullet used for game shooting, and a heavy one for target work.

In the .32 cartridges there are a great variety. Some of the lightly charged pistol cartridges are used in rifles by those who object to the smashing power of the .25-20. In squirrel shooting, where a shot is seldom taken at longer range than 25 yards, the value of a low trajectory is not considered; in fact, it is avoided purposely, as the high initial power necessary to reduce the curve smashes the small game too much. The .32-9-85 is sometimes used in an exclusively squirrel rifle; the .32 Smith & Wesson rifle shell is a superior one, as it can be reloaded with light or heavy powder charges.

The .32 extra-long is a good cartridge, but comparatively little used. The .32-20-115 Winchester and the .32-20-100 U. M. C. are extensively used in repeaters and some in single-shot rifles. I have shot several thousand rounds of these cartridges in various rifles, and found they had too great smashing power to use on small game at short range; were quite accurate up to 150 yards, and although they would often do good work at 200 yards, there was an unreliability about them at that range which would make me avoid them if I were to try and do good shooting at the target. These cartridges seem to do excellent work up to 150 yards, and fall off rapidly beyond that distance. All my experiments show the .25-20 the superior of the .32-20. The .32-30 Remington is a fine cartridge, and ought to have been one of the most popular American cartridges; it is very accurate, but not used extensively. The .32-40 is famous for its accuracy and low trajectory; it bids fair to retain its popularity. This cartridge is used generally on what may be termed mid-sized game: it will kill deer neatly, but I think a majority of hunters would prefer a larger calibre for large game. It has considerable smashing power at short range, but is much liked for shooting at woodchucks, loons, seals, geese, ducks, and coyotes. The .32-40 Bullard cartridge is a good one; but the .32-40 Winchester and Ballard being more generally used and higher esteemed, the Bullard cartridge is seldom found in gun stores.

There are many .38-calibre cartridges. The .38 extra-long is less popular than formerly; the .38-40-180 Winchester is more of a revolver than rifle cartridge, is fairly accurate up to 150 yards, but not to be compared at 200 yards with others in this calibre. The .38 Bullard is but little known, and but few rifles are made to take it; the .38-55 is one of the most popular of cartridges, but really

Fig. 90.—Stevens' Hunting Rifle.

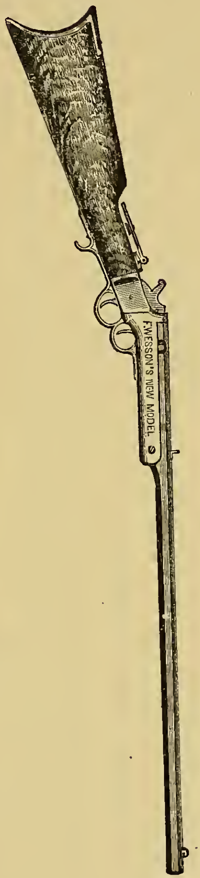


Fig. 91.—Wesson Hunting Rifle.

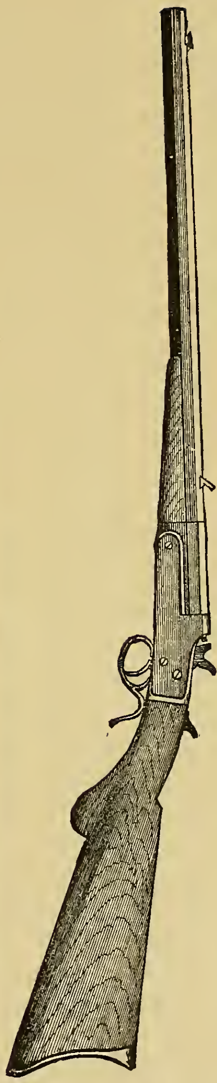


Fig 92.—Wurfflein Hunting Rifle.

more adapted for target than game shooting. If a person desired a rifle to be used for target shooting, and game occasionally, up to the size of deer, a rifle chambered for this cartridge would be a good one. The .38-56-255 is one of the cartridges that holds the amount of powder it purports to; is one of the best medium-charged cartridges I know of, combines moderately low trajectory, great accuracy and considerable killing power. It seems to kill deer, caribou, and moose well. The .38-90-217 is strictly a hunting cartridge, the result of much experimenting, and combines accuracy, low trajectory, and excellent killing power. It will shoot into an eight or ten inch circle at 200 yards when handled by an expert.

Among the .40-calibres are many for Sharps and Winchester single-shot rifles, and take patched or lubricated bullets; capable of doing fine work, but, as a rule, are more for target than game shooting; can be loaded to meet the ideas of sportsmen for a hunting cartridge; the .40-70 Sharps being especially meritorious. The .40-60 Marlin and the Winchester are good hunting cartridges, the former having a 260-grain bullet, the latter one of 210; the .40-65-260 is about the same. Many think these cartridges powerful enough for any game to be found in the United States, unless, perhaps, the grizzly bear. They will generally shoot ten consecutive shots into about an eight-inch circle at 200 yards; have no unpleasant recoil; moderately low trajectory, considering their accuracy, and kill clean, as a rule, even as large game as the wapiti. The .40-70 Ballard is good, but not so popular as the three preceding cartridges. The .40-82-260 will shoot into an eight-inch circle at 200 yards, but not so regularly as the .40-60 and .40-65. It is one of the best cartridges for rifles used exclusively for hunting, almost, it seems to the writer, the limit of accuracy, low trajectory, and power in this calibre. The .40-110-260 is an express cartridge. Will not shoot with the accuracy of the .40-82. Not very reliable much beyond 150 yards, but a killing cartridge at short range. The .41 .42, .43 and most of the .44 cal. cartridges are confined to obsolete arms and pistols. The .44 Winchester, model 1873, has probably killed more game than any other American cartridge, but its popularity is less than formerly. It has been much liked by those desiring one cartridge for revolver and rifle, but it has a great curve when shot at long range, and does not compare in accuracy with some other cartridges at 200 yards. It is accurate up to 150 yards, but more modern cartridges are considered vastly superior to this; but its light recoil and the great number of repeaters made for it insure a continued popularity to what I consider an inferior hunting rifle or cartridge, which I refer to as one and the same.

The .45-calibre offer also a variety of cartridges; the .45-75-350 has probably killed more large game than any other cartridge. It has killed thousands of times with a single shot nearly every kind of big game found within the borders of our country. It shoots with great accuracy up to 800 yards, and when designed was considered a superior hunting cartridge, a reputation it has never lost. The .45-60-300 combines accuracy and considerable killing power. The .45-70-405, and also with 500-grain bullet, possesses great and accurate range, good killing power, but has a high trajectory. I will refer later to the practice of sportsmen of reloading this and other cartridge-shells to make fine hunting cartridges. The .45-90-300 is one of the best — many believe it to be the best, — factory hunting cartridges to be found in America. It is the result of much experimenting, and is accurate, has a low curve, and great killing power. The .45-125-300 is an express cartridge not especially accurate beyond 150 yards, and largely used in rifles sold in India. The .45-85 is not so good a cartridge as the .45-70 or .45-90. There are other .45 shells for Sharps rifle, containing various charges, but are growing less popular as the rifles taking them become obsolete. In .50-calibre the 50-110-300 is a very powerful express cartridge of limited range. The .50-95 is much more accurate than the .50-110, and better for American game; it will shoot well up to about 300 yards.

Doubtless most of the arms classed as hunting rifles are shot with factory-made cartridges; but there are thousands of intelligent sportsmen who are far better qualified to judge of the essential features in a hunting rifle and cartridge than the manufacturers. The manufacturer's problem is largely to solve the question of cost in manufacturing. How can the best-looking, finest-shooting rifle be made for the least money, is constantly before the producer. The sportsman takes the rifle and seeks game; as the result of his experience he forms opinions as to the proper arm for hunting, and often presents them through the columns of sportsmen's journals. With the target shooter, the one feature above all others is accuracy. As a rule he will not complain of weight, cares little how high a curve the bullet takes in its flight, will clean a rifle after every shot, use any kind of sights, stand recoil, perform any amount of labor if he can only make the rifle shoot well. I believe fully twenty shots are fired at an inanimate target to one at live game; even the hunter, according to my observation, shoots ten shots at a mark to one at game. Almost all the testimony submitted to manufacturers of rifles and ammunition bears upon the wonderful accuracy of rifles or cartridges, and, if occasionally a protest is entered against the unfitness of these for hunting, it is offset by several testimonials of killing, with a target rifle and cartridge, some game at a distance the old hunter would seldom shoot at.

It seems as though we are fated to have the great bulk of factory-made cartridges suitable for target-work, and only a small proportion best suited for game shooting. We hear of successful shots at game, and seldom of the misses; but the investigating sportsman who overshoots his game, or fails to kill it when hit, is likely to quietly look for the cause of his failures, and try and remedy the trouble. If his appeals to manufacturers are unheeded, it is natural that he should seek to perfect his arm or ammunition.

The charge has often been made that the muzzle-loading rifle is superior to the breech-loader, because the former can be loaded with various charges. I think, so far as the charges can be made to shoot accurately, this can be easily accomplished in the modern breech-loading rifle. It is but simple justice to manufacturers to state that undoubtedly the factory-made ammunition is better for the majority of shooters than that which is prepared by the expert rifleman and hunter; for the manipulation of the rifle and ammunition has much to do with its success. The person who takes fifty or a hundred rounds of ammunition to the range, or from a tent in camp, and on a hot day will shoot shot after shot at a mark with rapidity, and never moisten or cool his rifle, would be no person to recommend specially prepared cartridges. The best ammunition in the finest rifle, in the hands of a good shot will do bad work if not manipulated properly.

It has been stated that, outside of the .22- and .25-calibres, there are no rim-fire cartridges in high esteem as hunting cartridges; the central-fires are more reliable and can be reloaded readily. The .22 central-fire take the regular bullets. In the .25-calibre central-fire I would recommend the 77- and 67-grain bullets. In .32-calibres there is a shell known as the .32 Smith & Wesson rifle shell. This is a superior shell, but rifles are seldom chambered for it; one can vary his powder and lead charges considerably with a straight shell like this. If a rifle is desired to shoot various charges of powder and lead, a straight shell is always preferable to a bottle-necked or tapered shell, as the latter will not hold a round or short bullet in place, if seated on a light charge of powder. There are straight shells of .38 .40 and .45 calibres, which can be loaded with different charges to reduce recoil, or the charge increased.

I am so many times asked to give advice on the selection of a rifle, I will state here my opinion in relation to rifles used wholly or in part for hunting; and at the same time mention that others, as well and perhaps better informed than myself, will very likely not agree with me. Were I to use a rifle for hunting alone, on large game, and could have but one gun, I should select either the .45-90 or the .45-70. The latter would be my choice if I could prepare my own ammunition; and the former, were I to use factory cartridges. I have experimented with the rifle for the government cartridge for several years, and feel satisfied with my choice for a hunting rifle and cartridge. I believe a .45-calibre is the best, for large game shooting, to be found in the United States. A .40-calibre is, perhaps, sufficiently large, but my choice is .45. I prefer the government shell, because it is straight and easy to procure wherever ammunition is found. I like rifles with twist for the government cartridges, because they will shoot well almost every .45-calibre bullet, from the lightest to the heaviest. The .45-90 will not shoot accurately a bullet over a certain weight; but the .45-70, with twist given by the Winchester Co., 18 inches, will spin bullets, weighing from 300 to 550 grains, with great accuracy.

Many writers have claimed that more twist than is sufficient to spin the bullet accurately was detrimental. I have not found it so, but always prefer a rifle with more twist than is necessary. I consider having a rifle chambered and rifled for the government cartridge quite an advantage over others, because it is as good a shell as can be found in America; it can be found in almost any store where cartridges are sold. It is, when loaded with the 405-grain bullet, a better cartridge for hunting than most of the regular cartridges; and the shell and rifle will shoot, I think, a greater range of bullets than any other. I experimented intermittingly for several years with hunting rifles, the various factory cartridges, and charges made up by myself. I kept a large quantity of bullets, which had killed game from the size of a fox to a grizzly bear, from rifles of various calibres, and had an interesting memoranda in relation to them; the result of my investigations were such that I had no use for a rifle, shooting anything from a deer up to our largest game, of less calibre than .40 or over .45, or that shot less than 60 grains of powder, or over 90. It has been my practice to try and learn how light a rifle could be procured, and how heavy charges could be shot from it, without flinching from dread of recoil. I was most impressed with the .45-calibre, and wanted the government shell, but objected to the heavy bullet, and commenced experimenting. The 500-grain bullet would often shoot a series of shots into a four inch group at 200 yards; the 405-grain bullet nearly as well; the 350 into slightly larger groups, and the 300-grain bullet would shoot often into an eight inch group. The latter was accurate, but its lightness and the quick twist of the rifle caused it to drift excessively.

I wrote the Ideal Manufacturing Co., of New Haven, Conn., to make me several moulds for bullets weighing 350, 330, and 300 grains, all with hollow points, and in due time received them. I found the tools were very carefully made, and the bullets, when cast, were apparently perfect. All of these bullets were tested in Winchester rifles, chambered for the .45-70 government cartridge. I shot them in five different repeating rifles and one single shot rifle, the testing being done at 200 yards with target sights, and at rest; when I had finished shooting one rifle I would wait several weeks, or perhaps a month or two, then repeat the experiments with another rifle. I would then invite some reliable shot to shoot, comparing his results with my own. Various kinds of powder were tried, and charges from 55 to 77 grains, and from slow burning to ducking powder. I also tried the Lord Keene bullet, and found it would not hit the target at 200 yards, and would open at 50 yards. The most satisfactory results, considering accuracy, range, and penetration, were secured with the 330-grain Ideal bullet, hollow pointed, and 75 grains of Hazard's FG powder. The charge has been tried on game and found very killing. The charge may be reduced to 55 grains of powder with this bullet, and very accurate and pleasant target practice secured.

Fig. 93.—45 cal. Bullet for Hunting.

One can also shoot 75 grains of Hazard's ducking powder with this bullet, and have a cartridge equal in power to the .45-90 factory cartridge, with nearly equal trajectory and greater accuracy. The illustration Fig. 93 shows this bullet.

Some of my friends have Lee rifles rechambered to take the .45 $2\frac{4}{10}$ inch straight shell, shooting 90 grains of powder, and the 330-grain hollow pointed Ideal bullet. This is also an accurate and very killing charge, and the cartridge can be used in a single shot rifle, or the Lee magazine rifle, but not in the Winchester .45-70 repeating rifle. The .40-calibre rifles are good; but the straight shells are not used in repeating rifles, and the taper shells for repeating rifles of this calibre are not so good for self-made ammunition. Besides, the .40-calibre straight shells are more difficult each year to procure.

If I wished to indulge in target shooting about as much as game shooting, and could have but one rifle, I would be satisfied with a .40-calibre chambered for the 70-grain straight shell, and with twist sufficient to shoot a 370-grain bullet; but would use a lighter bullet for hunting. If one finds pleasure in hunting both large and small game with the rifle, I think it more difficult to select the proper arm for small than large game. If one hunts in the New England or Middle States, the .45 or .40 answers for large game, and the .22- or .25-calibre for small game; but if the hunting is done in the West or South, the same rifle for large game would answer as in the other sections; but for small game, I think the .25 or .32 central fire preferable.

If the .25- or .32-calibres tear or smash the small game too much, lighten the powder charge; but keep in mind when you do this you increase your curve, and, in taking long shots, your liability to over or under shoot is greater.

I have experimented some with round bullets in hunting rifles, but, with one or two exceptions, the results were very disappointing: even in the exceptions, where fair results were obtained, I concluded that it was far better to resort to a .22- or .25-calibre rifle than try and shoot round bullets out of a large calibre. Modern rifles have too quick twist for round bullets; and I prefer to lighten the charge rather than employ the spherical projectile, which at best can never equal the elongated bullet.

A question which occupies the mind of a sportsman when choosing a hunting rifle is, whether to select a single shot, a repeater, or a double-barrelled rifle. The Colt's Patent Fire Arms Co. formerly made a double rifle; but its manufacture was discontinued some time ago, and this style of rifle is now made only to order in America. It calls for the very highest skill of the gunmaker to build a double rifle. There are but few gunmakers who can successfully accomplish it, and the cost is excessive. I do not believe there is a double rifle made which will equal in accuracy the single shot or repeating rifle. The accurate range of the double rifle is limited; and however suitable for hunting in Great Britain and India, it is not popular, and probably never will be, for hunting in America. It is said that there are one or two riflemakers in England who can make a double rifle so perfectly that both barrels will shoot well on the same elevation, and shots from right and left barrel can be fired into a bullseye of regulation size. Even the makers of double rifles, with a world-wide reputation, are obliged to use the greatest care in putting the barrels together; to often shoot, take apart and rearrange them, in order to regulate the arm so as to have both barrels shoot on the same line of elevation, as well as to keep the shots from crossing or shooting out. It is doubtless within the reach of mechanical skill to build a double rifle so it will shoot sufficiently accurate for hunting purposes, when the game is shot within 150 yards; but I have yet to see the double rifle which will shoot with sufficient accuracy to suit most American sportsmen.

I have referred in previous papers to the localities in this country where game must be shot at long range. It is known that in many sections most of the game is killed within a range of 100 yards; but it is also a fact that caribou in the barrens of Maine and New Brunswick are often shot at a distance beyond 250 yards, and antelope on our plains are many times killed from 200 yards upward. I have seen antelope killed with a shotgun; but my experience and the testimony of others lead me to believe that more of these animals are shot at a range of over than under 200 yards. The big-horn and mountain-goat are often shot at long range, but the Virginia deer and moose are chiefly killed within 100 yards.

I do not mean to hint that a double rifle cannot have range; of course it can. I think no double rifle can have anything like the accuracy of a single shot, and believe the double rifles do not possess accuracy enough for hunting certain game found in America. I think there is no rifle in the world equal to a fine double English express for shooting dangerous game at short range, when quick shooting is essential, and it would be difficult to fire more than two shots. This kind of game is not to be found in America. A double rifle of weight suitable to be carried, must have quite light barrels; and any double rifle, weighing from seven to eight pounds, must be a delicate instrument, quite liable to be injured in a rough country. It is well known that a slight blow on a heavy rifle barrel may easily affect its shooting qualities, and it will be easily seen that a light double express is more liable to get out of order than a rifle with a heavier barrel.

I have never yet seen a double rifle which possessed accuracy enough to place ten shots, five from each barrel, alternately, in an 8-inch bullseye, at 200 yards, aiming at one spot. Some of the experts who test double rifles, are so familiar with their idiosyncrasies, they can make allowance for the spread of the shots; or shooting outward, and, by aiming differently for right and left barrel, place the shots well together. Double rifles have their uses, but are not the best suited for all-round shooting in the United States. This is recognized by American sportsmen, and the question generally is, whether the arm for hunting should be a single shot or a repeater. Both arms have their special features of merit, and the question is to some a perplexing one.

Some of the points in favor of a single shot over a repeater are considered to be as follows: less dangerous, less complicated, and less liable to get out of order; will shoot a greater variety of ammunition; will shoot uncrimped ammunition, patched or unpatched bullets; will permit of the use of a longer barrel; an explosive bullet can be used; a greater range of rear sights on tang can be used.

The chief claims for a repeater are, greater rapidity of fire and a reserve of several shots.

There could be collected from the advocates of each system, enough testimony to fill several volumes, and the unbiassed investigator could perceive potent points in each. There is no denying that each system has its advantages and disadvantages. The single shot rifle has, perhaps, a greater number of advantages, but those of the repeater are more important. For target shooting, the person using a repeater against a single shot, is handicapped; but the person who can own but one rifle for hunting and target shooting, had better take the single shot.

I have collected a large amount of testimony from hunters in many sections of the United States, which, with my own experience, forms the basis of my opinion expressed in the following remarks in relation to hunting rifles. The first point to be considered is the question of safety. It is undoubtedly true that an accident is more likely to occur with a magazine than a single shot rifle, for the reason that improper ammunition may be employed. For many years I was a firm advocate of a single shot rifle, and opposed to a magazine, chiefly because I thought the latter dangerous to use. For years I investigated every case of accident with a Winchester magazine rifle I heard of—once riding forty miles in Dakota to find what I supposed would prove evidence that the Winchester repeater was dangerous. In every instance I found it was carelessness which caused the accident. In the case referred to, the party had used too small primers. It is not safe to use copper primers or pointed bullets in the tubular magazine of a repeating rifle; the shells should be solid head, with pocket sufficiently deep to allow the primer to be seated below the surface of the head of the shell. Care should always be taken in reloading cartridges, to have the primer properly seated, and the bullet should have a flat point.

Any magazine rifle is more likely to get out of order than a single shot, as there is so much more mechanism; but the improvements which have been made reduce this liability to a minimum. Ammunition which is likely to give more accurate shooting, can be better used in a single shot than in a repeating rifle; but it is certain that cartridges can be prepared containing the requisite amount of accuracy, and, as to the sights, effective ones can be employed, even if slightly less accurate.

For several years I thought a single shot Sharps .45-calibre rifle the king of weapons. It had done such fatal work I had a sort of reverence for it. I also had a .40-calibre Maynard rifle, which had quite a record on game; but my Sharps was, in my eyes, the most perfect of all hunting rifles. It was the 1874 model, with outside hammer, and I was inclined, in my exuberance of youth, to assert I could, when accuracy was considered, shoot it, and score as many points in a minute as any one with a repeating rifle of the same calibre. I shot a number of friendly matches with hunting companions, and the result was such that I continued to assert that one familiar with a single shot rifle, could equal the accurate fire from a magazine. This is, to some extent, true to-day; but certainly an expert in the use of the repeater can deliver accurate and more rapid fire than one with a single shot rifle.

In the friendly contests alluded to, the shooting was generally done at about 100 yards' range, and the target was often a barrel-head or a wooden box. I would load the rifle, and with my left hand full of cartridges, sometimes some in my mouth, besides a number in the pocket of a shooting-coat, I would commence firing. As soon as the rifle was discharged I would throw down the lever, the extractor throwing out the shell, and I could drop the fresh cartridge into the guide which led to the chamber; and while the cartridge was sliding into the chamber, I would be reaching for the lever, and almost as soon as the cartridge was in its place the lever would be closed, and the piece cocked and at my shoulder, the whole operation being performed almost as rapidly as operating the lever of a magazine rifle. I calculated on my opponents not being able to resist firing rapidly, which would cause them not to sight properly — something they would almost invariably do, or to fire so quickly as not to recover from the shock of the recoil before the next shot; and although more shots were fired with the repeater, they were less accurately delivered, the target being frequently missed. I utilized the time necessary to recover from the shock of the previous discharge in manipulating the rifle. I frequently, when shooting antelope with this rifle, would, when reloading, drop the cartridge from my hand, which would be ten inches away from the chamber, and it would slide into its proper place, permitting me to reload so rapidly as to fire three or four shots before the game was out of range.

Several times in the course of my hunting experience I have shot at deer or antelope, and had them stop for an instant, presenting a fine mark, while I, with numbed fingers, was fumbling for a fresh cartridge. Those who have hunted antelope know the habit they have of stopping short, wheeling about, and gazing for an instant at the hunter; and, as the shot is fired, they will seem to lose their heads for a second, bunch together in a confused mass, and then vanish like phantoms; and this on the plains, where the sky and ground seem to meet.

I was hunting in Dakota several years ago, and made for a small river. I crept through the cotton-wood growth which fringed the banks, hoping to get a shot at some geese which I noticed had dropped into the river. Suddenly, from the opposite side of the river, there was a mighty rush, and a deer plunged wildly up the bank. I had a Maynard rifle in my hands, and shot and missed the deer. It reached the top of the opposite bank and stopped, side toward me, for an instant, presenting a silhouette figure and a fine shot. It was very cold, and I was heavily clad with a thick reefer, which was buttoned snugly about me, had on buckskin gloves, and my cartridges were in my outside pocket. Before I could reload my rifle the deer had disappeared, and I was muttering, "If I only had a repeater." This incident, with several others alluded to, convinced me that many times a person will lose game if he is armed with a single shot rifle, which he could secure if he had a repeater. But, knowing this, I could be perfectly happy and contented if I were in a good game country where the game was chiefly deer, elk, and antelope, and had a single shot rifle; although, in cold weather, a repeater is a great convenience, for it is a difficult operation to load a rifle hurriedly with fingers stiffened and numbed with cold.

The chief value of a repeating rifle seems to me to be in hunting dangerous game, such as the grizzly bear, and the cougar; occasionally a wounded moose, elk, and black bear will turn on the hunter. I could relate scores of cases where hunters have lost their lives or been terribly lacerated and crippled by charging wounded animals. A double rifle will fire two shots, but there are hundreds of cases known where several shots were necessary to kill wounded game. A repeater is now a much more powerful arm than formerly, and, if hunting in company, a shot at a grizzly, if not fatal, generally checks him for an instant in charging, and often a companion can then fire the fatal shot.

I think I am correct in saying that a majority of American sportsmen now recognize the superiority of the repeating rifle over the single shot or double rifle for game to be found in the United States; there are disadvantages in it, but its special advantages will make it the chosen arm for large game. The use of a repeating rifle is chiefly confined to a hunting rifle.

CHAPTER X.

TARGET RIFLES. — RIFLES FOR OFF-HAND AND REST TARGET SHOOTING.

A RIFLE best suited for target shooting exclusively would be quite different from one for hunting or warfare. In target rifles the chief object is accuracy. Trajectory, penetration, and other points considered essential in a hunting rifle are almost wholly disregarded if accuracy can be secured. There are three well-patronized departments of target shooting with rifles in America. The most popular of these is off-hand shooting with a rifle which was, until recently, classed by the National Rifle Association of America and other organizations as any rifle, which was restricted to a maximum weight of ten pounds, fitted with any style of sights, not magnifying, and with a 3-lb. trigger pull. In certain clubs the restriction on the trigger pull is removed. The second department is rest shooting, with butt of rifle to the shoulder, but the barrel supported by an artificial rest. Some of the rifles used in this style of shooting are similar to those for off-hand match shooting; they are generally fitted with non-magnifying sights, often restricted to weight, but not, as a rule, to trigger pull. The third department is shooting with rifles of any weight, telescope sights, from any style of rest; sometimes from machine rests. There are some departures in this country from the three styles of rifle shooting named, but those mentioned will describe most of the shooting done at targets, excepting the military practice, which will be treated separately.

A rifle for off-hand target shooting is chosen according to the ideas of the marksman. Some prefer a heavy arm, claiming such contributes to holding; others demand a light rifle. A few years ago it was unusual to find a target shooter using a smaller calibre than .40; now, it is a rare thing to see an off-hand target rifle over .38-calibre, and I incline to the belief that the .32-calibre enjoys a greater popularity than the .38. It was formerly considered absolutely necessary to shoot a heavy bullet and a large charge of powder, and it was nothing unusual, as late as 1885, to find men shooting long range match rifles, off-hand, charged with 90 grains of powder and a 350- to 400-grain bullet. The .40-calibre had a reign of a few years, but had to give way to the .38-calibre, which has not yet been deposed, for the reason its excellence is well known, and if one wishes to indulge in both rest and off-hand shooting with one rifle, there is no better calibre.

The reader can probably easily see it is more difficult to procure one rifle best suited for the several styles of shooting I have mentioned, than for any one style wholly. If off-hand and rest shooting is to be indulged in with one rifle, certain features, to some extent, must be sacrificed, which would be retained if the arm was to be used exclusively for one or the other style of shooting. I will record what is considered desirable in a rifle to be used in the several styles of shooting by a majority of riflemen I have met.

A rifle for target shooting seldom weighs over ten pounds or under eight; a majority prefer between nine and ten pounds. The Schützen rifle sometimes weighs fifteen pounds; those are used almost wholly by German-American Schützen clubs, are barred from many American clubs, and are far less popular than the rifle weighing between nine and ten pounds, which is the weight of most rifles used by Americans. The length of barrel for off-hand range shooting is seldom over 30 or under 28 inches.

The weight of a target rifle is almost wholly governed by the size of the barrel, and the position a person assumes when aiming generally determines whether a light or heavy barrel is preferred. Most persons who shoot in the hip and body rest positions prefer a heavy barrel; those shooting with left arm partially extended, a barrel of medium weight, while those holding the left arm fully extended generally show a preference for a light barrel. The most desirable point in an off-hand target rifle is balance; by that I mean the barrel of such weight that when the rifleman takes the position he assumes when sighting, the muzzle will not be so light as to prevent holding the rifle still, or so heavy at the muzzle that the butt cannot be held to the shoulder easily. The question of sights is one governed by preference, and the various styles have been described in a previous chapter.

There is one thing about target rifles which, personally, I could never see any good reason for, and that is the Swiss butt-plate. Probably it helps the person who shoots with the hip rest position, and balances the rifle on the tips of the fingers; but, by the use of this butt-plate, a marksman accustoms himself to shooting with the butt more on his arm than on his shoulder. There is a natural place provided for placing the butt of a gun or rifle; and I believe a person can shoot better, stand recoil, and have the nerves less affected if the butt is placed on the fleshy part of the shoulder rather than on the muscles of the arm. If the shooter of the target rifle with a Swiss butt-plate attempts to shoot a heavily charged hunting or military rifle, he is likely to receive a shock that will not only cripple him, but cause flinching, that most fatal of all habits for a rifleman to contract.

I have alluded to the change of opinion, during the past few years, in relation to the proper calibre for off-hand shooting. I think intelligent American riflemen have almost unconsciously arrived at a conclusion that

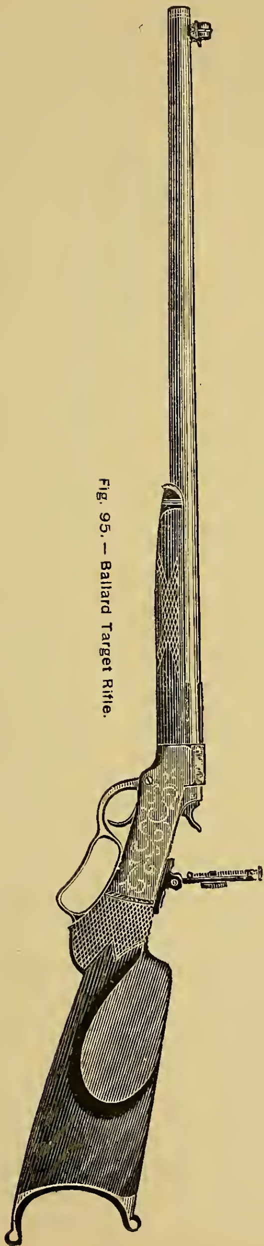


Fig. 95. — Ballard Target Rifle.

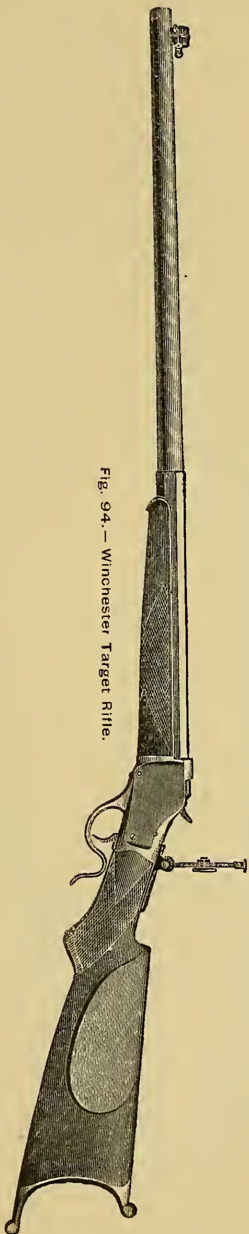


Fig. 94. — Winchester Target Rifle.

each individual must determine the question of the proper calibre for off-hand shooting, and it is not a question of what calibre shoots best, but what calibre can be shot best by different persons. With the weight of rifles commonly used by American riflemen, I believe a .38- or .40-calibre will shoot more accurately in various weather conditions out-of-doors, at 200 yards, at rest, than any calibre over or under those named; but I also believe that nine men out of ten will shoot off-hand at the target much better with calibres under than over the .38. The general reduction of calibres and charges is the reason for the wonderful skill and improvement in off-hand target shooting in America. There are comparatively few persons who care to visit the rifle range and shoot 50 shots with a heavily charged target rifle; it is extremely fatiguing, the nerves of the average person are shattered by excessive recoil, and soon there is an almost unconscious and uncontrollable inclination to flinch, and bad marksmanship and injury to the health result.

With a rifle charged so as not to give unpleasant recoil, the marksman fires double or treble the number of shots; he often ceases to shoot, when darkness compels a cessation, and thus receives the exercise with no injurious strain on his nerves, and secures so much more practice that improvement is almost sure to follow. Although the statement may seem absurd, it is a fact that some men of strong physique can shoot a .22-calibre more accurately than a .45-calibre, at a distance of 200 yards; and most of the best target shots of America can make much higher scores with a .32 than a .45-calibre. There is abundant evidence to show that the most accurate shooting rifle is not always the best for all off-hand shooting, where one's ambition is to make as high scores as possible. If one cares nothing for hunting with a rifle, and indulges in target shooting only, it would perhaps be sensible to select a rifle one could shoot best with; but if one practises at the range, to keep

Fig. 96.—Stevens' Target Rifle.

Fig. 97.—Maynard Target Rifle.

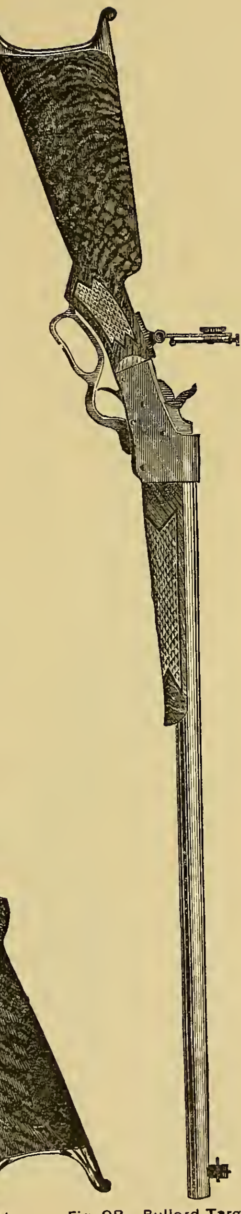


Fig. 98.—Bullard Target Rifle.

in good shooting form, the shooting of very small calibre and a light charge is likely to seriously impair skill in rifle shooting with a military or even a moderately charged hunting rifle.

It is quite generally admitted that a .38-calibre target rifle will shoot finer and with greater regularity than a .32-calibre. Wherever rest shooting has become a permanent department of rifle shooting, the various calibres have been tested with the greatest care, and by acknowledged experts. For rifles weighing between nine and twelve pounds, almost all skilled rest shooters have satisfied themselves that the .38-calibre, with about 55 grains of powder and a 330-grain bullet, gives the most satisfactory results for rest shooting at 200 yards, with an American match-rifle. Some expert manufacturers of heavy target rifles — those weighing from 15 pounds upward, — have unbounded confidence in this bore, and have made winning guns in tournaments where larger calibres contested ; but the following year, in a similar contest, a larger bore might be successful ; so it leaves the much mooted question undecided. Still, from my own observations, and the testimony of riflemen from many quarters of this country, I form the impression that a majority of American rifle-makers and shooters believe the .38-calibre is the best for a target rifle to be shot from rest at 200 yards.

The recoil of a rifle shot from a rest is more noticeable than when shot off-hand, and yet flinching is far more likely to occur with the latter. A person may flinch when shooting at a rest and not make anything like so wild a shot as he would doing the same thing in shooting off-hand. Few persons can shoot a 7½-lb. rifle of .45-calibre, charged with 70 grains of powder and a 405-grain bullet, for 100 shots at a target, without being greatly fatigued, and their nerves so shaken as to flinch or brace themselves in readiness to receive the recoil. Almost any one can shoot with pleasure the same number of shots with a

Fig. 99. — Remington Target Rifle.

Fig. 100.— Wurfflein Target Rifle.

.32-calibre, with 35 or 40 grains of powder and a 165- or 185-grain bullet, and keep the nerves in such condition as to do fine target shooting. The practice derived from shooting the latter charges or even with the .35- or .38-calibre, can be considered good training for acquiring skill with the rifle for hunting or military work.

It is generally admitted by American target shooters at the present time that there is a loss in accuracy below a certain calibre and charge; but, as the lightly charged small calibre enables them to shoot longer, keep in better condition, and hold finer, the gain is considerably more than the loss when using a lightly charged small bore. It is a mistaken idea that a .25-calibre, with 20 grains of powder and an 86-grain bullet, shoots more accurately than a .32-calibre with 35 or 40 grains of powder and the usual target bullets; or that the .32 will do finer and more reliable work that the .38-calibre. The work and targets of the .25- or .32-calibre are often wonderful, but they are selected and made under favorable conditions; and I never yet have seen regular and continuous work, in all kinds of weather, with the .32- and .25-calibre which would compare favorably with the work of the larger bores. If one aspires to become proficient as an off-hand rifle shot, with the object of using the rifle in hunting, or qualifying himself as one competent to use the rifle effectively for national defence, or even contest at the target under all conditions and at various localities, I would advise the use of no rifle in off-hand target shooting at 200 yards — of less than .32-calibre, or shooting less than 35 grains of powder and 165 grains of lead; and only a limited use of any calibre smaller than .32 at shorter range.

The second department in target rifle shooting I have alluded to as rest shooting with butt of rifle to the shoulder and barrel supported by an artificial rest. This style of rifle shooting has become very popular in America, and it has taught riflemen a great deal. Before its introduction, most of the shooting was either strictly off-hand at 200 yards, at long range, by lying on the ground, or at 40

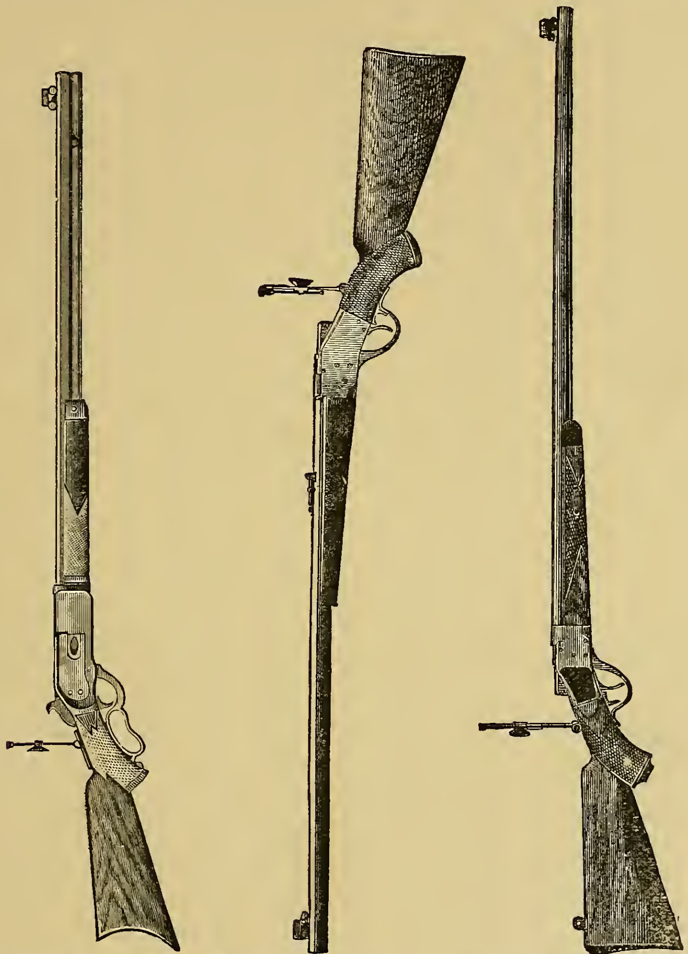


Fig. 101.—Winchester Model 1873 Repeating Rifle, with Target Sights.

Fig. 102.—Sharps-Borchardt Off-Hand Target Rifle.

Fig. 103.— Sharps-Borchardt Long-Range Target Rifle.

rods with a heavy rifle shot from a machine-rest. There were no known attempts to make rest shooting popular at

200 yards, with rifles under ten pounds in weight, and butt held to shoulder, on a fine target, until the Massachusetts Rifle Association, at the request of some of its members, introduced it. It was highly amusing to some of the riflemen to think of shooting with a rest, for it was supposed that any one at all familiar with rifle firing could shoot into the centre of the eight inch bullseye as long as desired, by resting the rifle. I well remember when Mr. F. J. Rabbeth submitted the proposition to the board of directors, the amusement it created. The rest match was authorized and similar ones have been continued ever since. To the dismay of many it was found that either from fault in rifle, ammunition or shooter, but few could keep ten consecutive shots in the eight inch bullseye; but from the initial match a number of riflemen commenced to study the rifle and this style of shooting, changing rifle and ammunition, until there has been developed a form of rifle which is considered best for this style of shooting, exclusively.

I have before stated that some riflemen use one rifle for off-hand and rest shooting, but those who essay to make high scores, sooner or later procure rifles specially adapted to one kind of work. The difference between a rifle for rest and off-hand shooting is almost wholly in the barrel. In an off-hand rifle, the shooter seeks to procure an arm which suits him in regard to balance; in rest shooting this is disregarded, but a long, heavy barrel is considered desirable. Twelve pounds is generally the maximum weight for rest rifles in the style of shooting I am now describing, and a handicap is often put on rifles exceeding that weight. The barrels are seldom over 32 inches in length and generally 30, and the calibre rarely less than .38 or over .40, generally .38. The chief advantage in a long barrel is the securing of a more certain sight. As you lengthen the barrel of a rifle you increase your liability to secure a variation in the size of the bore, and this often occurs on the last one or two inches of the barrel, making it a poor shooting rifle. Many condemned rifles have proved to be fine shooting arms by the cutting off of an inch or two from the muzzle end of the barrel.

It may be difficult for some to understand what is meant by good holding in shooting with a rest, but it is a fact that it is difficult to hold a light rifle perfectly still, even when resting the barrel on a solid rest. A heavy barrel materially aids in good holding, and therefore rest shooters' rifles are much heavier than those used for off-hand shooting. In the opinion of most rest shooters, nothing is gained beyond a certain weight, and some think a loss is apparent. Rifles for this style of shooting, of .38-calibre, which is generally used, rarely exceed twelve pounds in weight. A shotgun butt is becoming more popular for rest rifles, and most of these arms are equipped with set triggers, but provided with a safety lock. Telescope sights have of late been used to some extent, but as a rule these arms are equipped with sights similar to those used on off-hand target rifles.

There is a class of rifles much like those employed for rest shooting, which are very little used at the present time, and are quite likely to never again be popular. They are the long range target rifles. These arms generally have barrels of 32 or 34 inches in length and weigh just under ten pounds. They have a shotgun butt and the arrangement for the rear sight permits attaching at the grip or heel. There is little or no sale for such rifles in America at the present time; the sport has declined to such an extent as to call it dead, with no prospect of its being resurrected. The rifle for rest shooting has taken its place, and the skill necessary to excel as a rest shot is thought to be as of high an order as that required to win fame in off-hand or long range shooting. A great many riflemen devoted to off-hand shooting cannot find the pleasure in shooting with artificial rest that they can off-hand, standing with no artificial aid; but there are few intelligent devotees to the sport of rifle shooting but that recognize that the introduction of rest shooting has taught the fraternity more about the possibilities of rifle shooting than could be gained in shooting off-hand, and a steady improvement in rifle ammunition and the mode of manipulating the rifle has been apparent since the introduction of this style of shooting.

When rest shooting was first attempted at Walnut Hill, it was thought that the old, long range rifles could be utilized and a great advantage secured by the heavy charge of powder and lead, usually about 110 grains of powder and a 550-grain bullet. All who tried such rifles at 200 yards — and they were the most careful and skilful riflemen in Massachusetts, men who had won reputations as marksmen at home and abroad — satisfied themselves that for shooting at 200 yards the .45-110-550 would not compare favorably in accuracy with the .38-55-330, in a ten pound rifle. The impressions created by these tests were that the .38-calibre with the charge named was the more accurate; that the bullets from the long range rifle did not settle down to a flight of equal steadiness at 200 yards, but at the long ranges its superiority was manifest.

There is a class of rifles yet to be mentioned, to complete the list of those used at targets exclusively, and which is the most difficult of all to describe. They inclu[de] breech and muzzle loaders, of calibres from .32 to .65, [of] weights up to 50 or 60 pounds. In the other departments of rifle shooting in America, there is a similarity to the arm used in different classes. In this department, which I shall try to briefly describe, there is a great dissimilarity. Some allude to these rifles as muzzle loading, telescopic sighted rifles; but many modern rifles weighing less than ten pounds, used for hunting, are equipped at the present time with telescope, so this term is not proper. Probably most of the rifles of this class are muzzle loaders; it is only seldom one is found of as small calibre as .32, and there are not many of .38, though this latter bore is increasing in popularity. There are .39, .40, .41, and various regular and odd calibres. The National Rifle Club is the most representative body shooting this class of rifles, and the standard weight of rifles is 20 pounds; all competitors shooting rifles over that weight, must give ⅛ inch per pound, and under 20 pounds receive ⅛ inch per pound in each string of 10 shots. In this way the differences in weights of rifles are adjusted. There are but few rifles used for target shooting at the present time weighing over 20 pounds. As a rule, these heavy rifles are loaded with the greatest care, after which they are taken to a machine-rest, in which they are placed; the telescopic sight is trained on the target and the trigger set; the marksman then takes a seat by the side of the arm and watches the effect of the wind, as indicated by sets of long streamers placed at different parts of the shooting grounds. When satisfied the conditions are as good as likely to be secured, the trigger is touched and the rifle discharged. The devotees to this style of shooting have various opinions as to the best calibre and charges, and the rifles used are almost wholly made to order and not sold in the gun stores. I do not believe there are a hundred riflemen in America who practise this style of rifle shooting, but those indulging in it are full of enthusiasm, and, as a rule, care nothing for the other departments.

CHAPTER XI.

MILITARY RIFLES.

A RIFLE suitable for military use generally means a long range rifle, so modelled and of such weight that it may be shot from the shoulder, off-hand, at short, mid, or long range; or lying down in any position, and at various ranges.

American military rifles in use at the time of writing this chapter, are seldom smaller than .40 or larger than .50-calibre, the United States Government calibre being .45, as are most of the American military rifles manufactured by private firms and companies.

It has always been considered desirable to secure range and penetration in military rifles, consequently a heavy projectile is employed, which necessitates a quick twist in such rifles. A military rifle as shot from the shoulder must be limited in weight; therefore, when using a bullet sufficiently heavy to give long and accurate flight, with penetration, the powder charge must be limited to enable the soldier to stand the recoil; but by limiting the powder charge, a high trajectory is maintained. Thus a military rifle contains features considered undesirable in rifles for hunting or target shooting. In America, the popular calibre for a military rifle has been .45 for a number of years. The volunteers of the State of New York are armed with a rifle of .50-calibre; but, aside from this, the U. S. Army, and the volunteers of every State but New York, are armed with the U. S. Springfield rifle of

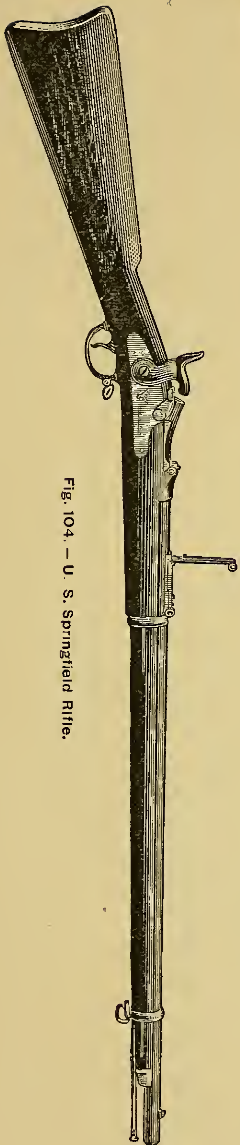


Fig. 104. — U. S. Springfield Rifle.

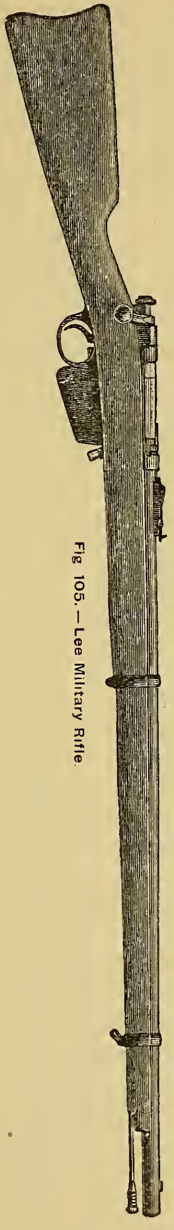


Fig 105. — Lee Military Rifle.

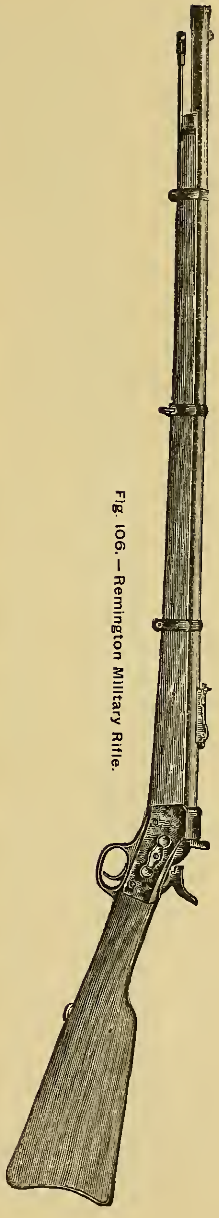


Fig. 106. — Remington Military Rifle.

.45-calibre. The U. S. Naval Department, to some extent, is supplied with the Lee rifle, taking the same cartridge as the Springfield rifle; and some branches of the volunteers are supplied with the Lee rifle. Besides the Springfield and the Lee rifles, — the former being manufactured at the U. S. Armory at Springfield, Mass., and the latter at the Remington's Works at Ilion, N. Y., — are various models of the Winchester Repeating Arms Co., made at New Haven, Conn., which find a large sale in foreign countries, and are largely used by mounted police and private guardians of peace. In addition to the various models of the Winchester Co., for infantry, cavalry, and mounted police, is the well-known Hotchkiss rifle, manufactured at this company's armory.

There are several models of American military rifles still in use, the manufacture of which has long been discontinued; these would include such rifles as the Sharps and Peabody-Martini. There are also numerous rifles which have not been manufactured in quantity, and are not likely ever to be, although, perhaps, possessing merit.

The inventor of a military rifle, or a new mechanism for such, was formerly considered a genius; but there are many intelligent American mechanics at the present time who could produce several new rifles annually, and most of the manufacturers of American rifles have numerous completed working models of military rifles which have never been introduced.

As military rifles are long range rifles and are obliged to shoot limited charges, the curve of the bullet or trajectory is very high, and consequently the soldier is very likely to shoot over or under the object aimed at. Military experts are aware of this, and they also know that success in future warfare is likely to be determined by the ability of an army to be able to fire very rapidly at the critical moment; hence, the grand problem with those endeavoring to perfect a modern military rifle is, how to

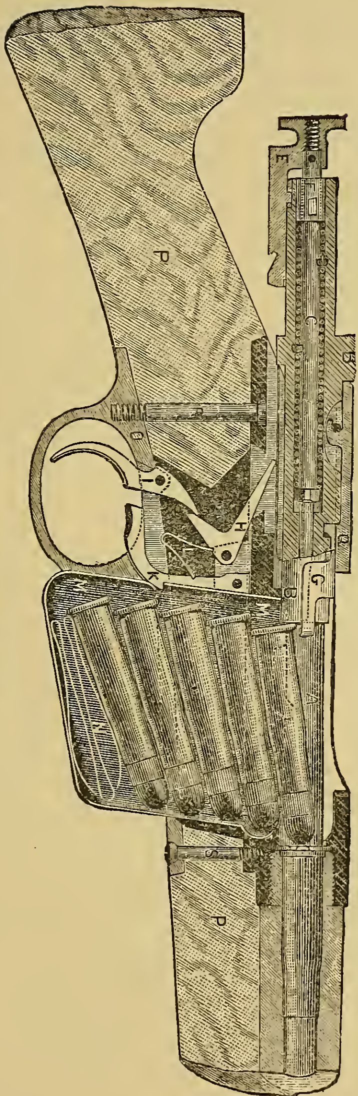


Fig. 107.—Sectional View of Lee Rifle, showing Mechanism and Magazine.

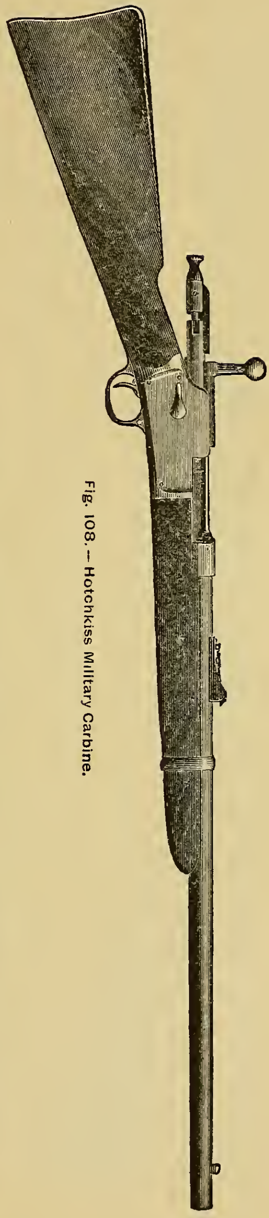


Fig. 108.—Hotchkiss Military Carbine.

lower the trajectory, keep accuracy, and a recoil that can be borne; also secure a rapid-firing rifle, which means a magazine system.

To write of military rifles at the present time is to chronicle what the rifle experts of the world know of arms which are likely to soon become obsolete. To attempt a description of the military rifle of the future would be to put on record what is undeveloped; for, in endeavoring to accomplish with the future arm what to the present time has been considered impossible with the old rifle and ammunition, —new principles must be employed.

With the .45-calibre, if range is to be retained, a heavy bullet must be used; if the powder charge is increased the recoil becomes unbearable; if the rifle is made heavier to take up the recoil the arm is unwieldy; if the bullet is lightened, range and penetration are sacrificed though the trajectory is lowered. Military authorities believe the desideratum therefore, cannot be reached with the .45-calibre with modern black powder and ordinary lead.

Recent experiments have been almost wholly in the direction of a reduction in the calibre for military rifles. In doing this it was soon noted that excessive fouling was encountered; it was seen that the projectile must be very hard and the twist of the rifle quickened. It also became apparent that beside overcoming the fouling, which would not only arise from a reduction in calibre, but by the more rapid firing, there was the difficulty of excessive smoke. Nitro powders have been recognized as the remedy for above obstacles; but such compounds have never been thought the best for rifle powders, and can be used in certain charges only with metallic-jacketed bullets. This form of projectile is thought to be less accurate than those of lead, and so wearing on the rifle as to quickly destroy its effectiveness.

It is claimed by the advocates of modern small-bore military rifles that the favored calibres, .30 and .32, are

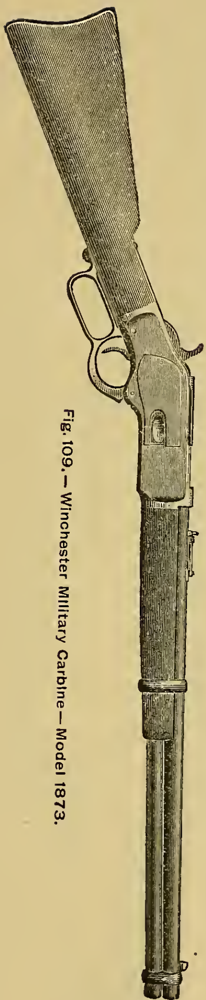


Fig. 109.—Winchester Military Carbine—Model 1873.

Fig. 110.—Winchester Military Carbine—Model 1886.

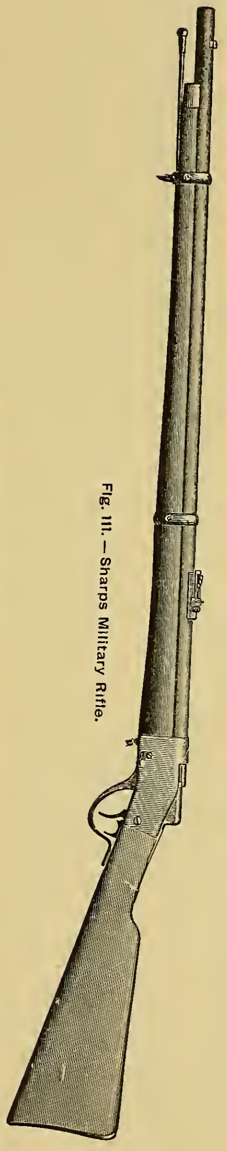


Fig. 111.—Sharps Military Rifle.

Fig. 112.— Winchester Military Rifle — Model 1873.

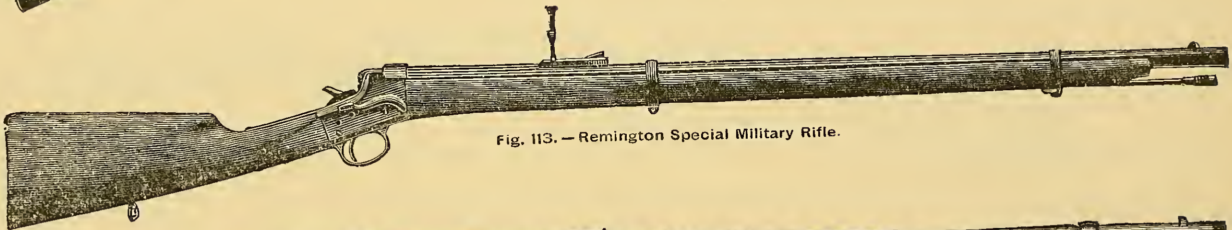


Fig. 113.— Remington Special Military Rifle.

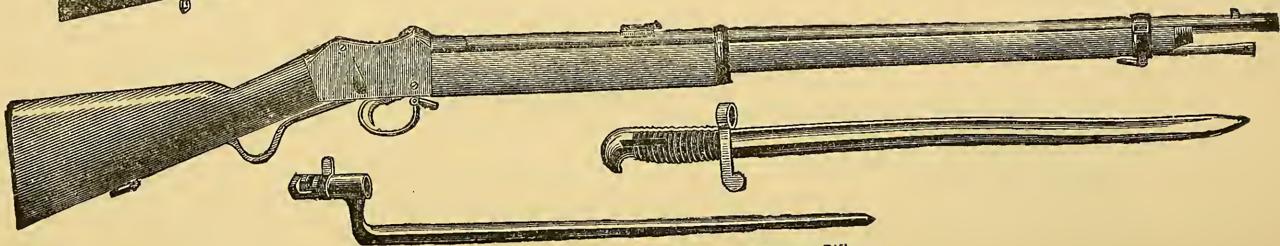


Fig. 114.— Peabody-Martini Military Rifle.

calculated to wound rather than kill, which is desirable. It is stated that the soldier can carry a much larger amount of ammunition with the modern small calibre; but to offset this advantage is the fact that if armed with a repeating rifle a soldier shoots much more ammunition.

I have yet to meet the well-informed military rifleman who believes that any small bore military rifle of .30 or .32-calibre, or cartridge for same, has yet been devised which equals the .45-calibre rifle with the ammunition at present in general use.

Most riflemen believe the future military rifle will embody a magazine system, and few doubt the bore of it will be smaller; indications point to a detachable magazine for the future American military rifle, and a bolt system rather than a lever.

Expert riflemen have seen no great improvements in nitro compounds for rifles, and unless the future develops improved compounds the indications seem to point to no smaller calibre than .38, and a powder between the present black compound and the uncertain nitro powders, which, so far as applicable to the use of rifles, seem undeveloped.

CHAPTER XII.

A POCKET RIFLE.

Among the numerous styles of firearms produced in America is one which seems like an overgrown pistol or a miniature rifle, which, so far as I know, is peculiarly an American invention, certainly only made in this country in quantity, and is known as a pocket rifle. These arms were for many years manufactured by Frank Wesson at Worcester, Mass., and J. Stevens & Co. at Chicopee Falls, Mass., also for a brief time by the Bay State Arms Co. at Uxbridge, Mass. For some time past Mr. Wesson has gradually decreased his products, and at present he has almost ceased manufacturing; the Bay State Arms Co. was discontinued, but the J. Stevens Arms and Tool Co., successors to J. Stevens & Co., has increased its producing capacity, suggested new ammunition, and altered the twists of its pocket rifles to shoot the modern small bore cartridges, so that at the present time all pocket rifles but the Stevens' are nearly obsolete, shooting cartridges which are not esteemed by riflemen; but the Stevens' pocket rifles taking the cartridges suggested, and favored by practical riflemen, stand without a rival. It was years before I was attracted to these little arms, and as I look back and remember the aversion I had for them, I think the cause of my dislike was because of the poor ammunition advertised to shoot in them.

Several years ago I was indulging myself with a fishing trip, and one of the days the weather being unpropitious, the rod was rested and I was casting about for some amusement, when my friend and host noticing my plight, said: "Why don't you get my little pocket rifle and shoot at a target? I have plenty of cartridges." This was irresistible for a person who loves to shoot, and in a brief time I was being initiated into the shooting of an 18-inch Stevens' pocket rifle. I was amazed at its accuracy, and my investigations at that time continued until my friend's cartridges were exhausted. The interest created in this class of firearms was awakened, and some time ago I commenced investigating and testing them to learn their capabilities with modern cartridges.

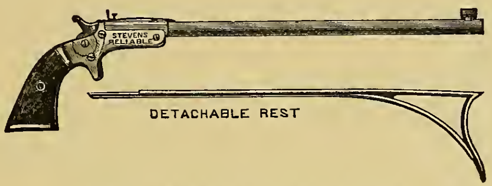


Fig. 115. — Stevens' Reliable Pocket Rifle.

There are two models manufactured by the J. Stevens Arms and Tool Co., which are esteemed by sportsmen, and are known as the Hunter's Pet rifle and the New Model Pocket rifle. The Hunter's Pet rifle is made with barrels from 18 to 24 inches, in calibres from .22 to .44, rim or central-fire cartridges, and weighs from 5 to 5¾ pounds. There can be one or more barrels fitted to one stock, permitting interchanging, and, if desired, a shot barrel, chambered for the .38, and .44 central-fire shells or the 20-gauge shot shell can also be made to interchange with the rifle barrels. The New Model Pocket rifle is made with barrels from 10 to 18 inches in length, in .22-, .25-, and .32-calibres, and weighing from 2 to 2¾ pounds. Both the Hunter's Pet and New Model Pocket rifles are fitted with various styles of sights, and one can have target, hunting or combination sights. There is also another model known as the Reliable Pocket rifle, made by the Stevens Company, which is still smaller than those mentioned. It has a 10-inch barrel and is made in .22-calibre.

Some pistol shooters have devised ways of converting their pistols into pocket rifles, by attaching a skeleton stock to the pistol and generally adding a long barrel.

In experimenting with these little arms, I soon formed the opinion that arms so light and compact as these were best adapted to small calibres. It is a fact that a Hunter's Pet rifle will shoot a cartridge as heavy as the .44-40-200 Winchester astonishingly well, but I always preferred a regular rifle for such ammunition; and as the .22 and .25 rim and central-fire cartridges seemed to be the legitimate cartridges for pocket rifles, I gave my attention to such almost wholly.

My experiments with the Hunter's Pet rifle were conducted at Walnut Hill, and were with four different barrels; three barrels were of 22 inches in length, two of which were for .22 and .25-calibre, and for the rim-fire cartridges, another for the .25 central-fire cartridge, and the fourth for the latter cartridge, but the barrel was but 18 inches long. The rifle was fitted with a Lyman sight on grip, and an aperture target sight on barrel. The shooting was at 200 yards with rest, and the plan adopted for testing the various barrels was as follows: three targets were thrown up from the pits, and as many riflemen did the shooting. As the sighting would be different for each, no attempt was made to keep the shots in the bulls-eye, but the shooting was for groups.

The first trial was with the .25-calibre rim-fire cartridge in 22-inch barrel, weather conditions good, there being but a light wind. Three groups of ten shots each were fired. In the best group, the ten shots were on or in a circle 10⅞ inches in diameter; nine of them on or in a 6½-inch circle, and five on or in a 2⅞-inch circle. The second series were grouped on and in a circle 10⅞ inches

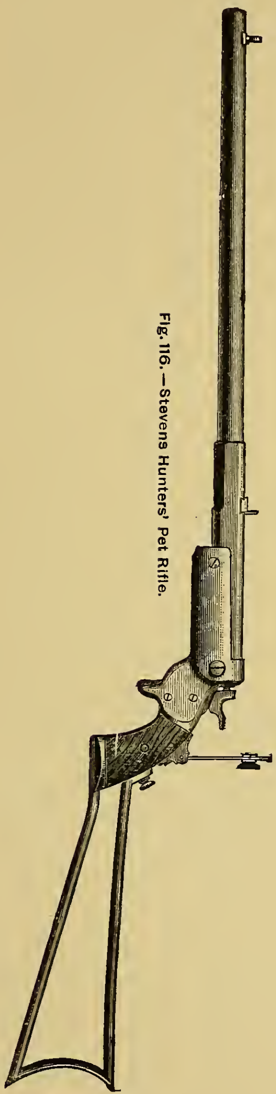


Fig. 116.—Stevens Hunters' Pet Rifle.

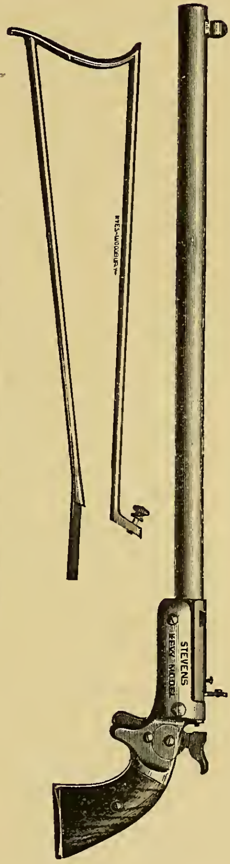


Fig. 117.—Stevens' New Model Pocket or Bicycle Rifle.

in diameter, and half of them in a 3⅝-inch circle. In the test, ammunition was used that had been on hand over a year. Both groups were enlarged considerably by one shot, which, if it could be properly eliminated, would show groups fine enough to satisfy most riflemen using a regular rifle, if taking such ammunition.

The second test was with the .25-calibre central-fire cartridge in the 22-inch Hunter's Pet, at 200 yards, with the regular charge of powder and the 86-grain bullet, three groups being shot. The best group showed ten shots on or in a 7-inch circle, and five in a 2¾-inch circle. The next best showed ten shots on and in a 7⅛-inch circle, eight of which were in a 3¾-inch circle, and five in a $1\frac{3}{16}$-inch circle.

While sighting the .25-central-fire barrel, after changing from the .25-calibre rim-fire barrel, in order to get the groups near the centre of the target, it was found that the shots were key-holing badly, one going through the target its entire length sideways, and most of the others tipping, and, although the groups were satisfactory, more than half of the bullets were staggering. In fact, it was a repetition of all previous experiments with the 86-grain bullet in this calibre. Perceiving the staggering bullets, the 75-grain bullet was substituted, and thirty more shots fired in series of ten shots each. All indications of tipping of bullets at once disappeared. The best groups showed the ten shots on and in a circle 5⅝ inches in diameter, eight shots in 2⅜-inch, and five shots in 1⅜-inch circle. The next best group was in 7¾ inches, and five shots were in a 3-inch circle.

The 18-inch .25-calibre barrel was then attached to the stock, and shot with the 75-grain bullet, and the ten shots were on and in a circle $7\frac{11}{16}$ inches in diameter, nine shots in 5¼ inches, and 5 in a 3¾-inch circle.

The .22-calibre 22-inch barrel was then attached and shot with the long-rifle cartridge of U. M. C. Co.'s make.

The best ten shots were on and in a 7⅞-inch circle, and five of the shots in a 3⅞-inch circle. It was the opinion of the three riflemen who shot the different barrels, that with good weather conditions one could very often place ten consecutive shots in the regulation bullseye at 50, 100, and 200 yards, with any and all of the barrels from 18 to 22 inches in length, and often much finer shooting could be done. In shooting the above scores of shots it was at once seen that if a less number of shots than ten were taken as a test of the shooting qualities of the barrels, much finer results could be presented. To illustrate: while shooting the ten shots with the 18-inch .25-calibre central-fire barrel, the writer remained in the pit while the shots were being fired from the rest at the shooting pavilion. After each shot was fired the target was lowered and the shot numbered. The first five shots were on and in a circle 3¾ inches in diameter; the first seven shots in a group 5¼ inches in diameter, and the tenth shot enlarged the circle to $7\frac{1}{16}$ inches. Before the shooter saw the target, and immediately after he fired the tenth shot, he called the shot as low, caused by a perceptible but uncontrollable movement at the instant of firing. Nearly all the groups were considerably enlarged by one shot.

Experienced riflemen can make their own deductions from this shooting, but to those of little experience I would say, it is much more difficult to shoot a light rifle, or a rifle with a light barrel, than a heavy one, especially from a rest; the shorter the barrel, the more difficult it is to shoot and greater the uncertainty in sighting. All of the above shooting was at 200 yards from rest with butt to shoulder, and muzzle rested, and no cleaning of the rifle between shots.

My experiments with the New Model Pocket rifle have been more desultory, more thorough, but the results less carefully recorded than with the Hunter's Pet. The reason for this is, I have for years carried a New Model Pocket rifle with me on almost every trip I have made, whether hunting, fishing, or recreating in the country in any form. A Hunter's Pet is often more convenient to carry than a regular rifle, and the Pet shoots so nearly equal to a regular rifle that its greater compactness and portability commend it to many. But quite a number seeking these features prefer to go still further, and in the New Model Pocket rifle they find an arm with one-half the weight of the Hunter's Pet, and about the same reduction in compactness, with scarcely any perceptible decrease in accuracy.

But as to the accuracy of this latter arm I have stated that my record is less minute. All my shooting and observations with the Hunter's Pet were at the target, but with the little New Model Pocket rifle it has been both at target and on game. But as this chapter is chiefly one in relation to the capabilities of the arm, I will first refer to its accuracy. The New Model Pocket rifle, as before stated, weighs from 2 to 2¾ pounds, and has barrels from 10 to 18 inches in length, and is bored and rifled for the .22, .25, and .32-calibres; at the present time chiefly for the .22 long-rifle and .25 rim-fire Stevens' special cartridge. With the 18-inch barrel .22-calibre I have seen ten consecutive shots placed in the regulation bullseye at 50, 100, and 200 yards, and have seen the same thing done with the .25-calibre, shooting the rim-fire cartridge. At 50 yards I have seen a score of 97 out of 100 in ten shots, at rest, on the Standard American reduced target, with a two inch bullseye, made with the 18-inch, .22-calibre and long-rifle cartridge. At 100 yards, I find by my memorandum book that ten shots with this barrel, fired at that distance, could be enclosed in a three inch circle, and at 200 yards the first trial showed ten shots in a parallelogram 7½ x 8 inches. At the first trial of the .25-calibre rim-fire at 200 yards an aggregate of 92 points was secured on the

Standard target in ten shots, shooting at rest, and the second ten shots aggregated the same. With the 18-inch, .22-calibre, many scores of 45 out of 50 in ten shots, Creedmoor count, have been recorded in off-hand shooting in regular matches at Walnut Hill, and two or three 46's, these scores being in the 70's by Standard target count.

The 15-inch barrels in .22-calibre shoot nearly as well as the 18-inch, but it is a little more difficult to sight, and the 12 and 10-inch barrels, though very accurate, are still more difficult to sight, as the sights are so near together. The front sight appears to grow larger each time a shorter barrel is tried; and in shooting at a bullseye of regular size at prescribed distances, the front sight on a 10 or 12-inch barrel is much larger than the bullseye aimed at. Barrels under 15 inches in length had better be used as pistols, holding them as such in one hand.

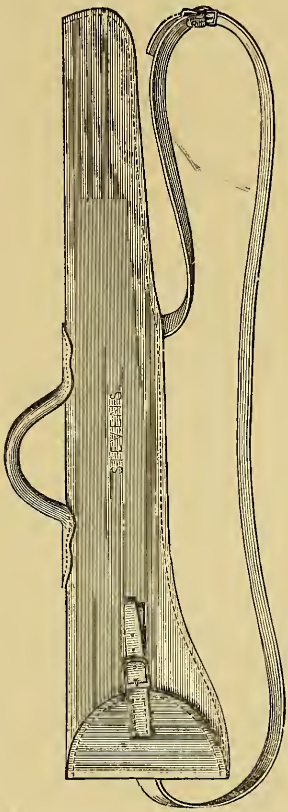


Fig. 118. — Case for Stevens' Pocket Rifles.

Many persons consider such arms as pocket rifles toys, or diminutive shooting irons solely for playthings. But they are of the greatest service for hunting, as well as a great source of amusement. A pocket rifle can be carried when a regular rifle cannot. The barrel of a 15-inch pocket rifle can be readily detached and carried with the stock in an ordinary-sized hand-bag. With such an arm, I have shot, or known to be shot, various kinds of vermin, nearly all kinds of feathered game, including the wild turkey, besides hawks, crows, blackbirds, kingfishers, and sheldrake. Several deer and a moose I know of being killed with pocket rifles, but, of course, would not advise firing at deer and moose with such arms. I know, however, one man who has killed many deer with an 18-inch Hunter's Pet, chambered and rifled for a .32-20 Winchester cartridge.

It is not my object to claim that a pocket rifle is better, or as good as a regular rifle, for, under most circumstances, they are not, but they have their uses, and at times are far better than a full-sized rifle. When hunting in a big game country they are far better to shoot grouse and other small game than a large rifle or a shotgun; they can be transported in a smaller space than a regular rifle, and when it is not convenient or possible to carry the regular rifle, a pocket rifle can be transported without inconvenience, and they are sufficiently powerful and accurate to kill certain kinds of game. Many anglers carry them when on fishing trips, and find a frequent use for them in shooting off small limbs of trees in which their lines become entangled.

If these little arms possess the merits they have been shown to have, why should not the fraternity of sportsmen know it? I have often convinced sceptical people, who insisted that the little "pop-gun" was a boy's plaything, that besides being a source of perennial enjoyment, it was of great practical value as an exterminator of predatory birds and animals; and they were always willing to acknowledge its merits when some toothsome small game was gathered in by it, and notwithstanding my penchant for big bore heavily charged hunting rifles, I think there is nothing I prize more highly in my sporting outfit than a pocket rifle.

CHAPTER XIII.

POSITIONS IN RIFLE SHOOTING.

In previous chapters I have written of the various styles of rifle shooting followed in America. In each department there are various ways of manipulating the rifle; rules often governing them. In certain styles of rifle shooting, a man may shoot the rifle in any way desired; but in the clubs which follow the national or nearly similar rules, there are certain restrictions, and among them are provisions for positions. In off-hand shooting, up to and including 300 yards, the position is generally standing on both feet, free from any artificial rest or support. Formerly a rifleman was compelled to hold the left hand in front of the trigger guard, — unless he was left-handed, when this would apply to the right hand, — but this rule has been abolished, and now a person may hold his left hand and arm fully extended as far as he can reach, or he may place it on the trigger guard, or even back of it if desired; the right hand and arm may be in any position; legs and body as desired, so long as the rifleman stands on both feet and receives no artificial support. Such shooting is classed as off-hand shooting.

A rifleman is generally able to shoot well in almost any position, if the object shot at be large and at short range; but when he aims at the eight inch bullseye at a distance of 200 yards, or one proportionally reduced at a shorter distance, it is found that it is impossible to hold the rifle perfectly still, and the attempt is made to find a position in which one can hold the rifle best. Undoubtedly the physique of a person has its influence on the choice of positions, for nearly every rifleman sooner or later decides on some position which suits him best, and takes it when shooting. Young riflemen very naturally study the posi-

Fig. 119.—Off-hand Position.

Fig. 120.—Off-hand Position.

tions of experts, but as they find fine shots shooting in various attitudes, it generally follows that they try the different positions until they find a preferred one. As a rule, if one becomes skilful in rifle shooting, the position he shoots successfully in is retained through the rifle-shooting career; though in some instances I have known men who have become good shots, to develop into phenomenal marksmen by simply changing position; others have deteriorated in skill by such change. I think a young rifleman should consider the subject of the best position to take, and when he has decided on one to continue to shoot in it. The person who often changes his position in rifle shooting, in my opinion, will not shoot so well as if he followed one mode of holding the rifle. When one becomes accustomed to holding the rifle in one way, even if it be a bad way, he can generally shoot better in that position than he can at first in a better one.

There are persons who shoot well with the left arm fully extended who would do very poor work with the rifle balanced on the tips of the fingers of the left hand and the elbow resting on the hip; and the man who was accustomed to making high scores in the latter position, would, as a rule, do poor shooting with the left hand and arm extended.

It has been found impossible to define any one position which shall be followed in rifle shooting, especially in off-hand work, and keep an interest in the sport. Many attempts have been made to compel following a certain position in target shooting, but gradually American riflemen have recognized the fact that any one selected position would be advantageous to some and disadvantageous to others; that an arbitrary definement means driving certain devotees to the sport from it, and the liberal provision of any position without artificial support, has become almost universal.

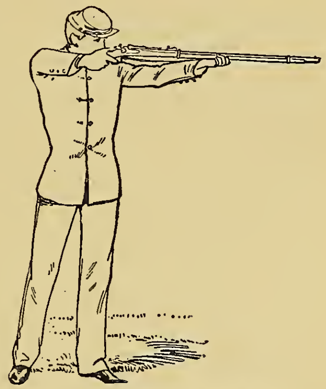


Fig. 121.—Off-hand Position.

There is a popular impression that the ungraceful and sometimes ridiculous positions assumed, when rifle firing, are confined to the rifle range. Such is not the case. It is true that many positions are to be seen on rifle ranges, which would not be chosen as models of grace; but it is because there are many assembled at one place of meeting, and the awkward positions are conspicuous. I have seen some old backwoodsmen hold rifles in most ridiculous manners, and have observed devices to assist in holding the rifle still, which would discount those seen on rifle ranges.

Anything written on positions in rifle shooting will perhaps prove more interesting to the beginner than to the veteran; but often many who have followed one style of rifle shooting for years are introduced to another style, and find themselves seeking for a position in the new department of the sport. I will therefore give the various positions adopted by some of the most famous riflemen of America in the several styles of shooting.

Figure 119 shows what is generally known as the off-hand position, with arm partially extended, and which for ease, grace, and command over the rifle, is, in my opinion, superior to all others, and worthy of imitation by all young shooters. If one desires to become expert in shooting the hunting rifle, there is no better way of holding the arm than this, and in target shooting a greater command over the rifle is secured than in most other positions. Pulsation is less noticeable in this position than in others, and there is less cramping of muscles and cords than otherwise. The temptation to gain a support for the left arm is more than many riflemen can resist, and they abandon this excellent way of holding a rifle before the muscles are well trained to the position. While I shall endeavor to avoid being didactic, I cannot refrain from urging young riflemen to try and cultivate the art of rifle shooting in this position, as certainly it is much preferable, if one indulges in hunting with the rifle. Some of the best rifle shots in America shoot in this manner; among those I remember are Mr. O. M. Jewell, Mr. A. C. White, Major C. W. Hinman, of the Massachusetts Rifle Association, and Col. Wm. E. Fitch, of Albany, N. Y., T. J. Dolan, of New York, and many other fine shots, showing conclusively that although perhaps harder, it is quite within the possibilities to shoot as well as the best in this manner.

Fig. 120 is nearly like that shown in Fig. 119, and all I have said of Fig. 119 applies to Fig. 120. It will be seen that the left arm is fully extended, and is referred to as off-hand position with arm fully extended. Fig. 121 shows the same position with the military rifle. There are some riflemen who hold the left arm a little further extended than shown in Fig. 119, and others a little less than shown in Fig. 120. Some riflemen claim that holding the rifle in Fig. 120 position strains the cords in the left arm to such an extent as to cause unsteadiness, which is relieved by taking position No. 119. I think if one can hold according to position No. 120, it secures a better control of the rifle when the wind is blowing, and there is less liability of the rifle "getting away from you," as riflemen say, which means, when at the moment the trigger is pressed the control of the rifle is lost. It appears, however, from testimony of many riflemen, that many do not prefer this way of holding a rifle on account of the strain on the cords of the arm, which extends to the back of the neck, and some even claim, affects the vision. Mr. J. B. Fellows, a very reliable and excellent shot with an enviable record, has never shot in any other manner. Lieut. W. G. Hussey, of the Massachusetts Team which visited England, shoots brilliantly in this position. Col. H. J. Burns, of California, has won a reputation as a fine rifle shot by shooting thus, so has Col. E. J. Cram, of Maine, and many others. I know many hunters who hold a rifle in this manner, and for shooting at moving objects it is undoubtedly superior to any other.

Fig. 123 is generally known as the body rest position. It is quite popular. The rifleman stands erect, inflates his lungs as he places the butt of the rifle to his shoulder, the rifle rests between the index finger and thumb, at a point just in front of the trigger guard, the fingers of the hand are tightly closed, this gives a firmness to the muscles of the arm ; the elbow of the arm in front of the trigger guard is carried nearly under the rifle, and the set and extended muscles of the arm find a natural support on the distended breast. This is the adopted position of the well-known target shot, Mr. Geo. F. Ellsworth. Many hunters adopt this position. It is doubtless less fatiguing to shoot for two or three hours at the target in this way than with the arm fully or partially extended, and for this

Fig. 122.—An Off-Hand Position of an Expert American Rifleman in 1891.

reason it commends itself to many. I am under the impression that this position is not so good for hunting as some others, and will give my reasons. I shot for several years at the target in this manner, and so much practice was indulged in that I could not shoot well in other off-hand positions. I found myself later on the plains, and when I was about to shoot at game I thought best to take another position. I tried that shown in Fig. 120, and found I could not hold the rifle satisfactorily. I would try to sight on game in position shown in Fig. 120, and being unable to hold well would assume position Fig. 119; still, not

Fig. 123. — Body rest Position.

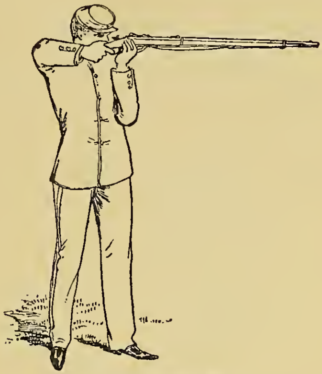
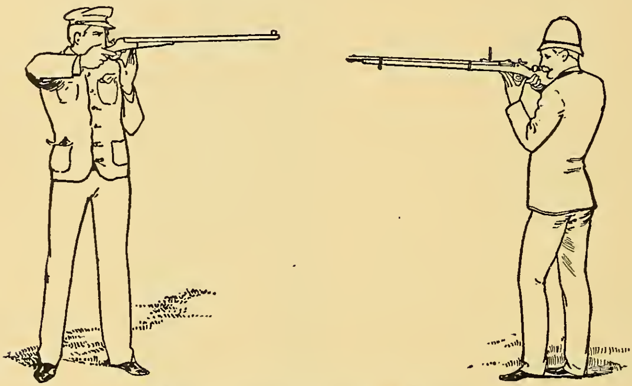


Fig. 124. — Body rest Position.

holding well, would take my regular position, Fig. 123, when I could hold well enough to kill game. I later discovered that any unusual exercise — and all who hunt are likely to take very vigorous exercise — caused increased pulsation and palpitation to such an extent as to make unsteady holding. When I attempted to shoot at moving game I found position Fig. 123 very unsatisfactory, and Fig. 120 best suited to it. Thus I became impressed with the idea that unless one confines his rifle shooting to the target, it is best to adopt a position one will use in hunting, even if his scores be lower at the target.

Fig. 124 shows the body rest with the military rifle, and a certain amount of support gained by the index finger being extended along the forestock of the rifle. Some marksmen allow the trigger guard to rest in the palm of the left hand; others, the rifle resting between the thumb and forefinger, or through the first and second finger, the inside of the arm, from elbow upward, supported against the body. Lieut. Fred Kuhnle, of California, shoots thus; so does Mr. Geo. C. Thaxter, the wonderful off-hand military shot of Nevada, and Mr. L. L. Hubbard, of Massachusetts. Of California's noted rifle shots F. O. Young, Howard Carr, Chris. Meyer, Ed. Hovey, S. I. Kellogg use this position, or one much like it. I think stout men, as a rule, prefer the body rest positions.

Fig. 125 is incorrectly called by many the hip rest position. It is a body rest position, with the rifle balanced



Figs. 125 and 126. — Body rest Position.

on the tips of the thumb and fingers. No doubt that a person can shoot a long time without fatigue in this position; and one with a delicate manipulation with a lightly charged rifle can shoot with amazing fineness at the target. New Hampshire's wonderful shot, Mr. George H. Wentworth, has made some of the finest known scores in this position, shooting a Maynard .32-calibre rifle. Some of the Massachusetts team which visited England, shoot in this manner, as well as many German American shooters, and those who do most of their rifle shooting at the target. There are some who get a natural support by combining the body rest and the hip position to a greater or less extent.

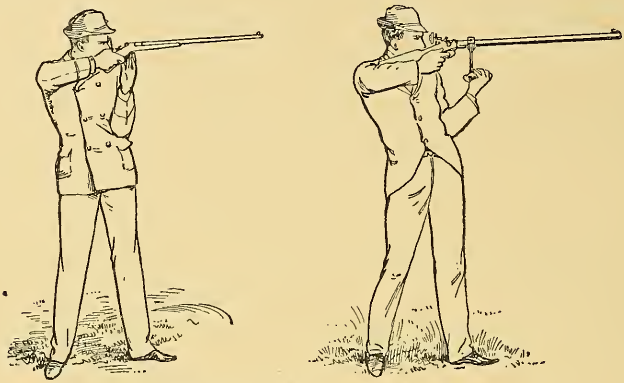
Fig. 126 shows an inclination to hip rest position, Fig. 127 shows the regular hip rest.

Certain individuals have slim bodies, long arms and fingers, and in trying positions for off-hand shooting they discovered by throwing forward the left hip, resting the elbow on it, the rifle on the tips of the thumb and first and second fingers, the former on the trigger guard and the latter just in front of the guard, they secured an almost perfect natural rest for the rifle. Such marksmen as Messrs. H. G. Bixby, of New Hampshire, E. F. Richardson, of Massachusetts, W. Milton Farrow, F. J. Rabbeth, C. H. Barstow, George R. Russell, Nathaniel C. Nash, and many other famous target shots have demonstrated what can be done in the way of target shooting in this position. This position is not a new one, as will be seen in Fig. 129, which is of an English rifleman in 1808. Some follow the mode referred to above, of resting the trigger guard in the palm of the hand, and the elbow on the hip. There is no doubt that the persons who can take the hip rest position have a great advantage in target shooting, but I think they would not be so successful in game shooting. Corpulent men cannot well adopt this mode of shooting.

When Mr. H. G. Bixby commenced rifle shooting he shot in position Fig. 120, and made good scores. He was ambitious to excel and tried the hip position and astonished the rifle-shooting world with his work, eclipsing many previous performances in target shooting. So brilliant were his scores that staid old shots were tempted to adopt his position, but most of them were unlike Messrs. Bixby, Richardson, and Farrow in form, and made unsatisfactory work of the hip rest position, and wisely returned to their old manner of holding a rifle.

Fig. 128 shows a mode of holding a target rifle practiced by German Americans and those who shoot with them. A palm rest is attached to the rifle to aid in holding. Such appliances are fitted only for target shooting, and are not popular among most of those to the manor born.

Riflemen are inclined to recommend to all, the position they have found best suited to themselves; as a result



Figs. 127 and 128. — Hip Rest Position.

many beginners endeavor to shoot in a manner not suited to their forms. The best advice the writer can offer is to select a position you think best adapted to the style of shooting you desire to excel in, trying to secure a comfortable one, then stick to it and don't change.

The longer the distance at which a rifle is shot, the greater the difficulty in shooting in an off-hand position. In America most of the target rifle shooting, up to a distance of 200 yards, is done off-hand; and beyond that range various positions are adopted. There are ways of holding the rifle which are advantageous to hunters, and preferred to off-hand; for, when seeking game, no prescribed rules are recognized; it is a question of the most reliable way of holding the rifle.

In some States the kneeling position is permitted in

Fig. 129.—Off-hand Position of an Expert English Rifleman in 1808.

military rifle practice at 200 yards; but, as a rule, this is not allowed except at 300 yards and beyond, and sometimes not until reaching the 500-yards' range.

Fig. 130 shows the kneeling position usually adopted by military marksmen. There are some slight modifications to this. The rifleman places the right knee on the ground, brings the butt of the rifle firmly to the right shoulder, places the left elbow on the left knee; the rifle generally rests in the palm of the left hand, either at a point just in front of the trigger guard or on the guard; the fingers of the left hand, as shown in illustration, are tightly closed, if preferred. Some riflemen extend the right limb, from knee to point of toe, along the ground; others place the front toes of left foot on the ground, if they wear a stout pair of shoes, and sit

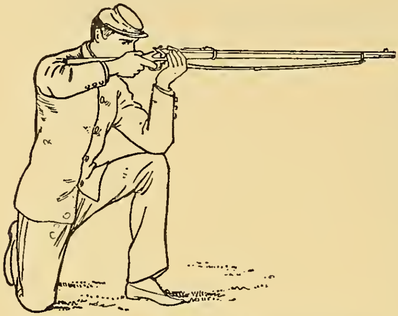


Fig. 130.—Kneeling Position (Military Rifle).

Fig. 131. — Kneeling Position (Hunting Rifle).

on the calf of the leg. This latter mode throws most of the weight of the body on the left leg, from the knee down, and on the foot. Others throw the weight of the body forward so it is largely supported by the right limb, boot, body, and arm.

Fig. 131 shows a position much used at one time by the writer, in hunting, and is from an instantaneous photograph taken when about to fire, and unknown to the shooter. There are many times when hunting, that it is impossible to stand and shoot in the off-hand position without being observed by the game; and, again, it is impossible to see the game in the prone or back position, and perhaps the sportsman has no time to take a sitting position. Fig. 131 shows an excellent way of holding the rifle under such circumstances.

I have many times endeavored to reach a certain spot, which seemed to be the nearest and best point from which to make a shot; the game, perhaps, would be restless, or perhaps stop, after the first wild rushes, to satisfy their curiosity; at such times, or under the conditions above alluded to, I have found the Fig. 131 position excellent. Dropping on the right knee would be the first movement, tightly closing the fingers of the left hand, the second, placing the butt of the rifle hard to the shoulder next; then dropping the rifle between the thumb and fore-finger, at a point just in front of the trigger guard, which would rest in the palm of the hand; the index-finger of the right hand on the trigger, the other fingers tightly closed; lungs fully inflated. In this position there would be a support from the tersely drawn muscles of right leg, arm, and hand, and the butt of the rifle pressed with considerable strength against the right shoulder, at a point as near the breast as you can conveniently place the stock. Although the muscles of the right hand are drawn taut, the index or trigger finger should not partake of that rigidity, but left to steadily but quickly press the trigger.

It is no easy matter to shoot well in the positions shown in Figs. 130 and 131, until accustomed to them. At first, one is likely to declare he can hold steadier in the off-hand position. This is because there is an unnatural strain in certain cords and muscles; but practice soon gives a steadiness, and the average person can shoot better thus than in any of the off-hand positions. One can also largely overcome the swaying of the body, caused by the wind, in the kneeling position. As one becomes corpulent, the kneeling position is more difficult. There is

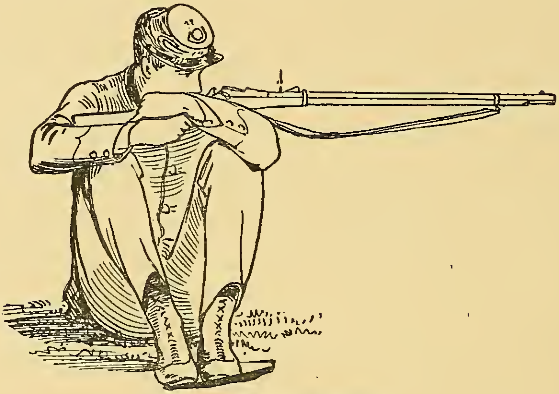


Fig. 132. — Sitting Position.

little doubt that the kneeling position is more reliable than the off-hand, and sitting is more certain than kneeling.

As the distance at which a rifle is shot is increased and the size of the object aimed at retained, the difficulties are so much greater that rules in target shooting generally permit kneeling and sitting beyond a specified range. Figs. 132 and 133 show two excellent positions, and one accustomed to shooting thus has a great advantage over the person shooting in any off-hand position. At 300 yards, shooting at the 8-inch bullseye, very fine scores have been made with the U. S. Springfield rifle held in this manner. Fig. 132 is probably a steadier position, but individuals with a full abdominal development find it difficult, if not impossible, to shoot thus, but resort to that shown in Fig. 133.

This is not only an excellent way to shoot with a military arm, but is good for target shooting with a match rifle, or with a hunting arm. Practice is required to develop the

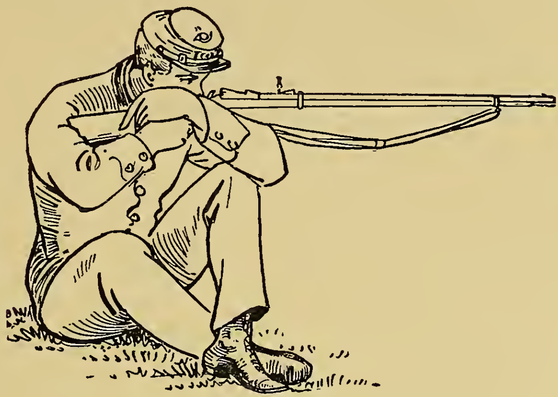


Fig. 133. — Sitting Position.

muscles in order to take these positions with ease and comfort. They cannot be assumed so speedily as Figs. 130 and 131, but are more reliable if time permits taking them.

Fig. 134 shows the prone position, and is very reliable for target shooting with match or military rifles, and, under certain conditions in hunting is the most reliable position I know of. Everyone who hunts with a rifle, especially if he seeks game on our western plains, should cultivate shooting in this manner. Certain military matches call for this position. The Interstate competition at Creedmoor makes this one of the conditions of the match, while the back position is allowed in the Hilton Trophy and other contests; consequently, the States sending representatives to compete annually at Creedmoor advise practising at 500 yards, lying prone. Many attempting the prone position at first experience some difficulties. It is quite unsatisfactory, and I believe injurious to the health, to shoot a heavily charged rifle in this position, as persons are usually attired. I have known

Fig. 134. — Prone Position.

men to seriously injure their health by shooting in that most absurd costume, the modern officer's fatigue jacket and a stand-up collar. These jackets, or even a civilian's usual costume, fit snugly, and the stiff collar prevents free circulation of blood, and the neckwear is drawn tightly across the spinal cord. When the rifle is discharged, the recoil gives the effect of a blow on the back of the neck, and this, with the usual clothing, has the effect of greatly fatiguing the shooter. A tight-fitting collar makes vision uncertain, and the effect of recoil often produces severe headache, sometimes of a serious nature. It is well in any style of rifle shooting to wear no snug-fitting clothing especially about the neck ; but, in mid or long-range shooting, if lying down either prone or on the back, discard the tight-fitting vest and coat, remove linen collar, and, if convenient, wear a loose-fitting woollen shirt and a blouse.

Fig. 135. — Back Position.

In taking the prone position, Fig. 134, relax all muscles of the body below the arm, hugging the ground as close at possible, spread the legs and throw them to the left, thus greatly reducing the effect of the recoil ; brace the muscles of the right and left arms, and inflate the lungs. Some vary the position of the left hand, grasping the rifle and placing the fingers around it; others close the fingers of the left hand, resting the rifie between thumb and

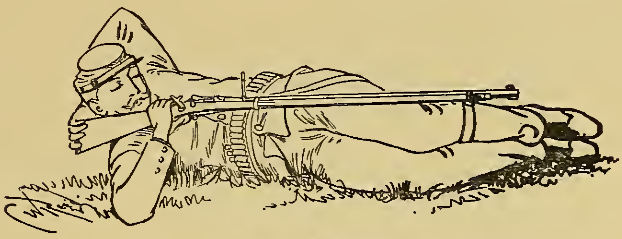


Fig. 136. — Side Position.

fingers. Keep the rifle plumb, as, by rolling it to right or left the shots will fly in the direction the rifle is rolled, even if the sight and windage be correct; hold the breath while pressing the trigger.

I have alluded to the excellence of this position for hunting; for a long shot I prefer it to any, and always

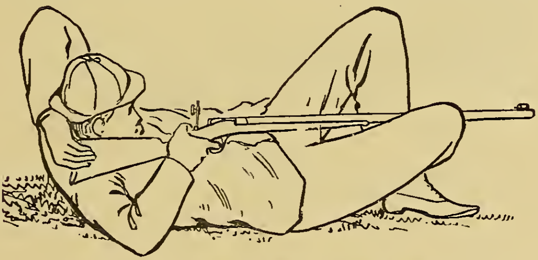


Fig. 137. — Back Position (Match Rifle).

take it when time and the ability to see the game permit. The certainty of this position for target shooting has been graphically illustrated by the brilliant scores made by military marksmen at the 500 and 600 yards' ranges; clean scores of ten successive bullseyes at the former range being frequently made.

Fig. 136 shows the back position, often adopted in target shooting with military or special military rifles. Excellent scores have been made with such arms shot in

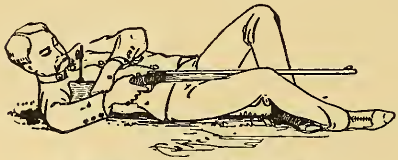


Fig. 138. — Long-Range Back Position.

this manner. It is not a desirable position in which to shoot hunting rifles, and not recommended, as the barrels of such rifles are generally too short.

Fig. 136 is a position adopted by many of the military marksmen of the regular army and volunteers when shooting at mid and long range, and is chiefly confined to such shooting. The strap is used to take the recoil, and the

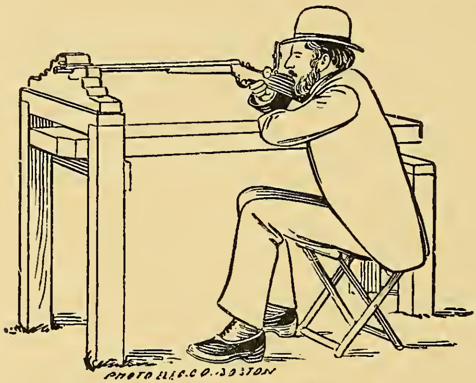


Fig. 139. — Position for Rest Shooting.

trigger is pressed by the thumb. There are some variations to this position, often the shooter lies more on his back than shown in the illustration. A person trained to this position can fire many shots rapidly, and it is much used in skirmish firing.

Figs. 137 and 138 show the most popular positions in long-range match rifle shooting. When this department of rifle shooting was popular in America, there were many positions different from these, advocated and used by riflemen, but a majority finally decided for this special work at 800, 900, and 1,000 yards, with a match rifle; no position was

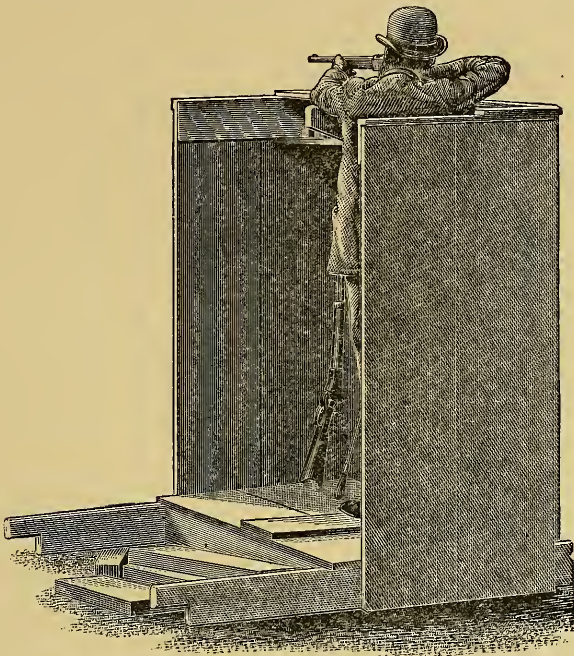


Fig. 140.—A Portable Rest for Rifle Shooting, used by Mr. Wm. Lyman.

as reliable as on the back, and Fig. 138 was adopted by a majority of the best long-range rifle shots. Mr. William Gerrish and Major Charles W. Hinman shot thus when

Fig. 141.—A Portable Rest for Rifle Shooting—Folded.

they made their wonderful scores of 224 out of 225, or 44 bullseyes and a centre, in forty-five shots; fifteen shots each, at 800, 900, and 1,000.

This concludes the positions in shooting without artificial support. Rest shooting, which is quite popular in some sections, is generally done as shown in Fig. 139.

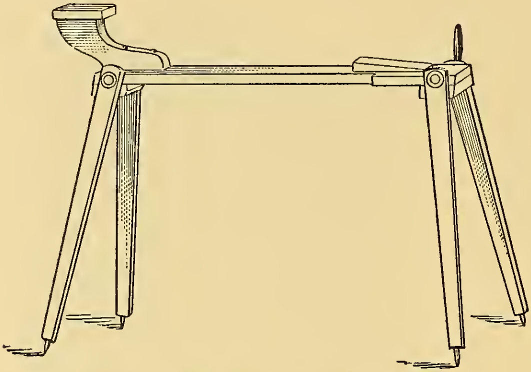


Fig. 142.—A Portable Rest for Rifle Shooting—Open.

The rifleman seats himself beside the rest, and supporting the rifle barrel on the rest and with stock to shoulder, aims and fires. Sometimes the stock is rested, which is permitted.

Figs. 140, 141, and 142, show different styles of portable rests for this mode of rifle shooting.

CHAPTER XIV.

AIMING, SIGHTING, HOLDING, AND FIRING.

Most lexicographers define aiming, as pointing a missile toward a point or object; and sighting, to look along the barrel of a gun or rifle in aiming. I think riflemen would define aiming, as pointing the rifle in the direction intended to shoot; and sighting, placing or aligning the sights on a certain point or object. The latter term seems to express more than the former.

When a rifleman is ready to shoot, he takes his position, aims, and sights. If he is equipped with a plain, open-sighted rifle, with a fixed front and rear sight, he aligns the front with the rear sight; if the latter has a notch in it, the tip of the front sight is seen through the notch; if the rear sight is a bar, the tip of the front sight is generally seen over the centre of the bar; the front sight is placed on the object desired to hit, and the trigger pressed. If the shot strikes below the object sighted on, more of the front sight should be seen through the notch or over the bar. If the shot strikes above the object aimed at, less of the front sight should be seen. The least bit of the front sight being seen is called a fine sight; when the whole or most of it is seen when sighting, it is termed a coarse sight, and if half as much as the fine and coarse sight is seen it is called a medium sight. The illustration (Fig. 143) shows the fine, coarse, and medium sights. If a rifle is sighted so as to permit hitting an object, one inch in diameter, at 25 yards, by drawing a fine sight and holding the rifle properly, at 50 or 75 yards, a coarser sight would likely have to be taken; and at 100 or 150 yards a still coarser sight would be necessary, until at a certain distance a sight would have to be taken above the object desired to hit. Under such circumstances one must have elevating sights on his rifle to permit sighting at the spot

Fig. 143. — Fine, Coarse, and Medium Sights.

Fig. 144. —How to Sight with Open Sights.

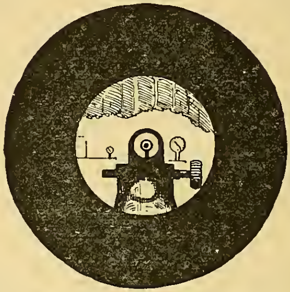


Fig. 145. — How to Sight with Target Sights.

where he desires the bullet to strike, or sight at a point above, to allow for the drop of the bullet, and perhaps at one side to overcome the drift of the bullet ; the former caused by power of gravitation, the latter by force of the wind, and, to a certain extent, by the twist in the rifle. Target shooters, as a rule, insist upon devices for elevating the rear sight and lateral movement to the front or rear sight for drift, which permits sighting directly at the bullseye. Military authorities seem to consider it better to make the calculation by the rear sight. Many hunters elevate the rear sight to provide for the drop of the bullet, but seldom use a wind-gauge; and not a few hunters make allowance for the drop of the bullet at long range, and the effect of the wind, by holding or sighting over and to one side.

The National Rifle Association rules call for a bullseye, for target shooting, eight inches in diameter at the 200 yards' range; 22 inches at 500 and 600 yards, and 36 inches at 800, 900, and 1,000 yards. At distances less than 200 yards the bullseye is proportionately reduced to the distance.

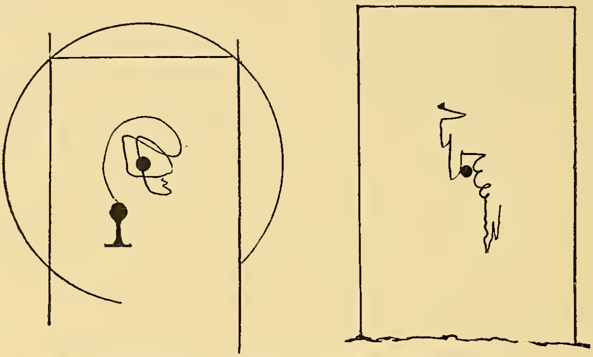
It is the general opinion that a spot smaller than the eight-inch bullseye cannot be sighted on with certainty by the average rifleman, and as a good rifle will generally shoot into a smaller group than eight inches at 200 yards, it shows that good rifles and ammunition will shoot finer than a person can see to sight with non-magnifying sights.

Very few persons, except riflemen, have any idea of the size the regulation bullseye appears to be at the distances at which it is shot at. Fig. 144 shows the size of third-class target, which has an eight-inch bullseye, as it appears when aiming with an open-sighted hunting rifle; it also shows the size of the rear notched sight and the front open sight and the bullseye. If the rifle could be held still, so as to secure such a sight as shown in Fig. 144, providing the arm was properly made, charged, sighted, and shot under favorable weather conditions, it should place most of its shots well inside the bullseye.

Fig. 145 shows the bullseye as it appears when a sight is taken on the eight-inch bullseye at 200 yards, with a match rifle fitted with a front wind-gauge and aperture sight and a rear Vernier sight with a peep cup. The large black circle represents the eye cup on the rear Vernier peep sight, the hole is about $\frac{3}{64}$ of an inch in diameter; but, when sighting, it is brought near the eye, and it takes in the whole target, as well as fully twenty feet over, under, and each side of the target. The hood which covers the front sight is shown the size it appears to be, as is the aperture sight and the bullseye of the target, when a nearly perfect sight is secured.

The illustrations in Figs. 144 and 145 were sketched by an artist at Walnut Hill, and in order that it might not be the result of a single individual's impression, several riflemen gave, on paper, the size of the bullseye, sights and other points shown, and, when compared, agreed with what is shown in these illustrations.

I have alluded several times in this work to the impossibility of any living person holding a rifle perfectly still, especially when shooting off-hand. The action of the heart and circulation of blood make this impossible. At a short range, with a very large target, the tremor of the sights is less apparent, but at 200 yards no person can hold a rifle still enough off-hand to keep the front sight on the bullseye as shown in Fig. 144, except for the briefest

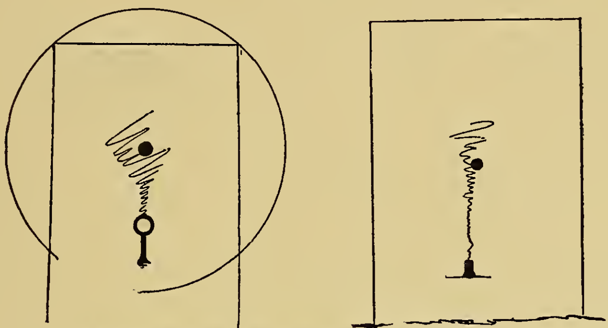


Figs. 146 and 147.—Illustrating the tremor while sighting.

time. Long practice enables some individuals to become skilful in holding, and some are naturally of less rapid pulsation than others, and consequently steadier. A person possessed of an excitable temperament, or who is full-blooded, is less likely to make a good rifle shot than one of a phlegmatic temperament. Anything that stimulates, increases, or causes irregular pulsation, is detrimental to good rifle shooting. Violent exercise is also detrimental.

A rifleman shooting at the 200-yard target, off-hand, takes his place at the firing point, aims, and tries to sight on the bullseye. The front sight of his rifle takes the most erratic course, sometimes travelling off the target. By inflating the lungs and ceasing to breathe for a moment the rifle can be held much steadier. The best of shots experience the movements of the front sight as illustrated. Often while shooting there comes to a rifleman a spell when he can hold the rifle quite satisfactorily, and good shots are generally made; but, even when holding well, the front sight takes a motion, such as shown in Figs. 146–149.

How to sight depends upon the kind of sights used. With plain open front and rear sights it is a question



Figs. 148 and 149. —Showing tremor when holding still.

whether you are to draw a coarse, fine, or medium sight. I have stated the effect of seeing little or much of the front sight through the notch or over the bar of the rear sight; but that referred to regulating the elevation by that means, and, as a rule, is followed when time does not permit raising the rear sight. Some riflemen prefer, if possible, to see the same amount of front sight, and regulate the elevation by raising or lowering the rear sight; others drawing a very fine sight; while still others use a coarse sight, regulating it by seeing as much as the depth of the V notch.

The next question is, where to place the front sight?

When target shooting, and using either a front open or a pin-head sight, most of the expert shots aim just under the bullseye, some just touching it; others seeing a little white between the tip of the front sight and bottom edge of the bullseye.

If the front sight is placed in the bullseye, as shown in Fig. 151, it is uncertain whether one is sighting one inch or six in the bullseye. Just here is the difference between

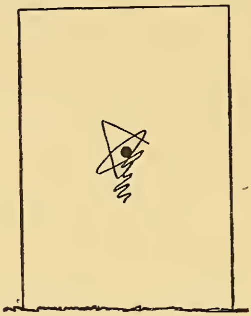


Fig. 150. — Course of the sight when holding steadily.

Fig. 151. — Touching the Bullseye too much.

sighting at a bullseye and game. At the latter, one tries to place the sight where it is desired to have the bullet hit; in target shooting, one generally sights below where he wishes the bullet to strike. In sighting a hunting rifle remember this, and if aiming at a large bullseye, sighting at six o'clock, or at bottom edge of bullseye, the bullets should strike at the point sighted at and not in the middle of the bullseye.

In sighting with an aperture sight, the bullseye should be held as near the centre of the aperture as possible, and have the aperture sufficiently large to see a white circle distinctly around the bullseye. Most beginners at target shooting use much too small apertures. A short barrel target rifle should be equipped with a smaller aperture sight than one with a long one.

In sighting with a rear peep or a Lyman rear sight and a front open sight, never try to draw the point of the front sight to the bottom of the rear peep hole; let the eye find the centre of the rear peep sight, and place the front sight under the bullseye if target shooting, or on the game if hunting; that is, if you believe the elevation is right.

The question of whether to use one eye or both in sighting is one upon which much has been written. When one shoots well with both eyes, he naturally claims it is the correct way to shoot; those accustomed to closing one eye, find it difficult to shoot with both eyes open, and are sceptical as to its advantages. Judging from my own experience, it makes but little difference, and one can shoot well with one or both eyes open. A person uses but one eye in sighting a rifle, even if he has both open; the eye he uses being the master eye. With a shotgun, I believe shooting with both eyes open advantageous; but with a rifle, although I generally keep both eyes open, my vision is concentrated in one eye. In snap shooting with a rifle, when the arm is used as a shotgun and the aim largely a calculation, the advantage of double vision seems to me to be an aid. In sighting at an object, if the hold is unsteady and a long sight is taken, the vision becomes uncertain and the sights blur, caused by the attempt to focus on two or more objects at different distances at one time. If such is the case, and time permits, close the eye used in sighting, for a moment, and take another sight.

Much has been written against open sights, and many have discarded them on account of the blurring when sighting. This trouble can be largely overcome if the rifleman can train himself to prevent the eye focusing on the rear sight. If one attempts to see the rear and front sight, as well as the object sighted, there arises an uncertainty of vision which is quite confusing; but it is possible to draw the front sight into the notch of the rear sight, and let the eye focus on the front sight and object aimed at, ignoring the rear sight. In my opinion, the chief merits of the Lyman rear and other peep sights, are the ability of the rifleman to look through the holes without focusing the eye on them. This is also shown in the aperture front sight of a target rifle; nearly all the expert rest and off-hand shots at Walnut Hill use such a front sight.

With a correct sight it seems an easy matter to secure a good shot by pressing the trigger, if rifle and ammunition are right. To excel in rifle shooting one must have the faculty of pressing the trigger without greatly disturbing the aim, and to do so requires an immense amount of practice. Go to any rifle range and one will be likely to hear this conversation: —

"How are you doing?"

"Miserably. I can hold well enough, but can't 'pull of.'"

Although expert riflemen know that to pull the trigger of a rifle will cause bad shooting, the expression, though incorrect, is almost universally used.

There are many persons so well trained in sighting, that they can hold the 200-yards' bullseye within the aperture sight at that distance for several seconds, but when attempting to press the trigger there comes an unsteadiness which is quite perplexing. Many believe if they were permitted to use a set trigger this difficulty would be overcome, but my own opinion is decidedly against this. The lighter pull is, doubtless, an aid to some, but it never overcomes the uncertainty of controlling the sight, which comes when the slightest movement is made with the trigger finger, which seems to unlock the confined nerves. It is natural for persons to brace themselves to receive a recoil, to flinch to a greater or less extent, to give a sudden pull of the trigger, and I venture to record here my opinion that these three faults contribute more to cause poor rifle shooting than any other. The best living rifle shots commit these errors, and when it is known that they occur when pressing the trigger, it will be seen that this seemingly simple operation is far more important than those who have written on the rifle seem to have recognized. A rifleman who is unsteady, but has the knack of pressing the trigger correctly, will outshoot the man who can hold the bullseye in the aperture of a front rifle sight, but flinches or suddenly pulls the trigger. I have sometimes thought it was impossible for any one to acquire perpetual command over the trigger finger.

The best known marksmen, when shooting at an eight-inch bullseye, at 200 yards' distance, at times find themselves unsteady; the sights float about in a most annoying and uncontrollable manner, as shown in the illustrations. After vainly endeavoring to place the sight on or under the bullseye, the vision of the eye seems fading, and a mental calculation is made, that to press the trigger quickly so the rifle will be discharged the instant the sight touches the proper place would secure a bullseye; sometimes this is done successfully, and some riflemen adopt this style of pressing the trigger, but often the attempt proves a failure, and I do not think it is the correct way. Again, a rifleman secures as good sight as he seems likely to secure; he applies a steady pressure to the trigger, and just as the last ounce of pressure is being applied the sight floats away, and in hopes to discharge the rifle before the good sight is lost, a quicker pressure is applied; perhaps the attempt is successful, or the sight is recovered in time, and the shot is a good one. In my own experience I always feel, when a good snap shot is made, that it is a most unfortunate occurrence, for it has a tendency to prompt me to try it again, which generally results in a very poor shot. A rifleman may make a fine shot by a quick pull, but, as a rule, he never keeps all his shots in so small a group as the one who gives a slow, steady pressure to the trigger.

If one shoots at a large object at short range it is possible to do effective shooting with but little care in pressing the trigger, but at regulation ranges on the customary size targets, extreme care must be exercised in this important part of rifle firing.

Quick shooting does not necessarily mean carelessness in pressing the trigger, although it is more difficult to do correctly in firing rapidly. While aware that it is far easier to write of the proper manner to press a trigger than to actually do it, I think a majority of good rifle shots will admit that the best way to secure good results at target or game shooting is to endeavor to avoid flinching. Practice holding a rifle, and, while holding it as still as possible, press the trigger steadily until the rifle is discharged, trying as much as possible to avoid any irregular pressure, and keeping continually in mind to maintain the same steady pressure until the rifle is discharged.

CHAPTER XV.

TRAJECTORIES OF RIFLE BULLETS.

THE trajectory of a rifle bullet is the curve which it describes in its course. Sportsmen generally refer to the trajectories of rifles, which is quite confusing and misleading, as one rifle may shoot several styles of bullets, and each have a different trajectory, and one style of bullet shot with different kinds of powder will describe various curves — therefore allusion to the trajectory of a rifle is improper, and could only be used with propriety where a certain standard cartridge was invariably used.

In previous chapters I have described the various styles of rear elevating sights, and stated that a person must either draw a coarse sight, or aim above the objects desired to hit with a bullet when at a certain distance, or provide for the drop of a bullet by elevating the rear sight.

As soon as a bullet leaves the muzzle of a rifle it is attracted toward the earth by the power of gravitation, and will, theoretically, strike the ground, if the axis of the bore and the surface of the ground are parallel, the same instant a bullet of same weight would if dropped from the hand to the earth from the same height as the bore. The power of gravitation cannot be overcome, but the ingenuity of man has devised plans whereby the velocity of a bullet is so increased within a certain distance that its curve is lessened for that part of its flight.

I have previously alluded to the low trajectory of a bullet being chiefly esteemed by hunters, and not so essential to target shooters. With the former it lessens the liability to over or undershoot the game, and to flatten trajectory one must either lighten the bullet or increase the powder charge, but as the latter increases recoil the former method is resorted to even though it is at a sacrifice of accuracy.

There are many things about rifles and rifle shooting that are perplexing; what is demonstrated one day seems refuted another; but years of study of this fascinating weapon make it evident that certain principles are correct, and there is a general acceptance of them.

It is known that a rifle with a certain twist will shoot a bullet of proper composition, if of correct size and weight, with accuracy up to a great distance. If one seeks accuracy alone, he can obtain from American rifles all a reasonable person can expect. But, if the rifle showing this extreme accuracy was used for hunting, one would perhaps make frequent misses, and, if painstaking and careful, would seek the cause. Sooner or later it would probably be discovered that the misses were from shooting over or under the game; then one would realize that besides holding and sighting properly, it was necessary to be able to judge distances correctly and set the sights to suit several ranges. Most men accustomed to rifle shooting will find little trouble in hitting frequently a spot 12 inches in diameter at 150 yards when the sights of a rifle are arranged for that distance; but place an accurate shooting rifle in the hands of an expert target shot, and unless the correct elevation was known, if the spot constituted the whole of the target, it might be missed many times. This was especially common with American rifles made a few years ago, which were shot with light charges of powder and heavy bullets. Shooting at game on the plains of the West made this fault conspicuous in many American hunting rifles.

Long ago it was discovered that a high trajectory was undesirable in hunting or military rifles, but experiments clearly showed that as the projectile was lightened the accuracy, penetration, and range were sacrificed. With hunting rifles there has been such a desire to flatten the trajectory, that in many instances the other desirable features have been lost sight of entirely.

The ancient adage — a little learning is a dangerous thing — is well exemplified in the craze for hunting rifles of extremely flat trajectory, and I have found myself many times propounding the query: What does one gain by a very flat trajectory if accuracy and penetration are sacrificed? I think the loss is often greater than the gain.

I think one of the most unfortunate and misleading tests that ever occurred in this country was the one conducted a few years ago, which gave simply the trajectories of bullets from hunting rifles, but not the accuracy. The only value in those experiments was because factory cartridges were used in many of the rifles, and this being the case one could make tests for accuracy, and their own deductions.

It has been shown, however, that the trajectory of one make of cartridges is different from another, that wind has its effect on the bullet's curve, and weight and manner of manipulation of the rifle are also believed to have their effects on the curve of a bullet.

Certain foreign express rifles were shot in this test, and as trajectory alone was exhibited as the result, without considering accuracy, it stimulated a craze which was likely, in the writer's mind, to do far more harm than good.

The desiderata in hunting rifles is to secure the flattest trajectory and maintain accuracy and a proper amount of penetration, as well as avoiding excessive recoil. I think I value a low curve in a bullet shot from a hunting rifle as much as any one, but fail to see merit in a rifle with an extremely flat trajectory which takes a whole third-class

Creedmoor target to catch a series of shots fired at a distance of 200 yards.

There are two classes of individuals I have often been bored by, while listening to their remarks. The first is the individual who shows a ten-shot target with all the shots inside of the ten circle of the Standard American target, shot at 200 yards, and in his enthusiasm dilates on the exceptional merits of the arm for hunting; the target being shot at rest with a 10-pound rifle, .38-calibre, charge 55 grains of powder and a 330-grain bullet.

The individual of the second class is he who tells of his 6-pound rifle which has a trajectory of 7 inches at 100 yards when shot at 200 yards. I am often unfeeling enough to wish the former could be placed in the hunting field, and the latter be compelled to face the butts on the rifle range.

Some years' experience with American hunting rifles, and knowing the advantages of low trajectory combined with accuracy, penetration, and moderate recoil, have forced me to the conviction that the best hunting rifle for all-round work in America is one without any of the above points predominating; but it should be stated, also, that for special work one may secure better results by permitting an excess of any one feature when others are not essential.

To secure the trajectory of a rifle at 200 yards, one should choose for the work as level a piece of ground as possible. It would be better to select a covered range, but as that is not generally practicable, a place sheltered from the wind as much as possible is preferable, as wind affects the curve of a bullet. A series of screens, eight in number, should be erected 25 yards apart, the first at that distance from the firing point. These screens should be sufficiently large to catch the bullets; and to construct them frames of pine wood are used, which are covered with tissue paper. The paper is tacked to the frames and lightly sprinkled with water spray, so when dried it is tightly drawn, with no wrinkles. The screens must be firmly attached to posts driven in the ground at the several distances, the attachment being by nailing or otherwise.

After arranging the screens, a peg should be driven into the ground by the side of each screen. It is necessary to have these pegs the same height, and a careful adjustment is necessary by a competent surveyor with an engineer's level. It has been shown that these pegs change their position, being affected by the elements; and to secure the trajectory with accuracy, a frequent testing of the pegs is essential. An excellent aid in regulating the pegs, is to place in the top of each, a screw. As a variation of the pegs is detected, caused by a slight upheaving or disturbance of the earth, by the turning of the screws up or down, the irregularities can be adjusted to a nicety without disturbing the pegs.

With the screens arranged and pegs adjusted, the next operation would be sighting the rifles in order to shoot the bullet through the screens. This is done by shooting at the 200-yard target ; and unless the rifles shoot accurately enough to keep the shots inside the six circle of the Standard American Target, it would require very large screens to catch the bullets.

On the first screen, which is at 25 yards from the firing point, is a spot placed where the straight line from the muzzle of the rifle to the centre of the 200-yard target intersects this screen, at which to aim ; the rifleman lies on the ground, in the prone posture, the end of his rifle supported, and the muzzle over the first peg. An assistant stands by the side of the shooter to advise him when the muzzle of the rifle is over the first peg ; and the vertical distance from this peg to the centre of the bore of the rifle is measured and recorded. The shot is then fired, and if the bullet passes through all the screens, the distances from the top of the screw in each peg to the centre of the bullet-hole in the different screens are measured ; the measurements should be taken by means of a straight rule with an arrangement for keeping it in a vertical direction by means of two spirit-levels at right angles to each other. An arm, adjustable as to length, slides up and down the rule which is kept at right angles to it. The bottom of the rule is placed on the top of the screw in the peg, and the end of the arm on the shot-hole, the rule being kept perpendicular by means of the levels. These figures give the height of the curve of the bullet above the fixed plane at the several distances. From each measurement is deducted the distance from the top of the screw to the centre of the bore of the rifle.

This would give the correct trajectory at the several points, if the bullet struck the 200-yard screen at the same distance above the peg as was the muzzle of the rifle ; but if not, a correction must be made, proportional to the distance of the point from the muzzle of the rifle.

At different times during the past few years trajectories have been taken at Walnut Hill, the work being conducted by Major Charles W. Hinman, aided by competent engineers. Major Hinman is well known as one of the most reliable and expert rifle shots in America, and is considered as high authority in all matters pertaining to the rifle ; and his experiments were closely watched by the writer.

These figures are believed to be accurate, but it should be remembered that a different quality of powder from that used would have its effect on the curve of the bullet in its flight. The wind might also change the trajectory if the same charges were used.

There are other methods of securing the trajectories of rifle bullets, differing chiefly from the above in details regarding measurement ; but the one described is that followed at Walnut Hill, by Major Hinman, to whom credit is due for all the figures herein presented : —

Calibre.	Powder, weight in grains.	Bullet, weight in grains.	Length of barrel in inches.	HEIGHT OF TRAJECTORY IN INCHES AT								
					25 yards.	50 yards.	75 yards.	100 yards.	125 yards.	150 yards.	175 yards.	200 yards.
.22	5	30	28	0	8.3	14.5	18.7	20.4	19.8	16.2	9.4	0
.22	10	45	26	0	7.3	12.8	16.2	17.6	16.6	13.7	8.1	0
.22	15	45	30	0	5.3	9.4	12.2	13.5	13.1	10.8	6.5	0
.25	20	67	28	0	3.6	6.4	8.3	9.4	9.2	7.6	4.7	0
.25	20	77	26	0	5.4	9.0	11.6	12.8	12.3	10.2	6.0	0
* .25	32	76	30	0	3.4	6.0	7.7	8.4	8.1	6.7	4.1	0
* .25	32	76	30	0	2.8	5.0	6.4	7.0	6.8	5.6	3.3	0
* .25	32	67	30	0	2.7	4.8	6.2	6.9	6.8	5.6	3.4	0
.32	13	90	24	0	7.5	13.5	17.5	19.2	18.4	15.0	8.9	0
† .32	20	115	24	0	5.8	10.3	13.2	14.4	13.8	11.3	6.7	0
† .32	30	125	26	0	4.6	8.2	10.5	11.5	11.0	9.0	5.4	0
.32	35	147	28	0	4.1	7.3	9.3	10.2	9.8	8.0	4.7	0
.32	35	165	28	0	4.5	8.0	10.2	11.2	10.9	8.8	5.2	0
† .32	40	125	30	0	3.7	6.5	8.4	9.2	8.9	7.3	4.3	0
† .32	40	150	26	0	4.8	8.4	10.7	11.6	11.1	9.0	5.3	0
.32	40	165	30	0	4.9	8.6	11.0	11.9	11.5	9.4	5.5	0
.35	60	245	28	0	4.7	8.1	10.4	11.3	10.9	8.8	5.2	0
.38	50	255	28	0	6.1	10.5	13.4	14.5	13.6	10.9	6.4	0
.38	50	330	28	0	6.6	11.4	14.5	15.5	14.6	11.7	6.6	0
‡ .38	55	255	26	0	5.8	10.1	12.8	13.9	13.1	10.6	6.2	0
§ .38	90	250	30	0	3.2	5.7	7.2	7.9	7.5	6.2	3.7	0
.40	60	265	28	0	4.5	7.9	10.2	11.2	10.8	8.8	5.2	0
.40	60	330	28	0	5.2	9.3	11.8	12.7	12.2	9.8	5.9	0
.40	62	210	28	0	4.4	7.8	10.3	11.4	11.1	9.2	5.5	0
.40	75	230	28	0	4.1	7.2	9.3	10.1	9.7	7.8	4.6	0
.40	82	260	30	0	4.1	7.4	9.6	10.5	10.2	8.4	5.2	0
* .40	83	390	35½	0	4.6	7.9	10.0	10.8	10.2	8.2	4.8	0
.40	90	300	26	0	4.3	7.5	9.5	10.3	9.7	7.8	4.6	0
.40	95	265	34	0	2.9	5.4	7.2	7.6	7.4	6.0	3.7	0
.40	95	380	34	0	3.5	6.3	8.0	8.7	8.3	6.6	4.1	0
* .40	98	445	34	0	4.5	7.7	9.7	10.5	9.9	7.9	4.7	0
.40	110	260	30	0	3.7	6.5	8.4	9.1	8.7	7.1	4.2	0
.44	40	200	24	0	6.0	10.8	14.0	15.4	14.8	12.1	7.2	0
.44	90	520	34	0	4.0	7.2	9.3	10.4	9.7	7.9	4.7	0
.45	60	300	28	0	5.5	9.5	12.0	13.0	12.4	10.0	5.9	0
.45	70	405	32.6	0	5.1	8.9	11.2	12.0	11.3	9.1	5.4	0
.45	75	350	28	0	4.7	8.3	10.5	11.4	10.8	8.8	5.2	0
.45	85	290	28	0	4.3	7.5	9.5	10.4	9.9	8.0	4.8	0
.45	90	300	30	0	4.5	7.9	10.0	11.0	10.6	8.7	5.2	0
.45	109	550	36	0	4.6	7.9	10.0	10.8	10.2	8.2	4.8	0
.45	125	300	30	0	4.0	7.0	8.9	9.8	9.4	7.7	4.5	0
.50	110	300	30	0				11.5				0
.50	115	300	26	0	3.9	7.1	9.4	10.6	10.4	8.7	5.3	0

* Specially prepared ammunition. † Actual 30 calibre.
‡ Actual powder charge 48 grains. § Special bullet.

ACCURACY.

Class A. — Will shoot nearly all of its shots on or into a 6-inch circle at 200 yards: .32-40-125 — .32-40-150 — .32-40-165 — .38-55-255 — .40-83-390.

Class B. — Will shoot nearly all of its shots on or into an 8-inch circle at 200 yards: .22-10-45 — .22-15-45 — .25-20-77 — .25-32-67 — .25-32-76 — .32-20-115 — .32-30-125 — .40-62-210 — .40-82-260 — .44-40-200 — .45-60-300 — .45-75-350 — .45-70-405 — .45-90-300 — .40-90-300 — .45-109-550.

Class C. — Will shoot nearly all of its shots on or into a 12-inch circle at 200 yards: .38-90-250 — .40-75-230 — .40-110-260 — .45-85-290 — .45-125-300.

Class D. — Will shoot nearly all of its shots on or into a 20-inch circle at 200 yards: .50-110-300 — .50-115-300.

The figures presented in this article are the results of the experiments conducted intermittingly, covering a period of several years. During that time I shot, or saw shot, all of the rifles mentioned, and elaborate notes were made. I became fully convinced that the trajectories of rifles are uncertain, like the accuracy. Most riflemen who have given careful thought and study to this subject, believe that various factory cartridges have different trajectories; wind has quite an effect on the curve of a bullet — a rear wind decreasing, and a front wind increasing the trajectory. The manner of holding a rifle also has its effect; also the shape and temper of the bullet, strength of powder, and even the form of the shell. If a rifle is shot with freshly and accurately reloaded ammunition, there is greater accuracy and more uniform trajectory.

I have made careful observations as to the accuracy of the cartridges, and rifles using them, and have formed an opinion as to the amount of accuracy one might expect from them. I am well aware that the results will vary, and that some better shooting may be obtained than credited to these arms, — and often worse; — also, that one shooting continuously any one of the rifles mentioned, would secure, perhaps, better average results. My memoranda indicate that in the experiments I witnessed, it was within the probabilities to secure about the results credited to the different rifles, if the arms were properly made, shot by an expert rifleman, and with good ammunition.

Among the American rifles which possess accuracy, moderate trajectory, penetration, and no excessive recoil, are those taking the following cartridges: —

.25-20-77 — .32-40-165 — .38-56-255 — .40-65-260 — .40-82-260 — .45-75-350 — .45-90-300.

These rifles take factory cartridges, and are excellent for hunting in America. Often improvements are made over these cartridges by riflemen skilful in making ammunition and manipulating the rifle.

CHAPTER XVI.

WHAT IT IS POSSIBLE TO DO WITH A RIFLE.

It is generally known that a rifle when properly loaded is capable of projecting a bullet to a certain distance with accuracy. The distance and the amount of accuracy has been a theme for discussion ever since the rifle was invented, and doubtless will continue to be as long as it is used. Rifles have always been used in competition, successful marksmen have ever received homage, and in recounting exploits hyperbolizing has developed. The rifle has always played an important part in stories of warfare, hunting, or romantic tales, and hence the hero of many a story has been made to perform feats of marksmanship quite beyond the possibilities of rifle or man.

The sportsmen's papers give evidence of the lack of knowledge of the possibilities of the rifle even among those who shoot the arm, and I have often blushed for the editors who attempted to elucidate those who sought for information on this subject.

Does any one know what it is possible to do with a rifle? Beyond a certain limit I claim they do not.

It is many years since the rifle was invented, and from its incipiency men have striven to excel and perform feats which were considered impossible. By the ingenuity of man, rifles have been improved so as to shoot a greater distance and with increased accuracy; but there has always been a blessed uncertainty which has kept alive an interest in the arm, which would have been lost if perfection had been arrived at.

It is usual to speak of the possibilities of the rifle as though a perfect arm was all that was necessary to secure perfection in rifle shooting. I have studied the rifle for more than a quarter of a century, and many of my intimates more than double that time, and I believe it is generally admitted by the best living experts that from the very commencement in making a rifle there is an uncertainty, and if, perchance, a perfect rifle is made, it is not certain that it can be duplicated.

But if the rifle be perfect, the ammunition may not be correct, and if right at one time it may not be just right at another; for many believe that a certain degree of hardness in a bullet may be better for a cold temperature, and another composition suitable for different weather. Then comes the shooter with his varying physical condition, his changeable vision and uncertain nerve, and difference in manipulation of the rifle. All these are important factors in rifle shooting, and if they could be controlled, the ever varying weather conditions, the unperceived air currents, the changeable light, the difference in the atmosphere, would prove insurmountable barriers. By years of careful observation the rifleman learns the effect of certain conditions, and trains himself in such a way that by his skill he is able to guard against many obstacles which prevent others from making fine scores.

It is supposed to be within the reach of good mechanical skill to make rifles accurate enough to use in hunting or warfare; but experts to-day believe that no one can produce a rifle, with certainty, which is capable of shooting continuously into the 12, 11, or the 10 circle on the Standard American rest target at 200 yards. As before stated there is an uncertainty about the metal of which the barrel is composed, and no one can tell at the outset whether a superior or inferior barrel can be made from a bar of steel; the various processes are all uncertain and the shooting qualities of a rifle are determined by experts at the factory or on the range, by shooting. There are certain features which, if found in a rifle, indicate its probable good shooting qualities, but for various unknown reasons some rifles possess superior shooting qualities to others.

The best rifle maker may construct two rifles which may be as near alike as possible to make them, but there is no certainty that one will shoot as well as the other; and for some inexplicable reason one will shoot a bullet of a certain alloy in a satisfactory manner while the other will not, but do good work with a bullet, harder or softer.

Riflemen usually refer to the good or bad shooting qualities of a rifle as though the arm was the only factor. This illustrates the conceit of man, for, without a doubt, the rifle being a mechanical production, is nearer perfect and less variable than ammunition and man; but all the factors which help to make perfection in rifle shooting are uncertain and variable, and when one error has been discovered and corrected by a rifleman, another develops, and therefore the devotee who essays to secure perfection in this art is ever baffled, and when results indicate that perfection is about to be realized, the uncertainty before alluded to in rifle, ammunition, shooter, and weather prevents it, and therein largely makes the attraction in fine rifle shooting.

With the exception of the .22- and .25-calibres, all rifles shooting modern rifle ammunition are considered suitable to shoot at a distance of 200 yards, and even the .22 and .25 are used at this range. Nearly all rifles shot at the target out-of-doors are shot at ranges from 200 yards upward, and a rifle which will not shoot well at 200 yards is of very little use to American riflemen for target shooting, hunting, or warfare. The size of the object aimed at when shooting at 200 yards is generally a bullseye eight inches in diameter. This a majority of riflemen with normal vision can see. The ratio of increase is at the same proportion at 500 and 800 yards, and the decrease is upon the same ratio at distances below 200 yards.

It is doubtful if the average rifleman could see an object smaller than eight inches distinctly enough to sight on, with non-magnifying sights, at a distance of 200 yards, and, as it is known that a modern American rifle will, if properly made, correctly charged, and handled by an expert, place a majority of shots in an eight inch bullseye at 200 yards, it is safe to say that a rifle should shoot well enough to hit nearly every time anything that can be seen distinctly enough to sight on without magnifying sights up to a distance of 200 yards. The hunter is generally satisfied with such a rifle, and the military arm possessing accuracy sufficient to hit the proportionately increased bullseye at the longer range, would, doubtless, be considered as containing sufficient accuracy.

The target shooter demands a more accurate rifle; it is with such arms, and by those shooting them that the possibilities of the rifle are better illustrated, for they are fitted with fine sights and every known device to aid in securing extreme accuracy. But let us sacrifice everything which is considered practical and military; fit the rifle with such appliances as will aid in securing the best results, with the one object of learning what it is possible to do with a rifle.

I have mentioned 200 yards as the distance at which rifles are generally shot at a target. No expert rifleman would view with any special interest a fine target made with any rifle over .25-calibre, at a distance under 200 yards, or containing less than ten shots. It is known that there are some rifles that shoot well at 150 yards that utterly fail to do fine work at 200 yards, and a person who offered a target of five shots at 200 yards as evidence of the fine shooting qualities of a rifle would be regarded as a novice by the expert, and the target as only a hint of what possibly might be done. Turning to an old scrap-book, I can find many potent illustrations of the absurdity of five shots being taken as evidence of the reliable shooting qualities of a rifle. I find record of a score counting 96 on the Standard American rest target, shot with a .25-calibre central-fire rifle, and in the score were four shots counting 11 and one counting 12, and these were consecutive shots. I have record of 9, 10, 12, 9, 11 in five consecutive shots with an 18-inch Stevens' pocket rifle, .25-calibre, rim-fire; another series of five consecutive shots with a .22-calibre Stevens' pocket rifle, counting 10, 10, 9, 10, 11. No well-informed rifleman would accept these groups of shots as evidence that such rifles could be relied on for such work.

Five consecutive shots, counting 12 each, have been made on the Standard American rest target at 200 yards, and the diameter of that circle is $1\frac{41}{100}$ inches. There are plenty of persons who would wager that the same rifleman and ammunition could not repeat the performance at a stated time, or place ten shots inside of the 10 circle ($3\frac{36}{100}$ inches in diameter), or fifty shots inside the 9 circle ($5\frac{54}{100}$ inches in diameter), or one hundred shots inside the 8-inch bullseye. The person who would make such a wager would probably know that rifle, shooter, ammunition, and weather conditions were likely to vary, and none of them could be positively depended upon, even with the heaviest rifle, telescopic sights, and a machine rest.

I have witnessed a great deal of rifle shooting under various conditions. For over twenty years I have visited factories where rifles have been manufactured. I have witnessed the shooting of men who were selected for their expertness to test rifles. I have been present on rifle ranges when many of the best-known records have been made, have shot with the best-known amateurs and professionals, and for several years have received many of the best targets made in the rifle-shooting countries of the world; but, taking the Standard American rest target, by way of illustration, I never yet have seen, consecutively, fifteen shots placed in the 12 circle, twenty shots in the 11, forty in the 10, sixty in the 9, or one hundred in the 8-inch bullseye. I believe there are but few, if any, rifles which, combined with factory ammunition and the uncertainty of the shooter and weather conditions, that will shoot fifty consecutive shots into an 8-inch bullseye at 200 yards, shooting with rest and telescope, or any style of sights.

It is now generally recognized that no group shot at less than 200 yards represents what the rifle will do at 200 yards. No series of less than ten shots is accepted as evidence of what can be done with that number of shots.

I have had many of the best-known targets in my possession, and noted the effect on persons unacquainted with rifle shooting. A bullseye 36 inches in diameter, containing twenty shots at 1,000 yards, elicits little or no enthusiasm from them, while one of ten shots, at 75 feet, with all the shots broken into one hole, creates extravagant praise. A clean ten-shot score of bullseyes shot off-hand at 200 yards, is considered tame beside ten shots, which could be covered by a dollar coin, shot at rest at 50 yards.

I have asked many riflemen for an explanation of the reason for the exaggerated stories of the work done with a rifle, and a majority believe it is the general inclination to magnify the distance at which the targets are shot, for the sake of telling a startling story.

Up to the time of writing, there have been nearly a hundred ten-shot clean scores of bullseyes made in off-hand shooting at 200 yards, but no one has been able to place ten shots on or within the 10 circle, and in rest shooting no one has been able to place ten shots on or within the 12 circle on the Standard rest target in one score. It is considered brilliant shooting to place ten shots in the 11 circle at rest, and the same number in the 10 circle is very fine work. As before stated, five shots in the 12 circle have no special value; seven shots are more difficult and wonderful; ten shots never yet attained, and beyond that

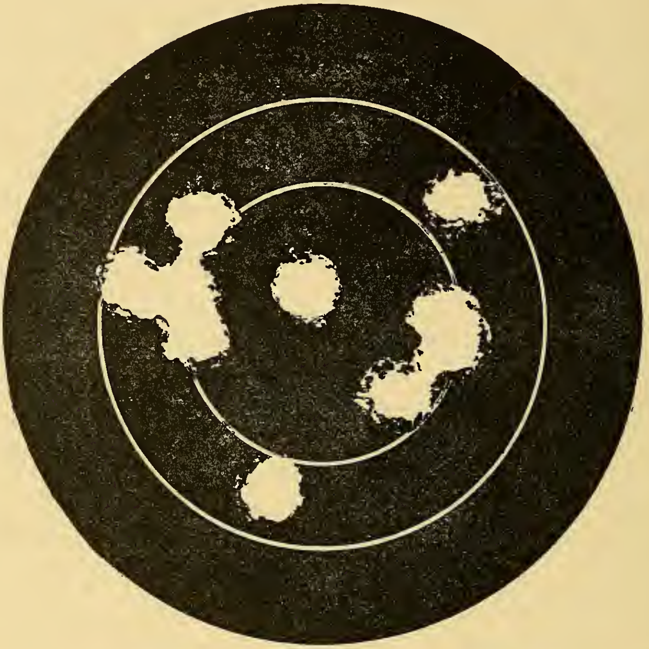


Fig 152.—Copy of actual score, counting 118 out of a possible 120. Shot at 200 yards' rest, by Mr F J Rabbeth at Worcester, Mass., March 6, 1890 Target, full size.

the difficulties of the task are rapidly multiplied, and seem at the present time almost among the impossibilities.

Beyond 200 yards, the shooting at the present time in America is chiefly with military rifles. Five shots at the regulation bullseye, at 500, 600, or 800 yards, are common; seven bullseyes are not so common; ten are seldom made, and any number beyond that is considered remarkable.

Riflemen remember, as a rule, only the best results secured, and are prone to allude to them, consequently many who hear of these performances are inclined to measure the average work of rifles by occasional results. If a score consisted of a large number of shots, perfection, or making

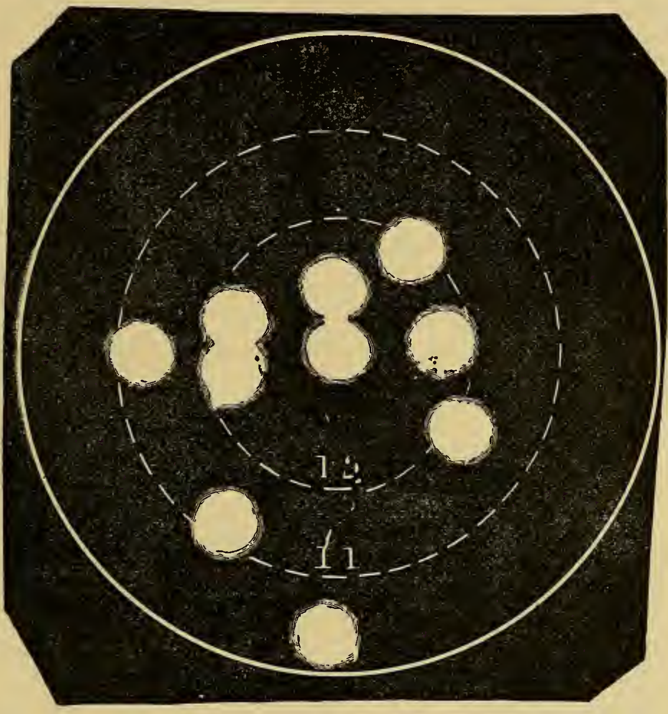


Fig. 153.—Copy of actual score, counting 116 out of a possible 120. Shot by Mr. J. R. Munroe at Walnut Hill, Feb. 9, 1889.

the possible, would probably never be attained. Ten shots have long been recognized as a good test of skill, and the results which have been attained on American rifle ranges, it is thought, represent all one can reasonably expect from rifle and man.

Sportsmen are often shown marvellous targets, so fine they are almost incredible, but they are, perhaps, honestly made at the distance named, but how? I will try and explain. Frequently a man will shoot for several years, and in the course of time, by discontinuing shooting at a certain group at the first wild or unsatisfactory shot, and commencing another group; or withdrawing or suppressing a score with a bad shot, and laying before the public the best scores, we have presented only the very best scores or groups of shots out of thousands fired during many trials. This is really no deception, for every expert is expected to put forth his best work. In fact the rifle-shooting fraternity do not care to see how bad work a person can do, and the pleasure is derived from inspecting the finest targets and witnessing the most skilful shooting. I have seen targets of ten shots which could be touched or covered with a silver dollar, which were shot at a distance of 200 yards, and later the same rifle, ammunition, and man, shooting at the same distance and place, would not be able to shoot into an 8-inch bullseye; and mark you well, brother riflemen, I have seen this with breech and muzzle-loading rifles; rifles weighing twenty pounds, fitted with telescopic sights and shot from machine rest, as well as the ten-pound breech-loading rifle fitted with the usual target sights. Later these same rifles would shoot with astonishing fineness but intermittingly, that is, unless the rifleman had concluded the rifle had shot out and disposed of it. I have seen targets shot by experts of the rifle factories which would take a circle 10 or 12 inches in diameter to enclose the shots, and the next group be in a 3-inch circle; the latter would perhaps be sent to a customer with the rifle, and the value of the arm based on the best target.

Ten shots usually constitute a score, and the fine work done indicates the excellent shooting qualities of American rifles, perfection of ammunition, and skill of the marksmen. Several times, this number of shots have been placed on or in the eleven circle ($2\frac{33}{100}$ inches in diameter) of the Standard American target when shooting from a rest, but this is no evidence that a rifle is capable of shooting continuously into so small a space. Most intelligent and well-informed riflemen know that ten shots is a fair test of marksmanship, but not an infallible one. It requires a good rifle, perfect ammunition, and a fine marksman to record a superior score, and conditions of matches where most of the best shots of America contest, are such that the possible is just beyond the reach of the best-known skill.

The development of skill in both off-hand and rest shooting is well illustrated by the evolution of the target. A few years ago the coarse 8-inch bullseye with no divisions was considered fine enough to shoot at; then it was divided, later trisected, and finally for rest shooting the smallest circle on the Standard American target was made finer by two additional circles. At the time of writing no one has secured the possible in ten shots on either the rest or off-hand Standard target, at two hundred yards, and if this should be accomplished it is no evidence that any great number of shots could be placed in the inner circles of the rest and off-hand targets in the respective styles of shooting.

The finest targets made represent the possibilities of the rifle for a certain number of shots and not for continuous work. No living person can tell with certainty how many shots can be placed in the same spot; the shorter the distance the more certain can one be of placing a series of shots exactly together; but as you increase the distance the uncertainty becomes greater, and a rifle, although the noblest of all weapons, an instrument of precision and marvellous accuracy to a wonderful distance, and although accurate and reliable enough for all practical service, is variable in its work, affected, to a greater or less extent, by unknown and unforeseen causes, and to this uncertainty is added the variation of ammunition, changes in weather condition, and the uncertain condition of the shooter.

CHAPTER XVII.

THE MANIPULATION AND CARE OF RIFLES.

To secure fine work from a rifle, a person besides having a perfectly made arm, correct ammunition, and even superior ability to hold the weapon as near still as it is possible, must manipulate the rifle properly to secure even fair shooting from it.

I have endeavored in previous chapters to show that rifles are made for various purposes; chiefly for hunting, defence, and as instruments for testing skill in target shooting. It is to be regretted that a majority of people in this world will insist upon a rifle being an instrument for one and all purposes equally. Such people hear of a fine-sighted long-range rifle placing a series of shots in the regulation bullseye at 1,000 yards, and they infer that a .44-calibre Winchester, model 1873, should do the same; they even apply this work to a revolver. It is no easy task to convince a person unfamiliar with rifles that he is in error when he claims the .45-125-300 rifle has a greater range than the .45-70-405, and it is quite as arduous a task to convince the person of his error who believes a rifle with an accurate range of 1,000 yards is superior for hunting to one having accuracy only within 250 or 300 yards. Rifles are for different purposes and each style of rifle must be manipulated differently. There are also various ideas of the best way to manipulate a rifle to secure the finest results; some considering a certain operation absolutely necessary while others ignore it entirely. I will endeavor to give in this chapter, certain rules and ways of manipulating rifles which are employed by many riflemen.

It is generally thought desirable to test a rifle for accuracy and for the purpose of arranging the sights, by shooting it from a rest, soon after purchasing. If the rifle is a hunting arm it is desirable to shoot it at short range for the purpose of aligning the sights and arranging the elevation. I usually sight my hunting rifles so as to hit a spot 1 inch in diameter when shot at about 30 yards; this enables me to shoot at the head of a grouse at short range, for they are often shot at as short a range as 12 or 15 yards. In testing the rifle, if it throws the ball high at 30 yards it is necessary to lower the rear sight, or raise the front sight. Frequently rifle barrels are tapered so as to be of much less diameter at muzzle than at the breech, and when shot with ordinary sights it will be found that the rifle shoots several inches over the spot aimed at when shot at 30 or 50 yards, and perhaps the rear sight cannot be lowered; then the only recourse is to build up the front sight. It is often found that the rifle shoots one or more inches to the right or left which necessitates moving the sights laterally.

Remember, when correcting vertical error, to move the rear sight in the direction you wish the bullet to go, and the front sight in the opposite direction. Do not move the front or rear sight so much as to cause it to appear to be fixed at the right or left of the centre of the bore, but try and move both so as to have them appear in line over the centre of the bore. When you move the sights, do it by means of a piece of brass placed on the sight, and the blow struck on the brass and not directly on the sights, as by the latter means you dent the sights and the barrel. In shooting the rifle be careful and hold it plumb, as by rolling it the shots will incline in the direction the rifle is rolled.

In testing a rifle or sighting it, always use the charge you would at the target or hunting. Always rest the rifle at one place on the barrel; the best place is 2 to 5 inches from the end of the muzzle. Avoid resting for one shot there, and the next at a point on or near the fore-stock. If possible, rest the barrel on a cushion of some soft material. Press the butt to the shoulder firmly, and with a uniform pressure. Be careful not to press the butt to the shoulder lightly with one shot, and firmly with another, as such treatment is likely to cause variation in the shooting even if sighted correctly each time. There is no cushion to receive the recoil which is equal to the shoulder of a person. Do not screw a rifle in a vice, for you cannot make it shoot well in that way.

After aligning and arranging the sights at the short-range, shoot the rifle at the different ranges, and make a memoranda of the elevations. If you are shooting a hunting rifle don't fire rapidly. I have seen men visit the rifle range to test a hunting rifle, open a box of cartridges and stand at the firing point, shoot fifty or more shots as rapidly as they could, and complain because the rifle did not shoot accurately. Rapidity of fire is generally at the expense of accuracy; therefore, if the atmosphere is dry, shoot slowly, and keep the rifle as cool as possible. It often happens that a rifle is shot rapidly for a brief time, as with a repeating rifle when hunting. It is well to wipe out the rifle if possible after rapid firing, and you will at such times frequently perceive lead attached to the wiping rag. The presence of lead in a rifle barrel is detrimental to good shooting, therefore try and guard against leading the barrel, and, as soon as discovered, try and remove the lead.

A person is less liable to do good shooting on very cold or extremely hot days. When the air is moist, the sun obscured by clouds, and the temperature even, is the most favorable time for rifle shooting. Changeable light affects elevation. Wind causes the bullet to vary in its flight — a head wind causes the bullet to shoot low; a rear wind accelerates its flight, and consequently the bullet does not drop so much; a right or left wind influences the drift of the bullet in one or the other direction.

The twist of the rifle has its influence on the drift of the bullet. I have frequently been surprised at the accuracy secured by light bullets and heavy charges of powder in rifles with quick twist, — in fact, it was difficult for me to accept the results, — and would repeat the experiments, but as practically the same results could be secured, I finally formed the opinion that accuracy was not impaired with excess of twist and a powder charge up to a certain limit, but, although trajectory was lowered and accuracy maintained when a lighter bullet than intended for the rifle was employed, the drift with such rifles and ammunition was excessive.

A rifle, whether for target or game shooting, should always be shot for alignment of sights before entering a match or seeking game. It is a fact that some rifles are not bored concentrically, or the sights are not properly arranged, and the arm will not shoot true to the aim, although the shots may bunch together. Most riflemen prefer to sight their rifles by shooting them from a rest; for there is a positiveness about the result which is not felt when shooting off-hand. Shooting a rifle from a rest is more difficult than is accredited to the performance. A firm, steady rest is essential; I prefer sighting a hunting rifle in the following manner: —

Place a target at the shortest distance at which one is likely to shoot when hunting, and in front of a bank of earth large enough to catch the bullets. Secure a table or stand which rests firmly on the ground, and seat one's self by the side of the stand. Near by should be placed several files, among them a flat, a three-cornered, and one or two small rat-tail files. A piece of brass rod one or two inches long, and quarter of an inch thick, a small hammer, two screw-drivers of different sizes, should be included in the tools for the work, and with such a kit of tools a rifle ought to be perfectly sighted. Load the rifle, and resting both elbows on the table, grasp the rifle as you would when shooting off-hand, aim at the spot on the target. If using a rear open sight, have it lowered to the lowest point, and draw a very fine sight. If using a Lyman rear sight, have it lowered as much as possible; take a careful aim, press the trigger slowly and carefully, without thinking of the rifle being fired or the recoil. When the rifle is discharged, inspect the target. If the shot is low, the remedy comes in lowering the front sight or raising the rear sight. But perhaps the front sight has an ivory tip, and it would spoil it to file it down, so the rifleman turns his attention to the rear sight. It is an easy matter to raise the sight, but it seems desirable to have the rear sight arranged so that it can be placed at its lowest point, and be ready for shooting at the shortest distance; which enables the sportsman to place it at that point, and know it is at the desired place without ceasing to watch the game. In this predicament, the recourse is to raise the rear sight, and then arrange it so that it cannot be lowered below the desired point; or, build up the rear sight. If the shot is high, the notch of the rear open sight must be cut down or the front sight raised or built up.

I have often found that owing to the taper of the barrel there was no front sight in the market high enough to use with the rear sight. Often, too, the rifle is supplied with a Lyman sight on the tang, which cannot be lowered to the desired point. Or with a Maynard rifle with two barrels of different calibre, length, and taper, a rear Lyman sight may be lowered enough to shoot at 25 yards with one barrel, and the other barrel being of less diameter at muzzle, it may be found impossible to lower the sight as much as wanted. By building up the base of a front sight, this difference is remedied, and one can have barrels of different lengths and taper, so sighted that the Lyman rear sight can be run down to its lowest point and shoot with either barrel at 25 yards, and secure your elevation beyond that range with each barrel; not agreeing, of course, only at the shortest range.

It is true that Lyman rear sights of different heights can be obtained, but sometimes the changing of this sight would mean weeks of delay. The collar and part of the Lyman rear sight can be cut down, also a pin placed in the sight to prevent lowering below a certain point.

When it is apparent that there is quite a difference from the sights in the market and those desired, I find it a good plan to make a very high front sight, and by shooting and cutting it down until I have secured the right height and then having a sight made, or purchasing one of the style preferred, — to correspond in height to the one improvised, — I get the proper sight for the arm.

If the shots from the rifle are the right elevation, but to the right or left, the usual way of correcting the fault is to knock the front or rear sight, or both, and to do this the piece of brass above referred to should be used.

When using the rear Lyman sight and lateral error is found, when the front open sight appears to be in the centre of the slot, the fault is likely to be in the Lyman sight being canted to one side or the other. If the shots are to the right, loosen the screws which attach the sight, and place a piece of paper or thin card-board under the right side of the base. If the shots are to the left, place the paper or card-board under the left side. As a rule, the sights can, to use a rifleman's phrase, be "squared up" to a nicety. When the sights are correctly arranged, the card-board can be trimmed off so as not to show.

If the rear sight be an open sight, it may be necessary to cut the notch deeper, and generally the abominable ears or horns of the sight are cut off, then the notch cut to suit, bevelling the top-side nearest the front sight, as well as the notch. A V notch or U notch or a square notch ⊔ are the varieties used.

The filing, of course, leaves the sights bright. A simple way of bluing them is to remove the sights from the rifle, wipe them clean and free from oil, after which attach them to a wire and hold them in a flame until the desired color appears, then allow the metal to cool.

In sighting a match rifle it is not essential to have the rear sight come to a stop at the lowest range used. It is desirable to "square up" the rear peep sight, and the usual way is as described. See that the rear sight has no back lash, which is hazardous to good shooting. If a front wind-gauge sight is used, see that the fitting of the wind-gauge hood is snug.

When shooting a rifle without cleaning between shots, it is well to blow the breath into the barrel. Sometimes a rubber tube is used for this purpose, but the use of such an implement should be confined to the range.

It seems almost superfluous to give a description of how to load a breech-loading match rifle, but the many requests received at the office of a sportsmen's paper for enlightenment, indicate there are many seeking such information. Most target shooters using a patched bullet, manipulate the rifle as follows: after firing, the action is opened and shell removed; the rifle is tipped over so that the barrel is toward the ground; a Fisher cleaning brush, with bristles at one end and rubber bands at another part, — the brush has been placed in a can or bottle of water, — is pushed through the barrel with a rod, and in the slots of the rod are pieces of flannel. The bristles of the cleaning brush scrub off the burnt powder, the rubber bands on the brush carry out most of the water, and the rag wipes out the remainder of the water. Sometimes this is all the cleaning done, but often another cleaning rod with a rag in the slot, and sometimes a third, is used, with the object of making the inside of the barrel perfectly clean and dry. Keep watch on the rags, and as they become damp, supply dry ones; for, if the patch becomes wet, it is liable to tear easily and let the lead touch the barrel, and lead without lubrication leads the barrel and destroys accuracy. Very few riflemen oil the barrel between shots. If it is done, care must be used to lubricate the same each time.

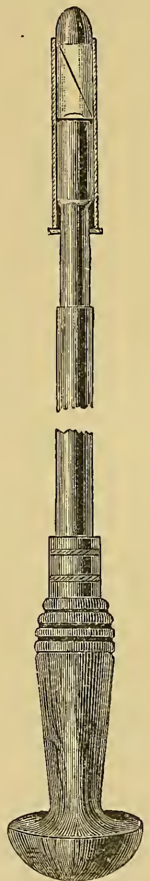


Fig. 154.—A Bullet Seater.

After cleaning, a patched bullet is placed in the barrel. Sometimes the patch is cut or slit with a pocket knife diagonally; but often this is omitted. Some simply drop the bullet in the barrel through the chamber; others place the bullet in a ball-seater, Fig. 106, and by aid of the ball-seater place the bullet in the barrel just ahead of the chamber in the rifling; still others use a wooden plug, shaped like the chamber, to seat the bullet, and sometimes the bullet is seated in the mouth of the shell. Frequently shooters on rifle ranges use but one shell, reloading it for each shot; or, if preferred, the shells can be loaded in quantity and carried to the range. Shells for target rifles are usually filled to the top, the powder shaken down by tapping, a wad of blotting-paper or card-board placed over the powder, nearly flush with the top of shell. The bullet is seated just beyond the end of shell, and the little space of about ⅛ inch between base of bullet and wad is called the air space, which is considered desirable, or certainly not objectionable.

Most riflemen believe that a rifle loaded as just described shoots with the greatest accuracy; but hunting and military arms are seldom shot in such a way, and, while I admit the chances are much in favor of the rifle loaded, as are most of those used for target shooting, possessing greater accuracy, I am sure that a hunting rifle—the arm I am more deeply interested in than all others — is capable of shooting far finer than any living man can sight or hold.

Use your hunting rifle as you would a fine horse — never overheat the rifle by rapid firing unless an emergency calls for it; then you can spurt it for all it is worth for rapidity and accuracy, but the moment opportunity offers, treat the rifle as you would the steed — cool it; wipe it; cover it; and guard it from knocks or falling, or unnecessary exposure.

I have been so greatly fatigued by an all-day's hunt that a moment after I rolled myself in my blanket, on the open Dakota plains, I have been sound asleep, but I have never yet fallen asleep for the night, when on a hunt, if I had shot my rifle during the day, without wiping and oiling the inside of my rifle barrel. I do not care if the outside of the rifle is rusted and scarred, but I want the inside of the barrel free from rust and lead.

Many riflemen complain of rifles rusting, especially in small bores like the .22-calibre. The liability of rust is greater with small calibres, but a very little attention at the proper time I have always found a preventive. I generally wipe the inside of a barrel with a woollen rag placed in the slot of a wooden or brass rod; never use an iron or steel rod. I wipe out the barrel thoroughly with two or three different dry rags, then use one saturated moderately with sperm oil or vaseline. Be sure your cleaning rags are dry, as, if wet with water, the oil will not prevent rust. Some riflemen choose to wipe the barrel dry after oiling.

If lead accumulates in the barrels, procure some quicksilver, and, after corking one end of barrel, pour the mercury in, and roll it back and forth. The lead will amalgamate with the quicksilver, and thus be largely or wholly removed.

A large proportion of rifles which are considered imperfect are spoiled by improper manipulation, and many which are considered ruined could be made to shoot well if handled by a well-informed rifleman.

CHAPTER XVIII.

THE PROPER AND THE ABSURD USE OF THE RIFLE.

The rifle is not only the noblest of all weapons, but is an instrument from which many find their greatest pleasure. It can be made a weapon which enables man to face the wildest and fiercest animals that walk the earth. Wild beasts, many times the size and strength of man, are fearlessly met in their native lair, and man, a pygmy, when compared with certain beasts, coolly faces an animal, takes aim with his rifle, presses the trigger, and generally the wild beast falls dead from the bullet from his rifle. There is no other instrument known with which the sportsman would dare to meet such wild beasts face to face. There are many persons possessing sufficient wealth to enable them to indulge in almost every known luxury; but the acme of pleasure is to hunt beasts of the greatest ferocity, and they will travel thousands of miles, seek the wildest regions to hunt the most ferocious animals, and their chief dependence is the rifle. While some find a pleasure in the use of the rifle as just described, others find it a necessity, and employ its use for food or profit. The perfection of the military rifle, and skill in its use make a mighty nation. Then there is rifle shooting at the target as a pleasure and pastime, the knowledge of which can be applied to any style of rifle shooting. With the numerous devotees to the various styles of rifle shooting there is much in the way of adventure and feats of skill which furnishes a fruitful source for writers, and the rifle has been conspicuous in tales of adventure and accounts of contests of skill.

There are certain legitimate uses for the rifle which have been described in previous chapters. Hunting with the rifle is to many the greatest of sports; defence and warfare are sometimes necessities; so is hunting for profit or food. Target shooting, whether with hunting, military, or match rifle, off-hand or with rest, at long or short range, at stationary or moving objects, is instructive, beneficial, and, to many, a pleasant pastime. All of the above uses of the rifle are considered legitimate.

There is a class of rifle shooting, however, which is held forth as requiring the greatest skill, which is senseless, of no practical value, and if by my efforts I can record anything that will prevent persons from cultivating it or applauding it, I shall be repaid for my labor. I refer to what is termed "fancy rifle shooting." As a rule, the fancy rifle shooter is a conspicuously poor rifle shot in regular and accepted legitimate uses of the rifle. I write advisedly on this subject, for my duties for many years have bought me in contact with many of the leading professional shots of the world, some of them magnificent shots; but, with the exception of a few, their skill lies in cultivating some absurd manner of shooting at short range, which no one familiar with the rifle recognizes as of any practical value, and then proclaiming themselves as champions of that special mode of manipulating a rifle.

Riflemen of mature years, perhaps, having arrived at the age of discretion, are less liable to be influenced by the exhibitions of the "fancy rifle shooter" than those of tender years, so I would especially direct my remarks to the young.

If a person acquires sufficient skill to place half his shots in the regulation bullseye from 25 to 1,000 yards, in the prescribed positions, he is acquiring a proficiency far beyond what the average rifleman generally attains. If one by natural gifts or assiduous practice is able to occasionally place all of his shots in a score, in an 8-inch bullseye at 200 yards off-hand, with a match rifle, he can rest assured that he is one of the best off-hand rifle shots, with match rifle, in America. If this can be done with a hunting rifle, sighted as such, or with a military rifle, he who accomplishes such a feat can properly consider himself as possessing greater skill than the average rifleman can ever hope to attain in that style of shooting, is equal to any living shot, and at the highest point in that style of rifle shooting. Such proficiency, and the ability to shoot an occasional ten-shot clean score at 500 yards, — a not uncommon occurrence, — and score an occasional 46 to 48 out of 50, at 600 yards, with the same style of rifle, in my opinion would entitle a man to the reputation of being one of the best living rifle shots at the target. If, with such skill, a person could cultivate shooting accurately at moving objects, or shooting quickly, he would possess all the skill necessary for hunting or warfare, far beyond what some of the best-known riflemen of America possess. I have mingled among expert riflemen, professional and amateur, for many years, and have never yet known of one possessing such a high order of skill.

With a target rifle, when shot at a rest at 200 yards, if one is able to occasionally score from 110 to 118 on the Standard American rest target, he can be well satisfied with his skill as a rest shooter.

I should consider the rifleman who is able to frequently secure aggregates of 80 to 86 in ten shots off-hand at 200 yards, on Standard American target, and a majority of his scores aggregating in the eighties, a first-class off-hand target shot. From 47 to 50 out of 50 points on Creedmoor target would be about the same order of skill. I should rate the rifleman who made a total of from 75 to 80 frequently, under the same conditions on Standard target, or 44 to 47 on the Creedmoor target, as a second-class target shot. Scores below 75 on Standard target, or less than 41 on Creedmoor target, I should consider the work of a third-class shot, if such scores represented his best work.

It is much easier to gauge the skill of the target shot than that of the hunter, for, with the latter, no prescribed rules are followed, and other elements are to be taken into consideration. A third-class marksman on the rifle range may make the best hunter; but chances, according to my way of thinking, are always in favor of the first-class marksmen securing the most game if sufficient time is given for a full comparison of skill. In certain styles of hunting, such as still-hunting, the knowledge of woodcraft is more necessary than superior marksmanship; and if some fine target rifle shot goes to the woods, and with the strange and unfamiliar surroundings gets flustrated at the sudden sight of game, it is not strange, but, however, sooner or later, when accustomed to such occurrences, his superior marksmanship will count heavily in his favor.

I have endeavored to show what amount of skill I consider necessary in legitimate target rifle shooting to secure distinction. Such shooting is at prescribed distances and under rules specifying the way a rifle should be held. There are persons who seek to astonish the world by what they term "fancy rifle shooting," and the accounts sometimes published of their performances seem to indicate they have amazed many.

There is no practical value to skill in shooting a rifle sideways, upside down, leaning over a chair, shooting between the legs, with rifle on head, or in any such absurd positions. Be content to shoot the rifle like a man, with butt to shoulder, at regulation distances, and my word for it, you have quite as much of a task as you can accomplish in a lifetime if you essay to become a first-class shot. One may practise continuously, acquire amazing proficiency, and he never will become so fine a rifle shot that he can, with absolute certainty, hit the regulation bulls-eye every time, shooting off-hand at the prescribed distances, or in the permitted positions at mid and long range in target shooting, and the same uncertainty will exist in the field.

Shooting at objects thrown in the air is another useless style of shooting to cultivate. There is nothing like it in practical shooting. If the objects were thrown sideways or away from the shooter, the case would be different, for it would teach one to follow moving objects, which is an accomplishment of great practical value for those who hunt with the rifle; in fact, it is the much neglected part of rifle practice in America, and I hope some day to see more provisions made for practicing with the hunting rifle on rifle ranges. This can be easily and safely done by providing a disappearing target, or a rolling target, and confining the practice to small calibres with light charges.

There is no better practice than shooting at slow flying birds or jack-rabbits running. But objects thrown into the air are shot at generally when they come to a standstill, or nearly to that point. Whenever you meet a person who boasts of his skill in hitting objects thrown into the air, try and gain permission to throw the objects. If you succeed, throw them to right or left and see how many are hit with a rifle bullet. Nearly every professional shooter can hit objects tossed into the air with a bullet from a rifle, if the objects are large enough, shot at a distance of a few yards, and tossed by one understanding just how to throw the objects. I have seen professional shots break many successive glass balls tossed into the air at ranges of 6 to 10 yards, who could not be relied on to keep ten shots in the 4-ring of the Creedmoor target at 200 yards, shooting off-hand. I have seen an almost continuous stream of fire poured from a Winchester rifle by persons who would make misses at the regulation target. The shooting with a rifle and ball with certainty from horseback and the animal running, is a myth, but recorded as a fact by writers describing frontier life. If one wishes to know the uncertainty of such shooting, try it; they will probably find shooting when the horse is standing as difficult a performance as they care to undertake; also try shooting from a canoe when there is a little ripple on the water. There is no certainty about the former, and it is extremely difficult in the latter way. Shooting from horseback with cartridges loaded with shot and fired from a .50-calibre Winchester rifle, or the same arm with a smooth-bore barrel is quite as difficult a performance as any one desires, and it is the way such work is generally done. Splitting cards with a rifle bullet had better be eschewed; driving nails, exploding cartridges, and such practices are useless, and the time and ammunition thus expended can much more advantageously be employed in shooting at a long distance, and at objects small enough to make the performance difficult. I think the practice of shooting at an object so large as to make hitting it every time almost a certainty, is calculated to do more harm than good. Some persons delight in indulging in trick shooting with a rifle, such as smashing clay pipes at 10 yards; they are happy if they can devise some way no sensible person would ever think of shooting; and if they can shoot at very short ranges and break something, they style themselves champion rifle shots of the world, exhibit their skill to admiring audiences, but somehow their names are never found among those who participate in international contests; they don't go to Creedmoor and shoot the rifle, neither are they seen on the first-class rifle ranges, and I have rarely seen them in the field.

CHAPTER XIX.

CONSTRUCTING A RIFLE RANGE. — LAYING OUT A RANGE. — ARRANGEMENT OF THE BUTTS AND PITS. — SYSTEMS FOR MARKING SHOTS.

Most riflemen desire a rifle range which affords comfort, and is favorably located for good shooting. Criticisms have often been made on the arrangements of modern rifle ranges, and claims put forth that the conditions are unlike what would be found in hunting or warfare. Much of the shooting done on American rifle ranges is with target rifles, and by persons who indulge in it for the love of rifle shooting as a sport. Many do not care to kill game, and have no interest in implements of war, but admire rifle shooting, and desire to make as fine scores as is possible, with every known appliance to aid them. The rifle to them is a fine instrument which requires great skill to handle dexterously, and it is only as a pastime that they shoot it. They require the finest rifle that can be procured, and will make considerable of a sacrifice to secure the best, and stop at no reasonable expense, if they can procure a device which will aid them in making better scores. There are others, who shoot hunting and military rifles, and desire every favorable condition they can secure when practicing or testing rifles and ammunition. Almost every person who shoots a rifle on a rifle range, desires the grounds located as free as possible from air currents, and where one will not be exposed to the elements when shooting. A rifle range should be located, if possible, in a flat, open country, or where there are no ravines or gullies crossing the range, for currents of air to sweep through, which deflect bullets in their flight. It is desirable to have the targets located so that the shooting is toward the north; for, if located east, the morning's sun will shine in the face of the shooter; if located west, the afternoon's sun will prove troublesome. If possible, place the targets so as to have a natural backing; a hill or rising ground will save building a bank. Some rifle ranges are built with the targets for 200 to 1,000 yards, side by side. I think this should be reversed, if possible, and all the firing points side by side, and the targets set back to the proper points; this would prevent accidents, which might occur from passing from one range to another. Owing to the decline of long-range rifle shooting, there are but few ranges in America which include the 1,000 yards.

In the opinion of most riflemen, there is no arrangement so safe and satisfactory for the market as a pit below the target. The targets generally used beyond 200 or 300 yards are the first and second class Creedmoor and the United States Army targets, and iron, paper, or canvas are the materials from which they are usually constructed.

After selecting a site for a rifle range, clear away all shrubbery which would interfere with sighting, and measure with great care the distances required. Do not resort to pacing the distance, but use a measuring line; a steel tape is preferred. When the distances have been accurately measured, the pits can be dug. The fortifications thus erected are called the butts, and inside the butts, the pits. The butt at the top should be at least five feet wide and level at that point. If means permit, pave and wall the pit with brick or stone. It is not necessary to have fine masonry; stones similar to those used in building stone walls may be used. If such material is not procurable, use logs, as by the use of stone or logs the pit will keep its shape, and the sides will not be so likely to cave in and crumble away. When this is omitted it is less secure and always untidy. Arrange the bottom of a pit so the water can run off and not stand in the bottom, rendering it damp, uncomfortable, and unhealthy. Back of the pit it is desirable to have another embankment, which is to catch the bullets passing through the paper targets or missing those of iron. The length of the butts is governed by the number of targets; the height, measured from the bottom of the pit to the top of the butt, should be not less than eight feet. The butt should be watched, and any washing away by rain should be at once repaired. The distance between the butt and rear embankment should be about five feet, and the intervening space covered or roofed with boards, cutting away a place for the targets, and to enable the marker to watch for the shots, the width being determined by the size of the target.

With the butts constructed and the pit covered, the arrangement of the targets can be commenced. If the targets are to be of iron, it is usual to procure slabs of the desired height and width. It is easy to secure the proper length, but generally two or more slabs are necessary to obtain the required width. The iron generally used for targets is about one inch in thickness. The slabs are erected by propping up with iron bars. After erecting the targets they are painted white, and the bullseye and lines drawn or chiselled on the target and the bullseye blackened.

The iron target is rapidly disappearing in America, and it should have been abandoned long ago. It is more dangerous than the paper target, on account of flying lead; and a trap must be placed in the cover of the pit, which it is necessary to close before each shot, raising afterward, and the shot signalled with a marking disk, one side of which indicates the value of a shot, the other arranged with a brush to paint out the shot. Whenever this trap is opened, the marker in the pit is in danger; for, if a shot strikes the target, a shower of lead flies, and a portion of it will pass down through the trap, which is liable to cut the hands and face of the marker and perhaps destroy his

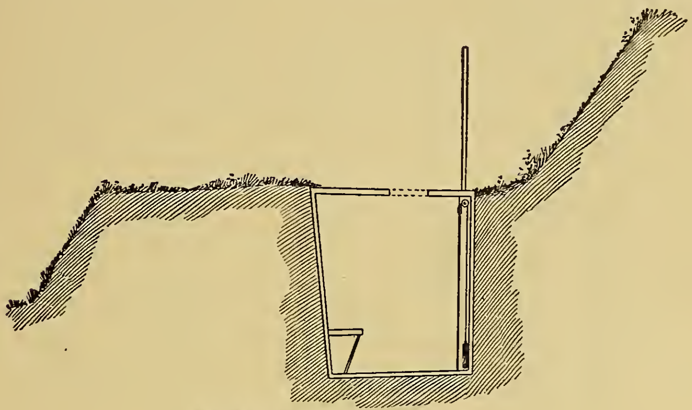


Fig. 155.—Sectional View of Rifle Pit.

eyesight. It matters not how great care is exercised by clubs, there is a liability for the best and most careful rifleman to shoot on the wrong target, and to shoot before the trap is closed, although a danger signal is used; it has been done hundreds of times, and markers severely injured. Besides this, it is difficult to keep an iron target in good condition, especially when many are shooting, as in large tournaments. The bullseye will become irregular in shape; and it is quite difficult, and perhaps impossible, to tell whether a shot touches it or not. In rainy weather the black paint will run, and often oblige a cessation of the shooting. As all these faults became known, most American riflemen cast the iron target aside, and its place has been supplied by paper targets, which are now almost universally used, — so much so that a detailed description of the iron target seems unnecessary. The arrangement for using paper targets, which has given the best satisfaction on the principal ranges, is as follows: —

A frame of the width of a full target, and about two feet longer, is constructed. It is made of pine wood, one and a half or two inches in thickness and three inches wide. The object of making the frame longer than the

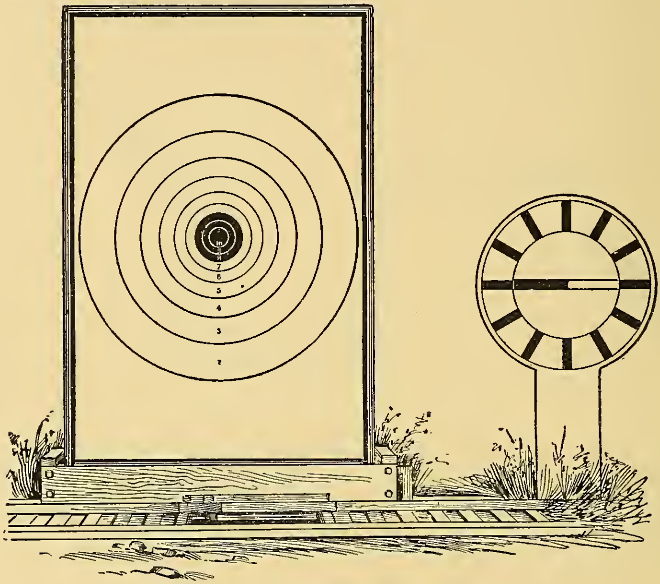


Fig. 156. — Target Raised ready for Firing.

target is in order that it may extend into the pit when the target is raised, making it easy for the marker to draw down to plug or paste the shots. A coarse, stout cloth, usually gunny cloth, is tacked tightly to the frame; over this is tacked a covering of white cotton cloth, on which the paper target is pasted. Very thorough trials of the different modes of arranging targets have been made at Walnut Hill and elsewhere; and it has been decided that no arrangement is as desirable as the window-sash device. A frame similar to that used for windows is constructed, enabling the marker to raise and lower the target as he would a window.

A system of double targets was for some time in use, which was thought by some to expedite shooting; as when

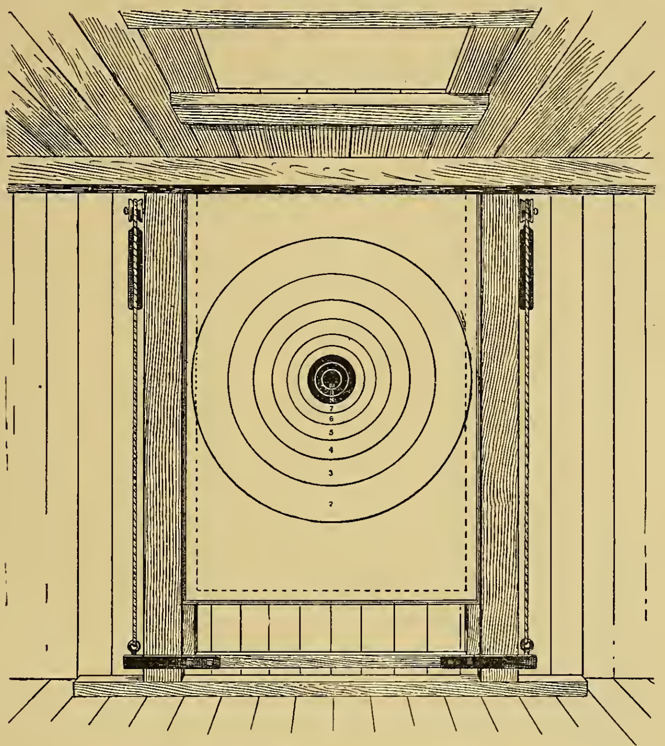


Fig. 157. — Target lowered into Rifle Pit.

a shot was placed on one, another was raised, and while the shot was being clocked and the hole pasted, another marksman would be taking his place at the firing point, aiming or even firing. The chief objection to this plan was, it necessitated having two shooters on a target ; for, if one person was firing alone, he could not see the location of his shot until he or some other party had fired another shot to throw down the second target and bring up the first. With the double arrangement of targets there is always one displayed, and consequently the danger of accident is greater; for whenever a target is shown, it is possible that some one may fire on it, even if danger signals are displayed: therefore a majority of riflemen favor the single target arrangement.

The sash arrangement to receive the target is placed in the pit; and the illustration shows it with the target mounted, set in the sash and lowered into the pit. Another illustration shows the target raised from the pit to the position it is when shot on.

Although the iron target is rapidly falling into disuse, especially at short range, 200 yards, the Creedmoor count is still used, though chiefly by military marksmen. There are two modes of marking shots by Creedmoor count, in general use. The first is by the disks, placing one where the shot strikes the target, and signalling the value at the same time; the white disk indicating a bullseye, counting 5; the red a centre, counting 4; the black and white an inner, counting 3; the black an outer, counting 2. The marking disks are arranged in the pit, as shown in the illustration (Fig. 161). If an iron target is used, a brush on the inner side of the disk paints out the shot at the time of signalling the value. If paper targets are used, and the disks employed, the proper one is placed upon the location of the shot, after which it is replaced in its rack, the target lowered, the shot pasted, a white one being used for shots outside the bullseye, a black one when in it. Well grounded objections have been raised to marking by disks. The color is sometimes mistaken; if used to paint out the shot on an iron target, it is necessary to be supplied with paint in the pit, which causes much dirt, and the brushes are stiffened and made unserviceable. The disks occupy space in the pit, and are unnecessary if the better mode of clocking the shots is employed.

A device for registering the value of shots, which has given satisfaction at Walnut Hill, and is in use at many of the leading rifle ranges in America, was perfected by Mr. J. W. Soule, a practical rifleman and mechanic possessing a very high order of skill.

His device is designed to accurately indicate on a dial the value of shots at rifle ranges, and its mechanism is as follows: A brass plate, supporting two bearings at right angles with each other (one horizontal for the hand spindle, the other vertical for the shaft), is fastened to the back side of the dial, the hand spindle bearing projecting through the dial. The index hand and shaft are connected by brass bevel cut gears. The shaft extends from the dial into the pit, and is there connected with a segment of metal, having numbers on its arc corresponding to the numbers on the target. The segment is provided with a series of holes to correspond with its numbers. The shaft has firmly attached to it by a set screw, a spring lever, extending over the segment, said lever having a projecting pin on its under side, which fits into the holes in the segment. In operation, the marker notes the value of the shot on the target, and covers the corresponding number on the segment with the lever (which locks in that position), and the hand is moved to a like number on the dial. This can be seen in the accompanying illustration.

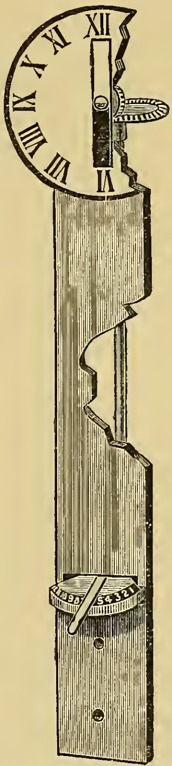


Fig. 158. – Soule's Target Index.

By using this device, the value of a shot remains in view until the next one is marked, which is quite an advantage. The target index here shown is very popular with American riflemen, because it can be used to mark shots by

Creedmoor count, by Standard American target count, either on the off-hand or rest target, by Massachusetts target, or, in fact, any target counting from one to twelve, or less.

The somewhat primitive method of showing a card with a large figure thereon is employed by some clubs, as

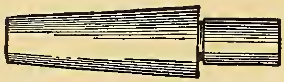


Fig. 159. — Indicator Plug.

Fig. 160. — Indicator.

well as a post with figures arranged, and a pointing indicator set opposite the figure representing the value of a shot. But no system has given such general satisfaction as the clock or dial indicator. Riflemen who shoot at targets and are scored the results, desire to know the location of their shots which are pointed out by the disk system but quite unsatisfactorily, and is only proper for military or what might be termed coarse shooting. In connection with the target index is a plan which, wherever tried, seemingly gives satisfaction. It was originated at Walnut Hill by Mr. Geo. R. Russell.

After a shot has been fired, the target is drawn down into a pit by the marker, who is supplied with an indicator plug, which is shown in the accompanying engraving.

Fig. 111 represents a wooden plug. Fig. 112 represents an indicator; both are shown full size. This indicator is composed of card-board; it has a black centre and a white outer. Through the centre of the indicator is a hole through which the right-hand end of the plug is inserted from the reverse or white side and carried to the groove shown in the engraving, where it is held firmly. The left-hand end of the plug is placed in the bullet-hole, and the target raised out of the pit for the second shot. By aid of the telescope at the firing point, the rifleman who has fired

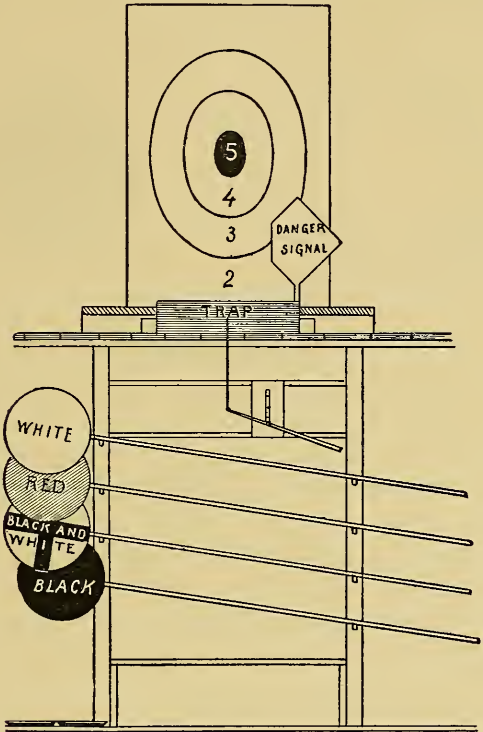


Fig. 161. — Arrangement of marking Disks for Creedmoor or Elliptical Targets.

his shot can distinctly see where his bullet struck. If inside of the bullseye the white outer makes it seen, and the exact location spotted ; if outside of the bullseye the black centre makes it conspicuous and easily discerned.

After the second shot is fired the target is again lowered by the marker, who hears the spat of the bullet as it strikes the target. The indicator is removed from the first bullet-hole and placed in the second; the marker pastes a gummed paster over the first shot-hole; if outside of the bullseye one of white, if inside of the black, one of that color. If the bullet cuts the edge of the bullseye a black paster is used up to the edge, and a white one for outside of the black. The target is then raised for

Fig. 162. — White Paster — Full Size.

Fig. 163. — Black Paster — Full Size.

another shot. At the side of the target, over the pit, is the clock dial previously described, the hand of which is set to the figures representing the value of the shot by the marker from the pit; this being readily seen with the naked eye by the rifleman and scorer at the firing point.

With the pits properly constructed and the targets in good working order, attention can be given to arranging the firing points. If the plan of having but one line of firing points for the various ranges is adopted, a shooting pavilion can be arranged, either extending down the entire line or part way. If the firing points are at different parts of the range, it is common to locate the shooting house near the 200-yard range. At Walnut Hill one steps from the club house to this firing point, and this plan prevails at the ranges of a majority of American rifle clubs. It is desirable to have a solid and substantial footing while aiming, preferably the ground. Many clubs permit the use of wind screens, and also cover the firing points by projecting eaves to keep off the rain. Early in the history of rifle clubs many protested against these provisions for protection in inclement weather, but it was found that riflemen would not shoot except when the weather was favorable, unless the range was supplied with screens and other appliances, and one club after another added them until the custom has become almost universal. It is usual to have each target numbered or lettered, and corresponding figures at the firing points, to aid riflemen in shooting at the right targets; a fine is usually imposed for shooting on the wrong one. There should always be a flag of some striking color provided for the markers at the pit, and one for each firing point. Should a target get out of running order, or anything occur to call the markers from the pit to the front of the target, the flag at the pit should be planted at the end of the butt, targets should be lowered if possible, and the scorers at the firing points should respond by planting flags in front of the firing points; all firing should cease, rifles uncocked and actions opened.

Fig. 164.—Combined Marking Disks and Brush.

After repairing targets the marker should return to the pit and lower his flag, when all of the flags at the firing points from which shooting is being done should be removed. It is best to keep flags flying from such firing points as are not in use on shooting days, and only remove them when the targets are opened.

It is customary to locate at different places on the range, flags or streamers, and a wind dial. Both are intended to indicate the direction and force of the wind.

These flags and streamers are made of any suitable material. The wind dial is illustrated. It is so arranged that the wind will indicate on a clock dial the direction from which it blows, and riflemen speak of a wind which blows the indicator opposite the figure three, as a three o'clock wind; when pointing to the figure six, as a six o'clock wind.

It is sometimes difficult to provide a backing or rear embankment sufficiently large to catch stray bullets which come from wild shooting, and if a range is situated in a thickly settled country it is necessary to provide a safeguard. This is done by erecting a barrier about twenty yards from the firing point, with holes cut in it, through which the rifleman shoots. The barrier may be built of ordinary timber, two inches in thickness. Heavy posts should be driven in the ground to which two rows of plank are attached, leaving a space of two feet between, which should be filled with rocks or earth. The hole through the barrier should be of such size that shots passing through it will hit the target, and therefore if an unsteady marksman flinches, or jerks the rifle so the bullet would fail to hit the target, the shot would be caught in the safety guard.

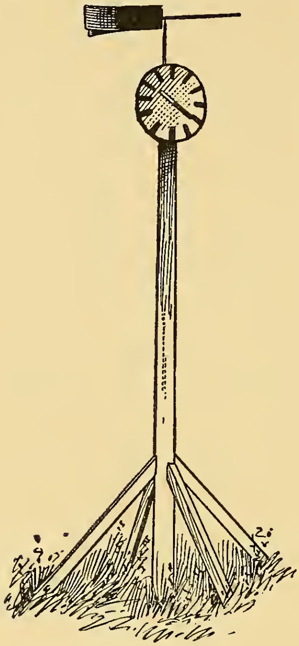


Fig. 165.— Wind Dial.

With the ranges measured, pits built, targets and target indexes erected, a wind dial set up, and firing points arranged, the outdoor part of the range is completed. The shooting house should be provided with racks for rifles, and shelves for the riflemen's kits.

On visiting the grounds of a large rifle club, or where matches are being shot, one usually purchases entries, and is supplied with a double ticket; this is handed to the scorer who places it in a score board and calls the name of the shooter in turn. On well-equipped ranges two telescopes are supplied at each firing point, one for the scorer, the other for the shooter. Upon firing, if the target is hit, it is lowered into the pit, the shot plugged with the indicator, the target raised from the pit where, by aid of the telescope, the shooter and marker see the location of the shot. It is the duty of the scorer to see that the marker clocks the shots on the target index, and if correctly done he calls the shot and records the value on the score card which, when completed, is aggregated, and one part of the ticket given to the shooter, while the other is held by the club for record, or determining the position of contestant in the match.

There should always be an executive officer present, to whom all disputed shots or other questions should be referred for final or temporary settlement.

CHAPTER XX.

TARGETS USED BY AMERICAN RIFLEMEN.

RIFLE targets are generally known as inanimate objects at which riflemen shoot for practice or trials of competitive skill. Thousands of matches have been shot on the crudest forms of targets, such as a blaze on a tree, a conspicuous mark on a rock, a knot of a tree, or roughly marked spots of various sizes and shapes, and at distances from a few yards upward. Contests on such targets would probably be settled by the greatest number of hits. It is well known by riflemen that a target should be larger than the conspicuous object or point aimed at. A target consisting only of a spot of such size as to call forth any skill to hit or pleasure to shoot at, would give but little satisfaction; for, if missed, and the rifleman was conscious of holding the arm properly, he would desire to know where his shots struck, in order that he might correct the fault. If the rifle was held right, the arm properly made, and the ammunition good, the chances would be that the error was in the sights being improperly set to correct the force of wind, or some similar cause. Therefore, nearly all targets are considerably larger than the conspicuous spot aimed at, and by this arrangement a marksman can learn where his bullets strike.

If there were no contests of skill in rifle shooting, there would be less need of anything more than the crudest of targets, such as alluded to. From the time rifles were first made, until the present, those who shot them have measured skill with each other. A target sufficiently large to catch all the shots which show skill in aiming and firing worthy of record, is generally employed, in the centre of which a spot, of a size suitable to the distance or kind of sights used, is placed. If two persons are shooting a match, the first may place six out of ten shots in the place aimed at, and miss the target entirely with the remaining four shots. The second may hit the object aimed at but three times, but place the remaining seven shots within an inch of the spot sighted on. It would not take much reasoning to determine that the second marksman displayed greater skill than the first; but, if the object aimed at constituted the whole of the target, or some of the crude forms alluded to which did not show the close shots, such as a bottle or rock set on a stump, then the first person would probably be voted the superior shot. Most intelligent riflemen recognize the value of close shots, and claim their proper value.

One of the oldest and best methods ever devised for determining the value of shots, one which never has or will outgrow its usefulness, is known as string measurement. If the marksman is shooting a score, and this system of scoring is employed, he will measure from the exact centre of an object aimed at, whether large or small, to the centre of each shot, add the results of the shots together, and the person securing the shortest string or the least number of inches has made the superior score. For many years this mode of scoring shots was followed, and is to some extent practiced to-day, especially in contests where muzzle-loading rifles are used. Every few months some writer to the sportsmen's journals advocates a return to this system, but it probably will never be used to any great extent again in any contests, except by the class referred to, or perhaps matches where there are but few contestants. The equity of the string measurement system is shown in Figs. 166 and 167. If shooting at a bullseye the size of these circles by Creedmoor count, the person making the target shown in Fig. 166 would make the better score; but, if scoring by string measurement, the one making the Fig. 167 target would be the winner,

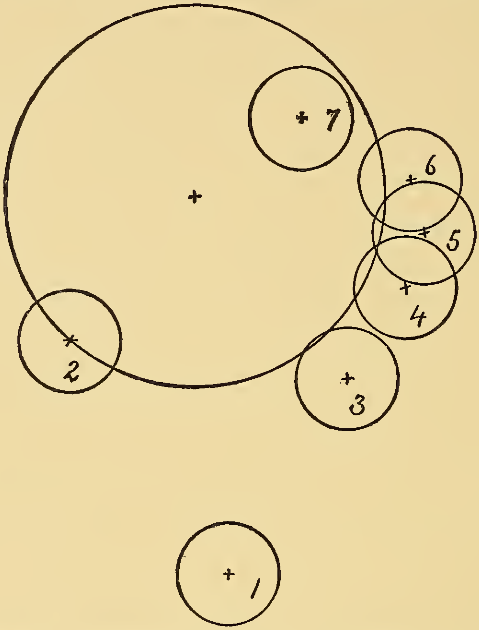


Fig. 166.—A Score Exceeding Fig. 167, by Creedmoor Count.

and he would actually do better shooting. Rifle shooting in America has become a very popular sport, and the number of rifle clubs is increasing; the citizen soldiers in most of the States now pay considerable attention to rifle practice; tournaments are held in various sections of the country, and men become wonderfully skilful in off-hand shooting, by constant practice. In fact, there are thousands of off-hand rifle shooters where there are dozens who shoot from a rest. The off-hand shooters meet at large tournaments, and it is nothing unusual for a contestant to fire a hundred shots a day. The expenses of shooting festivals are large, and it is customary to encourage rapid firing, therefore it would entail an enormous amount of labor to employ the string measurement system of counting; besides, in off-hand shooting, a mode of marking is employed which is speedier, generally accurate enough to

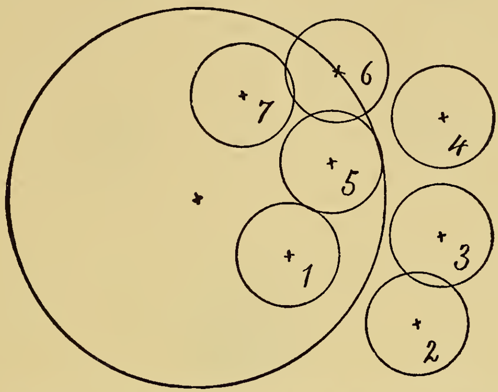


Fig. 167. — A Score Exceeding Fig. 166, by String Measurement.

correctly determine the value of shots, permits marksmen to shoot much more, and therefore enables a great number to participate in a match, and is cheaper. The plan chiefly employed is placing markers in pits, who signal the value of shots.

The National Rifle Association of America was formed Nov. 24, 1871, and prior to that time targets of various designs were used. Upon the organization of this association, a set of targets was adopted which are shown in the accompanying illustrations, the sizes being: —

A. — Up to 300 yards; target, 6 x 4 feet; bullseye, 8 inches square; centre, 2 feet.

B. — Over 300 to 600 yards; 6 feet square; bullseye, 2 feet square; centre, 4 feet.

C. — Over 600 to 1,000 yards; 6 x 12 feet; bullseye, 3 feet square; centre, 6 feet.

In all cases bullseyes to count 4, centres 3, outers 2.

This set of targets was used by the National Rifle Association and other clubs. The square bullseye, however, did not give satisfaction to a majority of riflemen, and on April 6, 1875, the N. R. A. voted to substitute a round

A Target.

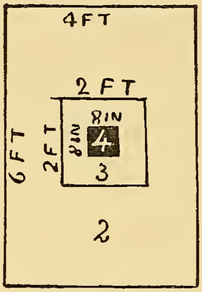


Fig. 168.

B Target.

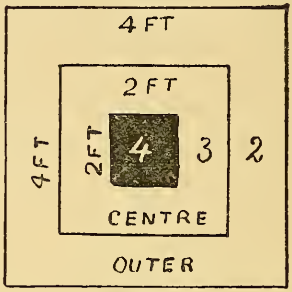


Fig. 169.

C Target.

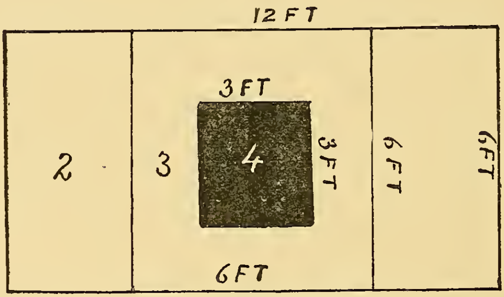


Fig. 170. — Old Creedmoor Targets.

bullseye and circles, also to add another circle and change the count to bullseye 5, centre 4, inner 3, and outer 2, the size of the original targets being retained. It is evident from the records of this association that riflemen were not very proficient in off-hand shooting as late as 1875, for in the annual report of that year is found the measurements of the new targets and the following comments : This change seemed to work well for comparative purposes, and also necessitated finer shooting ; but the third-class, or short-range target, having proved itself to be too difficult for our young military and other marksmen, requiring extraordinary skill to produce a first-class score, and acting upon some very valuable suggestions submitted by Gen. Shaler, it was decided to abolish one numerical count per shot, bullseye, centre, inner, and outer.

The Creedmoor targets with the second measurements, however, became popular and were almost universally used by American rifle clubs for several years after their adoption. These targets are illustrated and have the following dimensions: —

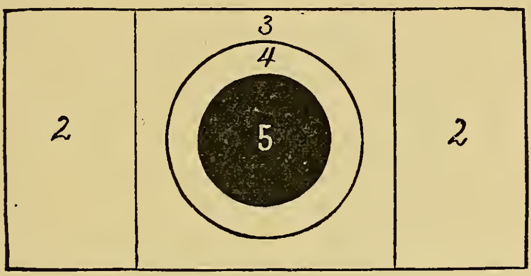


Fig. 171.

First-class, 6 x 12 feet.
Bullseye, circular, 36 inches in diameter.
Centre " 54 " "
Inner, square, 6 x 6 feet.
Outer, remainder of target.

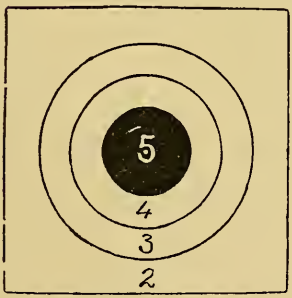


Fig. 172.

Second-class, 6 x 6 ft.
Bullseye, circular, 22 ins. in diam.
Centre " 38 " "
Inner " 54 " "
Outer, remainder of target.

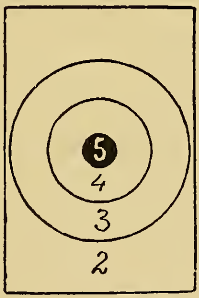
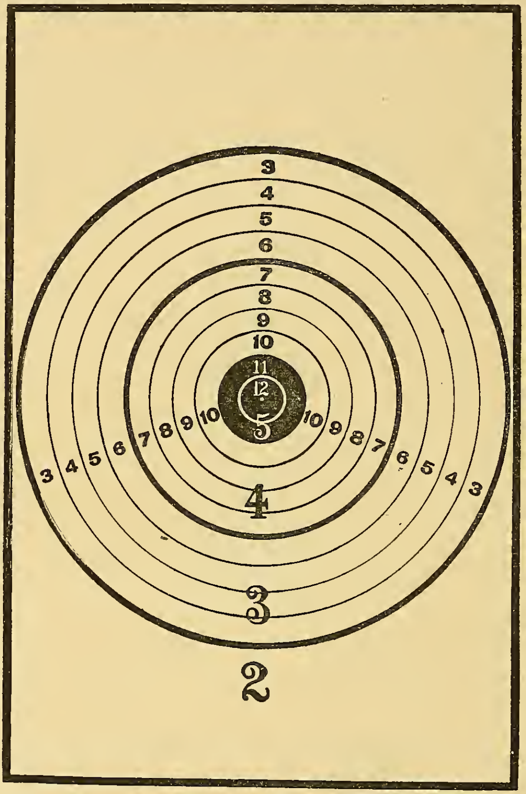


Fig. 173.

Third-class, 6 x 4 ft.
Bullseye, circular, 8 ins. in diam.
Centre " 26 " "
Inner " 46 " "
Outer, remainder of target.

Present Creedmoor Targets.

An excellent target was designed and adopted by the Massachusetts Rifle Association early in its history. It has generally been known as the Massachusetts target, and is shown in the illustration. Its dimensions are as follows : —



TARGET 4 x 6 FEET.

Count 12.	Bullseye, circular,	4	in. diam.	} Creedmoor Bullseye.
" 11.	" "	8	"	
" 10.	"	12½	"	} Centre.
" 9.	"	17	"	
" 8.	"	21½	"	
" 7.	"	26	"	
" 6.	"	31	"	} Inner.
" 5.	"	36	"	
" 4.	"	41	"	
" 3.	"	46	"	
" 2.		6 x 4 feet.		Outer.

Fig. 174. — Massachusetts Target.

It is an excellent target, and is used to some extent to-day; but it never attained the popularity it deserved, probably because it recorded more accurately than the Creedmoor target, and was used at a period when the skill of American riflemen in off-hand shooting was much below what it was ten years later. Good rifle shots, as

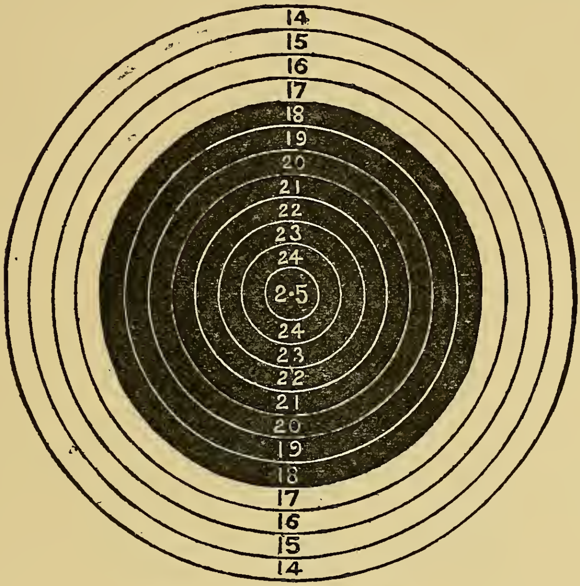


Fig. 175. — German Ring Target.

a rule, preferred this target to the Creedmoor; indifferent shots clamored for the latter, because a shot as wide of the bullseye as ten inches would count as high on the Creedmoor target as if within an inch. But if those shots were on the Massachusetts target, the former shot would count 10, and the latter 7. The Creedmoor targets being the ones adopted by the National Rifle Association, and the Massachusetts target being the same size as the third-class or off-hand target, and some of its rings corresponding with the lines on the third-class Creedmoor target, permitting Creedmoor or Massachusetts count, rifle clubs frequently had the two targets on their ranges; and for a period of about ten years these two targets were chiefly used by American rifle clubs following the National Rifle Association rules.

There are many rifle clubs in America that do not shoot under the rules and regulations of the National Rifle Association, and the targets used by them are generally different from those authorized by that organization. Some of these clubs existed before the National Rifle Association was formed. Their members, as a rule, use fine-sighted rifles, — frequently set-triggers, palm-rests, and other devices, — which are not, or were not until recently, permitted by the National Rifle Association. The targets used vary, but they are generally made up of a series of rings. The German ring target is perhaps as popular as any of the old ring targets; it has a bullseye 12 inches in diameter. The whole target, including bullseye, is divided into circles ¾ inches apart, the centre circle being 1½ inches, and counting from 25 down.

Another ring target, which was popular at one time in this country, had the following measurement: —

"RING TARGET," 2 x 2 FEET.

Count	12.	Bullseye,	circular,	2	inches	diameter.
"	11.	"	"	4	"	"
"	10.	"	"	6	"	"
"	9.	"	"	8	"	"
"	8.		"	10	"	"
"	7.		"	12	"	"
"	6.		"	14	"	"
"	5.		"	16	"	"
"	4.		"	18	"	"
"	3.		"	20	"	"
"	2.		"	22	"	"
"	1.		"	24	"	"

At many of the large shooting festivals, especially if the German-American riflemen are prominently connected with them, there are often a variety of targets used, with some of which the element of luck has something to do with a person's score. The Man target is sometimes used, and the illustration shows it in a reduced form. The whole of the target is black, the lines are ½ inch apart, the centre counting 20, and the numbers run down to one on each side.

The Eagle target has been used for years at German and Swiss festivals, and has been introduced into this

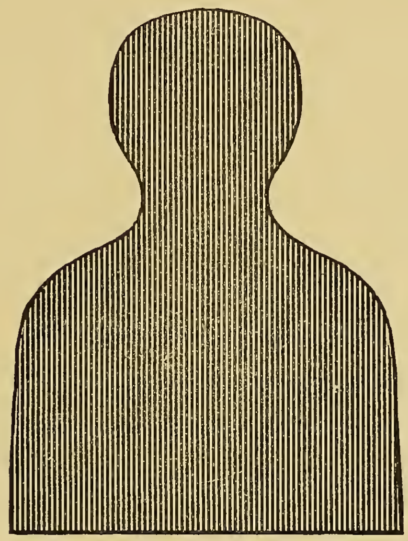


Fig. 176. — Man Target.

country. One is illustrated which has been used by the Rochester Schützen Gilde at Rochester, N.Y., at its tournaments. This organization is composed of German and American riflemen. The Eagle target is fastened to the top of a pole 40 feet from the ground. It is made of wood, handsomely painted, and is 9 feet high by 12 feet wide, and is composed of 18 parts or sections, firmly dowelled together. These parts are numbered, and contestants endeavor to shoot them off. The single parts are of 1-inch pine; one ½-inch dowel holds them in the joint of the 3-inch body shield, which must be hit to drop. If the wrong piece drops, the piece falls back to the treasury. A dynamite cartridge is placed in centre of body, which is protected by an 8-inch iron plate, with ¾-inch hole for centre, in which is a blank cartridge to ignite the dynamite for exploding the body. In order that the reader may clearly understand the modes of determining the value of successful shots on this target, I append an extract from a programme of the above organization showing the order in which the single parts shall be shot off: —

1. Ball of centre crown.
2. Right small ball.
3. Left small ball.
4. Right flag.
5. Left flag.
6. Crown itself.
7. Right ring.
8. Left ring.
9. Reichsapfel.
10. Szepter.
11. Right head.
12. Left head.
13. Right shank.
14. Left shank.
15. Right wing.
16. Left wing.
17. Tail.
18. Body.

In Germany riflemen shoot at a body 2 feet in diameter, and weigh the splinters. The amount each bullet tears off calls for a stipulated amount per weight, and the rifleman knocking off the last splinter receives the king prize. This latter mode of shooting has not found much favor in America.

There have been many targets in use before and since the Creedmoor targets were adopted, a majority of which are made up of series of rings, similar to the German ring target, but with varying widths of circles, and to which various names have been applied; I will name and briefly describe some other targets of uncertain popularity.

The Point target has a black of 12 inches diameter, divided into three parts; the inner circle is 3 inches in diameter, counting 3 points; the next circle, 6 inches in diameter, counting 2 points, and the balance of black, counting 1 point. Shots out of black do not count.

Off-hand, 25-ring target; composed of 6-inch black and 24 rings, ½ inch apart from centre; count 1 to 25.

Premium off-hand target; bullseye 4 inch, and black with a white 1½ inch centre. A prize for each time the white carton is struck.

A target known as the Stich target has been used at some of the German-American festivals in this country. It possesses so little merit that it is generally avoided, and a desire for variety seems to be the only excuse for its existence. This target has a black of 12 inches diameter, in the centre of which is placed a bullseye of 6 inches diameter; the balance of the target is white. None but bullseye shots count.

Star target, off-hand; a clay target 6 inches in diameter.

There are various targets representing figures of persons, animals, and birds, which need only be mentioned, for they savor of very short ranges, and Flobert or saloon rifles, and are far from inspiring to the true rifleman.

The Creedmoor target with a round bullseye was largely in use for off-hand shooting by American rifle clubs for about ten years. On Oct. 22, 1879, the first ten-shot clean score known was made in an off-hand match, and in the following year several were recorded. From that time forward they were made with great frequency, until finally two or more would be made in an afternoon's shooting, and runs of 20 or more bullseyes consecutively. In contests where experts were numerous, especially if there were re-entries permitted, ties would be so frequent that much time was consumed in settling them by additional shooting. In fact, in certain matches one was obliged to secure all bullseyes to gain a position, and a centre shot would be no better than a miss. It was generally recognized that the Creedmoor target was altogether too coarse for the modern American match rifles in the hands of skilful marksmen. About 1882, riflemen demanded a target with a decimal count, and one which would give the advantage of close shots; it was also urged that the lines of the Creedmoor target must be retained in order to count either decimally or as Creedmoor.

With these demands there was nothing to do but increase the width of the circles as you receded from the bullseye, and acting on this plan a target was designed by

Fig. 177.—Eagle Target.

Major Charles W. Hinman, adopted by the Massachusetts Rifle Association in 1883, and called the Massachusetts Decimal Target.

When this target was designed it was known to the board of directors that accepted it, that the string measurement system was by far the most equitable known, but it also knew that such a mode of marking could not well be adopted at large tournaments. It was aware that a majority of intelligent and skilful American riflemen recognized the fact that it required a greater amount of skill to place a shot in the centre of the bullseye than on the edge, and far better holding was necessary to plant a shot within an inch of the bullseye than eight inches away from it. It was familiar enough with the skill of American rifle shooters to know most of the shots not in

Fig. 178. — Point Target.

the bullseyes, especially when re-entry matches were shot, would be very near the bullseye, which indicated that the finer circles should be there. In addition to this was the demand for a decimal count, and a rapidly growing belief that as shots were placed farther away from the bullseye the penalty should be increased; and finally, it was desirable that the lines of the old Creedmoor target be retained, to permit shooting with match rifle, military rifle, or rest shooting. All these points were considered by the designer and board which adopted the decimal target.

This target is so similar in appearance to the Standard American target, that in its reduced size, suitable for illustrating in these pages, it could not be distinguished from that target. The dimensions of the target were 4 x 6 feet.

Count.		Diameter of Circle.
10	Bullseyes.	3½ inches.
9	Bullseyes.	5¾ "
8	Bullseyes.	8 "
7		10¼ "
6		12¾ "
5		16¼ "
4		20½ "
3		26 "
2		33 "
1		41¾ "

The Massachusetts Decimal Target was the first in America known to the writer, to include the decimal count, and the plan of increasing the width of rings from the one in the centre of the bullseye. It was used by the Massachusetts Rifle Association and other clubs for about two years. The principle of this target was new to American riflemen, but met with favor by a majority of the fraternity. With the somewhat radical change, however, there were a number unprepared to indorse it, and freely criticised it. In 1884 a target was adopted by the Gardner Rifle Club at Gardner, Mass., a club famous for its excellent shots. It was used by a number of rifle clubs, and named the American Decimal target. Its count was 1 to 10, had an 8-inch bullseye counting 9 and 10. Diameter of 10 circle 4 inches; 9 circle 8 inches; each additional circle 1⅛ inches apart.

During the latter part of 1884 and through 1885, the target question was in a chaotic state in America. Designs were presented with great frequency, and individuals, confident that their plan would supply the long-felt want, published targets which were placed on trial at rifle ranges. Some clubs adopted certain targets, while others had a variety in use, that riflemen might shoot on the one preferred. The result of this multiplicity of targets was an inability by riflemen to determine the correct value of scores when reported in the sportsmen's journals. A comparison of scores was difficult, and only possible with one knowing the measurements of the numerous targets, which was well nigh impossible, owing to the increasing number, and little favor most of the new targets received.

In 1885 *The Rifle* was first published, and the editor, by communicating with every known American rifle club, learned that the third-class Creedmoor target was no longer favored by a majority of clubs for 200-yard shooting, and there was a general desire for a Standard American target, in order that riflemen would, on glancing at a score, know its value. Clubs and individual riflemen were invited to submit designs for a Standard target. It should here be stated that some riflemen favored a departure from the Creedmoor lines, and submitted designs disregarding them, as well as the decimal count, but a majority seemed to favor the plan alluded to previously, of combining a decimal and Creedmoor count. For about a year *The Rifle* published meritorious designs and printed the views of all riflemen submitting them. The targets containing sufficient merit to receive consideration were the following: —

Old targets, in use prior to discussion: Creedmoor target; German Ring target; Blunt's U. S. Army Elliptical target; Massachusetts target; Massachusetts Decimal target; American Decimal target.

The new designs submitted were as follows: Ring target, designed by Henry S. Harris, count 1 to 10; bullseye 9 inches in diameter, count 10, 9, 8; diameter of circles 3, 6, and 9 inches respectively; diameter of other circles, 7, 12 inches; 6, 15 inches; 5, 18 inches; 4, 21 inches; 3, 24 inches; 2, 27 inches; 1, 30 inches.

Ring target, by Charles L. Holmes, count 1 to 20; outer circle 40 inches in diameter; each additional ring 1 inch apart; smallest ring 2 inches in diameter.

Decimal target, by F. J. Rabbeth : —

Count 10	Bullseye,	Diameter 3½ inches.
" 9	Bullseye,	" 5½ "
" 8	Bullseye,	" 8 "
" 7		" 11 "
" 6		" 15 "
" 5		" 20 "
" 4		" 36 "
" 3		" 33 "
" 2		" 49 "
" 1		" 4 x 6 feet.

This target was designed in July, 1885, and published in the August, 1885, issue of *The Rifle.*

Decimal target, by Charles W. Hinman. The dimensions of this target were as follows : —

DIAMETER OF CIRCLES.		WIDTH OF RINGS.
10 circle, 3.36 inches.	Bullseye.	
9 " 5.54 "	Bullseye.	9, 1.09 inches.
8 " 8 "	Bullseye.	8, 1.23 "
7 " 11 "		7, 1.50 "
6 " 14.80 "		6, 1.90 "
5 " 19.68 "		5, 2.44 "
4 " 26 "		4, 3.16 "
3 " 34.22 "		3, 4.11 "
2 " 44.96 "		2, 5.37 "
1 Balance of target, 4 x 6 feet.		

The 8, 9, and 10 comprise the Creedmoor bullseye ; 4, 5, 6, and 7 the centre, counting 4.

Farrow target, by W. Milton Farrow. Size 4 feet square ; count 10 down to 2 ; bullseye contains three circles, counting 10, 9, 8, the inner circle being three inches in diameter ; 7, 6, 5, and 4 circles represent the centre of Creedmoor target, the 4 circle corresponding to that line on Creedmoor target, as does also the 3 circle ; the 2 count represented the balance of target.

Decimal ring target, by W. T. Whitford ; size of target 4 x 6 feet ; count 10 to 2 ; diameter of rings 3, 5, 8, 12½, 18½, 26, 35, and 46 respectively.

Decimal ring target, by "White Carton ;" 48 inches square ; count 10 to 1 ; outer ring 46 inches, same as

Creedmoor three ring; 10 ring, 3½ inches in diameter; width of other rings as follows: —

9, 1¼; 8, 1; 7, 1; 6, 1¼; 5, 1¾; 4, 2¾; 3, 2¾; 2, 3¼; 1, 6¾. Bullseye 10 inches in diameter, with a 6-inch white centre.

Byran target, by John M. Byran; target 4 x 6 feet.

Bullseye circular,	8 inches diameter, count	5
Inner centre circular,	16 " " "	4
Centre "	28 " " "	3
Inner "	46 " " "	2
Outer "	remainder of target.	

Decimal ring target, by Mat. Gindele; similar to Hinman and Rabbeth design, with slight difference in diameter of rings.

After a full discussion of the merits of the above targets, a circular was addressed to every known club in America, asking their choice for a 200-yard, off-hand target, and if they would adopt the target chosen by a majority of the clubs, and notification given, to forward their votes before January 1, 1886. The following responses were received.

Arlington Heights Rifle Club, Arlington Heights, Mass.; members, 18. Choice, the one designed by Chas. W. Hinman, and illustrated on page 8 of the August *Rifle*. Are willing to adopt any target chosen by the majority of American riflemen, provided the Creedmoor lines are retained as a basis. —Clarence T. Parsons, *Sec'y*.

Ashburnham Rifle Club, Ashburnham, Mass.; membership, 8. Choice, Hinman target. — F. H. Parker, *Sec'y*.

Baldwinsville Rifle Club, Baldwinsville, N. Y.; membership, 15. Choice, the American Decimal target. Willing to adopt the target chosen by the majority. — S. C. Snydam, *Sec'y*.

Bellevue Rifle Club, Bellevue, Ky.; membership, 31. Choice, Massachusetts target. Expect to adopt the target chosen by the majority. Chas. B. Scherrer, *Sec'y*.

Bellevue Rifle Club, Bellevue, Ohio; membership, 9. Choice, Farrow target, on the Creedmoor target. — H. Eberthauser, *Sec'y*.

Berdan Rifle Corps, Milton, Mass.; membership, 15. Choice, Hinman target, provided it is printed complete or in parts, otherwise the Farrow target. Willing to adopt the target chosen by the majority. — M. A. King, *Sec'y*.

Bismarck Gun Club, Bismarck, Dakota; membership, 60. Are willing to cast their vote in favor of the target having the majority. — W. H. Williamson, *Vice-Pres't.*

Brattleboro Rifle Club, Brattleboro, Vt.; membership, 51. Choice, Farrow target, with an outer 4 x 6 feet. — A. E. Knight, *Sec'y.*

Canton Rifle Club, Collinsville, Conn.; membership, 10. Choice, Massachusetts target. Not willing to say they will adopt the target chosen by the majority. — S. J. Lyon, *Sec'y.*

Chautauqua Sportsmen's Association, Jamestown, N. Y.; membership, 6. Choice, Massachusetts (modified) target. Commencing at the present time with 10, and ending with 1. Will adopt the target chosen by the majority. — A. F. Ward, M.D., *Sec'y.*

Cincinnati Rifle Association, Cincinnati, Ohio; membership, 52 Choice, Massachusetts target. Bullseye count 11 and 12. 8 inches in diameter. Prefer the above; but certainly must abide by the choice of the majority, as we wish to use the standard. — Al. Bandle, *Sec'y.*

Cocheco Rifle and Gun Club, Dover, N. H.; membership, 15. Choice, Hinman target. Willing to adopt the target chosen by the majority. — W. S. Bradley, *Sec'y.*

East Tennessee Rifle Association, Knoxville, Tenn.; membership, 20. Choice, Massachusetts target. Are willing to adopt the target chosen by the majority. — Charles C. Hebbard, *Sec'y.*

Elgin National Rifle Club, Elgin, Ill.; membership, 44. Choice, Hinman target. We are willing to adopt the target receiving the largest number of votes. — H. A. Wyman, *Sec'y.*

Gardner Rifle Club, Gardner, Mass.; membership, 29. Choice, Hinman target. Willing to adopt the target chosen by the majority. — G. C. Goodale, *Sec'y.*

Haverhill Rifle Club, Haverhill, Mass.; membership, 30. Choice, Rabbeth target. Willing to adopt the target chosen by the majority. — J. P. M. Green, *Sec'y.*

Hillside Rifle Club, Waltham, Mass.; membership, 23. First choice, for the Hinman target; second choice, the Farrow target, or one including the Three-Ring or Creedmoor target. Willing to use the target chosen by a majority of American riflemen. — W. H. Stone, *Sec'y.*

Irish Rifle Club, New Haven, Conn.; membership, 25. Choice, Farrow target, excepting the height. Willing to adopt the target chosen by the majority if it corresponds to the size of the Creedmoor target, and has lines to correspond with the two, three, and four line, and an eight-inch circle in the black. — P. O'Connor, *Sec'y.*

Lake View Rifle Club, Lake View, Ill.; membership, 36. Choice, Farrow target. — W. H. Bradley, *Sec'y.*

Lawrence Rifle Club, Lawrence, Mass.; membership, 63. Choice, the Hinman target. This club will use target agreed upon if its use is general. — J. E. Shepherd, *Sec'y.*

Leominster Rifle Club, Leominster, Mass.; membership, 8. Choice, Hinman target. Would recommend that the Creedmoor lines be retained. Willing to adopt the target chosen by the majority. — Charles A. Joslin, *Sec'y.*

Lockey Rifle Club, Leominster, Mass.; membership, 10. Choice, Hinman target; but would prefer retaining all the Creedmoor lines. Will adopt the target chosen by the majority. — H. R. Davis, *Sec'y.*

Manchester Rifle Association, Manchester, N. H.; membership, 50. Choice, first, Hinman target; second, Rabbeth target. Willing to adopt the target chosen by the majority. — A. E. Knowlton, *Sec'y.*

Massachusetts Rifle Association, Boston, Mass.; membership, 177. Choice, Hinman target. Will adopt a target chosen by a majority of votes cast. — James E. Leach, *Sec'y.*

Maynard Rifle Club, Chicopee Falls, Mass.; membership, 38. Choice, Hinman target. Willing to adopt a target chosen by the majority. — W. S. Page, *Sec'y.*

Merrimac Rifle Club, Merrimac, Mass.; membership, 12. Choice, Hinman target. Will adopt the target chosen by the majority. — F. Judkins, *Sec'y.*

Minneapolis Rifle Club, Minneapolis, Minn.; membership, 25. First choice, Hinman target; second choice, Rabbeth target. Will not say they will adopt the target chosen by the majority, unless it be one of the above named. — C. M. Skinner, *Sec'y pro tem.*

Money Creek Rifle Club, Money Creek, Minn.; membership, 12. Choice, Hinman target. Willing to adopt the target chosen by the majority. — E. N. Berry, *Sec'y.*

Moran Rifle Club, Morantown, Kansas; membership, 10. Choice, first, Hinman; second, Farrow; third, Rabbeth. Will adopt the target chosen by the majority. — C. J. Norton, *Sec'y.*

National Rifle Association, New York; membership, 450. Choice, Hinman target, provided the outer ring shall be made to conform to the inner line upon the Creedmoor target. — John S. Shepherd, *Sec'y.*

New York Rifle Club, New York, N.Y.; membership, 42. Choice, Hinman target; second choice, Rabbeth target. We advocate an 11-inch bullseye. We are willing to adopt the target chosen, provided that the Creedmoor lines are retained. — James Duane, *Capt.*

Nimrod Rifle Club, Newark, N.J.; membership, 32. Choice, Creedmoor target. Willing to adopt target chosen by the majority. — C. R. Brown, *Sec'y.*

Pittsburgh Rifle Club, Pittsburgh, Pa.; membership, 32. First choice, Hinman target; second choice, Rabbeth target. Will use the target chosen by the majority. — J. B. Jones, *Sec'y.*

Pontiac Rifle Club, Pontiac, Mich.; membership, 26. Choice is unanimous that a standard target should be adopted, and are willing to accept that designated by the majority. — W. G. Elliott, *Sec'y.*

Rod and Gun Club, Springfield, Mass.; membership, 45. Choice, Farrow target. Are willing to abide by the decision of the majority of riflemen for a standard target. Our second choice is the Massachusetts target. — T. T. Cartwright, *Sec'y.*

Salem Independent Rifle Association, Salem, Mass.; membership, 25. Choice, Hinman target. In all probability will adopt the target chosen by the majority. — C. F. Steele, *Sec'y.*

Saratoga Rifle Club, Saratoga, N.Y.; membership, 34. Choice, Hinman target. Willing to adopt the target chosen by the majority. — Wm. H. Gibbs, *Sec'y.*

Savannah Rifle Association, Savannah, Ga.; membership, 139. Choice, Byran target. Do not care to commit themselves to adopt the target chosen by the majority. — Jno. M. Byran, *Sec'y.*

Springfield Shooting and Fishing Club; rifle members, 20. Choice. Farrow target, as described in your issue of September, 1885. Will accept the target chosen by the majority. — E. E. Peters, *Sec'y.*

Third Division Rifle Association, Albany, N.Y.; membership, 128. Choice, Farrow target, adding the outer ring and making the target 6 x 4 to correspond to the present Creedmoor. Willing to adopt the target chosen by the majority. — William E. Fitch, *Sec'y.*

Topeka Rifle Club, Topeka, Kan.; membership not given. Choice, Hinman target. Willing to adopt the target chosen by the majority. — F. H. Martin, *Sec'y.*

Wheeling Schützen-Verein, Wheeling, West Va.; membership, 25. First choice, Farrow target; second choice, Hinman target, with the understanding that we are satisfied with the target the National Rifle Association adopts. — E. S. Scheufler, *Sec'y.*

Worcester Rifle Association, Worcester, Mass.; membership, 21. Choice, Hinman target. Voted to adopt the target selected by the majority. — M. G. Fuller, *Sec'y.*

In the January issue of *The Rifle*, the American rifle clubs recorded their votes for a Standard American target, the result being as follows: —

Total number of votes cast		1,951
Number of votes for specified targets		1,865
Hinman target	1,161	
Farrow target	339	
Byran target	139	
Massachusetts target	113	
Massachusetts (modified) target	36	
Creedmoor target	32	
Rabbeth target	30	
American Decimal target	15	
Additional votes requested to be recorded with the favored target	86	

One club voted for the Hinman target without giving its number of members. The vote by clubs: —

Total number of clubs voting		43
Hinman target	24	
Farrow target	8	
Massachusetts target	4	
Massachusetts (modified) target	1	
Byran target	1	
Rabbeth target	1	
Creedmoor target	1	
American Decimal target	1	

Two clubs requested their votes to be recorded with the one receiving a majority of votes, and are not included in the above.

The small number of votes for the Rabbeth target, which possessed great merit, was because the designer, in an article in *The Rifle*, admitted the superiority of Major Hinman's.

After the above vote was announced, circulars were addressed to all of the known rifle clubs, asking if they favored changing the outer circle of the chosen target from 22.48 to one of 23 inches radius, which would be retaining all the old Creedmoor lines, and also if they approved calling the chosen design the Standard American target. Every club replying approved of the changes, and the target was published as illustrated, and ever since its adoption has been used by most American rifle clubs. As a result of a majority of clubs using one target, members of the rifle shooting fraternity are able to correctly judge the value of each other's scores made in various sections of the country.

The present dimensions of the Standard American target are as follows: —

DIAMETER OF CIRCLES.		WIDTH OF RINGS.	
10 circle,	3.36 inches.		
9 "	5.54 "	9,	1.09 inches.
8 "	8 "	8,	1.23 "
7 "	11 "	7,	1.50 "
6 "	14.80 "	6,	1.90 "
5 "	19.68 "	5,	2.44 "
4 "	26 "	4,	3.16 "
3 "	34.22 "	3	4.11 "
2 "	46 "	2	5.89 "
1	Balance of target, 4 x 6 feet.		

The 8, 9, and 10 comprise the Creedmoor bullseye; 4, 5, 6, 7 the centre, counting 4; 2 and 3 the Creedmoor inner, counting 3. The 1 same as the outer, counting 2.

After a year's discussion of the target question, and a vote of all the known American rifle clubs, and the final adoption of a standard target, the *American Field* issued a target almost similar to Mr. F. J. Rabbeth's design, there being but one or two lines in the bullseye differing, and embodying the principles orginated by Major Hinman. The centre of this target has the following measurements: diameter of rings, 1st ring, 2 inches, counting 11, used only for rest shooting; 2d, 4 inches, counting 10; 3d, 6 inches, counting 91; 4th, 8 inches, counting 8; 5th, 11 inches, counting 7; 6th, 15 inches, counting 6; 17th, 20 inches, counting 5; 8th, 26 inches, counting 4. It will be seen that the rings outside the bullseye are similar to Mr. Rabbeth's target, which was produced long before, so similar in fact, that it is known among riflemen as the Rabbeth-Field target.

The American riflemen were apparently satisfied with the standard target, for, after it was adopted, it was used exclusively by nearly all the American rifle clubs, and never before in the history of rifle shooting in America have so many clubs at one period shot on a similar target.

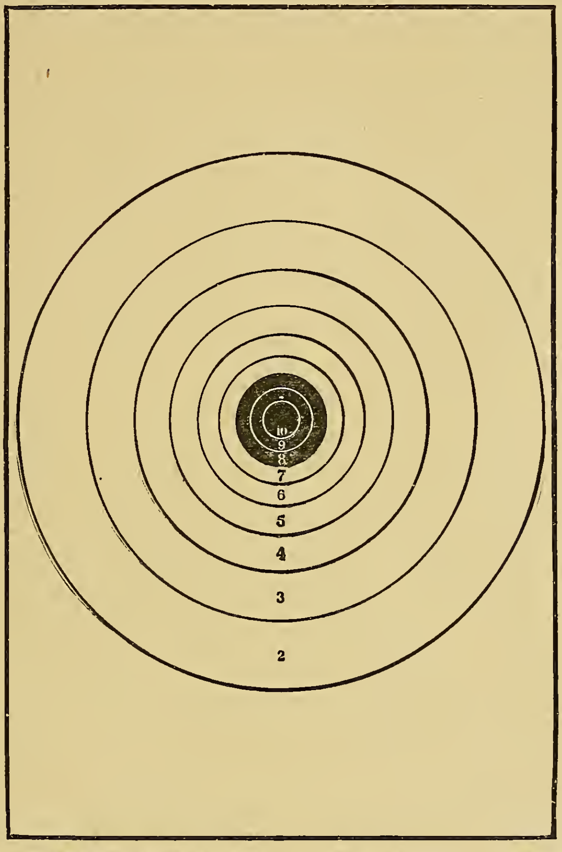


Fig. 179.—The Standard American Target. Adopted by a majority of American Rifle Clubs, January, 1886.

When the Standard American target was adopted, it was thought it would answer for off-hand and rest shooting; but, when the latter style of shooting was practiced, the clubs permitted rifles of any weight and trigger pull, also any kind of sights; besides this, the skill of

American riflemen developed so rapidly in rest shooting that the possible of 100 points was made so frequently as to make it somewhat uninteresting. Several scores of 100 were made at Walnut Hill in a single day (50 perfect scores are on record), and Mr. F. J. Rabbeth scored a run of 37 consecutive tens in a regular match at this place. In May, 1887, the Massachusetts Rifle Association made the target still finer by placing two circles inside of the ten circle, counting 11 and 12; they were 2.33 and 1.41 inches in diameter. A majority of riflemen seem to be satisfied with the 8-inch bullseye at 200 yards. A few, however, claim to prefer a smaller one, and a number call for a larger one. In some cases the 7 circle on the Standard American target is blackened and the bullseye thus increased in size.

In 1888, Mr. William Hayes, the well-known rifleman of Newark, N. J., designed and published a target which he named the American Champion target. This target has a round, black bullseye of 10 inches in diameter, containing circles 1 inch apart, counting from 15 down to 11; the balance of target is white, containing circles 1 inch apart, counting from 10 down to 1. Mr. Hayes, in submitting the target for approval to American riflemen, wrote to *The Rifle* as follows: "The reason for originating this target is simply this: I believe American riflemen have become so proficient with rifles under the National Rifle Association rules, that they need a target with a finer discrimination than even the Standard gives them, and realizing the fact that an 8-inch bullseye is too small, under many circumstances, to sight at readily, and knowing that a 10-inch object to aim at is very satisfactory at 200 yards, I submit this target, trusting it will meet with their approbation. The carton, of 2 inches diameter, is small enough for the best of rifles, even from a rest, and the circles of 1 inch space give a shooter a relative value for each shot that a larger division does not give. In fact, it brings the shooting down to approximately string measurement, which undoubtedly is the correct test for all rifle shooting. In making this target I do not in any way wish to interfere with the Standard or the Rabbeth-Field targets, but trust it will at least make a pleasant variety for shooters who have heretofore been using no others."

The targets previously described, as used by American riflemen, are those adopted by the National Rifle Association of America and clubs shooting under its rules, and for military rifles or match rifles; also, targets used largely for match rifles in rest or off-hand shooting. There are innumerable designs used for gallery rifle shooting, which are only printed in small sizes, generally similar in construction to the ring targets, and are not sufficiently important to warrant illustration or description.

In 1885, several targets for military rifles exclusively, were designed by Captain Stanhope E. Blunt, of the U. S. Ordnance Department, Inspector of Rifle Practice at Headquarters of the Army. They corresponded in size to the first, second, and third class Creedmoor targets; but in place of the round bullseyes were ellipses, the centre and inner lines on the second and third class targets were also ellipses, as was the centre line on the first-class target. The illustrations shows these targets :—

When it was announced that the elliptical targets were to be used by the soldiers of the regular army in rifle practice, it caused some consternation among civilian riflemen, and probably more among the volunteers, for many of the latter desired to follow the rules and regulations of the regular army in this branch of a soldier's duty, but were loath to adopt the elliptical bullseye and lines. A delegation from the National Rifle Association proceeded to Washington, with the object of urging the regular army officials to abandon the elliptical form and retain the circular one. It was found that the representatives of the regular army and those of the volunteers entertained different ideas as to the best form, and as nothing could be gained by argument, the matter was dropped. The entire army commenced practicing on the new elliptical

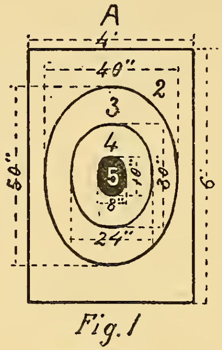


Fig. 180.

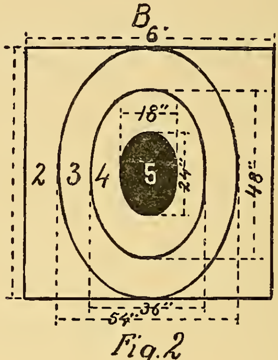


Fig. 181.

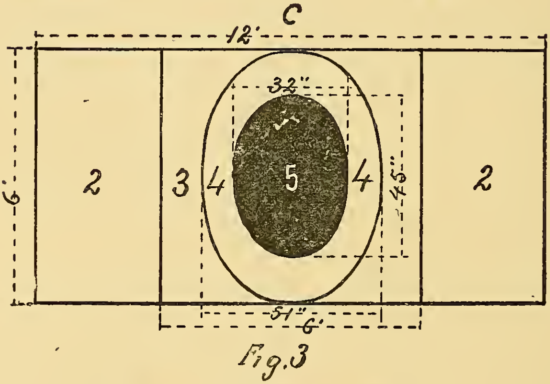


Fig. 182. — U. S. Elliptical Targets.[1]

targets, followed by one or two States ; but the majority of the guardsmen continued the use of the Creedmoor targets.

Captain Blunt, in his excellent manual, states that, "As targets used by the armies of different foreign nations are widely dissimilar, both in the shape and the number and

[1] The illustrations are from Small-Arms Firing, Blunt, and published by permission of Captain Blunt and Charles Scribner's Sons, New York, publishers.

size of their various divisions, it is not possible, even if it were considered desirable, to so arrange the targets for our service that any comparison can be instituted between the practice of our soldiers and those of any one foreign country." He therefore selected what he thought the best shape and proportions "suggested by the natural variation of the U. S. Springfield rifle, by the average degree and direction of the proficiency desired from and by the soldier and by the distance considered sufficient for his instruction." Those desiring an explanation of Captain Blunt's designs are referred to his work.

The soldiers of the United States Army use these targets because they are compelled to. The States using them are those desiring to follow the example of the regulars, but the mass of American riflemen prefer the Creedmoor form. An elliptical bullseye is difficult to paint on an iron target, and almost impossible to keep in shape. The merits or demerits have been fully discussed in military and sportsmen's papers. Suffice to say they are the adopted targets of the United States Army, and strictly military targets. At the time of the introduction of the elliptical target, there was a series of silhouette targets devised and introduced by Captain Blunt, which reflect the highest credit upon the originator, and, in the opinion of the writer, should be adopted whenever the volunteers seek to acquire a practical proficiency with the national arm.

It is creditable to the volunteer who acquires sufficient skill to enable him, with the Springfield rifle, to pit himself against the civilian rifleman with a fine match rifle on the Standard American target, and surpass him. It has been repeatedly done at Springfield, Walnut Hill, Mass., and elsewhere. It excites admiration from all lovers of rifle shooting, to see the regular or militiaman so proficient as to be able to place nearly all his shots in the circular or elliptical bullseye at known distance.

This skill is praiseworthy and desirable; but when one witnesses a national or State rifle competition, and observes a soldier taking aim several times before firing, consuming many minutes to a shot, it is likely to suggest the query: How much practical value is such practice to a soldier? Evidently Captain Blunt understands this. I consider his silhouette targets the greatest innovation in military rifle shooting this country has seen in the present

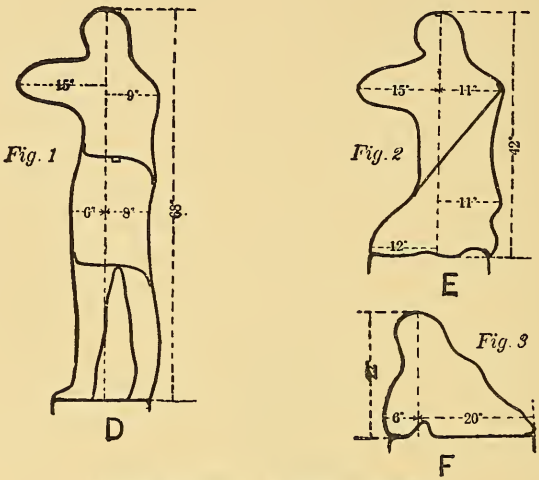


Fig. 183 and 184. — U. S. Army Man Targets.

century, for they teach the soldier to shoot rapidly, which is generally necessary in warfare.

Targets D, E, and F are usually iron skeleton frames representing a soldier standing, kneeling, or lying prone; they are covered with cloth, colored black, and designed to be shot at by the soldier at unknown distance, the soldier firing as many shots as possible within a specified time. Target G is for company skirmish firing, and target H for volley firing.

The silhouette targets, designed by Captain Blunt, appeal to all practical men, and have several times suggested to the writer the desirability of somewhat similar targets for practice, by those who hunt with a rifle. With the exception of the silhouette army targets, nearly all shown in this series contain a black spot of varying size, at which the marksman aims, generally at a known

Fig. 185. — Company Skirmish Firing.

distance. Such targets have their uses, and will always be more popular than others. But many believe that if one desires to hunt, and wishes to be trained to shooting at objects somewhat similar to game, they should select for a target objects similar to what they will be likely to find in the chase.

In England, regular competitions are held at the National Rifle Association meetings, formerly at Wimbledon, now Bisley, shooting at moving objects resembling deer. A running deer target was presented to the National Rifle Association of America by the Winchester

Fig. 186. — Volley and File Firing.

Repeating Arms Company, and it was popular for a time, but the great army of American riflemen seemed to prefer a stationary object at which to shoot at a known distance.

In an issue of *Shooting and Fishing*, April 24, 1890, there appeared an article by the writer, suggesting targets for hunters, which brought several letters of approval, which seemed to indicate that the idea was appreciated by many. It also met with some criticism, on the ground that the targets were unlike game, which would often be seen but for a second. The idea of those targets was not to place the shooter under similar conditions as when shooting game; that would be well nigh impossible, but it would embody some of the conditions, and, to some extent, in teaching a sportsman how to place shots at a desired point.

The article referred to is as follows: —

A suggestion has been made by Mr. William Lyman that a target for hunting rifles is desirable. I quite agree with him, and believe if one was produced which gave satisfaction, it would increase the number of rifle shooters, and give an opportunity for many who shoot only the hunting rifle, to practice on a target, which to a certain extent resembles the game shot at in the field. At the present time we have in the Standard American target I believe, the best one ever used for small bore target rifle shooting; but it is in no way similar to the game likely to be shot at, and while I would not like to see it abandoned, and there is not the slightest probability that it will, I would like to see the experiment of shooting at a target resembling game. I have for several years intermittingly thought of such a target, and wondered how it could be produced and give satisfaction. Mr. Lyman's suggestion has again aroused my interest to such an extent, that I will venture to offer my ideas, hoping they will meet the approval of riflemen who shoot hunting rifles, or bring forth suggestions for a better target.

The United States Army uses silhouette targets of men standing and kneeling or sitting, which are well enough for military marksmen, and perhaps appropriate for soldiers to shoot at; but the targets for sportsmen should represent some kind of game animal. I have sketched two figures, a deer and a jack-rabbit, which occur to me as appropriate subjects; the first to be used at 200, the second at 100 yards with rifle. I would suggest the following: The divisions or counts to be as indicated in the accompanying sketches; viz., 1, 2, and 3, the latter being

Fig. 187. — Target for Hunting Rifles.

where a shot would be likely to be instantly fatal; the 2 possibly fatal, and 1 not likely to be fatal. There might be a series of circles if desired, in the heart region, and the count increased, but if this were done, the argument could be made that a brain or spine shot would be equally as fatal as a heart shot; on the other hand there is never the thrill of satisfaction to a sportsman who makes a brain shot as when the bullet is placed fairly through the heart, and if the circles were placed in the heart region, counting say up to 10, the latter to indicate a shot in the centre of the heart, it would perhaps suit some sportsmen better. I would suggest a target with a background of white, of the regulation size at 100 and 200 yards. I would have the outline of the deer or rabbit printed on a dark brown paper,

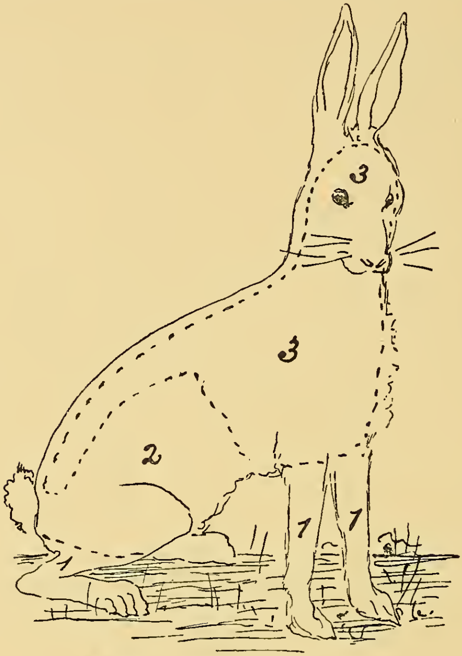


Fig. 188. — Target for Hunting Rifles.

the outline being one-eighth inch wide, which would serve as a guide in cutting out the form of the animal; inside of the figure have the dotted lines, as shown, with the additional circles if desired. Cut out the figures, and paste them onto the white target so as to leave the figures of the animals standing out in contrast to the white background, showing no lines, and nothing but the figures to aim at. I think such targets would closely resemble the living animals when presenting shots under favorable circumstances, and suggest mounting on the square target of regulation size for convenience, and to facilitate marking. A simple silhouette with no background but the field, would be difficult to set up and keep in order, as well as mark the value of the shot. I would suggest the following mode of marking: After the shot is fired, the marker, stationed in a pit, shall pull down the target, insert a plug in the shot-hole, throw up the target ready for the next shot, also for the inspection of the shooter, who will see the exact location of his shot by aid of the telescope; the marker then to indicate the value of the shot by the clock or dial indicator. The next shot can then be fired, the target pulled down, the first shot pasted, and the last one plugged, and the target thrown up for another shot. The line of highest count touched by the bullet to determine the value of the shot.

Rifles permitted—Any rifle and no handicap allowed.

Positions—Any the conditions of the match called for. Off-hand position shall mean standing erect on both feet with no artificial rest or support, and in matches where conditions specify off-hand position, no other position shall be permitted. Any position without artificial rest to mean, standing, kneeling, sitting, lying in the prone, a back position without artificial rest.

Sights—Any kind of rear sight, but a front open sight.

Time permitted—Aiming and Firing—A contestant not to occupy more than ¼ of a minute in aiming and firing any single shot. No contestant shall remove the rifle from his shoulder to take second sight unless in case of a misfire. Any contestant consuming more than ¼ minute for aiming or for firing any single shot, or who shall remove the gun from the shoulder for a second sight or other purposes, shall be scored a miss.

It will be seen that I do not propose any bullseye or object but the animal at which to aim, as it is believed that the value of the shots will largely depend on the skill of the shooter, and the practice will be an aid to those who hunt with the rifle.

A strictly hunting rifle could be used on this target, as an ivory-tipped front sight would be quite serviceable in sighting on the part which if hit would be fatal in a living animal, or bring the highest count if a hit on the target. I think one of these targets, especially the deer target, would be an ornament to any range and afford useful practice for sportsmen, and be a welcomed change for many who tire of constant shooting on the old regulation targets. It will not be convenient to provide for an artificial running deer on most ranges, and I think the targets here described may satisfy many.

CHAPTER XXI.

PREPARING RIFLE AMMUNITION.

Every person who shoots a rifle, will be likely to sometime prepare ammunition. One rarely finds an expert rifleman who uses factory cartridges, especially if he shoots at target, or where extreme accuracy is desired. Factory-made cartridges are expensive, and, however excellent when leaving the factories, may rapidly deteriorate by being stored in an unfavorable place. Tyros usually shoot factory cartridges; the old and skilful marksman rarely does. But, beside the questions of economy and more reliability in properly reloaded cartridges, is the necessity of reloading when one is located away from the large cities, where it is impossible to procure the products of the factories. If residing in a section where gun dealers are numerous, the great variety of cartridges make a very large stock necessary, if the dealer would keep a full line, and as many of the cartridges would be seldom called for, the stock would become old and deteriorate in quality; therefore, only the most called for rim and central-fire cartridges are found in the average gun store. Thus it seems necessary for a rifleman, if he desires to economize, to have reliable ammunition and be able to supply himself with such at will, to possess a knowledge of how to reload rifle cartridges. As in every art, there are various views entertained by different persons, as to the best mode of producing good results; and, not wishing to appear as didactic, I will preface my notes by stating that the following directions for reloading cartridges are the result of many years of observation and experiment, and, according to my views, are the best methods.

Central-fire shells only should be reloaded; and, if possible, always use solid-head shells. Formerly the solid-head shells cost a little more than the folded-head, as there were patents on the former; but, the patents having expired, the price of the two are now the same. But, as it costs less to produce the folded-head shell, the manufacturers are likely to send them in preference to the solid-head, unless specified. Folded-head shells are much more liable to burst when reloaded than solid-head; therefore, always procure the latter if possible.

The rifleman often purchases factory-loaded cartridges, solid-head, and, after shooting them, saves the shells to reload. It is presumed that one desiring to reload has purchased a set of reloading tools, and we will suppose that he has selected a set of the Ideal Manufacturing Company's, or the Winchester Company's, both of which are shown in the illustrations. The first operation is to remove the exploded primer; this operation is simple, and is as follows: place the decapping plug in the loading chamber of the tool, pin outward; place the shell over it, and, by pressing the handles together, the exploded primer is removed. The exploded primer can also be removed by other styles of decappers if preferred. After removing primer, place the shells in a vessel, and wash thoroughly. Cold water will do, but warm water is better, and some use soapsuds or soda water. If desirable to remove the stains from the shells, a little acid may be added to the water. If, in decapping, you find a cartridge unexploded by a misfire, do not attempt to extract the primer until you have removed the bullet and powder. After washing the shells thoroughly, dry them, but do so by a moderate heat, as, if overheated, the temper will be drawn from the metal and the strength of the shell impaired. It is important to have the shells thoroughly dried before reloading, especially in the primer pockets, which take the fresh primers. Water is likely to remain there, and care should be exercised in drying the shells in the pockets and inside the shells.

The next operation is expanding the shell. Unless this is done, the tyro is likely to meet with an obstacle. The factory-loaded cartridges, especially in the past, were crimped, and the mouth of the shell generally reduced by the heavy machinery used in seating the bullet, which did the seating of the bullet and crimping by one operation. I well remember the difficulties I found in attempting to reload cartridges for my hunting rifle, when hunting on the plains; the almost inevitable obstacle encountered by every tyro. Firing did not expand the shells sufficiently to permit the bullet to enter the mouth of the shell; neither did the decapping operation, which it was advertised to do in the old tools. I would attempt to seat the bullet in the shell by forcing it in with the tool, and the result would be the shaving off of one side of the bullet, or squeezing the lead over the shell, which would make about as bad looking a cartridge as one could imagine, and highly suggestive of inaccuracy. I was forced to devise a way of expanding the shells, and improvised an expander out of one handle of the reloading tool. It did the work, but unsatisfactorily. The Ideal Company's tool has an arrangement on the outside of the resizing or ball-seating chamber, which does the work well, considering that all the operations are in one tool, which is what many desire for the sake of economy of space when on a hunting trip. If a large number of shells are to be reloaded, a separate tool in the form of a swage is recommended, by the use of which and a blow of a mallet, the shell is expanded.

After expanding the shells, comes the operation of recapping or repriming. Note on the box of factory cartridges which you originally purchased, or the box containing the new empty shells, the number of the primer recommended for use, and, if possible, use no other. I have seen accidents caused by using a smaller sized primer than is recommended. Primers are made of brass and copper. The copper are more sensitive, or easier to explode, than the brass. In repriming, the former frequently explode; sometimes the brass ones do so; therefore, remember, never prime a loaded shell, and do not have powder about which is exposed, when priming shells. Owing to the sensitiveness of the copper primers, it is not advisible to use them in shells to be used in a magazine rifle, or a rifle shell using over 50 grains of powder. If

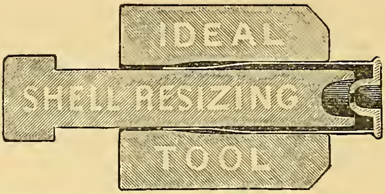


Fig. 189. — Sectional Cuts of Die, Plunger, and Shell.

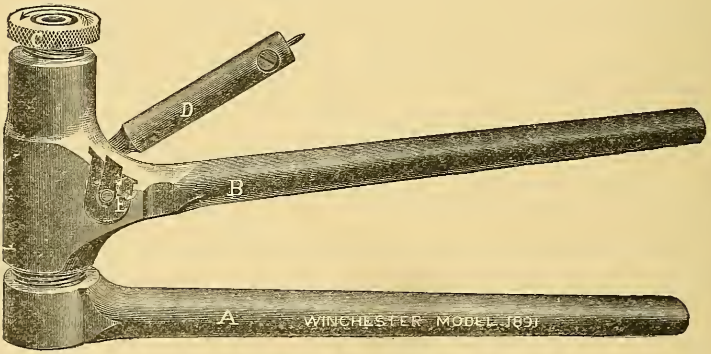


Fig. 190. — Winchester Reloading Tool, Model 1891.

copper primers are used in a shell taking a heavy charge, the firing-pin of the rifle is liable to puncture the primer (the copper being softer than brass), and an escape of gas is liable to occur, perhaps injuring the eyes of the rifleman, fouling the mechanism of the rifle, and, in some rifles, preventing the opening of the action. Just here will be shown again the superiority of solid-head shells. It is necessary to seat the primer well down in the pocket of the shell, for, if not so seated, it is likely to cause mis-

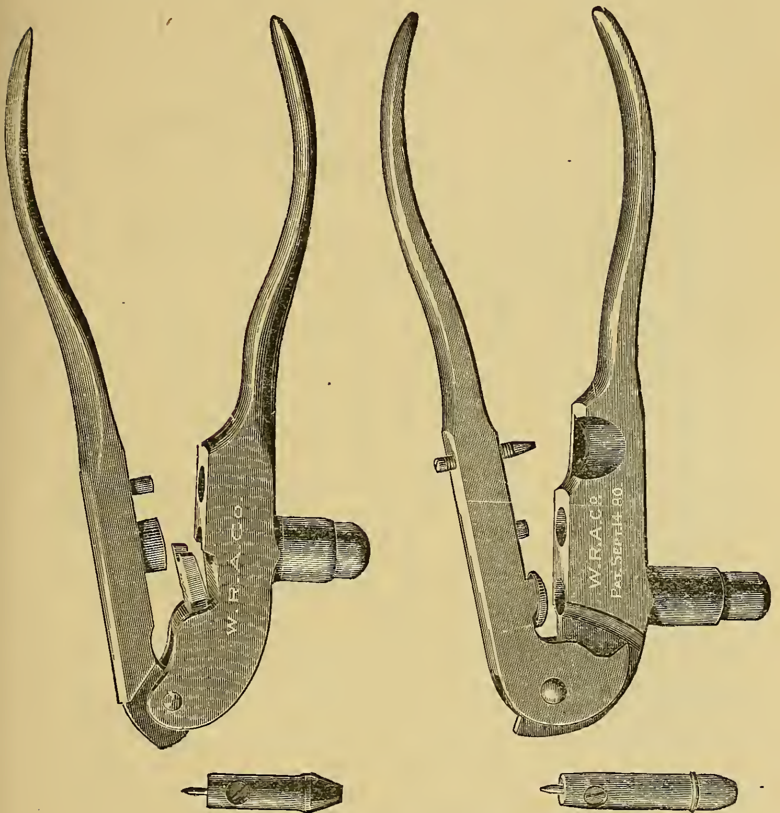
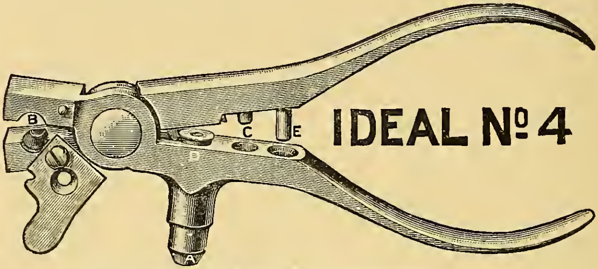


Fig. 191.—Winchester Reloading Tools.

fires; and if protruding beyond the head of the shell, is liable to cause a premature discharge when closing the action of the rifle. If folded-head shells are used, by seating the primer well down into the pocket there is insufficient support, and, after reloading a few times, the pocket is liable to break away and cause a misfire, or a spitfire if the primer is exploded. In repriming, I have alluded to the desirability of seating the primer well down in the pocket. To do this, many prefer a special or separate capper, but if economy of space, before mentioned, is desired, the Ideal and Winchester tools do the work well, but perhaps not so rapidly.



A—Opening Month of Shell. B—Bullet Mould.
C—Re-Capping. D—Loading Chamber. E—Bullet Sizer.

Fig. 192.—Ideal No. 4 Reloading Tool.

The shells of the factory cartridges are now restored to the condition of the new shells which perhaps some have purchased instead of the loaded cartridges. The next operation is to charge the shell with powder. Generally the advice given on the cartridge box is good, and should be followed. As there is a difference in the branding of powders by the several companies, I will state for the benefit of the uninitiated that fine-grained powders are used in cartridges for small calibre rifles and in pistol cartridges. In the first case, greater power is contained in small measured charges of fine than in coarse powder. In pistols, owing to the short barrels, it is desirable to secure quick combustion, which is gained in small-grained powders, and, therefore, greater power is secured from a charge of fine-grain powder during the time the bullet is passing out of the short barrel than would be if coarse powder were used. In a rifle with a large bore and long barrel, slower combustion is desirable, and, therefore, coarser powder is preferred. But in powders, the strength is also varied by the ingredients; and, as a rule, greater accuracy is obtained from the slower-burning powders; but the investigating or experimental hunter or marksman sometimes departs from general rules.

Fig. 193. — Ideal Flask.

In charging the shells with powder, the scoop coming with the set of tools may be used, pouring a small quantity of powder into a receptacle which permits of its being readily scooped. Dip the scoop full of powder, scraping the top off even, and pour into each empty shell. If one is to reload many shells, a Wilkinson loader, or a similar device is recommended. It is desirable to have the tunnel or powder receptacle covered; and, therefore, many riflemen using the Wilkinson loader discard the usual powder holder, and attach a flask or ordinary powder can in its place. The rifleman should be careful about permitting the charger to become empty, as an accident may result from this cause in the following manner: The charger becoming nearly empty, would deposit but a few grains of powder in the shell, or, perhaps, the charger being entirely empty, no powder would pass into the shell. Without noticing the absence of powder, a bullet would be placed in the shell and seated with the ball-seater. This shell, if placed in the magazine of a repeating rifle, would be carried into the chamber, and the hammer falling and striking the primer, the gas would probably force the bullet part way up the barrel, and, lodging there, would, upon the discharge of a second cartridge, burst the barrel. If used in a single shot rifle, it might be thought that the marksman had forgotten to remove the old shell ; or, not thinking the bullet had lodged in the barrel, insert a fresh cartridge, which would burst the barrel. Cases such as described, and from this cause, have come under my observation.

After charging each shell with powder, place a bullet in each shell, and, placing the shell containing the loosely seated bullet in the seater of the tool, bring the handles of the tool together with a steady pressure, which is so arranged that the bullet can be seated to any desired point. I would advise any one desiring to secure as accurate shooting as possible, to seat the bullet, and crimp it as little as possible. When cartridges are to be used in magazine rifles, it is desirable to have the bullets well seated below all the cannelures, and crimped firmly.

CHAPTER XXII.

THE ART OF BULLET MAKING.

In a former chapter I gave directions for reloading rifle ammunition, based upon my own experience and observations. Some riflemen do not care to undertake the task of bullet making, but there are many who are obliged to, owing to their remoteness from the supply depots, or to the rifles they possess taking a bullet difficult to procure. In addition to this, there is a well-founded belief that different rifles, although of the same calibre and of the same make, and using the same charge, will shoot best a certain bullet of a special degree of hardness, taking a specified thickness of patch, and of a particular size.

Bullets best adapted, and in general use to-day for target and game shooting, are chiefly composed of lead, with some alloy to harden them, the alloy being largely governed by the powder charge and purpose for which the cartridge is intended.

The two kinds of bullets in general use are the patched or jacketed bullets, and the naked or cannelured bullets. Bullets, as a rule, are cast by riflemen who make them for their own use. Manufacturers of ammunition usually cast slugs, and, by heavy machinery, swage the bullets into shape, this being the case especially with small bullets. But swaging is difficult with bullets of a certain degree of hardness, and, with many, undesirable if not impossible; and as this article is for the use of those desiring to make bullets in a limited number, I will not attempt anything but a description of bullet molding.

The molds supplied by rifle and tool makers are intended either for patched or cannelured bullets. For the former the mold is often in a solid piece; for the latter, on account of the cannelures, the mold is pivoted together; this form is also used for casting the patched bullet. Until recently, the molds to be found in American markets were inferior, and difficult to operate and secure good bullets from. Iron and steel molds were largely in use, but latterly brass or composition, although a little more expensive, have become popular. Iron molds will stand rougher usage, especially in the hands of novices, but they are liable to rust. Brass or composition molds will not rust, the lead flows into them better, but they are more likely to become injured, being softer. If a mold that opens is preferred, select one, if possible, that is joined together like a pair of pincers, or between the handles and molds, and not like a nut-cracker. It is necessary, in small molds, that the handles be protected by wooden handles, rubber tubing, or wound with cord or cloth, to prevent burning the hands. The Ideal Manufacturing Co. manufactures a good mold in its combination tool, if one desires a cannelured bullet, and a set of reloading tools in as compact a form as possible. This tool will serve the purpose, but a separate mold is generally considered preferable. Molds are often constructed for casting several bullets at one time, but the cut-off being in one piece, and acting on the several bullets at one motion. An amateur is recommended to use a mold casting a single bullet, as he will be likely to secure better results therefrom.

After securing the mold it is necessary to procure a kettle or pot in which to melt the metal, and one of iron is recommended; what is known as a plumber's kettle, is excellent, and should be found at almost any hardware store. The Ideal Manufacturing Co. also makes a vessel for melting lead. The next utensil necessary to procure is an iron ladle; and what is known as the Ideal Dipper, which has just been placed on the market by the Ideal Manufacturing Co. of New Haven, Conn., bids fair to be superior to anything yet produced.

If the rifleman has procured his mold, kettle, and Ideal Dipper, he can proceed to bullet making; but his path to success will probably be beset with obstacles, some of which I will try to clear away.

On the supposition that the beginner is to cast the bullets of pure lead, my advice would be to purchase lead

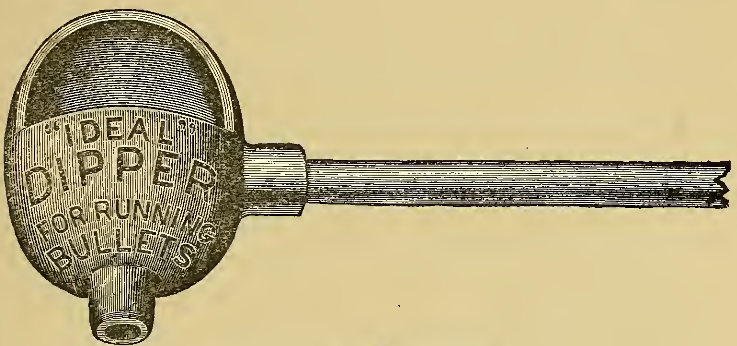


Fig. 194.— Dipper for Bullet Molding.

in small pigs. Some of the shot manufacturers, I believe, supply pure lead for casting bullets. I suggest purchasing the clean, pure lead, in preference to using old lead pipes or sheet lead, for these reasons: the manufactured lead is liable to contain more or less hardness or foreign matter, as it is claimed that every time lead is melted it hardens. The new lead is cleaner, better to handle, and more compact; but, if you cannot procure the lead in pigs, which costs but little more, use what you can obtain.

Being thus far equipped, the next operation is to melt the lead, a seemingly simple enough process, but good bullets and smoothness in running them depend largely upon keeping the molten lead at an even temperature, which means your heat should be as uniform as possible; therefore, whenever convenient, use a gas stove, which not only gives a uniform but a more powerful heat than can usually be obtained by other means. By attaching a flexible tube to a small gas stove, a seemingly perfect arrangement can be obtained. Of course where gas cannot be procured, seek to melt your lead by a uniform heat. The most expert bullet makers I know of do not hasten to commence casting; they let the lead melt and "cook," as they say. I have known them to leave the lead in a molten state for over an hour before commencing work. Lead can be heated too hot, or not hot enough. If too hot it will shrink too much and crystallize. If you observe a frosty appearance on your bullets it will indicate the lead is too hot. If not hot enough the bullets will contain flaws or seams, likely to cause irregular shooting, especially if the seams occur on the base. I will say here that a good bullet must have a perfect base. Do not make bullets near an open window, or where a draught sweeps across the surface of the molten lead; this will cause the surface to cool, and the lead will be unevenly heated.

After the lead is well melted, stir with an iron spoon. This will bring the impurities to the surface. If there is a large accumulation of dross, a spoonful of oil (not kerosene oil) poured into the molten lead will ignite and burn the dross. The matter which is not consumed can be skimmed off with the iron spoon. The lead having been brought to the supposed proper condition for molding, the next thing is to make ready the mold, a task sometimes by no means easy.

Many a tyro has become discouraged at the first attempt to cast bullets, by the lead adhering to the mold, and his inability to drop or knock the bullet from the mold. A new bullet mold will often cause a good and calm man to ejaculate. If the interior surface of the mold is bright, it should be blued by holding it in a flame; this will also burn off the oil or grease on the mold, which is necessary. Some smoke their molds, but this is objected to by others; the mold is also plunged into the molten lead. But, really, all that is generally necessary is to oxidize the interior surface of the mold, and heat, as a rule, readily does it.

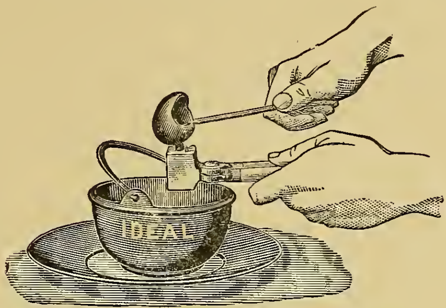


Fig. 195.—The Ideal Kettle and Ideal Dipper.

The mold should be heated to nearly the melting point of the lead, either by direct heat of the flame, or dipping into lead.

With the lead properly melted and the mold in good working order, the task of bullet making can begin. Before commencing, place a dish of water near you, and a mallet or stick of wood; the first to plunge the mold into when it is growing too hot, which is determined by the frosted surface of the bullet. Always do this when a bullet is in the mold, and not when the mold is empty, for, if a drop of water is left in the mold and hot lead poured into it, the lead will fly and endanger the eyes. The mallet, or piece of wood, is to strike the cut-off and rap the bullets out, and should be used instead of a piece of iron. Commence operations at this stage as follows: Take mold in left and ladle in right hand; dip the ladle part full of molten lead; place the mold over the kettle; place the nozzle of the Ideal Dipper in the countersink or sprewhole of the cut-off on the mold, holding the mold in a horizontal position; keep the nozzle of the Ideal Dipper in the sprew-hole, bringing the mold under the dipper as you pour the lead into it, and holding the dipper-nozzle in the sprew-hole for about two seconds. This gives the full pressure of the lead in the dipper on the bullet, and contributes to making it solid, and it is believed to largely prevent bubbles. The illustration (Fig. 142) shows the operation. Place the dipper back in the kettle; take the mallet in the right hand, rap the cut-off, dropping the surplus lead into the kettle, and knock out the bullet by a blow on the mold, opening it if it is one pivoted together.

This describes bullet making when pure lead is used, but most of the bullets used to-day for target and game shooting are hardened. If a bullet is to be used for shooting large and dangerous game which has a soft skin, such as a cougar or tiger, and is to be shot at short range, it would probably be best to use nearly pure lead, because the bullet would flatten or spread when striking the animal and make a large, ragged wound. But when penetration and accuracy at long range are desired, it is necessary to harden the bullets, and to what extent is determined by the bore, powder charge, twist, and fit of bullet; and it is just here that riflemen have various opinions as to the correct degree of hardness of bullets for various purposes.

The alloy of bullets is always alluded to by mentioning the hardest metal first. 1 to 16 meaning one part hard metal, generally tin, and sixteen parts lead. Tin, which is alluded to as being generally used, can be purchased in sticks, and in preparing the metal for the kettle a hatchet or chisel is usually employed to cut off the required amount. If bullets 1 to 16 are desired, the component parts would be 5 pounds of lead to which 5 ounces of tin would be added. I will repeat, it is believed by many that the longer the metal is kept molten, or the more frequently it is melted, the harder it becomes; therefore, if but few bullets were molded at one time, say 100, and a week hence another lot of 100 cast, and later another lot, the last batch would probably be harder than the first lot and this without adding tin.

It is a wise rifleman who learns what bullet shoots best in his rifle and sticks to that bullet. I mean by this, when one has found that a bullet 1 to 40 shoots as well as he thinks the arm is capable of shooting, and is content to accept that as the proper bullet. This being the case it is well to always keep one of the bullets to determine the alloy of those made in the future. The usual way to test the hardness of new bullets is to take one of the old and one of the new bullets when cold, and placing them side by side or across each other in a vice, squeeze them together. The one showing the greatest indentation is the softer; therefore, if the new bullet is softer, add more tin to the mixture, or if harder, add more lead and test until they indicate a similar degree of hardness.

Some riflemen take pride in the appearance of their bullets and enjoy the brightness of the leaden missiles. Any one can brighten and retain the lustre for a long time by dropping half or the whole of a silver dime in the molten fluid which melts and mixes with the metal.

The ways of determining the correct alloy for accuracy are as follows: First by target shooting, which, if satisfactory, is generally accepted by the rifleman without further investigation. Second, if unsatisfactory shooting be obtained the marksman will desire to see his bullets after firing. If in winter, and snow abounds, one can shoot into a bank of wet snow, and by following the track of the bullets, generally find them in good condition, but showing the marks of the lands of the rifle. If the bullet bears the mark of the lands its entire length, or beyond the jacket, if a patched bullet is used, it indicates there was too much upset, and the bullet was too soft, and requires more tin. A bullet showing this excessive upset would be liable to lead the rifle. Perhaps the bullets will show very light marks of the lands, and have sharp cut lines on their sides. This would indicate gas cutting, or the gas escaping by the side of the bullet, caused by insufficient expansion of the bullet into the grooves, showing the bullet was too hard, and should be softened by adding more lead.

I presume many riflemen have never given a thought to the matter of the deterioration of bullets. I am of the opinion that old bullets are much inferior to those freshly made. I believe that age oxidizes the surface of a bullet and deteriorates it. I do not think that a few months' age affects the bullets to any great extent; and I do believe that bullets which have been made for three or four years, and exposed, are much inferior to those which have been made three months.

The art of bullet making is easily acquired by any one with a moderate amount of perseverance; and, with a little practice, one can become expert, molding a bullet perfectly and rapidly. One of the best bullet makers I know of has repeatedly molded twelve perfect .45-calibre bullets in one minute, and has run 505 in one hour, and 1,000 in two hours, using a single Ideal mold. Even if one does not care to undertake this work, there is independence in knowing how.

Swaging bullets is generally confined to those used with a patch. If cannelured bullets are swaged, they must be lubricated first. The merit of those swaged and unswaged is a question upon which riflemen differ; the practice is followed by some and omitted by others. The operation is simple: a swage is generally supplied by rifle and tool makers; the bullet is dropped into it, which is followed by a plunger; a blow from a mallet forces the bullets to a uniform size if any variation exists. The bullet should be very slightly oiled, care being taken not to get on too much; the object of the oil is to prevent the bullet sticking in the swage.

Lubrication is found necessary when shooting naked or unjacketed bullets, and generally when the rifle is not cleaned after each shot. Were it not for lubrication, a lead bullet brought in contact with the rifle barrel would lead it, and the accuracy of the rifle be impaired. In lubricating naked bullets, the most favored mode is to have several concave rings or grooves cast around the bullet, which are termed cannelures, — a word, by the way, of French origin, and, although in general use, I believe found in but one American dictionary. The cannelures serve the purpose of holding the lubricant, and by this means the grease is evenly and well distributed, which is essential to secure good shooting. This mode of using lubricants is generally followed when using naked bullets. When a patched or jacketed bullet is used, and the rifle shot dirty, the cannelures are not used on the bullets, but a lubricating disk is generally supplied. A card-board wad is placed over the powder, the lubricating disk over the wad, and the patched bullet on top. The latter mode is not generally used by American hunters at present, the naked or cannelured bullet being almost wholly supplied by the cartridge companies, and is preferred by most sportsmen who cast their own bullets for hunting purposes or military rifle shooting. I will at first record the results of my observations on lubricants for cannelured bullets, and modes of lubricating such bullets.

The formulas for lubricants are numerous, and, although existing in such numbers, I believe that perfection under all conditions has not yet been attained. If naked bullets were used by the expert target shots, I think the rifle fraternity would know more about lubricants; but as patched bullets are considered more reliable for such work, although less practical, comparatively little attention has been paid to perfecting this compound, and the work has been left almost wholly to the manufacturer of cartridges. It is undoubtedly true that almost any kind of grease will, to a certain extent, serve the purpose of lubricating; but it is also true that certain preparations are better than others, for weather conditions, especially heat and cold, affect lubricants. For a long time the producers of American cartridges would use different formulas for goods manufactured in summer and winter. This plan might possibly be well if the entire product were consumed in one season; but as summer goods would be held over winter, and winter to summer, it can be seen that the consumer might be unfortunate enough to purchase just the wrong lot. The old absurd mode of outside lubrication for rifle and pistol cartridges made the deterioration certain, and the rubbing off of lubrication from one side of the exposed part of the bullet, which was an almost certain cause for inaccurate shooting.

Manufacturers of rifle and pistol cartridges have, since commencing the manufacture of metallic cartridges, sought to obtain a lubricant which would answer the purpose in hot and cold weather and in various climates. From information possessed by the writer, he has formed the impression that Japan wax is the best article manufacturers have found for a lubricant for general purposes, and less affected by climatic changes than other compounds. It can be purchased in large cities, but is rather a scarce commodity. I have collected, during the past fifteen years, a number of formulas for lubricants, and my scrap-book shows a variety of opinions as to what constitutes the best mixture. I will give, for the benefit of brother riflemen, a number, in order that they may experiment with the various compounds. I do this, as I have found that several expert and reliable riflemen have different opinions as to the best lubricants. The following formulas are recommended by American cartridge and arms manufacturers: —

The Winchester Repeating Arms Company advise the use of Japan wax or beef tallow.

The Marlin Firearms Company says: Make the lubricant of clear tallow, 4 parts; beeswax, 1 part.

Massachusetts Arms Company: 1 part beeswax to 3 parts tallow.

Ideal Manufacturing Company: Beeswax and common cylinder oil, 3 parts wax to 1 of oil; also, beef tallow with enough vaseline with it to soften it as desired.

J. Stevens Arms and Tool Company: Make lubricant of clear tallow, 4 parts; beeswax, 1 part.

Sharps Rifle Company (out of existence): 1 part beeswax to 2 parts of sperm oil, by weight.

Smith & Wesson: Melted tallow.

Bullard Repeating Arms Company: Fill grooves with beef tallow or Japan wax.

Among the riflemen I have met during the past quarter of a century, I have obtained the following: —

Three parts mutton tallow, one part wax. About a teaspoonful plumbago to a pint of the melted compound; cool a little of it, and, if it proves too hard, thin with a little sperm oil.

The above formula was used for many years by riflemen at Walnut Hill, who shot lubricated bullets prior to the general adoption of the patched bullet for target shooting, and at the time was considered as good as any thing tried.

J. G. B., of Staatsburgh, N.Y.: Vaseline and paraffine, putting in only enough of the paraffine to make the vaseline hard enough to work well on the bullet, — say, use a piece of paraffine about the size of a good-sized duck's egg to one pound of vaseline. There seems to be something about it, writes Mr. B., that suits the rifle barrel, so that you can vary it from soft to hard, more than any other mixture I have ever seen. Both being composed of mineral oils, it is also less affected by heat and cold.

Col. H. Simpson, an intelligent and expert marksman, wrote to *Shooting and Fishing*, about a year ago, of the trouble he experienced with lubricants; and, by not finding the proper article, his rifle leaded badly. He says: "I tried everything I could think of, or that was suggested to me, and took the greatest care in molding my bullets and loading. Still there was no improvement. Being impressed with the thought that the fault lay in my lubricant, I resolved to make some experiments, and was advised by a friend to try some of his. After two or three shots my rifle was leaded worse than ever. His lubricant was composed of Japan wax and a small admixture of tallow; and the increased gritty or waxy feeling of the inside of the barrel after the bullet had passed through, strengthened my conviction that anything of that nature was not a lubricant, as it does not sufficiently reduce friction. I tried softening the wax by adding more and more tallow, until I became convinced that the latter was the true lubricant; so I threw aside the compound, and commenced using pure tallow, which is known among all branches of mechanics as one of the best and most durable of lubricants. My rifle has not leaded since; and while I clean every ten shots, more from force of habit than anything else, I haven't the least doubt that it would shoot a whole afternoon without cleaning, as every time I clean, the inside of the barrel has a soft, slippery feeling, exactly the opposite of the condition described above, and offers no resistance to the passage of a cleaning rag.

"This experience set me to thinking of what caused the leading in the first place, as I had never been troubled with it before to any extent. I had always used the lubricant recommended by the Marlin Arms Co.; viz., four parts pure tallow to one of beeswax, and when new always found it worked admirably, both winter and summer. Then I remembered that when in a hurry I had often set the lubricant on a very hot part of the stove to melt, and had sometimes smelled a burning odor from it, and the thought flashed upon me that the repeated burning of the lubricant had consumed the lubricating qualities of the tallow, and left the hard waxy substance remaining. Opinions may vary as to the best substance for lubricants, but experience so far convinces me that plain tallow, with the addition of a small amount of beeswax in hot weather, is about as good as any. Not that there is much lubricating quality in wax of any kind, but mixture with it will prevent the tallow from running."

The above article brought out the following suggestion from the late J. C. Purvis-Bruce:—

"Some time ago, in *Shooting and Fishing*, I noticed a paper on 'lubricants' by H. Simpson, in which he expresses his opinion that plain tallow, with the addition of a small amount of beeswax, is as good as any. It is, perhaps, but I think if he will add a little vaseline (*pure*, without any scenting or coloring or other foreign substance), he will find the lubricant *par excellence*. It may not do in all guns, but it does splendidly in mine — a .400-bore 110 grains of powder, 270 grains of lead, hollow copper point express rifle,— and I think it should in most others. Be sure not to add too much wax, and let it be as pure and as fresh as possible. Vaseline, or petroleum jelly, I regard as the finest lubricant in the world."

Col. Simpson records the results of a trial, prompted by Mr. Bruce's suggestion, as follows: —

"His advice was to add a little vaseline to pure tallow, but I did not follow it strictly according to the letter; for it occurred to me that cosmoline contained precisely the same lubricating qualities, but was firmer and retained its consistency better, and would make a more desirable rifle lubricant. I was not so exact as to weigh the ingredients, but put five cents' worth of cosmoline in a small tin cup of pure tallow, and found it to work finely, 'setting' quickly, and sticking to the bullet like grim death. Care should be taken not to have the lubricant too hot. I think this mistake is often made. The cup should be set upon the outer edge of the stove, where the lubricant will just melt. I have used this lubricant every week for two months, and often, when two or three friends would be shooting with me and using my rifle, the barrel would become very hot, but there was not the first sign of leading. As a precaution, I cleaned every twenty or thirty shots, but it was really unnecessary, as the inside of the barrel had a perfectly smooth, even greasy, feeling, that betokened absence from any crust or leading. I also use this lubricant in reloading revolver ammunition, and agree with 'Jack' that it is a lubricant *par excellence*."

Mr. F. J. Rabbeth recommends beeswax and cylinder, or other heavy oil, one part oil to four of beeswax.

The French Government formerly used a lubricant composed of three parts tallow to one part beeswax; Switzerland and America, four parts tallow to one of beeswax, and, later, the American metallic cartridges were lubricated with a mixture of tallow one part, beeswax eight parts; finally the Government adopted Japan wax. A number of different mixtures were tried by the government officers; namely, tallow and beeswax, Japan wax, and the one which has always given the best results when used at once, sperm oil and beeswax. A good lubricant is composed of three parts tallow and two parts beeswax, with enough spindle oil to give the whole a salve-like consistency, so that it will not run in hot weather. The use of graphite is good, provided it can be thoroughly mixed with the mass, but it is a dirty mixture and but little used.

In 1873, the United States Government conducted a long series of experiments to determine the best calibre for adoption for military use. A number of different ways of lubricating the bullet were tried. The best results were obtained by the use of a grooved bullet, lubricated in the cannelures with eight parts of bayberry wax and one part graphite; but the growing scarcity of bayberry wax led to the final adoption of Japan wax.

I have drawn to considerable extent on my scrap-book, in order to exhibit the varied opinions of expert riflemen, and from which, no doubt, riflemen will find an excellent compound. Lubricant is often manufactured by a secret

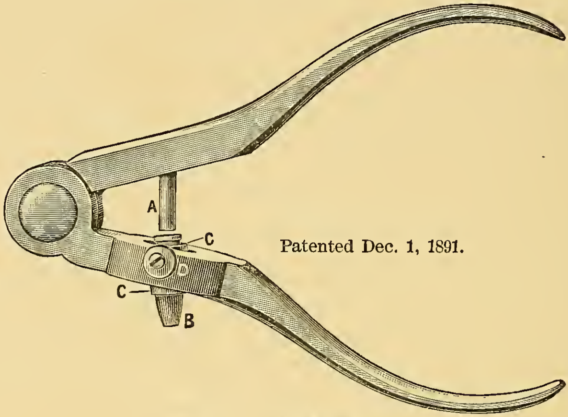


Fig. 196. — Ideal Bullet Sizer.

formula and sold in packages. Mr. Reuben Harwood has compounded a mixture which is highly indorsed by those who have given it a trial. Mr. George R. Russell, the expert bullet maker of Boston, has as good a lubricant as I ever tried.

When a lubricant has been secured, the rifleman can proceed to lubricate his bullets. One mode is as follows: Take a shallow tray or pan and melt the lubricant, keeping it at as even a temperature as possible. Procure a pair of cheap tweezers, with which seize the bullet and dip base forward into the lubricant to a point beyond the first cannelure from the point, after which set on a board to cool. There will be a quantity of surplus lubricant on the bullet which it is desirable to remove; an old way of doing this was to force the bullets through a piece of metal tubing, but provision has been made for this by the Ideal Manufacturing Company in its excellent tool. The operation of sizing the bullet by forcing it through a hole of proper diameter also removes the surplus grease. It is particularly desirable to remove all the grease from the base of the bullet. Most riflemen who have a large number of bullets to lubricate, prefer to use a lubricating pump and cold lubricant. One is illustrated which can be made by any skilful mechanic, and for those who make bullets in large quantities it is an excellent tool to possess.

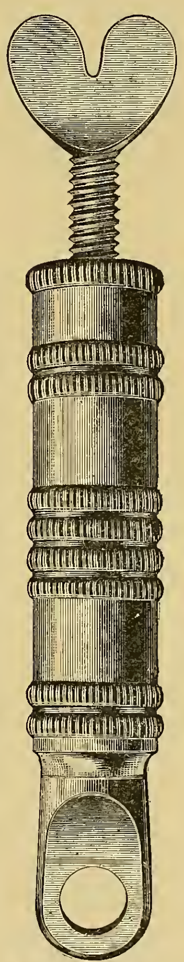


Fig. 197.—Mass. Arms Co.'s Lubricating Pump.

Lubricants deteriorate with age on account of oxidation, and therefore freshly lubricated bullets are superior to those which have been lubricated for a long time.

A patched or jacketed bullet is used in Europe for both target and game shooting. In America it is sometimes used for game shooting, and for target shooting with a special military rifle, in which case a disk of lubricant is used, being placed between a thin card wad over the powder and the bullet. With such a load the rifle is not cleaned between shots. The use of the patched bullet for game and military shooting is less each year in this country, but for target shooting with a match rifle, in most cases where fine shooting is done, the patched bullet is preferred.

The object of the patch is to keep the lead from contact with the barrel, a fact which most marksmen well know.

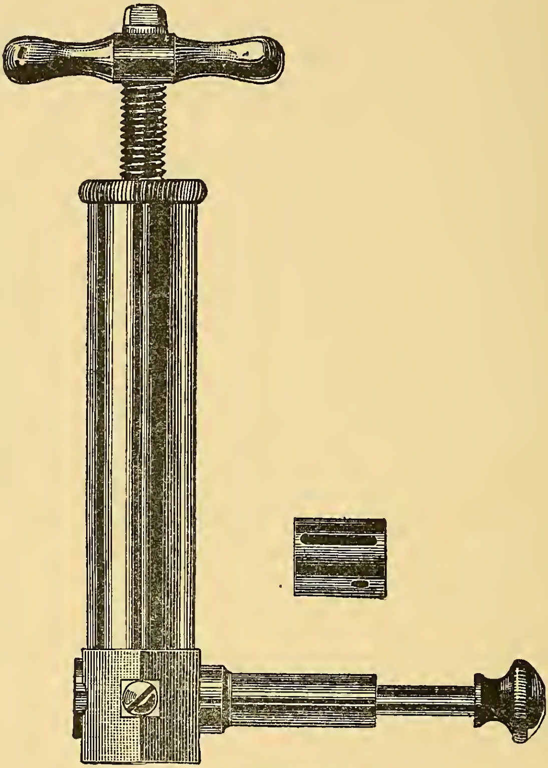


Fig. 198.—Harwood's Bullet Lubricating Pump.

Patched bullets for the standard makes and calibres of rifles can be purchased in most of the large cities, but so variable are the ideas of riflemen in regard to correctness of the fit of bullets, as well as the difficulty at times in procuring the size and weight, with the special thickness of patch, that the practice of making bullets is quite general among expert riflemen.

The bullet intended to be covered with a patch is cast without cannelures, and, until recently, was patched almost wholly by wrapping the patch around the bullet. The material for patching bullets for American breech-loading target rifles is generally paper. The Union Metallic Cartridge Company and the Winchester Repeating Arms Company use what is known as Bank Note Bullet Patch Paper, an American product of firm texture. It is usually sup-

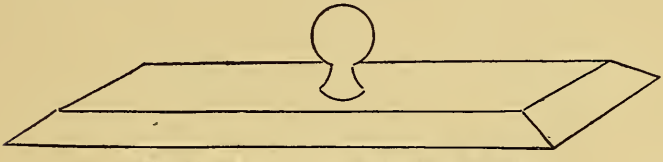


Fig. 199. — Form for cutting Patches for Bullets.

plied in three thicknesses, and the bullets, when patched, are known as thick, medium, and thin patched. Sometimes bullets are supplied patched with an extra thin patch.

Assuming that a rifleman desires directions for patching bullets, I will commence by describing the patch. The first thing to do is to fit a patch to the bullet ; and it should be shaped so as to go around the bullet twice and not lap over so as to make three thicknesses of paper. When the patch is properly fitted, a disk of metal can be made, which will serve the purpose of cutting out patches in quantity. The accompanying illustration (Fig. 199) shows a device, which often accompanies a first-class English express rifle, for cutting out patches, and which will also show the shape of the most popular form of paper patch.

Some riflemen have an arrangement for cutting patches which I believe will be new to many, and which I will illustrate and describe (Fig. 200). Take a piece of clean pine board, about 18 inches long by 10 wide; nail two tacks or nails in this board about an inch from the edge, about 12 inches apart, as shown in the illustration. Take a straight edge and draw a line from one nail to the other. Lay one end of the patch fitted to the bullet on this line, and mark the width and length, nailing two more tacks on the lower line. The space between the upper and lower lines represents the length of the patch, the cross extending above the upper and below the lower lines represents the width of the patch. With such an arrangement the

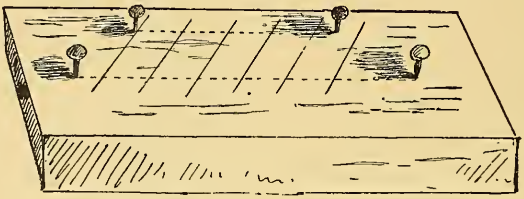


Fig. 200. — Device for cutting Patches for Bullets.

rifleman can, in a short time, cut patches enough to last him a year or more, and to do this he should proceed as follows: —

Take a number of sheets of the patch paper, and, if the edges come together evenly, place them against the two upper tacks; place a rule against the two lower tacks, and with a sharp knife cut across, remove the strip, move up the edge of the paper, and thus cut the patch paper of several sheets' thickness into strips, the width of which represents the length of the bullet patch. After cutting into strips, take a strip, placing it against the two upper tacks, or with the edges on the two horizontal lines; take the rule, place it even with the first oblique line, and with the knife cut it; then move the rule to the next line, cut, and so proceed until the entire strip of paper is cut. These pieces should conform to the shape of the single patch fitted to the bullet if the lines in the board are properly laid out and the directions followed.

After cutting out the patches, either by the aid of a metal disk guide or the latter plan, the rifleman can proceed to patch. In factories bullet patching is generally done by girls, as their nimble fingers seem better adapted to this work than the stronger but less deft ones of the sterner sex. At one time a little paste was used to moisten the end of a patch and make it adhere to the bullet when starting to patch the bullet, but it was soon discovered by expert riflemen that anything which caused the patch to adhere to the bullet after leaving the rifle

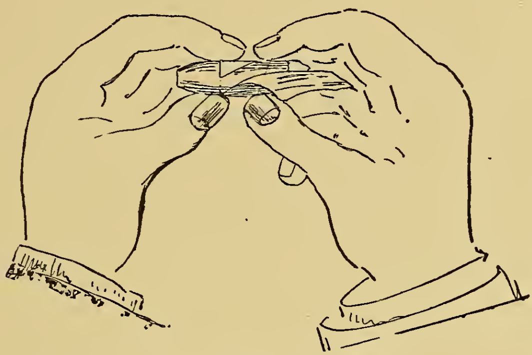


Fig. 201.— Mode of patching Bullets.

was detrimental to good shooting, and paste was forever discarded by intelligent riflemen.

Some place the patches in a saucer of water, the wet patch clinging to the bullet. This mode is questioned by some riflemen, as paper will sometimes cling to the bullet after leaving the rifle. Other riflemen wet the tip end of the patch with saliva, and claim to patch the bullet satisfactorily, and still others apply the patch perfectly dry. I know one rifleman who has a world-wide reputation as a marksman, who has twice shot on American teams in England, and whose record in some styles of legitimate shooting has never been equalled, who frequently casts his bullets an hour or two before starting for the rifle range. I have seen him repeatedly patch his bullets in the cars while travelling from Boston to Walnut Hill, but lately he has taken to patching on the range. He uses one shell which, after firing a shot, he decaps, applies a fresh primer, fills the shell, picks up a bullet, patches it, inserts it in the shell, and goes to the firing point. With

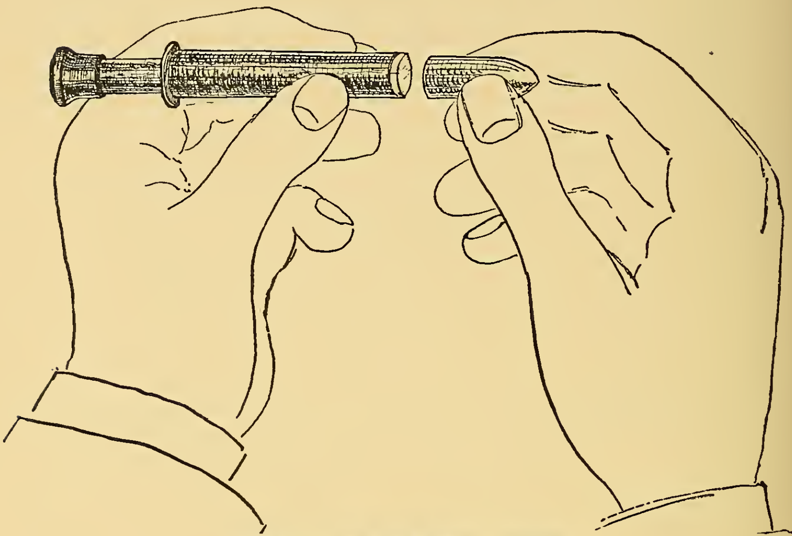


Fig. 202.—The Chase System of Patching.

three or four shooting on a target, he is able, without hurrying, to keep his place and fire in turn. I mention these facts to show that bullet making and patching bullets is not a very arduous task when the art is acquired.

In patching bullets it is usual to place an end of the patch on a bullet, as shown in Fig. 201, and wrap the bullet by rolling the paper from you, or the bullet toward you. The patch extends below the base of the bullet, which is twisted thus holding it. The Chase system of patching, which is used by many expert target shots, is illustrated (Fig. 202). The patch is square, going once around the bullet. The plug in the ball-seater is drawn back, the patch placed in the ball-seater, the bullet inside of the patch, after which the bullet with the patch is seated in the rifle-barrel in front of the chamber. This system of patching was originated chiefly to insure the patch parting from the bullet the moment it left the muzzle of the rifle. It is employed only where one shell is used, reloading after each shot, or where the shells are carried to the range loaded with powder.

Riflemen using the system of patching first described, frequently cut the patch or slit it along the edge, the object being to facilitate its leaving the bullet. My frequent allusions to the efforts of the rifleman to insure the patch leaving the bullet will indicate how important a factor this is to secure fine shooting. Patches have been found clinging to the bullets after they have been shot into a bank at the back of paper targets. Factory-made bullets have been found to which the patch was attached so fast as to hold the weight of the bullet, and, in fact, so the patch would have to be torn from the bullet, and part of it left sticking fast to one side of the projectile. Shooting with such bullets is likely to be quite variable.

CHAPTER XXIII.

ROUND BULLETS IN MODERN RIFLES.

It is astonishing how pertinaciously some individuals will cling to ancient and nearly obsolete ideas connected with rifles and rifle firing. Years ago rifles were made to shoot round bullets and short conical balls, and there are on record many statements as to their excellence. There is a limited range with such projectiles, and the most exhaustive experiments have shown that great care is necessary to secure even good results with a round bullet; and the advantages of an elongated projectile are so much greater, that little or no attention is given by makers of rifles or ammunition to their manufacture.

I have always believed that most of the advocates of the gain twist, and the use of the round bullet in rifles, formed their opinion more from writings of twenty-five to fifty years ago than from actual experiences at the present time.

Occasionally, a modern rifleman desires to know the amount of accuracy which can be secured by the use of a round bullet in a modern breech-loading rifle, and if he be a practical rifleman, and essays to gain this information by actual experiments, according to my observation, he soon becomes convinced that such projectiles had better be relegated to oblivion, and that the modern elongated projectile is vastly superior in range, accuracy, and penetration to the spherical ball.

It cannot be said that a round bullet will not shoot accurately in a rifle, for experiments show that they will; but to secure satisfactory work they must be shot from a rifle with a very slow twist, and much more care taken in loading than with other forms of projectiles. Even then you cannot surpass the accuracy of an elongated bullet; you would have only a very short range, and the rifle best suited for shooting round bullets would not shoot modern projectiles well. Very few riflemen of to-day would be willing to accept a rifle which is best suited for shooting round bullets; in fact, according to my own experiments, the only modern rifles at all suitable for shooting round bullets are those with slow twists, and shooting short, conical bullets. The twist used in express rifles is considered best for round bullets, but the depth of the grooves in such rifles is just the opposite of what most gun makers consider proper for the spherical projectiles.

The only advantage I could ever see in the use of a round bullet was a low trajectory at short range; but to secure any accuracy a rifle must be used, according to my experiments, which would be quite unreliable with an elongated projectile at a distance most who hunt with a rifle desire to shoot. One can load a breech-loading rifle from the muzzle, if the rifle has a slow twist, and sometimes secure very good work up to 150 yards, but I have no use for such an arm in hunting, for a modern rifle with a quick twist will shoot a light elongated bullet so accurately as to hit nearly every time an object as small as one can see to sight on with hunting sights, and far finer than a person can hold, besides shooting a heavier bullet with great accuracy.

I consider the rifle best suited for shooting a round bullet as obsolete, whether breech or muzzle loader, and a spherical bullet much inferior to a modern elongated projectile. It is evident that those who seek information on this subject, recognize the superiority of the elongated projectile, but desire to know what amount of accuracy can be obtained from round bullets in modern rifles with quick twist, chiefly for practice with reduced charges indoors, or where it is thought undesirable to shoot full charges. I have intermittingly given some attention to experimenting with round bullets in modern breech-loaders, but always came to the conclusion that the modern rifles had better be shot with the ammunition intended for them, and if practice was desired indoors, or at short range, the .22-calibre was much more desirable.

I have alluded to loading with round bullets from the muzzle and securing fair results at short range, but most of my experiments were with the balls loaded in the shell, and selected for rifles — a Sharps-Borchardt .45-70 and a U. S. Springfield rifle. Both of these rifles were fine shooting arms, and groups of ten shots on or in a 6-inch circle, at 200 yards, shooting at rest, could be secured without much trouble. The Sharps rifle was fitted with a Remington Special Military sight, and the Springfield had the Buffington sight. The shooting was done by an expert rest shot, one who has distinguished himself by his excellent work in this style of rest shooting. Bullets were made of pure lead, and of different alloys. Various charges of powder were tried, and the mode of loading as follows: —

The shells were primed, and the charges of powder poured into them; the round bullet placed over the powder, the bullet fitting the shell snugly, and lubricant distributed evenly around the outside of the bullet, precisely similar to the mode followed in loading shells for revolver ammunition for stage or indoor shooting.

The target used was the centre of the Standard American 200-yard target, and the distance 100 yards; therefore, any shot outside the four circle would be scored a miss. Seven shots constituted a score.

Following were the results — first test with Sharps rifle: —

	POWDER.	BULLET.	VERTICAL DEVIATION. INCHES.	HORIZONTAL DEVIATION. INCHES.	REMARKS.
1	20 grs. Rifle Ctg. No. 3.	Hard.	17½	9	2 shots off target.
2	20 "	"	18	8¼	
3	20 "	"	19¾	14	
4	20 "	Pure lead.	10½	7	1 shot off.
5	20 "	"	15	9	1 "
6	30 "	1 to 20	12	13	2 "
7	30 "	1 to 20	12½	15	2 "
8	30 "	Pure lead.	11	10	
9	50 "	1 to 20	7	15	
10	50 "	"	15	11	
11	50 "	Pure lead.		4 shots on target; very wild.	
12	70 "	1 to 20	11	14	
13	70 "	"			very wild.
14	70 "	Pure lead.	9	11	
15	70 "	"	16½	10½	

50 yards, Sharps rifle: —

	POWDER.	BULLET.	VERTICAL DEVIATION. INCHES.	HORIZONTAL DEVIATION. INCHES.
1	30 grs. Rifle Cartridge.	Pure lead.	4½	4
2	30 "	"	4¾	5
3	70 "	"	2¼	4¼
4	70 "	1 to 20	4½	1⅝
5	50 "	Pure lead.	5¼	4¾
6	20 "	"	12	9

NOTE. — Light powder charges fouled at breech of rifle; heavy charges at muzzle. Bullets extremely sensitive to wind and excessive fouling noticeable.

A trial was made with a Springfield rifle, the charge being 70 grains of Rifle Cartridge Powder and a soft lead bullet. The first seven shots were in a 7½-inch circle, four of the shots being in a 4-inch circle. The second series took a 13-inch circle to enclose the shots, but five of them were in a 5½-inch circle. Third trial in a 10-inch circle. Hard bullets were then tried with the same charge of powder, and it required a circle 11½ inches in diameter to enclose the shots, though six of the shots could be enclosed in a 9-inch circle. A second trial with the same charge required an 11-inch circle to enclose the seven shots. All the shooting with the Springfield rifle was at 100 yards.

The only modern rifle I ever succeeded in getting any satisfactory work from was a Maynard .40-60 rifle. This arm had a 26-inch twist, and would shoot a round bullet quite well, but the short conical bullet did so much finer work with half the trouble in loading that I quickly abandoned the round bullet.

The result of my experiments left the impression that round bullets in modern American rifles, even when the bullet of proper size was procured and loaded with the greatest care, would shoot with only very moderate accuracy up to about 60 yards, and it could not be relied on to do anything like the certainty an elongated projectile could. A round bullet in a modern rifle, according to my experience, will not shoot as accurately as a person can hold the rifle; therefore, I some time ago concluded that I had no use for anything in the way of a bullet, except an elongated one.

CHAPTER XXIV.

MODERN MACHINERY FOR MANUFACTURING RIFLES.

In previous chapters I have alluded to different processes of manufacturing rifles. There is a similarity in the processes, but the machinery employed to accomplish the same results is widely different. An excellent rifle can be produced entirely by hand-power machines ; and some of the machinery employed at the present time possesses surprising primitiveness. In some establishments the necessary machinery is built by the manufacturers of rifles, and it varies very much.

The only concern in the United States making a specialty of building machinery for the manufacture of rifles is the Pratt and Whitney Company of Hartford, Conn. This company has a line of machinery which enables the company to equip an armory with despatch with the latest perfected machinery ; and the illustrations in this chapter show some of the most important machines which are used in a modern rifle factory.

Fig. 203 shows a "Barrel Drilling Machine," which is employed to drill rifle and shotgun barrels, hollow spindles, etc., up to one-inch bore, and thirty-six inches long. The work revolves while the drills are fed in by the carriage. Oil is forced through the drills, and carries the chips away from the cut to the pan under the bed. The work is drilled the whole length from one end, and the machine is made double with each half complete in itself, and independent of the other.

There is a power-feed to this machine, and an automatic knock-off for the carriage; and the flow of oil can be

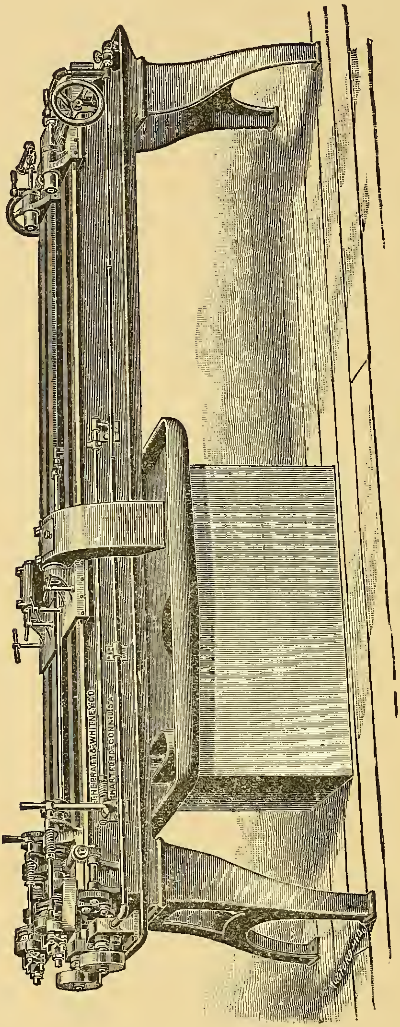


Fig. 203. — Barrel Drilling Machine.

easily regulated. The countershafts are arranged so that the work-head and oil pump of each half of the machine can be operated independently; and there are cones giving freer speeds for the work spindles.

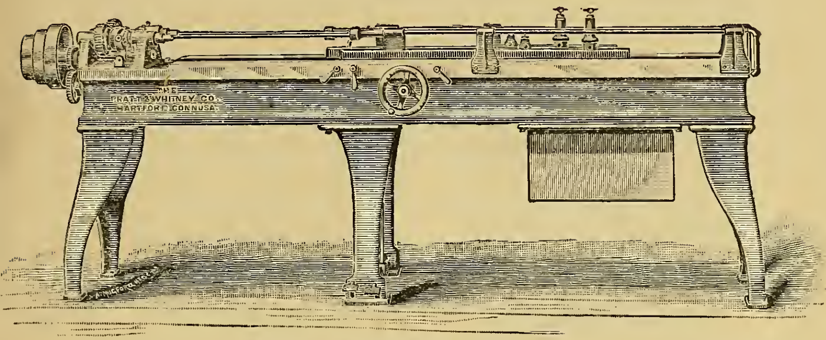


Fig. 204. — Smooth Boring Machine.

The countershaft runs 390 revolutions per minute, making the speeds of work-head 510, 680, 870, and 1,190

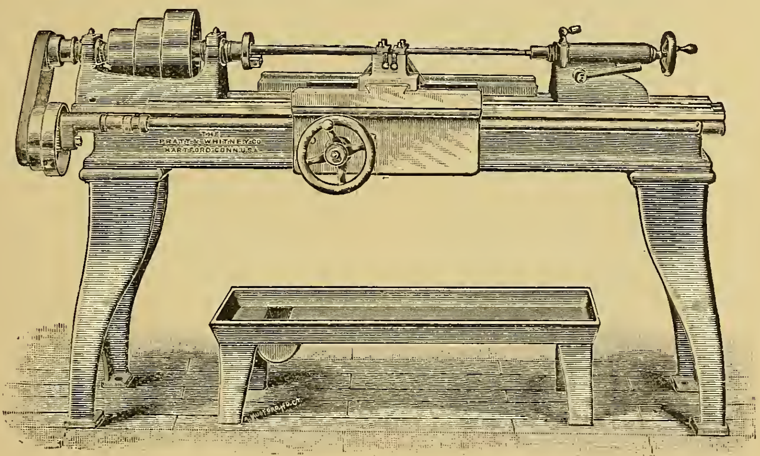


Fig. 205. — Barrel Turning Machine.

revolutions per minute. The capacity of the machine for ordinary rifle barrels is about twelve per day.

The Smooth Boring Machine, shown in Fig. 204, is designed to finish the bore of barrels after being drilled. The work is clamped in fixtures and reciprocating carriages, which feed the barrels, and square the reamers being driven by the head spindles. This machine is made double, both spindles being driven from the same driving shaft, but operated separately by clutches connected with treadles on the central leg. The carriages are driven from the head driving shaft by a system of racks and gears, the motion being reversed by means of hand levers on the front of the bed. The capacity of the machine is about twenty barrels per day. The Pratt and Whitney Company has, at the time of writing, in its works a new model Smooth Boring Machine, which will have several new features, and be automatic in its operation.

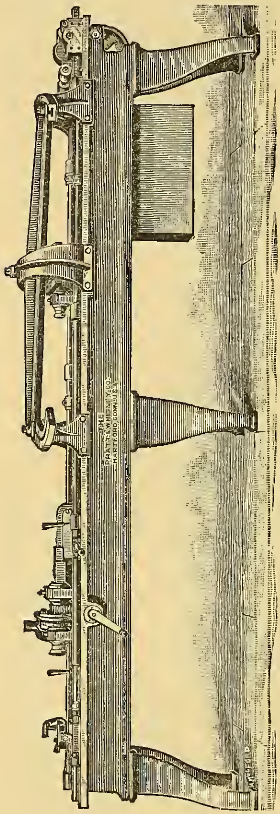


Fig. 206.—Rifling Machine.

The "Barrel Turning Machine," Fig. 205, is designed for finishing the outside of gun barrels up to forty inches long. It is a special engine lathe, with former attachment, belt feed and carriage arranged to hold as many cross slides as can be used to advantage in each operation. The usual practice is to divide the finishing of the barrel into several distinct operations, each cut being taken on a separate machine set up for the purpose. The machine is very rigid and well built, so that the work is practically interchangeable.

There are three speeds for the spindle, and three variations of feed, and the tools are kept flooded with oil by an oil pump and a convenient system of piping.

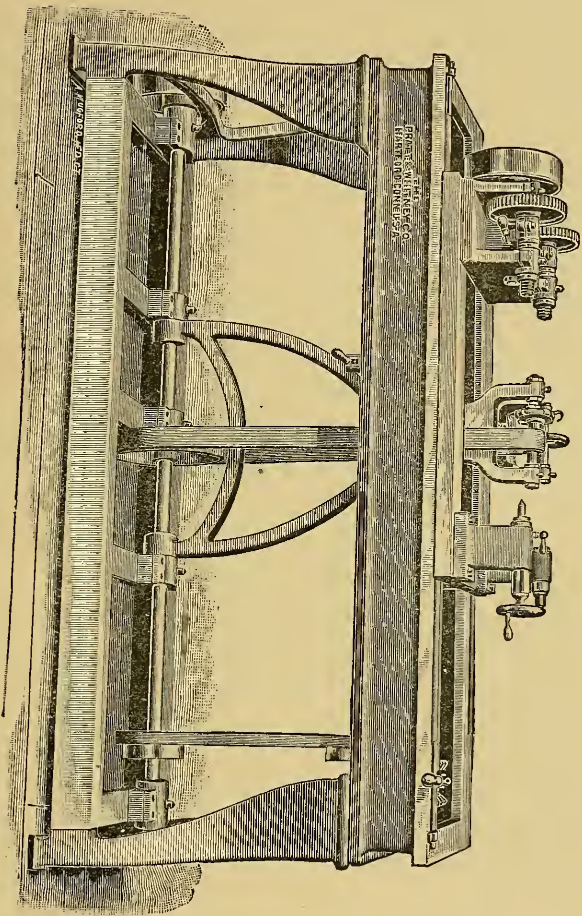


Fig. 207. — Stocking Machine.

The rifling machine shown in Fig. 206 is known as the "No. 3 Rifling Machine." It is designed for rifling barrels up to .45-calibre and forty inches long, with rifling of any pitch down to one turn in ten inches, and this would enable these machines to be used in the manufacture of the new military rifles. The cutter-bar is made to revolve as it advances by a pinion meshing with a rack in a slide, the motion of which is governed by an adjustable angle bar. The carriage has an automatic reciprocating motion, and the cutters are fed out by an adjustable feeding device. An oil pump supplies the cutters with a constant flow of oil, which keeps them cool, and carries away the chips. The machine is arranged so that the operator has full control of it without changing his position. The index provides for cutting three, four, or five grooves, or can be made for any number desired. The capacity of the machine for ordinary rifle barrels is about twenty per day, and is automatic throughout.

The "Gun Stock Turning Machine," Fig. 207, is designed to finish the outside of gun-stock to the desired form in one operation. There are two spindles geared from the same driving shaft, one for the work and the other for the former. The cutter and former roll are on a rocking frame, the roll being held against the former by a clock-spring arrangement. The driving and feed are both operated by clutches on the machine without stopping the countershafts. The carriage has an automatical reciprocating travel of nineteen inches. The feed screw and cutter spindle are driven from a shaft below, and the work and former spindles are driven directly from the countershaft. There are two countershafts. One runs sixty-five revolutions per minute, driving the work thirty revolutions per minute, the other two hundred and eight, driving the cutter three thousand revolutions per minute.

RULES
GOVERNING RIFLE SHOOTING.

REGULATIONS OF THE NATIONAL RIFLE ASSOCIATION OF AMERICA.

I. — MANAGEMENT.

A. — ANNUAL MEETINGS.

1. Annual meetings for competition will be conducted by an Executive Officer, wearing a *tri-colored* badge, aided by a Statistical Officer, wearing a *blue* badge, a Financial Officer, wearing a *white* badge, a Range Officer, wearing a *red* badge, and assistants, wearing badges corresponding in color to those worn by the chiefs of their respective departments.

2. The Executive Officer shall have control of the Range for the conduct of matches, and shall appoint an adjutant to assist him.

3. The Statistical Officer shall have charge of all statistics.

4. The Financial Officer shall have charge of all finances connected with these meetings.

5. The Range Officer shall have charge of all Firing Points, and of the shooting thereat.

B. — OTHER COMPETITIONS.

1. All other Association competitions will be conducted by an Officer or Director of the Association, or other competent person previously designated as the Executive Officer. In the absence of the Officer, Director, or other person previously designated, the Assistant Secretary or Superintendent of Range shall act as the Executive Officer.

II.—GENERAL REGULATIONS.

1. During the progress of a match, no one, except the Officers, Directors, and Employees of the Association, the competitors and the Scorekeepers, will be permitted within the ropes, without special permission of the Range Officer.

2. The squads of competitors will be stationed not less than four yards in rear of the firing points, where each competitor must remain until called by the Scorekeeper to take his position at the firing point, and until he has completed his score. The Scorekeepers will be seated close to and in rear of the firing point stakes.

3. Scorekeepers shall, as each shot is signalled, call in a loud voice the name of the competitor and the value of the shot, and at the conclusion of the score of each competitor, announce in like manner his name and total score.

Competitors must pay attention to the scores as announced and recorded, so that any error may be promptly investigated.

Scorekeepers shall write upon the blackboard the names of the competitors in each squad or file, in the order in which they are to fire. They shall record each shot upon the blackboard before entering it upon the score card, and shall not erase from the blackboard the names or scores of competitors until a proper officer has verified the score cards with them.

4. All competitors will be allowed to examine the records of the Scorekeeper during the progress of any match upon application to the Range or Executive Officer.

5. All protests and objections must be made to the Executive Officer, or, in his absence, to the Range Officer in charge. In case a competitor is dissatisfied with the decision of the latter, he may appeal to the Executive Officer.

All protests must be made in writing, in duplicate. These must be given to the Range Officer within two hours of the occurrence. One copy of the protest will be submitted to the party protested against, as soon as practicable. Except that when the protest charges fraud, it may be made at any time before the prizes for that competition have been awarded.

6. Any competitor feeling himself aggrieved by the ruling of an Executive Officer may make to the Secretary a statement of his grievance in writing, giving the names of two or more witnesses in the case, which shall be handed to the Executive Committee at its first meeting thereafter for its consideration. The decision of the Executive Committee shall be final, subject, however, to the discretion of said Committee, or any two members of it, to refer the matter to the Board of Directors for its decision.

7. All practice upon the Range is subordinate and must give way to matches of the Association, except as directed by the Executive Officer or Range Committee.

8. These regulations, and such special rules or directions as the Executive Officer may give, must be rigidly complied with by competitors and all other persons upon the Range grounds.

III. — RIFLES.

The rifles allowed in the competitions are — 1st, Military rifles; 2d, Special Military rifles; 3d, Any rifles, and must comply with the following conditions; viz. :—

1. Military Rifles to be such as have been adopted by the United States Government, for use in the army, or by any State or Territory for the use of its uniformed militia — except such rifles as have been specially issued to sharpshooters, or for experimental purposes. Filing or altering the sights of such rifles, except as authorized by the proper military authorities, is strictly prohibited.

2. Special Military Rifles, to be fitted with an arrangement for fixing a bayonet, or such other device as may be employed to take the place of a bayonet. Stock to be sufficiently strong for service purposes, and to be fitted with a metal cleaning rod and swivels for a sling; weight (without bayonet) not to exceed nine and one-quarter pounds. In all military rifles the minimum trigger pull shall be six pounds. Sights may be such as are allowed on military rifles or of such other pattern as may have been approved by the Board of Directors of

the National Rifle Association. The sight protector of the front sight may be used as a shade for the same.

3. ANY RIFLE, maximum weight ten pounds, minimum pull of trigger three pounds; sights of any description, except telescope, magnifying and such front aperture sights as solid disks or bushes pierced in the centre, which cover the target so as to conceal the danger signal when displayed. No stirrup constructed of metal or other substance, connected to the rifle by straps of any kind, for the purpose of taking up or lessening its recoil, will be allowed.

4. The usual military sling and swivels may be used.

5. Competitors shall submit their rifles and ammunition for inspection whenever required.

6. No hair or set trigger will be allowed.

7. No fixed or artificial rests will be allowed.

IV. — AMMUNITION.

For any military or special military rifle, any form of fixed ammunition may be used in which the bullet is securely inserted in the shell to a depth not less than $\frac{2}{3}$ the diameter of the bore, so that the cartridge may be carried in a belt, bullet down.

For any rifle, any ammunition may be used. When a breech-loader is used it must not be loaded, or when a muzzle-loader is used it must not be capped until the competitor has taken up his position at the firing point.

V. — TARGETS.

The targets are divided into three classes, and shall be of the following sizes, unless otherwise stated in the terms of the match: —

1. *Third Class*, to be used at all distances up to, and including, 300 yards — Target 4 x 6 feet.

Bullseye, circular,	8	inches in	diameter.
Centre,	"	26	"	"
Inner,	"	46	"	"
Outer, remainder of target.				

2. *Second Class*, to be used at all distances over 300, to, and including, 600 yards — Target 6 x 6 feet.

Bullseye,	circular,	22	inches	in diameter.
Centre,	"	38	"	"
Inner,	"	54	"	"
Outer, remainder of target.				

3. *First Class*, to be used at all distances over 600 yards — Target 6 x 12 feet.

Bullseye,	circular,	36	inches	in diameter.
Centre,	"	54	"	"
Inner, square, 6 x 6 feet.				
Outer, remainder of target.				

VI. — MARKING, SCORING, & SIGNALLING.

1. Bullseye,	counts	5;	signal,	white	circular disk.
Centre,	"	4;	"	red	"
Inner,	"	3;	"	white and black	"
Outer,	"	2;	"	black	"

Ricochet, scored R; " red flag waved twice, right and left, in front of the target. Ricochet hits will be marked out after the flag signal.

2. When a shot strikes the angle iron upon which the target stands, the marker will open the trap and raise and lower his flag three times in front of the target.

3. Any objection to the record of a shot as signalled or to one not signalled, must be made before another shot is fired. Any competitor challenging the marking of a shot, shall first deposit with the Executive Officer, or his representative, the sum of $1.00. If his challenge is sustained the money shall be returned. In case the challenge is not sustained, the money shall be forfeited to the Association. The challenger shall not be permitted to inspect the target.

4. When two shots strike the target simultaneously, the shot having the higher value will be marked first, and the competitor whose proper turn it was to shoot will be credited with that value.

5. Any alteration of a scoring ticket must be witnessed by the officer in charge of the firing point, and indorsed with his initials.

VII. — BULLSEYE TARGETS.

1. Bullseye targets will be open all the time during the Annual Meetings.

2. Tickets (entitling the holder to one shot at any Bullseye target) will be sold at the office of the Financial Officer, upon the Range, at 10 cents each, or twelve for $1.00.

3. Each competitor making a Bullseye will receive a Bullseye ticket, provided he fires in the position authorized at that Range.

4. At the close of the firing each evening, the pool receipts (less one-half retained for expenses) will be divided *pro rata* among those making Bullseyes, on presentation of their tickets.

5. No person will be allowed to fire more than three shots consecutively at any Bullseye target, provided others are waiting to fire.

VIII. — MATCHES.

1. The commencement of the Annual Meetings will be signalled by the firing of a gun, or blowing a horn at intervals of fifteen minutes. The first will be the signal for competitors and scorekeepers to assemble at the firing points, and the second to commence firing.

2. The matches will take place, if possible, at the hour previously named. Any deviation from the programmes will be posted upon the Bulletin-board as long beforehand as practicable. *The posting upon such Bulletin-board will be considered sufficient notice to all competitors of everything so posted.* It should be examined by all competitors daily, both morning and afternoon, before the shooting commences.

3. In team matches, at Annual Meetings, an officer will be assigned to each of the firing points as Supervisor, and will, in connection with the Scorekeeper, keep a record of the firing; and any disagreement between such Officer and Scorekeeper will

be decided by the Executive Officer, subject to appeal, as provided for in the Regulations.

4. Each Team may appoint a responsible person to act as Supervisor, whose duty it shall be to see that the rules of the N. R. A. are strictly adhered to by the team at whose target he may be assigned.

5. No practice will be allowed upon the Range on any of the days of the Annual Meetings, unless specially authorized by the Executive Officer. This does not apply to days upon which special matches of the Association, or of affiliating associations or clubs, take place.

IX. — ENTRIES.

A. — ANNUAL MEETINGS.

1. In all cases competitors for prizes offered to military organizations must be either officers or regularly enlisted members in good standing of the Regiment, Battalion, Company, or Troop which they represent, and shall have been such for at least three months prior to the match for which they are entered.

2. Entries must be made at the office of the Association, in New York City, prior to the Sunday preceding the commencement of the meetings, and all subsequent entries shall be called Post Entries, and a charge of 25 per cent additional will be imposed upon all such Post Entries. This does not apply to re-entry matches.

3. Competitors who are prevented from being present at any meeting shall have the entrance fees they have paid returned after the meeting, provided that they send their tickets, and give written notice to the Secretary before the day on which the prize for which they have entered has been announced for competition.

4. Competitors prevented from competing by illness will receive back their entrance fees in full, on production of a medical certificate and their entry tickets.

5. The holders of post entry tickets may be ordered to fire whenever target accommodations can be provided, but should

they be precluded from competing by deficiency of target accommodation, their entrance fees will be returned to them, the Executive Officer not being able to guarantee accommodation for all such entries.

6. All entries are received upon the express condition that the competitor is to appear at the firing point at the exact time named upon his score card, and complete his score within the limitation of time prescribed, regardless of weather or any other cause.

7. The same person shall not be a member of more than one team in the same match.

8. Competitors selected to shoot in team matches, or who are detailed to shoot off a tie, at a particular hour, and who find that such engagements will interfere with their shooting in other competitions, must at once communicate with the Executive Officer. These cases will be provided for, *when possible*, by altering the hour; and when that cannot be done, the entry will be cancelled and the entrance fee refunded, except in cases of ties, when he takes the next lowest prize.

B. — GENERAL REGULATIONS.

1. A register ticket may be transferred at any time before the firing for the match has commenced, by exchanging it at the office of the Statistical Officer for one having the name of the new holder. It is available only for the hour and target for which it was originally issued. Any erasure or alteration of hour or target not initialed by the Executive Officer will render the ticket invalid.

2. No post entries shall be received for any competition after the firing in such competition has commenced, unless expressly permitted by the terms of a match.

X. — SHOOTING.

1. Competitors must be present at the firing points punctually at the time stated upon their tickets, or forfeit their right to shoot.

2. After a competitor has joined a squad he shall not quit it until he has completed his firing, or retired.

3. No two competitors squadded to fire at the same time shall shoot with the same rifle.

4. In all competitions confined to members of military organizations, competitors shall shoot in a uniform, to consist of a military head-dress, uniform jacket or coat, and a body belt, to be worn as is usual in their corps.

5. In each match of the Annual Meetings, except where otherwise stated, the squad or team assigned to each target will be required to commence firing at the time named on the score card, and to continue firing at the rate of one shot per minute until the completion of the score.

6. The time for each squad to commence and close, will be signalled by firing a gun or blowing a horn every thirty minutes, from 9 A.M. to 5.30 P.M.; and no firing by any of its members will be permitted except between those signals. In case a competitor, without fault on his part, has been prevented from finishing his score within that time, he may apply to the Executive Officer for further assignment, the granting of which will be in the discretion of that officer.

7. Competitors retiring from matches forfeit all claims therein.

8. *No sighting shots will be allowed in any match*, but targets will be assigned as *Bullseye Targets* at which competitors may practice at any time, provided such practice does not interfere with their presence at the designated time at the firing point to which they may have been assigned, or in case of teams, after the hour named for the commencement of their shooting.

9. In all competitions restricted to military rifles, the competitors shall place themselves at the firing point by twos, and shall fire alternately until they have fired all their shots.

10. In other competitions the competitors shall fire their shots alternately throughout the squad.

11. No rifle shall be cleaned or wiped out, except between ranges, unless specially allowed by the terms of the match.

12. Whenever the danger signal is displayed, competitors about to fire will be required to open the breech block of their rifles (if breech-loaders). If they leave the firing point they must withdraw the cartridge.

13. Any competitor delaying his squad, will be passed by. In no case will the firing be delayed to enable a competitor to procure a rifle.

14. Competitors must shoot their scores at different distances, in the order named in the conditions of the competition.

15. In all competitions, unless otherwise provided by their terms, competitors will be allowed one minute to each shot.

16. Warming shots must be fired into the bank between the targets.

XI. — POSITION.

UNLESS OTHERWISE STATED IN THE TERMS OF THE MATCH, SHALL BE AS FOLLOWS: —

1. In all matches (except those specially for carbines), the position up to and including 300 yards, shall be standing. The elbow may be rested against the body.

2. In carbine matches, the position at 200 yards shall be standing; at 300 yards, kneeling or sitting; over that distance, any position (as prescribed for infantry).

3. In all other matches, at distances above 300 yards, any position may be taken without artificial rest to the rifle or body.

4. One-armed competitors will be allowed to use false arms without extra support, in the standing, sitting, and kneeling positions.

5. In all cases the rifle shall be held clear of the ground.

XII. — TIES.

1. Ties shall be decided as follows: —

A. — IN INDIVIDUAL SHOOTING.

1. When the firing takes place at more than one distance, by the total score made at the longest distance; and if still a tie,

and there be three distances in the competition by the total score at the second distance.

2. By the fewest OUTERS in the entire score.

3. By the fewest INNERS in the entire score.

4. In handicap matches (after the preceding), by the fewest CENTRES in the entire score.

5. If still a tie, by inverse order of shots, counting singly from the last to the first.

6. In matches where two or more scores added together count, if still a tie, by adding together the last shots of each single score, and if still a tie, by adding together the next to the last and so on.

7. By firing three shots at the longest range, and if still a tie, by firing single shots until the tie is decided.

B. — IN TEAM SHOOTING.

1. By the aggregate total scores made at the different distances in inverse order.

2. By the fewest OUTERS in the entire score.

3. By the fewest INNERS in the entire score.

4. By the total of each round in inverse order.

5. By the competitor on each side who has made the highest score, firing five rounds at the longest distance.

C. — IN HANDICAP MATCHES.

I. In case of ties in handicap matches, the handicap shall be added to the first shot or shots scored below a bull.

II. The names of competitors who have to shoot off ties will be posted on the Bulletin-board as soon after each match as practicable.

III. When the ties are shot off, one sighting shot shall be allowed without charge.

IV. Competitors not present at the firing points at the hour named for shooting off ties, lose their right to shoot.

V. If, having forfeited their right to compete, they shall still be within the number of prize winners, they shall take any prize that may be allotted to them by the Executive Committee.

XIII. — PRIZES.

1. Unless otherwise specified, no competitor will be allowed to take more than one prize in any competition.

2. Prize winners, upon application to the Statistical Officer on the Range, will receive certificates, which must be given up on receiving the prizes.

3. Prizes will be delivered on the Range at the close of the meeting, under direction of the Prize Committee, unless otherwise specified.

4. Any trophy competed for annually must be delivered to the Secretary of the National Rifle Association, by the organization or individual holding it, at least one week before the opening of the meeting at which it is again to be competed for.

5. All prizes and Bullseye money not claimed within thirty days after the day on which the same was won, shall be forfeited to the Association.

XIV. — PENALTIES.

Competitors must make themselves acquainted with the regulations, as well as with the conditions of any match for which they may have entered, as the plea of ignorance of either of them will not be entertained.

DISQUALIFICATION.

Any competitor —

(*a*) — Who shall fire in a name other than that under which he entered, or who shall fire twice for the same prize, unless permitted by the conditions of the competition to do so; or —

(*b*) — Who shall be guilty of any conduct considered by the Board of Directors or the Executive Committee as discreditable; or —

(*c*) — Who shall be guilty of falsifying his score or being accessory thereto; or —

(*d*)—Who shall offer a bribe of any kind to an employee—shall, upon the occurrence being proved to the satisfaction of the Board of Directors or the Executive Committee, forfeit all his entrance fees, be forever disqualified from competing at any time upon the Range of the Association, and shall not be entitled to have any prize won by him at the time of meeting awarded to him.

EXCLUSION FROM FURTHER COMPETITION.

1. Any competitor who shall be detected in an evasion of the conditions prescribed for the conduct of any match, shall be ruled out of such competition.

2. Any competitor, in any meeting or match, refusing to obey any instructions of the Executive Officer, or his assistants, or violating any of these regulations, or being guilty of disorderly conduct, or being intoxicated, will be immediately ruled out of all further competitions during such meeting or match, and forfeit his entrance fees ; and may also be reported to the Board of Directors or the Executive Committee, and be by them disqualified from the use of the Range.

3. Any competitor firing when the danger flag or trap disk is shown at the target or firing point, or knowingly discharging his rifle except at a target to which he has been assigned, or into the blowing-off pits, or as may be directed by an Officer, shall be debarred from all further competitions during the meeting, and shall forfeit his entrance fees. This shall not apply to a competitor accidentally firing at the wrong target, when no danger disk is up.

4. Any person discharging a rifle or snapping a cap within the enclosure, except in accordance with the regulations for shooting, may, at the discretion of the Executive Officer, be required to leave the ground.

5. Any competitor or other person found with a loaded rifle, except at the firing points and when about to shoot, shall be debarred from further competition during that meeting or competition.

6. Any person, whether a competitor or not, interfering with any of the firing squads, or annoying them in any way, will be at once expelled from the ground.

7. Any competitor discharging his rifle accidentally, either by his own want of care, or by reason of any defect in the rifle, may be disqualified from further competition in the match at the discretion of the Executive Officer.

8. Should a competitor lose his register ticket, omit to take it to the firing point, fail to attend at the prescribed hour, or give a wrong ticket, and so by his own neglect miss the opportunity given to him of competing for the prize for which his ticket was issued, his claim in regard to such competition shall be cancelled.

9. Any person firing on a wrong target will be reported by the scorer to the Executive or Range Officer present, and will be fined $1.00, or be debarred from further competition; or both, in the discretion of the Executive Officer.

10. Any competitor, who, after taking up his position for shooting and in proceeding to adjust his sights or change his position, shall not hold his rifle vertically, or with the muzzle towards the target, will be fined $1.00.

11. Any person ruled out of any meeting or competition shall forfeit all entrance fees.

XV.

1. All regulations heretofore adopted and inconsistent herewith, are hereby repealed.

2. Any of these regulations may be temporarily suspended or changed at any time by the Board of Directors or Executive Committee.

3. These regulations shall take effect immediately.

BY-LAWS OF THE MASSACHUSETTS RIFLE ASSOCIATION.

I. — NAME AND OBJECT.

This Association shall be called The Massachusetts Rifle Association. Its object shall be to promote rifle practice in Massachusetts.

II. — OFFICERS.

The officers of this Association shall consist of a President, two Vice-Presidents, a Treasurer, a Secretary, and a Board of fifteen Directors. The officers shall be chosen annually by ballot by the members of the Association, — with the exception of the President, who shall be chosen by the Directors from their own number, — and shall hold their offices for one year, and until others are chosen in their stead. The Directors shall also choose a counsellor, executive officers, and statistical officers, to hold their offices during the pleasure of the Board.

III. — MANAGEMENT.

1. The Board of Directors shall control the affairs of the Association, take cognizance of all infractions of the Charter and By-Laws, and fill vacancies which may occur in the offices of the Association, until the time of the next annual meeting.

2. A quorum of the Board of Directors shall consist of five members.

3. The Board of Directors shall, for their government, from time to time, make by-laws, rules, and regulations, and shooting-

rules for the government of the Association, not inconsistent with these By-Laws.

4. The interpretation of the Rules and By-Laws shall rest with the Board of Directors.

5. Any Director may at any time examine the records of the Secretary, or inspect the accounts of the Treasurer.

6. The following Standing Committees, each to consist of three members, shall be elected by the Directors, during the month of January, in each year, or as soon thereafter as may be: —

Finance Committee, Range Committee, Membership Committee, Prize Committee, Team Match Committee, and Glass Ball Committee.

The Directors shall also choose at the same time four members, who, with the President, shall constitute an Executive Committee.

IV. — DUTIES OF OFFICERS.

1. The President of the Association, or, in his absence, one of the Vice-Presidents, shall authorize the call of all meetings of the Board of Directors, and shall call special meetings of the Association at the request of four of the Board of Directors, or of ten members of the Association. He shall have the right, *ex-officio*, to be present at meetings of the committees.

2. The Secretary of the Association shall notify each member of the Board of Directors of all its meetings, and each member of the Association of every meeting of the Association; issue all other authorized notices to members; post on the Range a copy of all new rules made by the Directors; make and keep a true record of all meetings of the Directors, and of the Association; have custody of the books and papers, and the corporate seal of the Association, and conduct all correspondence.

3. The Treasurer shall collect and have charge of the funds of the Association, and pay such bills as shall have been approved by the Finance Committee. He shall keep account of his transactions, and make a detailed report thereof, with

vouchers annexed, when required by the Directors, and an annual report to the Association at its annual meeting. He shall give bonds in such sum as shall be fixed by the Directors.

4. The Statistical Officer shall keep a record of the statistics of the Association, and account and pay over to the Treasurer, weekly, all moneys received by him, less his disbursements in the various matches of the Association, with schedules giving an itemized account of the same, and shall be accountable to the Treasurer for all score cards and other tickets received by him for the use of the Association. He shall direct the services of the clerical employees at the meetings for competition.

5. The Finance Committee shall have the general supervision of the finances of the Association. They shall, from time to time, examine the accounts of the Treasurer and Statistical Officer, and recommend such methods in keeping the same as may seem for the interest of the Association. No obligations of the Association, beyond those necessary for current wants, shall be made until the Finance Committee shall have considered and reported upon the necessity and propriety of the plan proposed.

6. The Range Committee shall have charge of the Range, and all the property of the Association connected therewith. They shall keep the Range supplied by the purchase of all necessary articles for the use of the Range-keeper and the Markers. They shall audit all claims and bills against the Association for labor on and supplies used at the Range. But this committee shall have no power to make contracts or purchases in the name of the Association, for anything more than the usual supplies, unless authorized by a formal vote of the Board of Directors. They shall appoint a Range-keeper, Markers, and such other assistants as may be necessary, and direct their services. They shall require the Range-keeper to make returns of the property in his charge, — which returns shall be examined and indorsed by the committee or its chairman, and presented to the Board of Directors. They shall make such temporary rules and regulations for the use of the grounds and the targets as shall seem necessary. They shall generally do and perform everything needful to protect the

interests of the Association and secure a successful management of the Range.

7. The Executive Committee shall have general supervision of the affairs of the Association, not inconsistent with the powers and duties of other officers and committees as set forth, and shall report their action to the Directors for approval. They shall inquire into and report upon all infractions of the rules and regulations of the Association by any of its members, and recommend action thereon.

V.—THE BOARD OF DIRECTORS.

1. The stated meetings of the Board of Directors shall be held on the first Tuesday of each month. Special meetings may be called at any time by the President, or, in his absence, by one of the Vice-Presidents, and shall be called by either of them upon the request of three members.

2. All special committees for any purpose shall be appointed by the presiding officer, unless otherwise ordered.

3. Any member of the Board, who shall, in its opinion, conduct himself in a manner prejudicial to the interests of the Association, may be removed from the Board of Directors, by a two-thirds vote of all the members of the Board, at any stated meeting, provided the member accused shall have, at least ten days previously, been personally notified, in writing, of the charges against him, and a hearing given him thereon at a stated meeting therein specified.

4. Neglect on the part of any Director to attend six successive meetings of the Board shall be deemed a tender of the resignation of his office. But the Board may excuse any member for such neglect, and, before his resignation is accepted, under this By-Law, the member in default must be specially notified of the same.

VI. — MEMBERSHIP.

Any person giving his name, age, and address, shall, upon paying the sum of ten dollars, become a member of the Association, subject to the right of the Board of Directors to reject his name and return his fee, in case they shall deem it required by the interests of the Association.

VII. — RIGHTS AND DUTIES OF MEMBERS.

1. All members of the Association shall be entitled to equal rights and privileges.

2. All members shall subscribe to the By-Laws.

3. The annual dues shall be three dollars, payable in advance on the first day of January in each year, and if the dues of any member shall remain unpaid for three months thereafter, said membership may be declared void by the Board of Directors.

4. Any member can become a member for life by the payment, in one sum, of twenty-five dollars, and shall thereafter be exempt from all dues and assessments.

5. Any member who may refuse to pay any indebtedness to the Association, on demand, shall forfeit his membership in the Association, and cannot be reinstated in such membership, except by vote of the Board of Directors, and payment of all arrears.

6. No member shall be allowed to transfer his rights of membership.

7. Any member whose conduct shall be pronounced, by vote of the Board of Directors, as endangering, or likely to endanger, the welfare, interest, or character of the Association, shall forfeit his membership. Such vote shall not be taken without giving two weeks' notice to the offender of the charges made against him, and affording him an opportunity of being heard in his defence.

8. Any member having complaints or suggestions to make as to the management of the Association must do so, in writing, to the Directors.

9. No member shall take any property whatever, belonging to the Association, from its rooms or grounds, except on the authority of a resolution of the Directors.

10. Any member wishing to resign shall make his resignation, in writing, to the Secretary.

11. All rights and interest of a member in the property and privileges of the Association shall cease with the termination of his membership.

12. The scores made by the members shall be recorded in such manner as the Board of Directors shall, from time to time, prescribe. In case of a challenge given to, or received from, other marksmen, the representatives of the Association shall be selected by the Team Committee.

13. Non-members may be permitted to use the Range under such restrictions, and on payment of such amount, as may be fixed by the Board of Directors. The Range shall be free to members at such times as may be fixed by the Board; at other times each shooting party must pay such rates of target hire as may be established by the Board of Directors. *Provided*, That no targets shall be let to shooting parties on match-days of the Association, except at the discretion of the Executive Officer.

14. No betting shall be allowed on the grounds of the Association.

VIII.—MEETINGS.

1. The members of the Association shall hold an annual meeting on the second Tuesday of January in each year, and such special meetings as may be called pursuant to these By-Laws. If the annual meeting shall not take place at the time fixed, it shall be held as soon after as convenient, and the officers and Directors whose term of office shall have expired shall hold over until their successors shall have been appointed.

2. Fifteen members present at a general or special meeting shall form a quorum for the transaction of business.

IX.—AMENDMENT OF THE BY-LAWS.

Any proposition to amend these By-Laws shall be submitted in writing, with the signatures of the persons proposing the same, to the Board of Directors; the Board shall consider it at their next meeting, and submit it to the Association at its next meeting, notice being given to all members of the purport of the proposition. A two-thirds vote of all members present shall then be required for the adoption of the proposed amendment.

RULES GOVERNING COMPETITIONS.

I. — MANAGEMENT.

1. All meetings for competitions will be conducted by an Executive Officer, aided by a Statistical Officer and Assistants.

2. The Executive Officer shall have control of the Range for the conduct of matches, and shall give such directions to the employees of the Association as in his judgment are necessary for the proper management of the same, and for the preservation of order.

3. The Executive Officer and his assistants are required to see that the regulations, and such directions as the Executive Officer may give, are rigidly complied with by competitors and all other persons upon the Range.

4. They will see that the squads of competitors are stationed in rear of firing points, and that each competitor remains there until called by the scorekeeper to take his position at the firing point. The scorekeepers will be seated in rear of the firing points.

5. Scorekeepers shall, as each shot is signalled, call in a loud voice the name of the competitor and the value of the shot, and, at the conclusion of the score of each competitor, announce in like manner his name and total score.

6. All competitors shall be allowed to examine the records of the scorekeeper during the progress of the match, but in such a manner as not to interfere with, or inconvenience, the scorekeeper.

7. Any competitor feeling himself aggrieved by the ruling of the Executive Officer or of the Statistical Officer, may make the

Secretary a statement of his grievance in writing, which shall be handed at once to the Executive Committee for its consideration. The decision of the Executive Committee shall be final, subject, however, to the discretion of said committee, or any two members of it, to refer the matter to the board of Directors for its decision.

II. — RIFLES.

The rifles allowed in the competitions are: 1st, Military rifles; 2d, Special Military rifles; 3d, Any rifles, — and must comply with the following conditions, viz.: —

1. *Military Rifles*, to be such as have been adopted by the United States Government, for use in the army, or by any State or Territory for the use of its uniformed militia, except such rifles as have been specially issued to sharp-shooters or for experimental purposes. Filing or altering the sights of such rifles, except as authorized by the proper military authorities, is strictly prohibited.

2. *Special Military Rifles*, to be fitted with an arrangement for fixing a bayonet or such other device as may be employed to take the place of a bayonet. Stock to be sufficiently strong for service purposes, and to be fitted wtth a metal cleaning rod and swivels for a sling; weight (without bayonet) not to exceed nine and one-quarter pounds. In all military rifles the minimum trigger pull shall be six pounds. Sights may be such as are allowed on military rifles, or of such other pattern as may have been approved by the Board of Directors of the National Rifle Association. The sight protector of the front sight may be used as a shade for the same.

3. *Any Rifle*, maximum weight ten pounds, minimum pull of trigger three pounds; sights of any description, except telescope, magnifying, and such front aperture sights as solid disks or bushes pierced in the centre, which cover the target so as to conceal the danger signal when displayed. No stirrup constructed of metal or other substance, connected to the rifle by straps of any kind, for the purpose of taking up or lessening its recoil, will be allowed.

4. The usual military sling and swivels may be used.

5. Competitors shall submit their rifles and ammunition for inspection whenever required.

6. No hair or set trigger will be allowed.

7. No fixed or artificial rests will be allowed.

8. 3, 6, and 7 do not apply to rest-matches.

III. — TARGETS.

The targets, commonly known as Creedmoor targets, shall be divided into three classes, as follows : —

1. *First Class*, to be used at all distances over 600 yards. Target, 6 × 12 feet.

Bullseye, circular,	36	inches	in diameter.
Centre, "	54	"	"
Inner, square, 6 feet × 6 feet.			
Outer, " 6 feet × 12 feet.			

2. *Second Class*, to be used at all distances over 300 to and including 600 yards. Target, 6 × 6 feet.

Bullseye, circular,	22	inches	in diameter.
Centre, "	38	"	"
Inner, "	54	"	"
Outer, the remainder of the target.			

3. *Third Class*, to be used up to and including 300 yards. Target, 4 × 6 feet.

Bullseye, circular,	8	inches	in diameter.
Centre, "	26	"	"
Inner, "	46	"	"
Outer, square, 4 × 6 feet.			

The following described targets are recognized, and may be used on any occasion ordered by the Directors : —

MASSACHUSETTS TARGET, 4 × 6 FEET.

Count 12.	Bullseye, circular, 4 in. diam.	Creedmoor Bullseye.	
" 11.	" " 8 " "		
" 10.	" 12½ " "	Centre.	
" 9.	" 17 " "		
" 8.	" 21½ " "		
" 7.	" 26 " "		
" 6.	" 31 " "	Inner.	
" 5.	" 36 " "		
" 4.	" 41 " "		
" 3.	" 46 " "		
" 2.	4 × 6 feet.	Outer.	

"RING TARGET," 2 × 2 FEET.

Count 12.	Bullseye, circular, 2 inches diam.
" 11.	" " 4 " "
" 10.	" " 6 " "
" 9.	" " 8 " "
" 8.	" 10 " "
" 7.	" 12 " "
" 6.	" 14 " "
" 5.	" 16 " "
" 4.	" 18 " "
" 3.	" 20 " "
" 2.	" 22 " "
" 1.	" 24 " "

GERMAN RING TARGET.

Bullseye, 12 inches. The whole target, including bullseyes, divided into circles ¾ inch apart, the centre circle being 1½ inches and counting from 25 down to 1.

STANDARD AMERICAN TARGET, 4 × 6 FEET.

Count 10.	Bullseye, circular, 3.36 inches diam.
" 9.	" " 5.54 " "
" 8.	" " 8.00 " "
" 7.	" 11.00 " "
" 6.	" 14.80 " "
" 5.	" 19.68 " "
" 4.	" 26.00 " "
" 3.	" 34.22 " "
" 2.	" 46.00 " "
" 1.	" 4 × 6 feet "

CARTONS FOR REST SHOOTING.

Count 12.	Circular 1.41 inches diam.
" 11.	" 2.33 " "

IV. — MARKING, SCORING, AND SIGNALLING.

The value of shots on Massachusetts, Ring, and Standard American targets is shown on a clock-face dial placed near the target, and the location of shot by a small disk placed over the bullet-hole.

1. On Creedmoor target. Bullseye counts 5; signal, white circular disk. Centre counts 4; signal, red circular disk. Inner counts 3; white and black signal, disk. Outer counts 2; signal, black disk. Ricochet counts R; signal, red flag waved twice, right and left, in front of the target. Ricochet hits will be marked out after the flag signal. Shots on the wrong target, if not scored, will be marked $.

The carton (count 6) on first-class target is 22 inches; on second-class targets 11 inches.

2. When a shot strikes any part of a target outside of the boundary of the "Outer," a square red disk will be raised and lowered in front of the bullseye twice. Such shot is termed an "Angle-iron," and will be marked A.

3. Challenges will only be permitted at the discretion of the Executive Officer, and the challenging party must deposit fifty cents, to be forfeited in case the challenge proves unfounded. The Executive Officer may, in his discretion, challenge the marking of any shot the allowance of which would be unjust to other competitors, and correct the score accordingly.

4. Any objection to the scoring of a shot as signalled, or to one not signalled, must be made before another shot shall have been fired on the same target.

5. Scorers will, in cases where two disks of differing value are shown for one shot, record the value of the one first shown; but it shall be the right of the shooter to challenge the scoring (without being required to deposit), and the Executive Officer may decide upon the evidence the actual value of the shot.

Where two shots strike the target simultaneously, the shooter shall have scored to him the shot of the higher value.

6. Any alteration of a scoring-ticket must be witnessed by an officer in charge of the firing point, and indorsed with his initials.

7. Double entries are prohibited, no shot being allowed to count in more than one match.

8. No sighting shots shall be allowed except on targets specially designated for that purpose by the Executive Officer, and in no case on targets on which a match is in progress, unless in an emergency, to be decided by the Executive Officer

9. Unfinished scores shall be considered worthless after having been withdrawn from the scorer, and no shots can be claimed under or by virtue of the same after having been so withdrawn.

10. No scorer is allowed to have at one time more than one score card for each shooter (except at trap-shooting), and no shooter is allowed to shoot without having an unfinished score card deposited with the scorer.

V. — POSITION.

1. In all matches the position up to and including three hundred yards shall be standing. The elbow may be rested against the body.

2. At distances above three hundred yards any position may be taken without artificial rests to the rifle or body.

VI. — TIES.

Ties shall be decided as follows, viz.: —

A. At more than one distance, whether by individuals or teams: —

1. By the score at the longest distance.
2. By the score at next longest distance.
3. By the fewest misses.
4. By the fewest outers.

5. By the fewest inners.

6. By the fewest centres.

7. By the inverse order of shots, from last to first, as actually fired.

8. In individual shooting, by firing single shots at the longest distance ; in team shooting, by firing one shot by each man at the longest distance.

B. At one distance, whether by individuals or teams : —

1. By the fewest misses, outers, etc., as per foregoing Rule A, 3 to 7, inclusive.

2. In individual shooting, by firing three shots, the merit of which shall be decided by the above rule; if still a tie, by single shots.

3. In team shooting, by firing one shot by each man of the team, repeated until a team wins upon the aggregate of the same.

C. At one or more distances, individual shooting, where two or more scores are required to win : —

1. By foregoing Rule A, 3 to 7, inclusive.

2. By inverse order of shots, treating the scores, in the order in which they are made, as one continuous score.

3. By shooting as per Rule B, 2.

D. Ties in re-entry matches to be decided by the next highest score or scores.

In single-score matches, on all targets, the score containing the lowest shot shall rank lowest; if still a tie, by inverse order of shots; and, if still a tie, by each competitor shooting three shots, until decided.

No scores with handicap shall exceed a perfect score.

Competitors who have to shoot off ties will be notified as soon after each match as practicable. When the ties are shot off, one sighting-shot shall be allowed without charge. Competitors not present at the firing points at the hour named for shooting off the ties lose their right to shoot, and will be placed accordingly.

VII. — GENERAL RULES.

1. Temporary discontinuance of matches, on account of bad weather, and the closing limit for receiving entries, shall be at the discretion of the Executive Officer.

2. An entry-ticket, except when sold in block, may be transferred at any reasonable time, by presenting it to the Statistical Officer for exchange. Any erasure or substitution of name by the holder will forfeit the ticket.

3. In single-entry matches no entry shall be made after the firing begins if any participant objects.

4. Bullseye certificates not presented within thirty days, and prizes not claimed within three months after having been won, shall be forfeited to the Association.

Competitors will have choice of prizes unless otherwise stated.

The Executive Officer shall have power to appoint assistant officers and supply Badges to same.

Regular Shooting Days for Rifle shall be every Saturday and such other days as the Directors may order.

VIII. — PENALTIES.

1. Competitors must make themselves acquainted with the regulations, as the plea of ignorance will not be entertained.

2. No competitor shall be allowed to use more than one name besides his own in any one match.

3. A competitor failing to report at the time and target to which he is assigned, or shooting at pool or practice after the hour set for the simultaneous opening of a match, shall forfeit his entry. (The last clause will not prevent pool shooting between scores in re-entry matches.) Any member shooting at pool or practice between shots of a score shall forfeit the score.

4. All competitors and other persons must preserve order and decorum, submit to the direction and decisions of the Executive Officer, and make all objections and protests, if

any, to the proper officials, in a manner which will not disturb others.

5. Rifles may be discharged only in firing at the target in pools or matches, when the danger flag is not exposed, or into such warming-pits as may be designated (in that case without bullet) and any competitor or other person discharging a rifle otherwise, or having a loaded shell inserted in his gun while elsewhere than upon the actual firing point, may be disqualified for the time being, or fined a sum not exceeding three dollars, at the discretion of the Executive Officer.

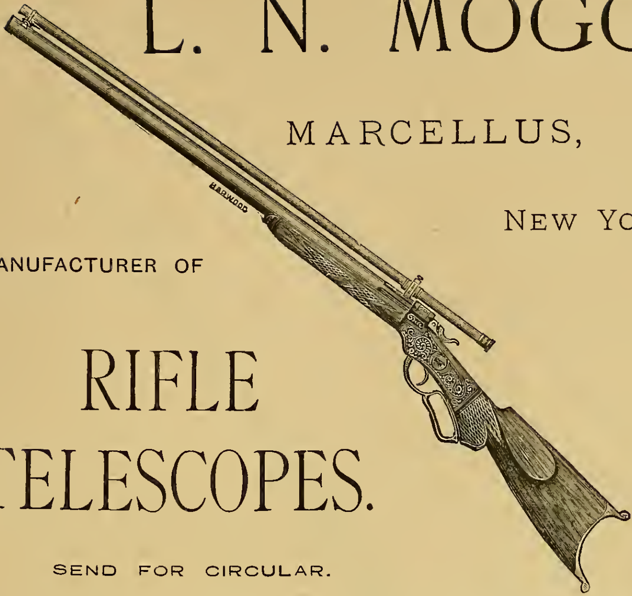
6. Any violation of rules or discreditable conduct which the Executive Officer may consider of such magnitude as to require it, shall be reported to the Directors for their action.

7. Any shooters firing upon the wrong iron target shall be fined one dollar, and on the wrong paper target fifty cents, to be paid before he proceeds with his score, and he shall be recorded a miss.

L. N. MOGG,

MARCELLUS,

NEW YORK.



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