AMERICAN SMALL ARMS

AMERICAN SMALL ARMS

A Veritable Encyclopedia of Knowledge for Sportsmen and Military Men. Illustrated with Five Hundred Engravings

BY

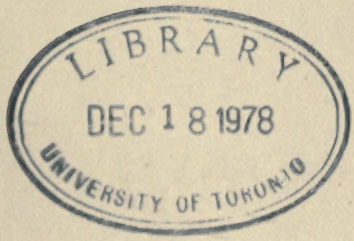
EDWARD S. FARROW

Late Assistant Instructor of Tactics at the United States Military Academy, West Point, and Formerly Commanding Indian Scouts in the Department of the Columbia

NEW YORK

THE BRADFORD COMPANY

1904



This Book
is Inscribed by its Author
to
VICTOR SMITH
as
a Tribute to a Generous Nature
and
a Memorial of Friendship

PREFACE

WHEN I captured the Sheep Eater Indians in the Salmon River Mountains of Idaho, in 1879, I was much surprised to find in their possession a great variety of American guns, many of which were practically unknown. Upon inquiring among brother Army officers and sportsmen, I discovered that there existed the most meager knowledge of American Small Arms and a complete absence of writings on the subject. To supply the want I set to work to prepare this volume, and it is hoped that it will point the way and awaken the interest of its readers in this most fascinating field.

I believe that American Small Arms are the best in the world, and regret that the United States Army has been permitted to use an inferior foreign gun—the Krag-Jorgensen. The descriptions in this volume are limited to Arms of American patent or manufacture and a few which have become Americanized —like the Ferguson and Mauser. Those desiring to extend their study and investigation to foreign Small Arms are referred to FARROW'S MILITARY ENCYCLOPEDIA, a new edition of which is now in preparation.

I believe we are now on the verge of a great world war—the struggle of nations in the race for commercial supremacy. Every nation is now strengthening herself, and never in the history of man have such preparations for bloody conflict been made as are now in progress. Should Japan be successful in the present war with Russia, inside of a decade there would be in China an army of three million Chinamen, equipped with modern weapons, and in possession of railroads. What could prevent this horde from sweeping westward? I have thought the present an opportune time to present this volume to the gun lovers and soldiery of our land.

E. S. F.

New York City, 1904.

AMERICAN SMALL ARMS.

It is doubtful at what time guns were first used as sporting arms; but early French and Italian works seem to indicate the close of the 14th century. We find a curious illustration in an old manuscript, entitled, "Ye Gonne and How to Use It," dated 1446. This curious sketch is evidently a caricature; but it is sufficient to show that all firearms were used for game shooting in the early part of the 15th century. We have notices of the same in several records of that century, and by the close of the 16th century the gun seems to have become so general a sporting weapon as to necessitate special regulations in several European countries. About 1580, an Italian work informs us, shooting at birds flying and animals in motion was first practiced; but this could not have been to any great extent. It was not until the close of the 18th century that shooting on the wing became at all common. Since that time it has been so universally practiced as to make shooting at any fixed object with a shot-gun unsportsmanlike. The well-balanced and light guns made by the crack gunsmiths of the early part of the last century greatly favored snap-shooting, and many of the sportsmen of those days, if they did not make such large bags as those of to-day, enjoyed sport into a good old age, and were hale and hearty to the last.

Sporting arms may be classed as shot-guns, pistols, carbines and rifles. Muzzle-loaders are but little used at the present time. Most breech-loaders employ the metallic case cartridge, and are divided into simple breech-loaders and repeaters. The essential parts of all such arms are the barrel, the chamber, the breech-mechanism, the lock, the stock, the sights ,and the mountings, and in repeaters the magazine. If the chamber be made in the piece which closes the breech, commonly called the breech-block, the arm is said to have a movable chamber; if it be formed by counterboring the barrel, it is said to have a fixed chamber. The latter has great advantages, and is generally used. With the fixed chamber the interior of the barrel is divided into two distinct parts, viz., the bore proper, or space through which the projectile moves under the influence of the powder, and the chamber in which the charge is deposited. The principal parts peculiar to breech-loaders are: 1st. The mova-

ble breech-block, by which the chamber is opened and closed. 2d. The breech-frame, upon which the breech-block is mounted and united to the barrel. 3d. The chamber, with its recess, to receive the rim of the cartridge. 4th. The firing-pin, which transmits the blow of the hammer to the cartridge. 5th. The extractor, by which the empty case is removed after firing.

The foregoing named parts may be said to be essential to all breech-loading arms in which the metallic cartridge is used; the different ways in which they are combined mark the systems. These combinations have reference chiefly to the modes of operating and locking the breech-block. The different systems may be classified into: 1st, those with a fixed chamber; 2d, those with a movable chamber. The latter have now become obsolete. The first class have: 1st, a movable barrel; 2d, a movable breech-block. With each the motion may be sliding, in which case it moves in grooves; rotating, when it swings on a hinge; or sliding and rotating combined. The greater number of systems belong to the class of a "movable breech-block rotating about an axis." In arms of this class the axis of motion may be parallel to the axis of the barrel, and above, below, or to one side of it; or perpendicular to that axis, being vertical or horizontal, and lying in or out of the plane of the axis. The position of the hinge has an important influence on the facility of operating the block, inserting the cartridge, and extracting the empty shell; the most suitable position is deemed to be in front of the center of the block. In this case the motion of opening and closing the block is natural and easy; the cartridge is pushed into its place by the block, and a very simple retractor serves to withdraw the empty shell after firing. The most serious defect found in breech-loading arms was the escape of the flame through the joint, which not only incommoded the shooter, but, by fouling the machinery, seriously interfered with its operation. At present this is entirely overcome by the elastic metallic case of the cartridge. The advantages of breech-loading over muzzle-loading arms are: 1st. Greater certainty and rapidity of fire. 2d. Greater security from accidents and loading. 3d. The impossibility of getting more than one cartridge into the piece at the same time. 4th. Greater facility of loading under all circumstances, and particularly when the soldier is mounted, lying on the ground, or firing from behind any cover.

There are certain functions performed by, and certain important conditions to be fulfilled in, the construction of the different portions of a small-arm. The barrel is by far the most important part of a firearm, its office being to concentrate the force of a charge of powder on a projectile, and give it proper initial velocity and direction; for these purposes, and for

the safety of the firer, it should be made of the best material and with the greatest care. In determining the exterior form, it is not only necessary to give such thickness to the different parts as will best resist the explosion effect of the charge, but such as will prevent it from being bent when subject to rough usage. Weight, to a certain extent is necessary to limit recoil, to give steadiness to the barrel in aiming, and to prevent it from "springing" in firing. The latter defect generally arises from bad workmanship, whereby there is a greater thickness of metal, and consequently less expansion on one side of the bore than on the other. In some sporting rifles the barrel weighs from 12 to 15 lbs.

Three points are to be considered in determining the caliber of small arms: 1st. It should be as small as possible to enable the hunter or soldier to carry the greatest number of cartridges. 2d. To diminish the amount of ammunition required, and to prevent the confusion liable to arise from a variety of calibers, there should not be more than two for all arms of the same service, viz., one for the rifle and the carbine, and one for the pistol. 3d. This point relates to the force and accuracy of the projectile, and to the flatness of its trajectory. The introduction of the elongated projectiles afforded the means of increasing the accuracy and range of firearms, without increasing the weight of the projectile, simply by reducing the caliber, which diminished the surface, opposed to the air. Too great reduction of caliber, however, gives a very long and weak projectile, and besides the effect of a projectile on an animate object depends not only on its penetration, but also on the shock communicated by it to the nervous system, or upon the surface of contact. These considerations have led to a general reduction of caliber of rifles.

The grooves being for the purpose of communicating a rotary motion to the projectile around an axis coincident with its flight, their construction will depend upon the form, dimension and material of the projectile, charge of powder, and angle of fire. The points to be considered in determining the form of grooves for arms are range, accuracy of fire, endurance, and facility of cleaning the bore. Experiment has shown that for breech-loaders these points are best attained by making the grooves broad and shallow, and with a rapid twist. The chamber being a receptacle for the charge, its shape is made to conform to that of the cartridge. Its diameter is made a little larger, and that of the bore a little smaller than that of the projectile. This facilitates the insertion of the charge, and causes the projectile to be compressed and held firmly by the lands in its passage through the bore. The bottom of the grooves and the surface of the chamber are generally continuous.

The breech-mechanism comprises the principal parts that are peculiar to arms loading at the breech. The functions of these parts are the opening, closing, and locking of the breech, firing the charge, and removing the empty cartridge shell. These are the objects for the accomplishment of which the different systems are variously contrived, and with which alone they are concerned. The most important conditions to be fulfilled in the arrangement of this mechanism are: 1st. The number of parts should be as few as possible, and all should be of the simplest construction. 2d. The strength and union of the parts should be such as not only to resist repeated discharges, but the bursting of a cartridge case, which sometimes occurs from defective material or workmanship. 3d. The locking of the breech-block should not only be secure, but all the parts by which it is effected should work freely without sticking. 4th. The parts should be so arranged that the hammer cannot strike the firing-pin until the breech-block is properly locked. 5th. The hammer should not necessarily rest on the firing pin when the piece is carried loaded. 6th. The breech should be unlocked without the hammer being brought necessarily to full cock. 7th. The working parts should, as far as possible, be covered from dust and water. 8th. The extractor should be so arranged as to require no cuts or openings in that part of the chamber which surrounds the body of the cartridge case. The lock is the machine by which the charge in the cartridge is ignited. Those of the present day belong to the percussion class, in which fire is produced by a blow upon the fulminating powder, contained in the cartridge case. Locks are divided into side and center locks, depending upon the position occupied in the stock; each of these may be either front action, wherein the mainspring is in front of the tumbler, or back-action, where the spring is in rear of the tumbler. The mortise, which forms a bed for the lock of the latter construction, seriously affects the strength of the stock at the handle, and for this reason the front-action lock is generally preferred for all arms, except revolvers. The conditions to be fulfilled in the construction of a lock are simplicity, strength, certainty of action, and freedom from such accidental motion of the parts as might produce explosion of the charge in the barrel.

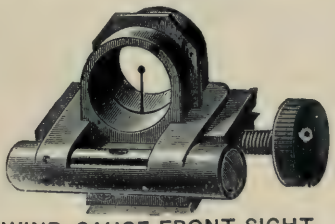
The stock is the wooden part of the firearm, to which all the parts are assembled; it is preferable that it should be in one piece. The material should be light, strong, and well seasoned. The butt, the part intended to rest against the shoulder and to support the recoil of the piece, should be of such length and shape as will enable it to transmit the recoil with the least inconvenience to the sportsman. The longer it is, to a certain extent, the

more firmly will it be pressed against the shoulder, and the effect of the recoil will be a push rather than a blow. The stock is crooked at the handle for convenience in aiming, and for the purpose of diminishing the direct action

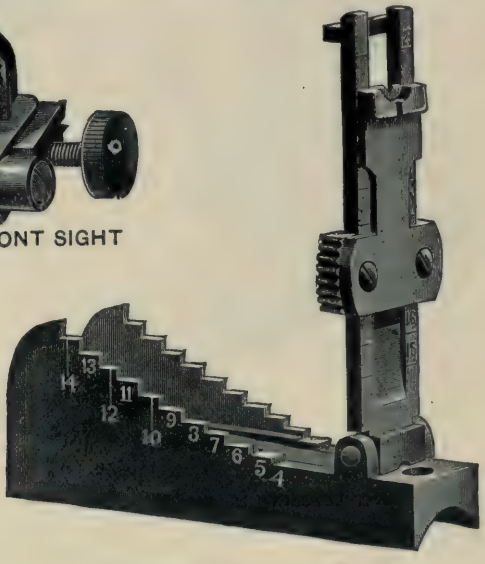
of the recoil. Changing the direction of the recoil in this manner causes the piece to rotate around the shoulder; but if the stock be made too crooked, the butt will be liable to fly up and strike the face.

The sights are guides by which the piece is given the elevation and direction necessary to hit the object. There are two; called front and rear sights.

LYMAN REAR SIGHT



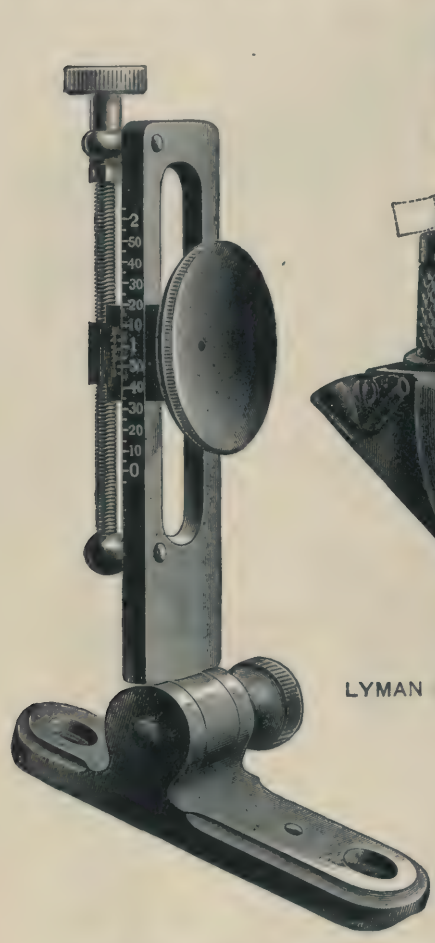
WIND GAUGE FRONT SIGHT



COMBINATION REAR SIGHT

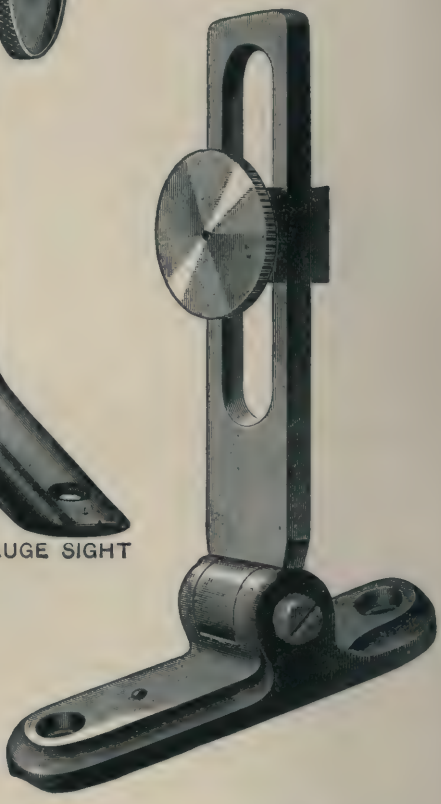
The front sight is fixed to the barrel near the muzzle. The fineness of its point is regulated by the length of the barrel, or distance from the eye, and the size and distance of the object generally aimed at; it is made coarser in military than in sporting arms, to prevent injury. The rear sight is attached to the barrel a short distance from the breech; it has a movable part, capable of being adjusted for different elevations of the barrel. A sight should satisfy

the following conditions, viz.: 1st, it should be easily adjusted for all distances within effective range; 2d, the form of the notch should permit the eye to catch the object quickly; 3d, it should not be easily deranged by accidents.



LONG TANG PEEP SIGHT

LYMAN WIND GAUGE SIGHT



LONG VERNIER SIGHT

Globe and telescopic sights are used for very accurate sporting arms, but they are too delicate in their structure and too slow in their operations for general purposes

The mountings may be divided into two classes, viz.: 1st, those which serve to connect the principal parts, generally bands and screws; 2d, those which protect from wear or strengthen the stock at certain points, as the butt-plate, guard plate, tip; 3d, the minor parts which secure the different parts (including the mountings proper) in their place, consisting of springs, screws, rivets, pins, washers and nuts.

A butt-plate is to protect the end of the stock from injury by contact with the ground; it is generally curved to fit the shoulder in firing. A guard-plate is to strengthen the handle of the stock; it may serve as a fulcrum for the trigger. A tip is a shield placed on the end of the stock towards the muzzle. If the piece be intended to carry upon the back, it is provided with swivels for that purpose, generally two, one of which may be fastened to a band and the other to the guard-plate, or to a point of the stock in rear of that plate. The trigger is a lever used to set the lock in motion. Triggers are divided, according to their construction and the force required to draw them, into common and set or hair triggers; the latter are employed only in sporting arms. The force required to set off the trigger, if very great, may disturb the accuracy of the aim; if it be slight, the piece will be liable to accidental discharges. The trigger has a guard which protects the finger-piece from injury, and from accidental blows that might produce explosions.

There are many types of magazine guns. 1. Those in which the magazine is a tube below the barrel, as in the Winchester. 2. Those in which the magazine is in the stock, as in the Spencer, Meigs, and others. 3. Those in which

the magazine is a separate piece attachable to the gun when required, as in the Lee. The cartridges are fed automatically into the chamber of the barrel, by the manipulation of the breech mechanism. It is only necessary to close the breech when the arm is ready to fire. This obviates the necessity of handling and charging each cartridge, besides preventing the considerable loss of ammunition, occasioned by dropping cartridges while transferring from the cartridge-box to the arm, which, in the excitement of rapid firing, are seldom recovered or saved. The principal objection offered to magazine guns is that their use causes a wasteful and unnecessary expenditure of ammunition. The same argument was largely used, when only a few years ago, the merits of breech versus muzzle-loaders, were being discussed, and is as weak now as then.

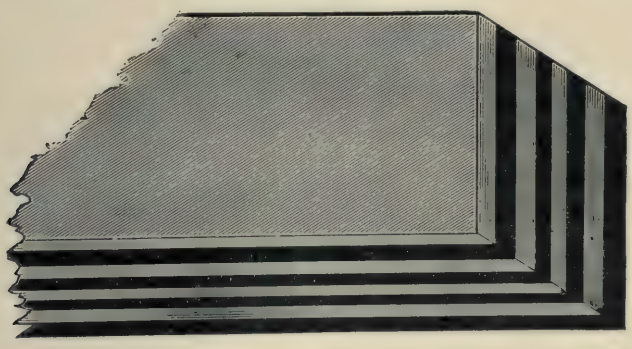
No valid reason can be given why, other essentials being equal, the same men should not aim as well, firing rapidly, as slowly sighting requires the same time, whatever may be the time used in loading; and if increasing the time

expended between the firing of one shot and sighting for the next, increases the effectiveness of the man, it follows, that to shoot accurately, a certain amount of the time must be wasted in operations other than aiming the weapon—a theory that could hardly be sustained.

The weight of a column of five ordinary service cartridges would be about seven ounces, at least four-fifths of which weight would in a tubular magazine, rest fairly upon the point of the bullet of the last cartridge, and which bullet comes directly in contact with the primer itself of the cartridge in advance of it. All ammunition manufacturers realize the difficulty experienced in preparing fulminate of mercury (used for primers), that will, in practical use, always have a uniform degree of sensitiveness. It can be made so sensitive that the slightest scratch will ignite it, and many fulminate mixers have lost their lives by a moment's inattention or relaxation of caution while compounding it. While it is generally possible to produce fulminate of nearly equal quality, still different batches do vary; and whether it be from difference in this quality or from the different position or placement of the fulminate in the primer as regards the cartridge-anvil, or otherwise, still it is certainly true that cartridges are to be found in use that will explode with one-half the concussion ordinarily required. It is a fact that cartridges have exploded by dropping a few inches from the machine in which they are loaded into the receptacle below. It is readily seen, then, that the use of such a spiral spring makes premature explosion not only possible, but very probable, and there is no way to prevent it, except by discarding it, as in the Lee or Chaffee-Reece guns. During the War of the Rebellion, guns using the spiral spring have been known to explode when the cavalry were on a march. Of course, such arms were discarded; but the same thing may happen to any arm of recent invention which is so constructed as to require a spiral spring.

Where the cartridges are fed from the butt-stock by a spiral spring the bullet is liable to strike the counter-bore of the barrel, making a notch in the bullet and rendering it useless for accurate work. When the cartridges are brought up by a carrier on an angle the same thing will happen—the counter-bore of the barrel either stops the bullet or cuts off a piece sufficiently large to make it impossible that its flight be accurate and make a good target, because of its irregular shape made by such contact. It is well understood that a good shot, when using any of the magazine guns in which the cartridges are fed by a spiral spring, uses it as a single-loader; and the reason is, that the bullet is generally so mutilated by striking the counter-bore, that its flight is not to be depended upon for accuracy.

The Parker shotgun, which is distinctively American, exhibits all the advantages of the many American systems of shotguns. The different parts are made by special machinery, and by workmen who make a specialty of one thing only, and are subjected to rigid inspection, so that no defective or imperfect part can find its way into the finished gun. The number of parts is reduced to a minimum, and the construction is so simple that the gun can be taken apart, for cleaning or repairs, with an ordinary screw-driver. The manufacture of shotgun barrels differs in many respects from that of rifle barrels. They must be light, therefore thin, and yet sufficiently strong — conditions which can only be obtained by an extraordinary tenacity of the material. In these combinations this tenacity is secured by mixing and blending the iron and steel so intimately together that the peculiar proportions of each, toughness and elasticity, are imparted to every portion of the mass, and the barrel thus receives the degree of hardness and softness required. The barrels of the Parker gun are manufactured in the following manner: The iron and steel are placed in layers, according to the figure that may be desired, which opera-



tion is called piling. These layers are securely welded together into a compact bar, which must be absolutely sound and perfect in every weld, as the slightest spot left unwelded or unsound in this operation will be sure to cause a total loss of the barrel. The process now consists in reducing this bar to such a sized rod as may be required for a certain weight of barrel. This rod is twisted similar to a rope, care being taken to have the twist uniform and even. Several of these twisted rods are placed side by side, being careful to have the inclination of the twist arranged in opposite directions. These several rods are welded together with the same care and precision as in the previous operation, to insure perfectly sound barrels. This is now termed a ribbon and is coiled spirally around a mandrel. This spiral ribbon is raised to a welding heat and jumped by striking the end against the anvil, thereby welding the

edges firmly together. They are then placed upon a welding-mandrel, reheated, and welded from end to end. Much skill and care are required in this operation to reduce this outside diameter to correct size and at the same time preserve the caliber, and also maintain the proper taper, the barrel being much larger at the breech than at the muzzle. The figure that appears in the figured barrel is dependent upon the correctness of this and the previous welding operations, for if hammered unevenly, the figure itself will be correspondingly uneven. Then follows the process of hammering in nearly a cold state, whereby the texture of the metal is condensed, closing its pores and making it harder. This finishes the operation of barrel-forging, and the barrel is ready to be bored. The curly figure that appears in the Damascus, Bernard, and laminated barrels is obtained by twisting the rods before referred to; the variation of figure being obtained by varying the piling. The white marks that appear in the finished barrel are iron, and the dark ones steel. The fine figure that is on the barrels of the high-priced guns is obtained by an increased number of pieces in the operation of piling.

This large number of pieces necessarily renders the operation of securing perfect welding much more difficult, and the liability of loss is greater. Some imagine that the curly figures of the barrel are simply etched on the outside, when they are, in fact, the visible proof of a superior strength both desirable and important to every shooter who cares for his personal safety; for if an iron barrel, no matter how strong and thick, is defective and does not stand the test, the defective part will splinter into more or less small pieces, while the Damascus, Bernard, and laminated barrels will tear like a woven fabric. This proves clearly the extraordinary tenacity of the material. These fine barrels are not, therefore, worked and twisted so neatly and nicely that they may look beautiful alone, but rather for the reason that greatest lightness, combined with greatest durability, may be produced.

Each barrel, after manufacture, should be carefully tested, and submitted to the necessary proof. The diameter of the bore should be verified with the standard and limit gauges. The standard gauge is a cylinder of the diameter of the bore, and the limit gauge is .0025 inch greater. The former should pass freely through the bore, and the latter should not enter it. The barrel should enter the groove of the stock one-half of its diameter, and it should bear uniformly throughout, particularly at the breech. The vent should be accurate in its dimension, position and direction, and a wire should be passed through it to see that it is free. The cone should be sound. The shoulders of the breech-screw should fit closely to the end of the barrel, and it should be

free from cracks or flaws about the tang-screw hole. The straightness of the barrel may be ascertained by turning out the breech-screw, and holding the barrel up to the light, and reflecting the image of a straight-edge from the surface of the bore. If the barrel be straight, the reflected image will be straight in all positions of the barrel. The bore must be free from all hammer marks, ring-bores, cinder-holes, flaws, cracks, etc., as such irregularities cause an inaccuracy of fire.

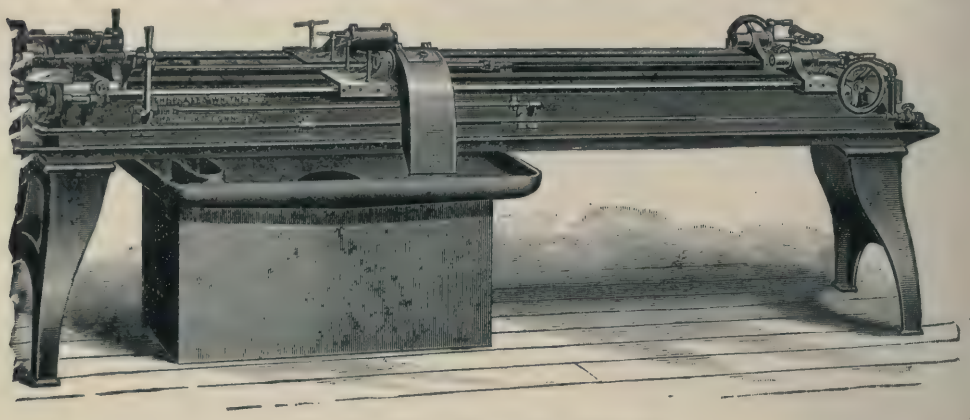
A wrought-iron rifle or carbine barrel will only endure about one-half of this charge. The breech-loading system after it is finished and assembled to the barrel is subjected to a "finished-proof" charge of a single service bullet and a charge of 85 grains of musket-powder, which is all that can be crowded into the cartridge-shell. Numerous trials have shown that the Springfield system will stand at least 120 grains of powder and three service bullets, weighing altogether 1,265 grains. The fact that a small-arm barrel seldom or never bursts or swells at the muzzle in proof shows conclusively that when such defects are found in service the cause is some obstruction in the bore. Obstructions arise generally from the improper stopping up of the muzzle to keep out moisture. It may arise from dirt introduced by resting the muzzle of the piece on the ground. Instances have occurred of the bursting of barrels by a bullet in the bore—the result of a charge insufficient to expel it. Very accurate and delicate machines are now used to weigh each finished cartridge, and reject any that may be deficient in powder. The barrel of a rifle will endure at least 10,000 fires before its accuracy is sensibly impaired; and its exterior dimensions may be very much reduced by wear without impairing its strength for service.

In the manufacture of rifle barrels the finest machinery is now used. The advent of the barrel-drilling machine has affected the manufacture of the smaller caliber rifle barrels to a greater extent than any other invention of the past fifty years. The operator can, without any particular effort of mechanical skill, drill a continuous hole through solid stock, with little deviation from a straight central bore of uniform size, if conditions are what they should be.

No particular apparatus is required for starting the drill; neither is any straightening required during the operation, and little or none until after the proof reaming.

The machine is double and has a horizontal bed. The heads are at the end and have mounted in them independent spindles parallel to each other. On their inner ends are chucks for securing and rotating the barrels in the adjustable rests which support, guide and control the starting of the drills,

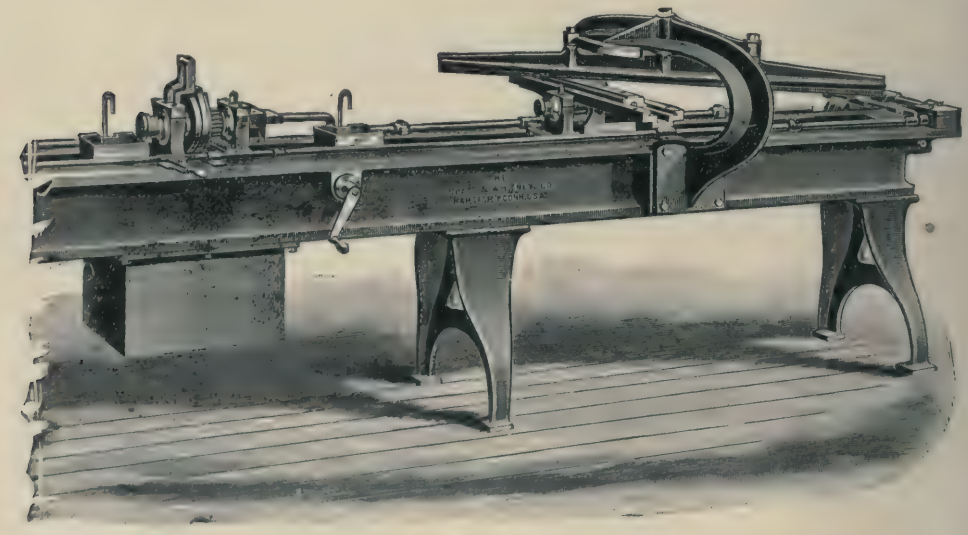
which are secured in the sliding carriages. These are fed positively 38 inches by a screw having automatic stops. The screw has a variety of speeds



GUN BARREL DRILLING MACHINE

through change gearing, to compensate for different qualities of stock to be drilled.

Two rotary pumps (one for each barrel) force oil, supplied from a tank placed underneath the machine, through a series of tubes into and through the drill. The oil lubricates the cutting lip, and forces out the chips into the basin on top of the tank, where they are drained, and the strained oil returned to the pump again.



RIFLING MACHINE

The rifling machine, in its most approved form, consists of a bed carrying a head for holding and indexing the barrel, and a carriage having a spindle

for holding the rifling rod, and all the appliances necessary to control its motion and feed the cutters automatically.

The head has a spindle which holds the barrel by means of a convenient chuck, and is provided with an indexing arrangement by which it is automatically turned at the end of each stroke of the rifling rod through the proper angle to give the required number of grooves.

The carriage has a spindle for holding the rifling rod, on which is a pinion meshing with a rack on the carriage cross-slide. The carriage is given a reciprocating motion by means of an ordinary open and crossed belt-reversing mechanism, which is operated by dogs on the carriage at the end of its stroke. The rifling bar controls the twist of the rifling, and is placed above the carriage, and connected with the carriage cross-slide by means of a swiveled slide. It is pivoted at its central point so it can be set at any angle, and as the carriage moves along the bed a transverse motion is imparted to the carriage cross-slide. This causes the spindle to turn as it advances, so that the rifling cutter describes a true helix. If an increasing twist is required, the rifling bar must be formed to suit the curve of the rifling, the ordinates of the curve of the rifling bar being in the same proportion to the ordinates of the developed curve of the rifling as the pitch diameter of the spindle pinion is to the bore of the gun.

The rifling rod is provided with one or more cutters, which are fed out by means of a wedge-shaped plunger, which extends beyond the end of the rod, and is driven in at the end of the stroke by an automatic feeding device. This is arranged so that the feed is always alike, whatever the variation in the travel of the carriage, and stops when the cutter has reached the proper depth. The rifling bar being set at the proper angle, and all the dogs and stop nuts being adjusted, the barrel is placed in the head, and the machine started by a lever placed at a point on the bed where the operator can observe all the motions of the machine. After starting, the carriage continues its reciprocating motion, the head indexes the barrel at the end of each stroke, and the cutters are fed until the grooves have reached the proper depth, when the feed stops, the machine is stopped by the operator, and a fresh barrel is put in place.

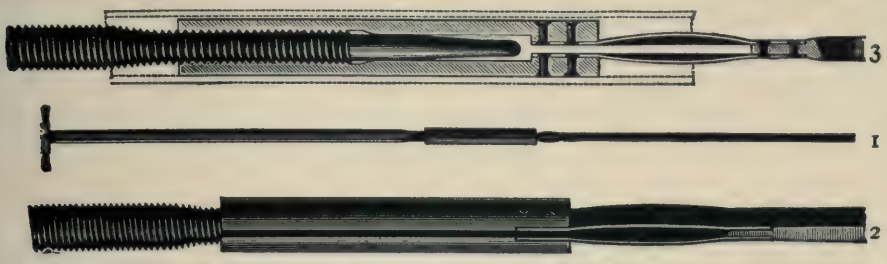
This machine is designed to take gun barrels of any size up to forty-five caliber and thirty-six inches long. The regular machine is arranged for four, five and six grooves of uniform twist, from straight to one turn in five inches, either right or left hand, but can be built for any number of grooves, and for an increasing twist of any desired curve. The cutting speed for ordinary steel is thirty feet per minute, and is uniform throughout the stroke. The

larger machines differ somewhat from this machine; the indexing arrangement being operated by hand,

The Pope system of rifling, noted for its excellency, has eight wide grooves, which are on a radius about three times the radius of the bore, and has the corners rounded out, so dirt is easier removed, and it is cleaner in use. This groove is cut just deep enough to clean the bore in the centre and give a depth at the corners of about .004". The lands are very narrow (about one-fifth to one-sixth the groove). The bullet is made with a base large enough to fill the grooves completely, and the body of practically the same diameter as the bore. This gives a form that is gas tight, loads very easily (being assisted in this by the narrow lands and choke bore) and on upset, instead of the body of bullet meeting only sharp lands and these cutting into the body more or less unequally, it is immediately held to place by the nearly flat centre of the broad grooves, and swells out into grooves equally and perfectly central; consequently it is accurate. In this system a false muzzle and starter are used, and the lubricated bullet seated from the muzzle, the shell with powder being afterward inserted in the ordinary way. In doing this the labor is very light, as the shooter has to handle nothing over a few ounces weight, the rifle standing in the loading stand. By the simple act of pushing the bullet home the sharp, flat base of the bullet cuts the dirt down behind it, and does so exactly alike, each time giving a uniformly clean barrel without the labor of cleaning. The result of these things is that we attain all the accuracy of patched bullets, and in ordinary hands more, without the labor of cleaning. This is also less labor than the ordinary way of seating a greased bullet in the breech, having to invert the rifle and generally sustaining its weight while so doing. Other things being equal, the man who tires himself least does the best shooting in the long run, and if this is accompanied by increased accuracy of the rifle, he has a great advantage over his fellows who do otherwise. A properly made barrel, loaded in this way, will shoot 10 shot groups at 200 yards that will average about 1 1-4 or 1 1-2 inches less diameter than the same or an equally good barrel shot dirty, bullet seated from the breech.

To insure good shooting the barrel must be kept free from dents and thoroughly clean. A frequent use of the Hotz gun barrel reliever is commended. This is a simple device by means of an expanding rod and tube to force indented portions outwardly. In the drawing 1 shows the expander rod and tube screwed together. 2 is a perspective view, showing part of the device. 3 is a longitudinal section showing the gun barrel with the device in operation, the gun barrel being represented by the dotted lines. The expand-

ing tube is constructed in semi-cylindrical sections, which are provided at their ends with a threaded bore communicating with a reduced bore, which are connected by two spring sections secured to a handle. The expander rod at its upper end is provided with an operating handle. The lower end of the expander rod terminates in a conical tip, surmounted by a reduced plain surface, above which a threaded surface is formed. In operation the expand-



ing tube is inserted in the gun barrel with the semi-cylindrical sections opposite the indentations to be removed. The expander rod is then entered at the opposite end of the barrel, and the tip of the rod is inserted in the tube until the threaded surface of the rod engages the threaded bore of the tube, thus causing the reduced plain surface of the rod to engage the smooth bore of the tube and force it outwardly against the depressed portion of the barrel.

There are numerous cleaners on the market. The Tomlinson is excellent. It is made in 8, 10, 12, 14, 16 and 20 gauges, and will fit any standard rod, and is so designed as to fit the entire length of the inside of shotgun barrels, notwithstanding the various chokes adopted by the different makers, and will therefore remove all lead, rust spots and foreign matter from breech to muzzle, and leave the barrels perfectly clean.

The sides are of brass wire gauze wrapped over wood, and although it cuts all lead and dirt from the barrels, it is too soft to injure them in any way. In fact, the constant use of this cleaner will improve the barrels by giving them a lengthwise polish. It should be inserted at the breech and not allowed to entirely leave the barrels at the muzzle. In a "pump" gun start the cleaner from the muzzle by compressing. A drop of oil should be put on the wire gauze, as it cuts more easily. By giving the cleaner a slight jar the dirt may be removed from the wire sides, and when they become worn they can be easily replaced by unscrewing the back cap.

A barrel cleaner has been recently invented, by the use of which any powder or residue remaining in the barrel is dissolved, and thus makes rusting impossible. The apparatus consists of a tin receptacle, from which the steam—generated by an alcohol lamp placed underneath—is led into the bar-

rel through a glass tube. The principle is the same as in the inhaler used by physicians. On the inside of every barrel there are small grooves caused by the tools used in manufacturing and partly in the material; these are not visible to the naked eye. Into these, as also into the pores, the residue settles, gases form and rusting results.

A proof that the formation of rust depends upon the nature of the material of the barrel, or rather upon the existence of the tiny scratches and grooves mentioned, is that rust occurs in the same spots again and again. Even though the formation of rust has been much reduced since the use of the newer nitro powders and primers, in some powders it is still strong enough to render good rifles useless in a short time.

PISTOLS.

A Pistol is a small rifle, usually aimed and fired with one hand. A revolver is a pistol having a revolving cylinder or revolving barrels. The term pistol, is, however, applied indiscriminately by many to both single-shot pistols and revolvers. The earliest single-shot pistols were of foreign manufacture, and of the dueling pattern. These, frequently of smooth bore, were followed by military rifled pistols, made by machinery. These, in turn, with the advent of the metallic cartridge, were followed by a variety of cheap single-shot, breech-loading pistols of small caliber. The first American revolvers were crude; but meritorious because of the reserve fire and ability to fire rapidly. The changes from percussion to rim-fire cartridges, and from rim-fire to central-fire cartridges retarded improvements in the aim to increase accuracy. The revolver to-day holds its popularity, and is owned and shot by most pistol experts; yet the single-shot pistol is generally used in target and match shooting. They are made in calibers from .22 to .50, most of them being made in the .22 caliber, the Stevens, Wurfflein and Smith & Wesson being chambered and rifled for the long-rifle cartridge in the .22 caliber, which is extremely accurate; .32, .38 and .44 calibers are also very popular. With few exceptions, modern American pistols and revolvers take the metallic cartridges, which are made in enormous quantities and variety of styles by our standard cartridge companies. The invention of the revolver is very far from new, specimens, with even the present system of rotation, being still in existence, which were manufactured at the beginning of the seventeenth century. Probably the first revolver to suggest itself was one in which several barrels were mounted on an axis, and made to revolve by the action of the trigger, so that their powder pans came succeessively under the action of the lock. This principle was never entirely abandoned, and in the reign of

George IV. was produced a pistol called the "Mariette," which had from four to twenty-four small barrels, bored in a solid mass of metal, made to revolve as the trigger was drawn back. At close quarters, such a pistol would doubtless have been useful; but its great weight and cumbrous mechanism rendered aim extremely unsteady. Contemporaneously from the first with the revolving barrels went forth the formation of a revolving chamber or breech, pierced with several cylindrical apertures to receive the charges. Being made to revolve, each motion brought a chamber into line with the one barrel, common to all, whereupon the weapon was ready for use. Numerous patents for this principle have been taken out, including one by the celebrated Marquis of Worcester in 1661. Various improvements were made, especially in the mode of causing revolution, an American, by the name of Elisha H. Collier, patenting such a weapon in the United States and England about 1818. In 1835 Colonel Samuel Colt brought to a conclusion experiments of some years' standing, and patented his world-renowned Colt's revolver, which was a great advance on all previous attempts, and is substantially still in use.

Several inventors are struggling with the problem of magazine pistols. The advantages of such an arm are great and obvious. So long as the powder chamber and the barrel are separate the revolver cannot lay claim to the title of an arm of precision or high power. The break in the arm where the cylinder and barrel meet, or are supposed to meet, permits a considerable escape of gas with a resulting loss of pressure and consequent reduction of velocity. Any attempt to increase the velocity by the use of longer and more powerful ammunition adds unduly to the length and weight of the arm without equivalent gain, for the higher and longer sustained the powder pressure the greater the escape of gass. Moreover, the present ammunition gives quite recoil enough. The defects of the revolver seem inseparable from the fundamental principles of its construction, and it is a recognition of this fact that has led to the present investigations of the possibilities of magazine pistols.

Present indications seem to point to the following characteristics, which it is desirable for the arm to possess: A calibre of about .32 (say 8 millimeters); a lead bullet with nickel, steel or copper envelope; a length of barrel, measured from the base of the bullet, of about twenty-five calibers; a bottle-shaped cartridge with unusually large but short powder space, to reduce the length of the cartridge as much as possible, and charged with quick-burning powder; the energy of recoil to be utilized to extract, load and cock; a light pull, say not over four pounds; a cocking device for single-shot firing; a detachable magazine to hold four to eight cartridges; a simple efficient safety catch, convenient to the touch, but protected against possible disturbance while drawing the pistol or returning it to the holster; a smooth exterior, as free from projections as possible; a strong, powerful grip; lastly, as great simplicity and strength of parts as are consistent with proper lightness and other qualities. What desirable qualities may be sacrificed to secure absolute efficiency only experience can decide. It is too often forgotten that arms must be suited to those who are to use them, and many desirable features must often be omitted, or their presence may make the weapon almost valueless for its designed use.

The United States Revolver Association has recently classified and defined the various styles of pistols and revolvers. For match purposes it has made the following classifications: Military revolver, any revolver, pocket revolver, magazine pistol and any pistol. A military revolver is defined as a revolver that has been adopted by any Government for the armament of its Army and Navy, and must conform in model, trigger pull, sights and ammunition to revolvers used in military service.. Any revolver is defined as a revolver of any calibre, maximum weight, three pounds, maximum length of bore, including cylinder, ten inches. A pocket revolver may be of .32 or .38 calibre, weight not more than twenty-five ounces, and have a maximum length of barrel, exclusive of cylinder, of four inches. A magazine pistol is one with a magazine other than a revolving magazine, and with a maximum length of bore of ten inches. Any pistol is described as any breech or muzzle loading pistol, with a maximum weight of three pounds, and a maximum length of bore of ten inches. The rules regarding trigger pull are that the minimum shall be four pounds for military revolver, two and one-half pounds for any revolver, four pounds for magazine pistol, two and a half pounds for pocket revolver and two pounds for any pistol. On military and pocket revolvers the front and rear sights must be fixed. On any revolver and any pistol a lateral sliding bar may be used on rear open sights. Front and rear sights in any revolver and any pistol must not be more than ten inches apart.

CARTRIDGES.

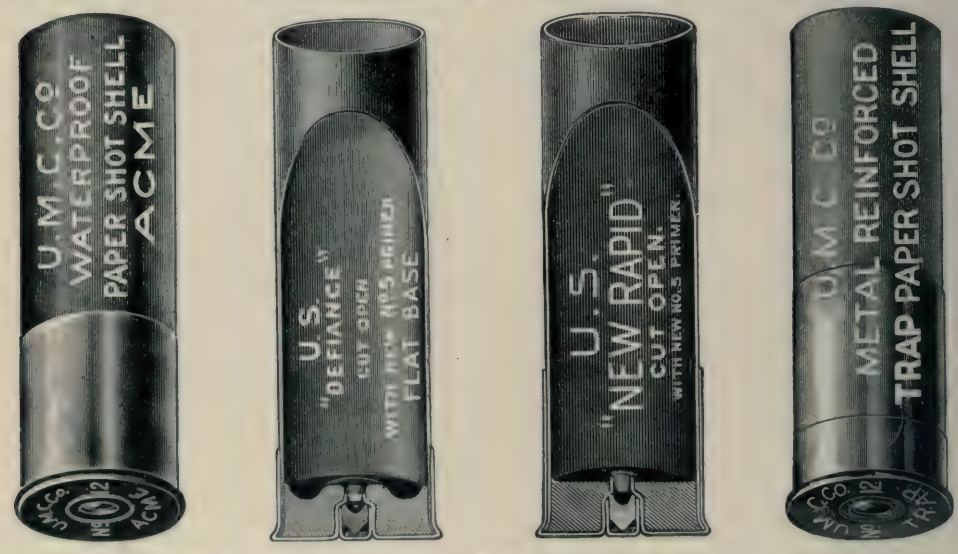
Paper cartridges are but little used at the present time. There are two kinds in the United States service—the ball cartridge, made with a single elongated ball, and the blank cartridge. The paper is first cut into strips of a width equal to the length of a trapezoid, using the pattern as a guide. A cutting-machine like that used by book-binders facilitates the operation when many hands are employed.

To form the cylinder, lay the trapezoids on the table with the sides perpendicular to the bases, toward the workman, the broad end to the left. Take the former in the right hand and lay it on a trapezoid, the groove in the former against the right edge of the paper, bringing the pointed end one-

third inch from the broad end of the paper; envelop the former with the paper; then, with the fingers of the left hand laid flat upon the paper, turn the former and roll all the paper upon it; hold it firmly with the left hand, with the choking-string in the right, take one turn around the cylinder at about one-third inch from the end; hold the former firmly in the left hand and draw gently upon the choking-string, pressing at the same time with the left forefinger upon the projecting end of the cylinder, thus folding it neatly down upon the end of the former. Having choked the cylinder close, carry it to the right side, and with the thread in the right hand, take two half-hitches firmly around the part that has been choked; cut the thread on the knife-blade and press the choke in a cavity in the table; place the former with a cylinder on it, on a second trapezoid; put a ball over the end of the former; roll the paper on the former and the ball; hold the cylinder in the left hand and choke and

tie it as thus described for the inner cylinder; withdraw the former, pressing the cylinder with the left hand, and place it in the box.

The following implements are required to fill the cylinder: One charger, made of a cylinder of wood or brass pierced with two holes through its length, holding the exact charge of powder; a funnel attached to one end of the cylinder, and a discharge pipe to the other. The holes in the cylinder are made to communicate and shut off, alternately, from the funnel holding the powder, and the discharge-pipe at the lower end, by a reciprocating motion given to the cylinder by the hands. Fill the funnel with powder, insert the discharge-pipe in a cartridge, holding the charger in both hands, and turn the cylinder; the charge of powder is deposited in the cartridge; insert the pipe in the next, and turn the cylinder in the opposite direction, and continue



in the same way for all the rest. Cartridges may be filled with a copper charger made to hold the exact charge, pouring the powder by means of a small funnel, which is inserted in the cartridge.

To pinch the cartridge, take it in the right hand, strike it lightly on the table to settle the powder; flatten the empty part of the cylinder and bend it flush with the top of the powder at right angles to the cartridge, the oblique side of the trapezoid on top, the cartridge standing vertical on the table; fold the flattened part in the direction of its length, with two folds from the exterior, meeting in the middle; bend this folded end back on itself and strike it on the table to set the folds.

When making blank cartridges, cut the paper into trapezoids, as for the ball-cartridges; roll the trapezoid on the former one turn, fold down this much of the paper on the head of the former with the left hand; roll the rest

of the paper; fold down the rest of the paper; touch the fold with a little paste on the finger; press the end of the informer on a ball imbedded in the table for the purpose; remove the cylinder from the former; place it in a box to dry. Fill the cylinders, as described, for ball-cartridges.

The cap for small-arms is made of copper. It is very slightly conical, with a rim or flange at the open end; it has four slits, extending about half the height of the cap. The cap is charged with fulminate of mercury, mixed with half its weight of niter, the object of the niter being to render the fulminate less explosive and to give body to the flame. To protect the percussion-powder from moisture, and also to secure it from falling out, it is covered over, in each cap, with a drop of shellac varnish. The copper for making the

FLAT BASE. CONICAL BASE.

caps is obtained in sheets forty-eight inches long and fourteen inches wide, weighing three pounds; a variation of four ounces, more or less, is allowed. The copper should be pure, free from seams, holes or blisters, well annealed, and as evenly rolled as possible, with straight and smooth edges. The copper is cleaned by immersion in a pickle made of one part (by measure) of sulphuric acid and forty parts water; it is scoured with fine sand and a hand-brush, and washed in running water; after which it is well dried in clean sawdust and rubbed over with a cloth slightly oiled; it is then ready for the mach ne.

The modern center-fire metallic cartridges may be divided into three classes: the solid attached head, the solid head and the folded head. There are two varieties of folded-head cartridges, the reinforced and non-reinforced. As regards priming, the above-named classes are divided into outside and in-

side primed cartridges, and may be designated respectively as re-loading and non-reloading cartridges. They are generally made from sheet copper or brass, the latter material having more elasticity, and the former more uniformity and durability.

Manufacture—Sheet metal of the required thickness, from .025 inch to .09 inch, is used for the various kinds of cartridges. This is fed to a double-acting die and punch, which cuts out a disk and forms it into a cylindrical cup at one operation. The cup is reduced to a cylinder of the required length in from four to six operations by dies and punches, and is called drawing or reducing. The cylindrical shell is trimmed to a standard length in a machine called the case-trimmer. After washing, the shells or cases have a flange formed at the closed end by pressure in a special machine called the header.

The headed case is tapered to a standard size. The open end is made cylindrical for the length the bullet enters it, so as to inclose the latter snugly; and if it be inside-primed, like the present service cup-anvil cartridge, the anvil is inserted and fastened at the same time by crimping the case around its edge.

Priming is done in a machine called the primer. For outside priming a percussion-cap is used, made in the ordinary way. Priming of fulminate of mercury should not under any circumstances, be deposited on brass, as it forms an amalgam, and rapidly deteriorates the metal and priming. Shellac varnish is used to protect the surface of brass. No injurious deterioration from this cause has been noticed in the use of copper.

Among the first of metal cartridges of American invention is the Morse, which was brought out a short time before the war of the rebellion, but not

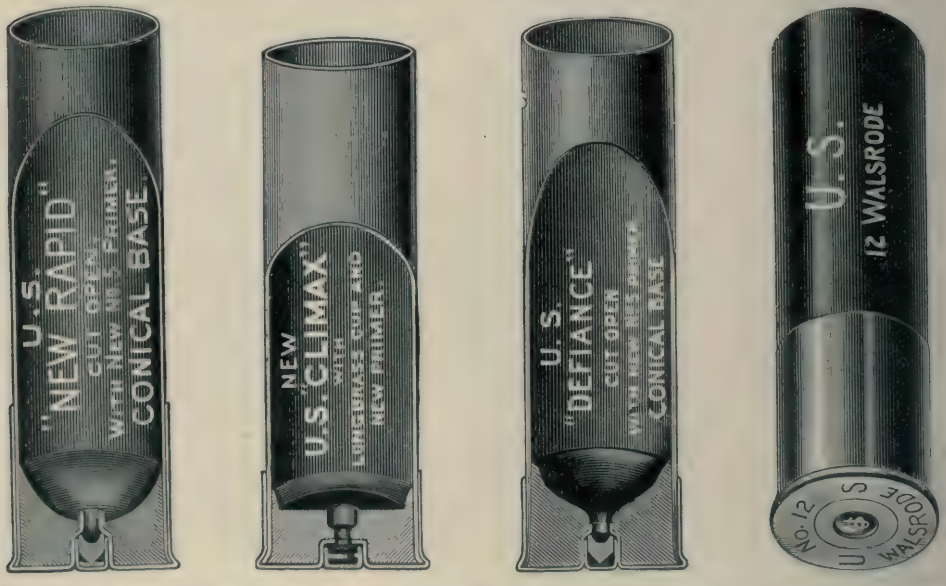
thoroughly experimented with at the time or introduced into service. Its objectionable features are apparent in the light of progress made. Its merits over paper or similar ammunition are apparent, the chief, perhaps, being that it was designed as a self-primed cartridge, had a flanged-head for extracting the case, and that it reduced the operations of loading.

About the same time the Burnside, Maynard and a few others were produced, some of which were good in their day and for the arms for which they were designed, but were fired by means of a cap, through a vent, at some distance from the cartridge, and were extracted by the fingers. With them there was not that necessary nicety of fit to the chamber of the gun, the joint was not absolutely closed, and the failures to explode were as frequent as with

the old-fashioned paper cartridge and percussion-cap. Such failures would, nowadays, be considered a most unwarranted percentage in any metallic ammunition laying claim to excellence, and, in the best known varieties, do not occur to the extent of one in one thousand rounds; in fact, many attain a much higher standard of surety than indicated by this figure. The records of the testing-rounds show long-continued firing and consumption of thousands of rounds without failure at all from any cause, and the summation of a year's practice and test, in proof of manufacture, exhibits but an exceedingly small percentage of such failures.

For some time the idea of combining the primer and cartridge did not assert itself, but some inventions were pushed in this direction, and the rim-primed cartridge was produced. In this the fulminate composition was placed in the folded head of the case. This mode of priming requires a large charge of the priming composition, which, being thrown into the fold by

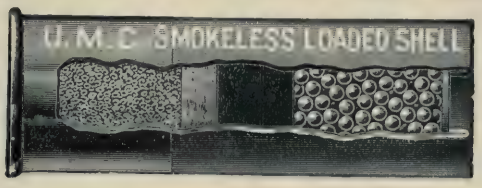
swiveling, the entire circumference of the head was not always primed thoroughly, and as the cartridge is exploded by striking the rim at a part of the head under the hammer, it not infrequently happened that it failed from the point struck not having any priming. The large charge required, also (about five grains against one-half grain for the center-fire), was a further objection to rim-priming; the exploding of so large a quantity of quick-powder in the folded head, the weak part of the cartridge, tending to strain and open the fold to bursting, as it frequently did. Another objection to rim primed cartridges is that they are more liable to accident in handling, and in shock of transportation, and in those incident to service; in fact, a number of instances of explosion in the magazine of repeating-arms, and in patent car-



tridge-boxes for service of such, have been reported, by which serious injury resulted to the soldier.

Hence, efforts to produce a still more reliable and satisfactory cartridge, and the development, production and general adoption for service of what is now so well known as center-primed metallic ammunition, its advantages being sure explosion when struck by the point of the firing-pin; less of fulminate and less strain on the head of the cartridge; greater security in handling and using under all exigencies of service. These cartridges have been subjected to the severest tests to demonstrate their capability to resist all accidents, such as mashing up boxes of ammunition and even firing into them with bullets. Only the cartridges actually impinged upon exploded under such tests, their neighbors being only blackened and not otherwise damaged. The safety of handling and transporting this ammunition in comparison with that

of the old-fashioned kind is vastly in its favor, and the risk attending its carriage is almost nothing. Its greatly superior quality to resist exposure of climate, moisture, etc., has also been proven by such exceedingly severe tests that it may be asserted to be practically water-proof. A central and direct blow on the point primed is an essential and highly important feature of the



center-primed cartridge; its general adoption and adaptation of all breech-loading service small-arms to its use, is the best proof of its acknowledged superiority. Simple modifications of the form of the head adapt it to safe use in magazine arms, even though the front of the bullet rests on the head of the preceding cartridge, while with all varieties of repriming ammunition the central fire is a sine qua non.

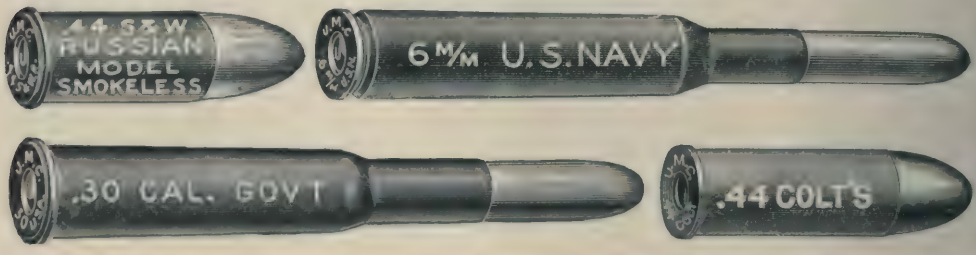
The Berdan, made in large numbers for the Russian Government, for use in the Berdan breech-loading rifle, has been most strictly and severely tested during manufacture, and has proved of great excellence. It is exceedingly ingenious; its re-enforcement simple and effective; its capacity as a reloader fully tested and demonstrated by prolonged and repeated trial, daily, during production of millions of rounds; a number of the shells being reloaded,

primed, and fired ten times, and much more extended trials have been had for special test of the endurance of the cases in this particular. Its chief distinguishing feature is that its anvil is of the same continuous piece of metal as that of which the case is made. Herein there is no possible displacement or misplacement of the anvil, and it has a fixed position with respect to the primer. The cartridge is singular in this respect, and superior to its rivals that require a separate anvil. In it was a happy idea hit upon by the inventor of making his anvil by a simple return of the metal of the pocket for the primer. All other anvils are its inferiors in that they have to be handled in

assembling the parts of the shell. Another advantage is, it presents a point to the primer inside, rendering it sensitive to the blow of the hammer. The use of the special Hobbs' primer is most excellent in this combination. Other varieties of an excellent re-enforcement may be referred to, as exhibited in the drawings.

These re-enforcements may be accomplished in various ways, as by a ring of expanding metal, a ring of solder, felt or papier-mache wads, etc. When the

ring of this metal is used as a re-enforcement it is best applied, and perhaps only effectually, in those cartridges having a pocket or return of the head for the priming. In these cases it should be so formed as to act by expansion against the walls of the case and of the pocket, to cut off the escape of gas to the folded head in both directions. The solder ring has been found to be a good re-enforce also, and in the wrapped-metal and some other varieties of



cartridges it serves also to attach the flanged-head to the body of the case. It was first used here for this purpose, and that it acted also as a re-enforce was a resulting discovery. The felt or papier-mache wad is not believed to be as good or to hold the head as securely, although it is extensively used in the various forms of Boxer ammunition. It is not believed that a simple ring of

any soft metal of any shape, as lead or its alloys, forced into the case at the head, will act as a re-enforce, as has been claimed. No matter how closely the metallic surfaces are in contact, if the re-enforcement does not expand more promptly and as fully as the case itself under all the pressure of the gas,

it does not strengthen or re-enforce the point to which it is applied. A re-enforcing ring works well, applied to a Martin cartridge, as well, in fact, as to a Berdan, and in the same manner. An objection to the Martin is its small anvil for small-headed cartridges, and their liability to burn the priming composition inclosing the pocket on the anvil, a difficulty met with in their manu-

facture, with the bar-anvil, and which can only be wholly eliminated by careful inspection of primed cases.

A very notable cartridge is the Boxer, as made at the Royal Arsenal, Woolwich, for the Snider and Martini-Henry rifles. A perusal of the English reports of their small-arm ordnance board will show the most casual reader that

the failures of these cartridges, from all causes, have been what would be considered in our trials of the best American cartridges as a very large percentage, sufficient to warrant the abandonment of a cartridge that failed so often. Unlike its American prototype, from which it was originally taken, its

parts are more numerous, and the steps of operations in its production more than double those in that simple cartridge. Its cost, hence, is also large, considering the low prices of labor and materials, and the very large numbers fabricated in the country of its adoption; a cost very much in excess, it is believed, of that of any other of the most approved American varieties of metal

cartridges fabricated under similar advantages of cheap labor, low-priced materials, and large production. It does not appear to be well adapted to stand the shocks of transportation or exigencies of service, is easily indented and disfigured, so much so as seriously to interfere, with ease of loading. Per contra, it is beautifully expanded and brought into shape of the exact walls of the chamber in firing, and extracts readily if the head holds, which, from the reports, seems not always to be the case. It is not suitable in its present state

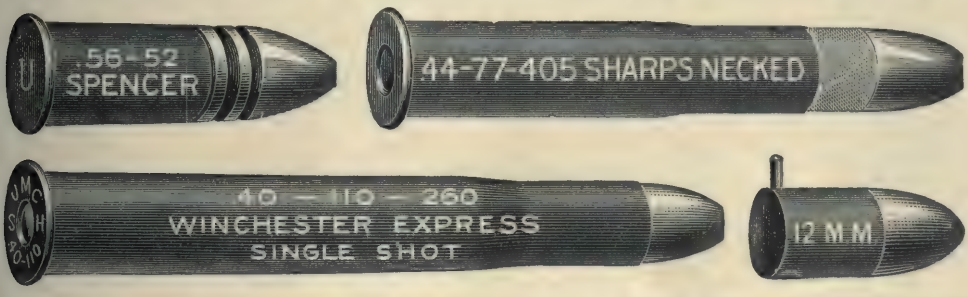
and form for use as a reloader, whatever may be claimed for it in this respect, and it is doubtful if it could be made so. The idea of such a use does not seem to receive encouragement from recent reports. Its attachable heads, from the peculiar and awkward mode of fixing them, are not exact or even, and may

not always be firmly put on. Made of iron, it is believed they never should be for cartridges subjected to all varieties of climate. The use of this metal for a cartridge, otherwise so costly, is the poorest kind of economy.

There are several varieties of solid heads, as the Hotchkiss, the Dutch, the

United States Cartridge Company's, etc. The head, here, is re-enforced by using a thick sheet-metal strip to form the case, and leaving sufficient stock in the head, in drawing the case, to flow out and form the flange solidly. That this is effective in making a very strong case is unquestionable; its manufacture requires some heavier plant for operations; its cost in metal and production is somewhat greater; and it is believed that the head is unnecessarily strong for the present work required by well-constructed breech-loading small-arms.

Experience, it is believed, has fully demonstrated that, in order to insure the best results in service, our small Army should be furnished with the most approved arms and material practicable. To effect this, the careful selection of an excellent (the best if it can be determined upon, for the chief trouble of such a selection seems to be from embarras de richesse in this branch of invention) system of breech-loading rifle small-arm, and suitably working efficient ammunition for the service of the same, is pre-eminently desirable.



If, from the abundance of good things to be chosen from, the difficulty of selection can be overcome, the rest, with adequate appropriations, is comparatively easy. A prime essential of such manufacture should be the institution of a rigorous standard from which there should not be the slightest de-

parture, except by competent authority. Especially should this apply to the chamber of the gun or seat of the cartridge, the dimensions of which should be invariably fixed, and the greatest nicety of finish and adjustment of breech-mechanism insisted upon. In other words, the chambers should, within the

limits of mechanical construction, be of the same dimensions, to the thousandth of an inch, both for the body of the cartridge and its flange or head. The seat of the extractor should not occupy any part whatever of the body of the chamber, and its surface should be as smooth as it is possible to make it. The depth of the flange recess of the chamber should only be sufficiently deeper than the thickness of the head of the cartridge to be employed in it to allow for the easy closing of the breech-lock, the small variations of thickness of metal from which the case is made, and of necessary manufacture. A difference of 0".01 is believed to be ample for all purposes; its diameter may be at least 0".03 larger than that of the cartridge-head, which should itself be

great enough to allow a secure hold to the extractor. All the angles of the chamber should be slightly rounded. The length of the chamber should be but a few hundredths of an inch longer than that of the case of the cartridge, and its throat, or seat of the projecting part of the bullet, should be accur-

ately attended to, so that, with the cartridge in situ, the breech-block being closed, it should always occupy the same relative position with respect to its bearings in the chamber, and the bullet have the smallest necessary distance to move before engaging the grooves of the barrel, which engagement should

be well advanced before the bullet is free from the case, to insure that it will start with its axis in the direction of the axis of the barrel. The expansion of the case in firing should immediately shut off escape of gas around its body to the rear—the only limits in difference of diameter of chamber and case allowable being those necessary to insure the required ease in loading, and there should be no fouling of the chamber in firing ball-cartridges.

A little reflection will convince all that an invariable chamber is the prime essential to the proper performance of the cartridge, assuming, of course, that the latter is also as carefully made. This once obtained, let us insist on the case of the cartridge fitting as closely as practicable—the limit of variation

allowable being only the very small unavoidable range of thickness in metal strips, and a reasonable life or wear of dies and punches necessary to the production of ammunition by the quantity. These degrees of perfection can

be obtained only by the adoption and preservation of exact standard gauges, by frequent and every-day careful inspection of material and work, and keeping the attention of mechanics directed to the necessity of constant watchful-

ness over and frequent verification of their tools, dies and punches, in current use to insure the desired nicety. Without this constant care in keeping up to the standard, work, however satisfactorily and successfully inaugurated, will soon become indifferent.

In the multi-ball cartridge two or more bullets or pieces of lead are substituted for the ordinary bullet, with the idea of doing more execution at short ranges. The following advantages are claimed for the encased multi-ball cartridge as manufactured by Merwin, Hulbert & Co.: 1. No leading

of barrel by any number of discharges. 2. At each discharge the casing acts as the cleaner and lubricates the barrel. 3. The lubricated case taking the rifling gives an easy transit of balls and accuracy of flight. 4. The lubricant is preserved under the different ordinary degrees of temperature. 5. By

the centrifugal force given to the casing and balls by the rifling, the casing is thrown off after leaving the barrel, the balls diverge or separate nearly equal to the front of three men at about one hundred yards distance. 6. The multi (or three-ball) cartridge in its effective (or destructive) results at each

discharge at short range is nearly equal to three separate discharges by a breech-loader throwing one ball. 7. The cartridge is firmly constructed and will withstand rough usage of actual service and preserve its uniformity of shape. 8. Continuous (and rapid) firing without requiring the barrel to be cleaned. 9. Preservation of powder. The casing as an insulator prevents

galvanic action between the metallic shell and balls, which chemical action in time would deteriorate the powder. 10. The casings are made, the balls placed and secured firmly therein, separate from the metallic shells and can be transported in bulk or otherwise without injury and attached to the loaded metallic powder case when desirable (or at reloading of shells).

BULLETS.

Since the advent of powder and ball, there have been thousands of varieties of all sizes and imaginable shapes, round and long, with points of every conceivable curve that can be geometrically figured, some with a flat base, others with depressions of all depths and shapes, some to be patched with paper, or covered with steel, copper or nickel, others with grooves, the width, depth and number of them varying according to the theories of the many so-called scientific men Scientific theory and practice do not always agree. Science will figure out the size, shape and weight of a bullet, and not the proper portion of a certain grade of powder. It will place this powder and ball in a rifle barrel of a figured length, bore and twist of rifling. The crank and the practical man go to work experimenting, they try this and that, varying the size of the bore and twist of barrel, powder, quantity and grade, the temper of bullets

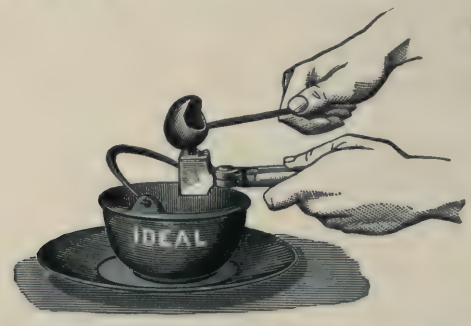
from pure lead to different proportions of tin, etc., and the result of all this is, we have a great variety of bullets of the various so-called calibers, while in point of fact there are very few, if any, of them what they are called. All this is very confusing to the uninitiated. The manufacturers of the various arms have by a long series of experimenting decided upon a standard size of bullet to be used in their different calibers, and the manufacturers of ammunition all make the bullets to that standard and they will not vary .001 of an inch as they come from the factory. There are, however, some who differ in their opinions as to what diameter of a bullet should be for their rifles; they will push a bullet through the barrel, and if the impressions of the rifling on it are not deep enough to suit their ideas, they decide that a bullet of the standard size

is not large enough and may condemn the mould. Others there are who desire to have their bullets smaller than the standard size and point to their fine records to prove that they are correct, which is simply a verification of "Many men of many minds." Of course, a bullet should fit so as positively to prevent the escape of the gas by the side of the bullet; all of the pressure generated by the ignition of the powder should be kept at the base of the bullet to expel it. If gas escapes through the barrel past the bullet, so much force is lost, and if the escapement is greater on one side than on the other, it will deflect the bullet and make the flight irregular, and accuracy under such conditions is out of the question. Some of the best authorities think a bullet when seated in the barrel by hand should fit to the bottom of the rifling so as to shut off positively all gas before the powder is ignited; others think that a space should be left between the length of the bullet and the bottom of the

rifling, the space to be closed up by the upsettage of the bullet at the time of the explosion. As to how a bullet of the standard size will fit a barrel depends wholly upon the bore and the depth of the rifling. Variations in both of these points are found, as well as in everything else; there are no two rifle barrels alike any more than there are two human beings; each has his own individuality and must be humored in accordance with his peculiarities. The bore of a rifle is the size of the smooth hole in the barrel before it is rifled, which is commonly called the caliber; this, however, is not the size of the bullet. The diameter of the bullet is determined by the depth of the rifling and should be large enough to shut off the gas. The depth of the grooves in the ordinary rifle barrel is from .001 to .004 of an inch according to the ideas of the various manufacturers, or those of the shooters who may order them in accordance with their peculiar notions. It must be remembered that it is the barrel, not the shells, that the bullet should fit properly to get good results. One great advantage for the Ideal reloading tool over all others is that it has a bullet sizer as well as a bullet mould combined with the loading chamber in

a convenient and handy form. The moulds thus can be made so as to cast the bullets a trifle above the standard size, allowing the use of any mixture of metal that the shooter desires; and, after the lubrication is in the grooves, they can be forced through the sizing die, this will press the lubrication solidly into the grooves, wipe off all surplus grease, and at the same time make the bullet perfectly round.

The casting of bullets requires time and patience. You cannot take an old iron spoon and hold it over the fire and as soon as the metal liquifies, or can be poured, spill it into a cold mould, and get good results; for instead of a full bullet, you will simply get a shriveled and wrinkled lump of lead. The



first requirement is a small kettle. The Ideal melting pot is made for this purpose and will hold about ten pounds of metal; such a body will hold the heat at a more even temperature, which is desirable. There should be a regular steady fire to keep it at the proper temper, not red-hot one minute and so cold the next that it will not flow. When ready to run the bullets, raise the dipper nearly full from the melting pot, hold the same over the pot and connect the mould to the nozzle; then turn the dipper, with the mould connected, slowly to a vertical position, as in the drawing, and the weight of metal in the

dipper above the mould will drive out the air and fill out the mould perfectly, assuring good, full, smooth bullets without the spilling of a particle of metal

The surface of the metal should be kept clear and the dipper clean. Keep the dipper in the hot metal when not pouring, for it must be kept as hot as the metal, which otherwise will be chilled, and stop up the nozzle. The metal

should be hot enough to flow freely, but never red-hot, as a red-heat oxidizes the lead rapidly, forming much dross, which hardens and deteriorates the metal. Sometimes a bullet, when cast, will show the grooves clean and sharply formed on one side, while on the other side they will not; or if it be an Ex-

press or hollow pointed bullet, the end of it may show a full sharp impression on one side of the core-peg and not on the other, causing the hole to appear eccentric. This does not imply that one-half of the mould is imperfectly cut, or that the core-peg is not held in the center, as these imperfect appearances may be changed from one side of the bullet to the other by simply tipping the mould from left to right, and pouring it right or left handed. The side of the mould, or the side of the core-peg that is presented to the entering flood of metal, will receive a full impression, while the opposite side may not. The face

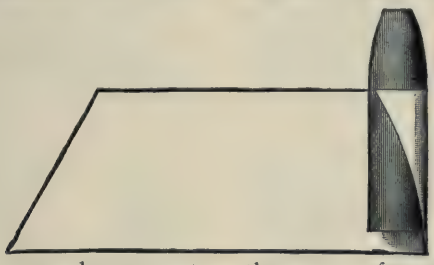
of the mould may be fitted too closely, and the trouble may be caused by air being imprisoned when pouring the metal too quickly. To avoid this, turn the mould and dipper slowly, coming to the position in the illustration only when the mould is full, and hold the dipper connected to the mould for an

instant, so that the shrinking bullet in the mould may draw the metal from the dipper; for, if separated too quickly, there may be a shrink hole at the base. Those using the Cylindrical mould may find an indentation caused by imprisoned air on the side of the point where the former punch connects; pouring the metal slowly as stated above, will overcome this. Do not be afraid to put a little oil on the joint of a mould and on the face of it also, it is a good plan to do this while hot before putting it away after using. A little oil in the mould may cause a few bullets to be imperfect by sputtering, but it will soon get over that and be the better for it. Sometimes the metal may solder to the inside of the pouring hole on the bullet mould cut-off, or on the nozzle of the dipper. An occasional touch of the nozzle to a piece of tallow or beeswax will obviate this. Never strike the mould with a hammer or other metallic substance for it will pean or stretch the side that is hit, and make the

bullet out of round. Use a billet of wood to strike the cut-off, or to eject the bullet. If bullet does not drop readily from the mould, open the mould wide, holding it with the bullet downward, and lightly tap on the lower bottom inside face of the half in which the bullet remains. This will be found much better than striking it on the outside, as it drives the mould away from the bullet, while striking it on the outside drives it against the bullet, and sometimes will make it stick more firmly. Never attempt to pry bullets out of a mould. It is impossible to use any metal across the inner sharp edge of a mould without injuring it, the slightest indentation on the edge of a mould will cause a bullet to stick, and the only way to get out any indentation is to have it recherried; the cherry should be the last and only instrument of metal that is used in the mould. Round bullets are more apt to stick in the mould than others on account of being lighter in weight and of being held by almost a complete half circle in the mould. Hot bullets should not be dropped on a

pine board, for they will absorb the rosin, neither should they be allowed to drop on other hard substances, for it will dent them.

Bullets to be patched with paper are smooth, without grooves. They are from three to six thousandths of an inch smaller than the standard size. The diameter is increased to the size desired by having a thin paper patch rolled around them, covering about two-thirds of the bullet from the base up. This paper is of fine, strong texture, similar to bank-note paper. It is specially prepared for this purpose, and is made in different

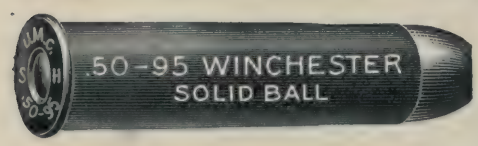


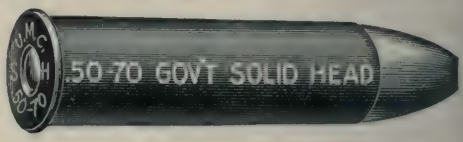
thicknesses, which are known to the manufacturers of ammunition as extra-thin, thin, medium, and thick. The extra-thin is about one and one-half thousandths in thickness and there is an increase of about one-half thousandth in each succeeding size; thus shooters wishing to increase or decrease the diameter of their bullets can do so by selecting the proper thickness of paper. There is a difference of opinion relative to the advantage or superiority of patched bullets over grooved, yet for hunting or military purposes the grooved ball is generally preferred, as such ammunition can be carried and exposed to wet weather without injury, while a part of the patch being exposed is liable to get wet and injured so as to impair its ac-

curacy. Still, for fine target-shooting, the patched bullet properly handled is, without doubt, preferable.

How to Roll on Patch. Lay the patch on a smooth board or table with the point of angles toward and from you; have point of angle toward you to the right; let the whole of the angle project over the edge of the board or table (this will leave the point of patch free, not stuck down to the table); then place the bullet squarely upon the patch (base to the left), letting as much of the paper project beyond the base as you desire. (See drawing.) The

angle projecting toward you can then be lapped up over the bullet, as shown. When in that position, place the forefinger upon the point of patch and bullet, and with a forward push roll the bullet up on the patch. You will soon perceive whether you are rolling it on true; if not, roll back, readjust the bullet, and try again. A little practice will soon enable you to acquire the art so that you will do it correctly every time. This is the method of patching bullets at the ammunition factories. This work is done by girls, who become ex-





pert, some of them patching over twelve thousand per day. The regular factory patched bullets have a cavity at the base. When patch is rolled on, the paper should project about two-thirds of the diameter of the ball and the projecting paper is twisted over the base and pressed into the cavity. With the flat base bullet (without cavity) allow the patch to project only one-third of the diameter of the ball and turn the edge of paper over inward, and press the base of ball, when so patched, flat upon a table.

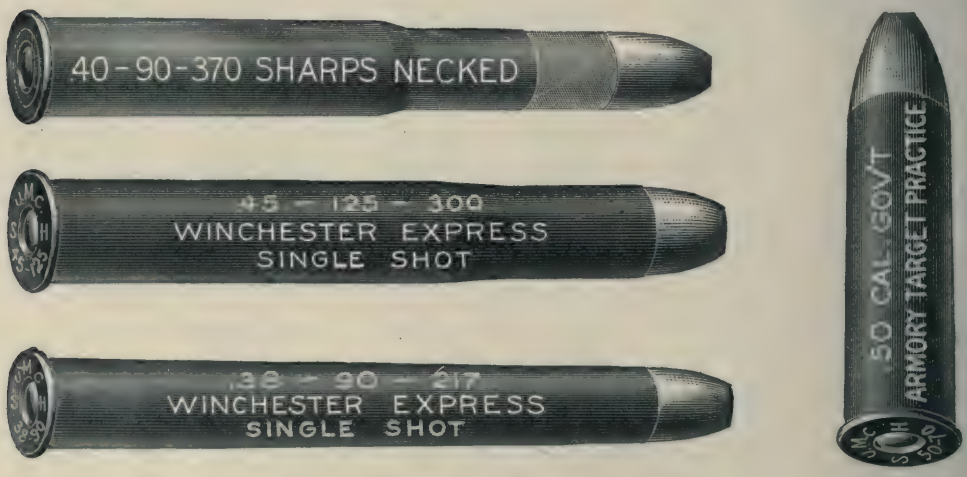
The proper lubrication of bullets is very important. If a rifle barrel becomes leaded inside, it is useless as far as accuracy goes; yet many shooters are very thoughtless about the lubrication of the bullets when preparing their ammunition; anything is good enough, and this is the cause of much trouble.

A barrel to do good work must be kept free from lead. All the grooves of a bullet should be packed full of a good fresh lubricant before being seated in the shells or in the breech of the barrel. Scantily lubricated or dry bullets will certainly lead the barrel. There are many recipes for lubrication; almost

every shooter has one of his own. The following mixtures will, however, be found good: Beeswax and common cylinder oil, three parts wax to two of oil. Also beef tallow with enough vaseline to soften it as desired, or pure vaseline with enough paraffine to harden it as required. Japan wax

with sperm oil enough to soften it is also excellent. Never use fats or oils that have been salted or that have acids mixed with them, for they will rust or pit the barrel. In cold weather, the mixture should be softer than in warm, but never so hard as to crack and drop off while loading. Cartridges when

loaded should be kept in a cool, dry place, never in the sun or in a hot place, for, if the lubricant melts it may get to the powder, and if so it will certainly destroy it. Verdigris or green corrosion near the mouth of shell indicates that ammunition is not fresh. Bullets that have been lubricated a long time are not as good as those freshly done, for the mixture may become hardened and lose some of its lubricating qualities. If in this condition, it will be best to remove the old lubrication by placing the bullets in hot water, which will soon melt it off, and then you can do them over freshly. Ammunition that has been made a long time, shipped about the country and stored in hot places, is frequently found to be worthless, simply on account of the lubrication melting and getting to the powder. Newly made ammunition is best, whether purchased or made by yourself. If the latter, you certainly know what powder is in it and how old it is. To lubricate your bullets, dip them



into the melted lubricant, covering all of the grooves, and set them on a board to cool. When cool, remove the surplus grease by forcing the bullets up through a tube a trifle above the size of the bullets. Originally, all metallic ammunition was lubricated on the outside. All bullets were seated in the shell on the powder, or up to a shoulder, without lubrication, and that part of the bullet that projected beyond the muzzle of the shell was dipped into hot lubrication, and, when cold, packed into boxes ready for use. Such was the only ammunition made for years. It, of course, is very much more uncleanly than the later production, which have bullets with grooves filled with lubrication, and the bullets seated in the shell deep enough to cover the grooves and lubrication, preventing the adherence of dirt and grit.

In the days of old, before arms were rifled, missiles were round and shot from a barrel that was smooth bore like a shotgun; the gauge or caliber was

numbered according to the quantity of a perfect sphere of lead there was contained in a pound. Thus, 50 gauge rifle was bored for a ball that took fifty of them to weigh a pound, 20 ga. twenty to the pound, 16, 14, 12, 10, etc.

The adjoining table reduces the standard shotgun or smooth bore gauge decimally to thousandths of an inch, also to millimeters.

Diameter in decimals of the inch.	Gauge or bore.	Diameter in millimeters.
.836	8	21.8
.775	10	20.0
.729	12	18.6
.693	14	17.8
.662	16	16.8
.615	20	15.6
.571	25	14.4
.537	30	13.6
.526	32	13.2
.488	40	12.4
.453	50	11.4

In comparison to caliber of rifled arms, it will be observed there is a marked difference; in this table, as the size of the gauge increases, the numerals designating the diameter of it decreases. Thus, the size of the hole in the barrel of a 25 gauge smooth bore is .571, while for 50 gauge smooth bore, it is only .453. For a rifle barrel of exactly .25 calibre, the bore should be .250; for a .50 caliber it would be 1-2 inch or .500. The caliber or gauge of the modern rifled arm, if correct, is designated decimally by hundredths. Thus, .32 caliber should be 32-100, .40 caliber. 40-100, etc., though few of them are really what they are called.

The approximate weight of these are as follows: 10 ga. 630 grs., 12 ga. 540 grs., 14 ga. 465 grs., 16 ga. 390 grs., 20 ga. 300 grs.

While we do not recommend round ball for choked bore shotguns, they are used by some shooters successfully; for 10 ga. choked bore use 12 ga. ball, for 12 ga. choked bore use the 14 ga. ball, and so on.

THE IDEAL SYSTEM OF NUMBERING BULLETS.

This system is much appreciated by sportsmen when once familiarized. There is very much of a mix up in the so-called calibers, causing many mistakes, some bullets being called .32 caliber that are smaller than the .30 calibers, while some .38 calibers are as large as .40 calibers. This, of course, is confusing and misleading to those who are not familiar with the subject, and the source of much trouble and many mistakes which may be avoided, if dealers or individuals will order by the numbers designated. The aim is to individualize the bullets with a certain number for each particular one and at the same time have the number of the bullet designate its standard diameter, also to inform people what arms use bullets of that particular standard size; for instance, when a person knows that the standard size of the bullet for his rifle is say .308, he will know that any of the variety of bullets numbered, whose first three figures is 308, will fit his arm, and with the assistance of the numbers and illustration, he can select the diameter, shape and weight of bullet, with which he may desire to experiment. Thus, all through the numbering, the first three figures of the number is the standard diameter (in thousandths) of the bullet it designates.

It must be remembered that the caliber of a rifle is the size of the smooth bore before it is rifled, and not the size of the bullet, as many suppose. If a rifle barrel is bored .30 caliber (.300) and rifled .004 of an inch deep, it will require a bullet .308 in diameter to fit to the bottom of the rifling. The .45 Government rifles are bored for .45 calibre (.450), but require a bullet .457 in diameter, on account of the depth of the rifling. The depth of rifling is varied by different manufacturers. Different depths of rifling will affect the fit of bullets, while the bore or caliber may be the same. There are, in fact, but very few rifled arms that are actually what they are called by calibers. Carefully note the following:

.226 is the proper diameter of bullets for the .22-15-60 Stevens straight. These bullets may be used in any of the cartridges or arms using bullets of the .228 diameter as specified below, for these bullets are cast full and are to be sized.

22636. A fine variety of bullets, weights varying from 40 to 98 grains, with deep grooves, which are not so apt to lead the barrel. The shape of the point is standard. All of the bullets may be seated with regular tools that are correct for any .22 central fire cartridges.

22637. A fine series of sharp pointed bullets, weights from 32 to 91 grains. They are clean and accurate shooters, and do not tear game.

22638. Express bullets. It is astonishing how much more deadly a bullet is with a hollow point. We have fine reports of the work done with these bullets, one statement that a .22-15-60 Stevens straight rifle, with an express bullet of about 60 grains, is as good a killer as a .32-20.

.228 is the standard diameter of bullets for rifles using the following cartridges: .22-10-45; .22 Extra Long C. F.; .22-13-45 W.; .22-20 Hornet, etc.

228151. This is the standard factory bullet. The grooves are shallow and rounding, and it does not hold much lubrication.

22834. These bullets have the same shaped point as the factory .22-45 bullets. They have deep square cut grooves which will hold more lubrication than those of the factory bullets, thus preventing the leading of the barrel, which is so annoying and detrimental to accuracy in small bore rifles. They may be seated with the regular reloading tools for any of the above cartridges.

22835. This series of bullets has proved to be very popular. The sharp point is preferred by many, as it does not tear small game. These bullets also have deep, square cut grooves.

.236 was at one time supposed to be the proper diameter of bullets for the new U. S. Navy Rifles, but now the rifle and cartridge is called the 6 m/m. U. S. Navy, and the proper diameter of the bullets for that rifle now is .244.

.23639, .23640, and .236199 are bullets made in the early experimental days, for the then called .236 U. S. Navy.

.257 is the proper diameter for bullets of all the .25 caliber central fire arms now made. For the various .25 caliber rifles, however, there is a variety of ammunition of different lengths and shapes, which is causing much confusion among dealers and customers. Note particularly that there are two different .25-20 cartridges. Both of them are bottle neck, but of different shape, and the cartridges are of different lengths over all, so that reloading tools correct for one will not load the other.

25716. This is the .25-36 Marlin series. The points are of the Standard Shape. The regular reloading tools for 25-36 M. seats them and the metal jacketed bullets.

25717. This is the .25-35 Winchester series. Loading tool that is correct for the regular .25-35 Winchester metal patched bullets will seat any of these, one groove will project beyond the muzzle of shell so that bullets will have a longer bearing to hold on to the quick twist rifling. For short range bullets, note the 78 grains weight and bullet No. 25721, both seat with the regular tool.

25718. This is the .25 caliber Long Sharp Pointed; it is only intended for long heavy weights. The sharp point prevents the tearing of game.

25719. These are the .25 caliber short, sharp pointed bullets of which there has been so much written. For short range and small game there are none better.

25720. This is the regular old standard .25-20 Stevens series. Any of these weights are correct for the .25-20 Stevens and Winchester single shot, .25-20 Marlin and Winchester repeating rifles, .25-25 and .25-21 Stevens Straight.

25721. This is the .25-35 Winchester 87 grain, short range bullet. It may

be seated in any regular reloading tool that is correct for the standard cartridge with metal jacketed bullet.

25727. Express bullets. These are made of various weights.

25728. Round bullet. Used by some for light indoor work or very short range. They shoot nicely with a very small charge; if too much powder is used, they will be apt to jump the rifling.

25729. This is the .25-36 Marlin short range. It will seat all right in the regular tool made for the standard .25-36 Marlin metal jacketed bullet. It has good length of bearing.

25730. This is made as the Standard .25-36 Marlin for full charge of black or low pressure powders. Seats correctly in same chamber that seats the metal patched bullet.

25731. A style of smooth bullet for patching with paper. Same is cast in the Cylindrical mould. Moulds for casting bullets of the proper size for patching up to the .25 caliber are made with the Leopold, round or flat point. These bullets are being used with the quick twist rifles and high pressure powders.

.299 is the diameter of the bullet, or the base part of it that fits the shells, known as .32 Short, .32 Long, .32 Extra Long, outside lubrication. There are two distinct diameters. The base part is to fit the shell, and the larger or forward part, the barrel, so a round or straight bearing bullet that is correct in size for the shell is too small for the barrel. The larger diameter that fits the barrel is .313 (same as .32 S. & W.).

299152. This is the regular bullet for the .32 Short, Rim or Central Fire shells.

299153. This is the standard bullet for .32 Long U. M. C., or .32 Long Colt, Winchester Central Fire shells.

299154. This is the regular bullet for .32 Extra Long, for Rim or Central Fire shells.

299155. This is the .32 Long Rifle, adapted to the Marlin Rifle, model 1892, and various pistols. The bullet is known as .32 Long, inside lubrication. It fits the same shells and is adapted to the same arms as the .32 Short, Long, and Extra Long. The hollow base expands at discharge to fit the barrel.

.308 is the recognized diameter of bullets for the .30-40 U. S. Govt., .30-30 Winchester, .30-30 Marlin, .30 Savage, .30 Blake, .32-40 Remington, etc. The original size of the .30-40 Govt., and .30 Savage was the same as the English rifles, which are bored to .303 gauge and use a bullet .311 in diameter; the U. S. Govt. changed the bore to .300 (.30 caliber) and use a bullet .308, which has become the standard for the American .30 calibers, though we believe the Winchester people are now making bullets .305 in diameter for their .30-30 Winchester. We would remark that the .308 bullets will do good work in any of the .303 caliber

English rifles. We would further remark that any of the standard bullets .311, factory made, or specials, may be sized down to .308 in diameter and make good bullets for the .30 caliber. See bullet 3084.

3081. When cast is .311 in diameter, which is correct for the .303 (English). It may be sized to .308. The 200 or 225 grains weight, some think, are fine bullets for the .30 U. S.Govt.

3082. When cast is intended to crimp into the top groove, same as in the standard metal jacketed bullet, the forward part of shoulder resting on the end of the shell to prevent ball receding. Chamber that is correct for the metal patched bullet .30-30 Winchester will also seat these bullets.

3083. When cast is .311, to be sized to .308. It is similar to No. 3082, except in weights and having flat point. These bullets will seat correctly in chambers that are for the .30-30 Marlin metal patched bullet, but will not seat in tool for the .30-30 Winchester.

3084. When cast is slightly above .308; when loaded in the regular .30-30 W. chamber, shell crimps over all the bands. Single mould will form a bullet with point rounded like 3082. The 152 grs. we call the standard .30 W.; 200 grs. is the regular .30 Govt. When it is seated in shell two grooves project. 3084 bullets seat properly in the .30 Savage tools.

3085. When cast is slightly above .308. These bullets have flat points in all cases, whether made in single or Perfection mould. They are intended particularly for the .30 Marlin, and conform to the shape of the metal patched bullet on the point, and the chamber that is correct for one is correct for all. The 147 grs. bullet is the standard.

3086. When cast is .311. This bullet was designed by Mr. Beardsley, of the Bridgeport Gun Implement Co. Fine reports have been received from this full length bullet, when sized to .308, using full charge of black or lower pressure smokeless powder in the various .30 caliber rifles. The lighter weights are reported fine for short range for all the rifles using bullets .311 or .308 in diameter.

3089. This is the .30-30 Winchester short range bullet. It may be seated correctly with any loading tool that is correct for the regular .30-30 Winchester cartridge. It has but one groove for lubrication and has a deep, hollow base.

30822. This bullet is exactly the same as 3089, with the exception that the point is round and the base is flat. It also may be seated with any regular reloading tool that is correct for the standard .30-30 Winchester.

30823. This is the .30-30 Marlin short range. It has flat point and flat base, and is seated correctly with any reloading tool that is correct for the standard .30-30 Marlin cartridge.

30810. This bullet is cast .311, and is designed for the .30 Savage short range (miniature bullet). It may be seated in the .30 Savage shell with the regular reloading tools, but will require special chamber to be properly seated in any of the other .30 calibers.

30812. When cast is .311 (correct size for .32-20, etc.). Here is a fine series of short range bullets that are well balanced, presenting a good length of bearing and number of grooves for sufficient lubrication. All of the short, sharp pointed bullets of different calibers have justly earned their reputation for accuracy and for small game killing. They do not mangle or tear. It has been proved, also, that bullets of this shape, when longer or heavier than bullets of other shapes, will fly more accurately and keep point on for a greater distance. We would remark also that bullets having a good length of bearing, with lubrication properly distributed, will hold the rifling better and are not so apt to jump the twist and lead the barrel, since they have a greater length of grip.

30815. These bullets are for the .32-40 Remington. We would remark that all of the .32-40 Remington bullets, whether grooved or patched, are proper size for the .30 caliber.

308156. This is the regular .32-40 Remington bullet. See under Remington Arms.

30824. This bullet is the same as 30823 with the exception that it has a deep, hollow base. It may be seated with the regular .30 Marlin reloading tool.

30826. Round ball for indoor work or very short range. Light charges of powder should be used, too much powder causing them to jump the rifling.

30841. This is a bullet from the Cylindrical mould, which is made for smooth bullets for paper patching. Moulds cast point, round, flat or Leopold.

31032. This is a bullet for the .32 Swiss Ordnance. It is not used larger, but is reported very excellent for large game.

.311 is the proper diameter of bullets for the following arms: .303 English rifles; .32-20 Winchester, Marlin and Colt's rifles and pistols; .32-35 Stevens and Maynard; .32-40 Bullard, etc. All bullets of the .311 diameter may be sized to .308 for the .30 caliber.

31111. This is the regular standard U. M. C. bullet for .32-20 Marlin and Colt's. It has but one groove, with point same shape as 3118. Any reloading tool for .32-20 will seat it. May be sized to .308. (For sharp-pointed bullets see No. 30812.)

31113. This is a round ball for light charge, short range, or small game. Too much powder will cause bullet to jump the rifling. With proper amount of powder they do good work.

31114. Here is a fine variety of bullets with wide, square grooves for lubrica-

tion. Excellent reports come from parties using them in both .30 and .32 caliber rifles.

311157. This is the same shape as the .32-40 Marlin 165, and is used with general satisfaction for large game.

31125. This is a bullet made especially for the .303 English rifles, and is the same shape and length as the metal jacketed bullet in the .303 Eley cartridge. Weight, 240 grains.

31133. Express bullet. They increase the killing powers of the .32-20 rifles greatly, and are correct shape for any of the regular .32-20 reloading tools.

31142. This is a bullet from Cylindrical mould. Cast smooth for patching. Mould can be made for casting round, flat, or Leopold point. Same will cast bullets of various weights.

3117. This bullet is the old standard .32-35-153 for Stevens and Maynard rifles, and is a favorite.

3118. This is the regular standard bullet, .32-20-115 Winchester. It has two grooves, and is same shape at point as the No. 31111. Any reloading tool that is correct for .32-20 cartridges will seat it. May be sized to .308.

.313 is the proper diameter for bullets for the following: .32-30 Remington; .32 S. & W. Short; .32 S. & W. Long; .32 Harrington & Richardson; .32 Merwin & Hulbert; .32 Colt's New Police, etc.

31355. This is the regular .32 S. & W. Short. (See Smith & Wesson Revolvers.)

31356. This is the regular .32-30 Remington. (See Remington Arms.)

31357. This is the .32 Colt's New Police, and .32 S. & W. Long. (See Colt's Arms and Smith & Wesson Revolvers.)

31358. Round ball for light charge or short range practice. Too much powder will cause them to jump the rifling. The proper charge will do good work.

315158. This is a special bullet used by some shooters; in the .32-40, .319 rifles it requires a thin paper patch. It is also the correct diameter for the Mannlicher rifle, 8 m/m.

.319 is the proper diameter of bullets for all arms using the well-known and peculiar cartridge .32-40 Marlin, which was first originated by the Marlin Fire Arms Co. and adopted by the Winchester, Remington, Colt's, Stevens, and others. There are also other cartridges known as .32-40 Remington (.308) and .32-40 Bullard (.311), but they require different diameter of bullets. The cartridge using the .319 bullet should always be designated as .32-40 M. and W., whatever rifle is made to use them. This will obviate many mistakes.

319162. This is a bullet that has won a place in the hearts of the users of the .32-40 rifles, using shell full of powder and seating bullet in the barrel.

31944. This is the regular standard .32-40-165 bullet, and has an excellent reputation.

31945. Express bullet. This is the same shape as the standard, so it will seat properly with the regular reloading tool. It increases the killing power of the rifle greatly for deer, bear, etc.

31946. This bullet has one very wide groove for lubrication with two strong bands. It is claimed that this bullet shoots well, does not strip or jump the rifling at higher velocities, consequently does not lead the barrel. The shape is standard and correct for the regular reloading tools.

31947. Here is a fine series of bullets. They are standard shape at the point. Short or long range. All seated with the regular tools.

31948. These bullets weigh 80, 120 and 155 grains. Reports of them are excellent, particularly of the two lighter ones for short range. Double adjustable chamber required to seat these and round ball.

31949. Here is a popular series of bullets from very light weight to very heavy, having sharp points. They are reported accurate fliers. Light weights are extra fine for small game; they do not tear or mangle. These bullets require special chambers to seat them.

31950. This is the factory .32-40-98 M. short range. Tool for regular cartridge will not seat it. No. 3 special tool only, made for it.

31951. Round ball for extra short range, very light charge of powder. Too much powder will cause them to jump the rifling.

31952. This series of bullets is known as the .32-40 short point. They have become very popular. For different purposes all of the weights have friends. No. 3 special tool only made to load them.

31953. This bullet was made for Col. Pickett, the well-known grizzly bear killer. It is for patching with paper. The mould has extra long bearing for core-peg.

31954. This bullet, from Cylindrical adjustable mould, is cast smooth for paper patching. Mould will cast bullets of varying lengths, with flat, round, or Leopold point.

.323 is the proper diameter of bullets for all arms using the following cartridges: .32 Ideal; .32-44 S. & W., .32 S. & W. rifle, etc.

32359. This is a bullet that has met with favor by those who have rifles using the .32 Ideal cartridge.

32360. This series of bullets is intended for rifles using the .32 Ideal cartridges, for light and heavy weights. Shape of point is standard and they will seat all right with the regular tools for .32 Ideal cartridges.

32361. This is the regular bullet for .32 S. & W. rifle, making a very nice short range bullet for rifles using the .32 Ideal cartridge.

32362. This is the regular bullet for .32-44 S. & W. target revolver. It also makes a fine short range bullet that will fit the .32 Ideal shells.

32363. Round ball for .32-44 S. & W. Gallery, may be used for very short range in rifles using .32 Ideal cartridges.

.358 is the proper diameter of bullets for all arms using the .38 Smith & Wesson cartridges; it is also the correct size to fit the shells for the old .38 Short, .38 Long, and .38 Extra Long. They will not, however, fit the barrels that are bored for the outside lubricated bullets.

358159. This is the standard .38 Short Outside Lubricated bullet. The heel or base of bullets of this style fits the shell; the largest diameter that fits the barrel is .375, same as .38-55 M.

358160. This is the regular factory bullet for the .38 Long outside lubrication. For the new .38 Long inside lubrication see bullet No. 35870.

358161. This is the standard .38 Extra Long bullet. There has been much trouble about this cartridge. The old Ballard rifles were all bored and rifled for the O. L. bullet, which is .375, but all of the factory ammunition has a straight, one-sized ball .358 in diameter that fits the shell only. For such the Ideal Tool No. 1 is made, which is correct for the Wesson rifles, but not for the Ballards, as the ball will drop through the barrel. For the Ballards we would recommend bullet No. 35870, which may be seated in the regular No. 1 tool.

35864. This is the regular .38 S. & W. bullet. (See Smith & Wesson Revolver.)

35865. This is the same shape as the regular .38 Long Colt's inside lubricated bullet. (See No. 35870.) It has not the cavity at the base, and we do not recommend it for those arms, because it will not expand and take the rifling, although it fits the shell correctly, and seats with same tool.

35866. Round ball for short range indoor or gallery practice for the .38 Smith & Wesson. Fits all the shells for the .38 Short, .38 Long and .38 Extra Long.

35870. This is the regular hollow base expansive bullet, or .38 Long Colt's inside lubrication.

360. This is the proper size of bullets for the .38-44 S. & W. revolver. Bullets of this size may also be used in arms using bullets of the .358 standard.

36071. This is the regular .38-44 S. & W. Target bullet. (See Smith & Wesson Revolver.)

36072. This is a special light weight bullet. We have good reports of it for light charges in the .38-44 S. & W. target revolvers and others.

36073. This is the same bullet as 36072, with the exception of the flat point

and hollow base, which is preferred by many, and which also helps the bullet to expand. These bullets have been favorably reported, when used in the .38 Colt's Navy.

36074. Round ball, for .38-44 S. & W. Gallery and other arms using this size.

36275. This bullet is correct for some of the old style .38 Stevens and Maynard. There are quite a number of old rifles using bullets of this size.

370163. This is a special bullet used by some in arms for the .38-55 by patching to .375 diameter.

.373 is the proper diameter of bullets for the .38-45, .38-50 Remington and .38-45 Ballard rifles; though the .375 bullets are used in them extensively.

373164. This is the .38-45-190 Bullard. Bullard rifles are not made now, but many of them are still in use.

373165. This is the standard bullet for the .38-40 and .38-50 Remington rifles (See Remington Arms.)

.375 is the correct diameter of bullets for all arms using the very popular cartridge .38-55 Marlin. This cartridge was first originated by the Marlin Fire Arms Co. and has been adopted by nearly all other makers of rifles. .375 is also correct for the following cartridges: .38-56, 38-70, .38-72, .38-90. The shape of bullets for all of these cartridges is the same as the .38-55-255 (except the .38-72, which has round point), and will interchange and seat properly with the regular tools.

375166. This is the factory .38-330 grooved bullet. It is used with a shell full of powder for target work.

375167. This is the .38-72-275 Winchester. The point being round, it requires chamber to fit it.

37576. This is the standard .38-55-255 bullet. It will seat correctly in tools for above cartridges. One band off is the regular .38-90-217 Winchester.

37577. Express bullets. They add greatly to the killing powers. The .38-55 rifle with express bullets are sure killers of deer and elk. These bullets are of the standard shape and will seat correctly in the regular tools.

37578. This bullet has one wide, deep groove for lubrication and two strong bands. It is claimed to be an accurate flier, also that it will not strip and lead the barrel if shot at a higher velocity. It has a round point similar to No. 37581.

37579. This series of bullets has many friends. They have wide, deep grooves, point is short, making nice, light weight bullets.

37580. Excellent reports come from this bullet as a very accurate one. It was designed by a sea captain, and has been used successfully in shooting large fish.

37581. This bullet is similar to the standard .38-255, except that the point is round, same shape as No. 37578.

37582. This is a fine short range bullet, and requires a special chamber to seat it.

37584. This is a popular series of bullets for both short and long range. The shape of point is standard. They seat all right in the regular tools.

37585. This is a fine series of sharp pointed, heavy and light weight bullets. They are accurate fliers. With the lighter ones, squirrel and other small game may be killed without mangling.

37586. This bullet was designed by the Zettler boys, of the Zettler Rifle Club, New York City. It has many friends. It is not the same diameter the whole length; the three base bands are .005 of an inch above the standard size, so they cannot be seated in the regular shell without being sized.

37587. Round ball, for light charge of powder, for small game, short range or indoor practice. Too much powder will cause them to jump the rifling; with proper quantity they shoot very nicely.

37588. This is the famous Rabbeth bullet. It is a record maker and is used with Chase patch.

37589. This is an illustration of bullet from Cylindrical adjustable mould. Bullet is cast smooth for paper patching. Mould will cast bullets of varying lengths, with flat, round, or Leopold point.

.386 is the proper diameter of heel of outside lubricated bullet to fit the .41 Colt shells. .406 is the size of the large diameter that fits the barrel.

386176. This is the old style .41 short Colt's O. L. bullet. No. 1 tool only. (See Colt Arms.)

386177. This is the old O. L. .41 Colt's long. No. 1 tool only for loading this. (See Colt Arms.)

386178. This is the new .41 Colt's long inside lubricated. The shells are longer than the old style and the bullet has a hollow base to expand at discharge to fit the barrel.

.400 is the proper diameter of bullets for all arms using the .38-40 cartridges—Winchester, Marlin, and Colt's rifles and revolvers.

40043. This is the regular standard .38-40 bullet. It is also a fine bullet for .40 Cal. short range, as the moulds cast it .003 large. See 40395 for a light sharp point.

40090. Express bullet. Those who have .38-40 rifles can increase their killing power 50 per cent. by using express bullets. The shape is standard, so they may be loaded with the regular reloading tools.

40091. Round ball. Is used with light charge for short range or small game. Too much powder will cause them to jump the rifling. Proper charge will do good light shooting.

.403 is the standard size of bullets for nearly all .40 caliber rifles—Sharp's, Ballard's, Remington's, Winchester's, Marlin's, Colt's, Stevens', and others. The following cartridges have bullets all of the same shaped points: .40-60-210, .40-65-260, .40-82-260, .40-110-260. The shells for these cartridges are different, by Marlin and others. These bullets may be interchanged, and, though of different weights, will all seat properly in the regular reloading tools for these cartridges. The .40-60 Marlin and Colt's bullet or shell is not of the same shape as the .40-60 Winchester. They require different tools. The .40 Bullard size is .413.

403147. This is an illustration of a bullet from the Cylindrical adjustable mould. The bullet is cast smooth for paper patching. Mould will cast bullets of varying lengths, with flat, round, or Leopold point.

403149. This is the original .40-330 grooved bullet, used in the .40-70 and .40-90 Sharp's, Remington, and Ballard, straight and bottle necked shells.

403168. This is the standard factory bullet, .40-60 Winchester. It weighs 210 grains, while the .40-60 Marlin weighs 260 grains. Loading tool correct for one is not right for the other.

403169. This is the standard Winchester bullet for the following cartridges: .40-65-260, .40-70-330, .40-82-260, .40-110-260, all Winchesters, though used but the bullets are the same.

403170. This is the .40-60 Marlin, 260 grains, factory bullet. It is frequently confused with the .40-260 Winchester. There is difference in the shape of point. This bullet will not seat properly in tool that is correct for the .40-260 Winchester.

403171. This is the only .40-370 grooved bullet made. All other .40 caliber, weighing 370 grains, are for patching with paper.

403172. This is the old .40-285 Sharp's, Ballard, and Remington; an old-time popular bullet.

403173. This is a special .40-305, used extensively for Sharp's, Ballard, and Remington rifles.

40394. This series of bullets was designed especially for the .40-70 and .40-90 Sharp's Straight, Ballard, and Remington. Sportsmen having these rifles report them fine. They are much less trouble than patched bullets.

40395. These are good light weight, grooved, short range, .40 caliber bullets. They require special chamber to seat them. Another good .40 caliber short range bullet is No. 40043.

40396. This is a series of bullets liked by many. The point is shorter than standard. There are some good light and heavy weights.

40397. Round ball. This is for extra short range or small game. Shoots well with proper charge. Too much powder will cause them to jump the rifling.

406150. This is the regular factory bullet for the .40-72-330 Winchester. The diameter is .003 larger than all other .40 caliber Winchesters. It is the only .40 caliber bullet having a round point, which is preferred by many. The other .40 caliber bullets that are large to be sized will fit nicely.

413174. Is the Bullard .40-70 or .40-75, and has a very good reputation.

413175. Is the Bullard .40-90-300, and, like the preceding, gives general good satisfaction.

415179. This is a special bullet used by some in the Bullard rifles with good results. It is not much used.

.419 is the proper diameter of bullets for the .44 S. & W. American Model pistol, .44 Evans rifle, .44 long Frank Wesson and Ballard rifles, and the .44 Merwin & Hulbert old model pistol.

419180. This is the .44 S. & W. American pistol bullet. (See Smith & Wesson Revolver.)

419181. This is the bullet for the .44 Evans New Model rifle, and is a very good one.

419182. This is for the .44 Long Ballard rifle; also for the .44 Extra Long Frank Wesson.

421183. This is for the old model Merwin & Hulbert revolver, and is very little used at present.

.424 is the proper diameter of bullets for all arms using the well-known .44-40 cartridge. It is the original .44 W. C. F. made by the Winchester Company for their model 1873 repeating rifles. It is now used by Marlin, Colt, and others, and has many friends among hunters.

424100. This is a short range, grooved ball for rifles or pistols. Requires No. 3 special tool with double adjustable chamber.

424101. Round ball, for short range or small game. Good when proper charge of powder is used. Too much powder will cause them to jump the rifling. Requires same tool as No. 424100.

424102. This is a short range ball for rifles, revolvers or pistols, and has a flat point and hollow base. Requires same tool as No. 424100.

42498. This is the regular .44-40 bullet for Winchester, Marlin, and Colt's rifles and pistols.

42499. Express bullet. The shape is standard. Loads correctly with the regular tools. Hunters will find that the killing qualities of their .44-40 rifles are increased 50 per cent. by the use of this bullet.

427103. This bullet is for the .42 caliber Russian rifle, and is very effective.

.429 is the proper diameter of bullets for the .44 Smith & Wesson Russian revolver and all other arms using that cartridge.

429104. This is the lightest short range groove bullet made of this diameter. To seat it properly, the No. 3 special tool with double adjustable chamber is required.

429105. This bullet is same as 429104, except that it has round point and flat base, making it a trifle heavier. It requires the same tool as above to seat it.

429106. This bullet is lighter in weight than the regular factory bullet, and is preferred by many on that account. Requires No. 3 special tool with double adjustable chamber.

429107. This bullet is the same as 429106, but lightened by having flat point and hollow base, which is preferred by some. Requires the same tool as above to seat it.

429108. Round ball. This is used for short range or gallery practice. Requires same tool as the others above.

429184. Is the regular .44 S. & W. Russian bullet, 256 grains. (See Smith & Wesson Revolvers.)

430185. This is the old model .44 Colt's pointed bullet. It is a heel ball and is for outside lubrications. The larger or forward part that fits the barrel is .446 in diameter. .430 is the size for the shell.

439186. Is the regular .43 Spanish grooved bullet, and is reported very effective at all times.

.446 is the diameter of bullets for the old Sharp's, Remington and Ballard rifles, both straight and bottle necked shells.

446187. This is the regular .44-90 B. N., 470 grains; and the 400 grains is for the .44-77 B. N.

446188. This is a special bullet for the above rifles, designed by Major McFarlane.

449189. This is the regular factory bullet for the .45 S. & W. "Schofield Model" revolver.

.451 is the standard size of bullets for the original .45 caliber Sharp rifles. There were many rifles, however, made by the Sharp Company toward the last of their existence, that were bored, rifled and chambered for the .45-70 U. S. Government cartridge, which requires a ball .457 in diameter. This mix up has caused much trouble among owners of these valuable rifles. It is generally safe for those whose rifles will chamber the regular .45-70 Government cartridges correctly to conclude that the proper size ball for such rifle is the .457 Government and not the .451 Sharp. The long range Remington and Ballard rifles also use the standard Sharp shells (and bullets), which are designated as follows: .45-75 Sharp's; .45 S., 2 1-10"; .45 S., 2 4-10"; .45 S., .2 6-10"; .45 S., 2⅞"; and .45 S., 3¼". 2 1-10 inches is also he standard length of the .45-70 Government shell.

451112. These bullets are the same shape as the .45 caliber Winchester. There are some fine light and heavy weights in this series.

451113. These bullets are similar in shape to the .45-70 Govt. No. 3 special tool only made to seat them.

451114. This is one of the old original Sharp's grooved bullets; it is called the old reliable. No. 3 special tool only.

451115. This is the famous Col. Pickett's .45-325 patched, express bullet. No. 3 special tool only.

451116. This is the same in shape as the 451115. It is solid and has a hollow base. No. 3 special tool only.

451117. Express bullet, shaped after the .45-70 Govt. No. 3 special tool only.

451118. Round ball, for short range or practice work. No. 3 tool with double adjustable chamber required.

451119. This is a very popular series of bullets, and excellent for large game. No. 3 special tool only.

451120. This is an illustration of a bullet from Cylindrical adjustable mould. The bullet is cast smooth for paper patching. Mould will cast bullets of varying lengths, with flat, round or Leopold point.

.454 is the standard diameter of bullet for the .45 Colt's revolver. The frontiersman's and the cowboy's friend.

454148. The heavier weight is lighter than the standard bullet and is claimed to be more pleasant to shoot. The lighter weight is the lightest grooved bullet made for the .45 Colt's. Requires No. 3 special tool with double adjustable chamber.

454190. Is the regular standard .45 Colt's, 255 grs. See Colt Arms.

45467. This bullet is very popular for medium charges, and requires the same tool as above.

45468. This is the same as 45467, except that it is made lighter by having flat point and hollow base. Some prefer this form of bullet. No. 3 special tool with double adjustable chamber required.

45469. Round ball. This is used with a very light charge for short range and gallery practice. Requires same tool as above.

.456 is the proper diameter of bullets for all arms using the following cartridges: .45-60-300, .45-70-350, .45-75-350, .45-70-330 Gould, .45-90-300, .45-125-300; all Winchesters. These bullets are all of the same shape and may be interchanged. They will seat properly in any reloading tool for above cartridges. This size is so near the U. S. Government .45 caliber that the bullets of both sizes may be interchanged; the latter, however, require different loading tools.

456121. This is a series of bullets having the standard points. All are correct for any of the regular reloading tools.

456122. This is the famous .45-330 Gould express bullet, designed by Mr. Barlow, and was originally made for Mr. Gould, editor of Shooting and Fishing. It has a great reputation as a killer of large game. The shape is correct for any of the regular reloading tools for 45 Winchester caliber. It is also used in the .45-70 Government shells. Requires chamber same shape as Winchester bullets.

456123. Round ball, is to be used with light charges of powder for small game or short range practice. Requires No. 3 tool with double adjustable chamber.

456191. This is the regular factory bullet for .45-60, .45-90, and .45-125 Express. The .45-90 Winchester shell is loaded with various charges of powder and different bullets; the cartridges are known as .45-85-350, .45-82-405 and .45-90-300. With Perfection mould you can get the whole series of bullets No. 456121 and the same reloading tool will be correct for all.

456192. This is the standard bullet for .45-75 and .45-70 Winchester. See Winchester Arms.

.457 is the proper size of bullet for the standard .45 U. S. Government rifles and all other arms using that ammunition. The .456 Winchester bullets are so near this size that they are frequently used for the same arms when lighter bullets are desired; they, however, require special chamber to load.

457124. This is the regular standard .45-70-405 Government bullet and is very satisfactory.

457125. This is the standard .45-70-500 Government bullet. No. 6 or No. 5 tool is made for this cartridge, as well as for 457124.

457126. This is a series of bullets lighter and heavier weight, having same shape as the Government 405 grains. Single mould will make round standard point. Perfection mould will make flat point. Either may be seated with the regular tool.

457127. This bullet has become very popular for light charge, small game, short range or gallery practice. The various U. S. Government Marine Barracks have been furnished with Armory moulds for this bullet, for target practice, on account of its accuracy. It requires double adjustable chamber to seat it.

457128. This bullet is the same as 457127, except that it is lightened by having point flat and base hollow, which is preferred by some. Double adjustable chamber required.

457129. Round ball for very short range, armory or gallery practice. Requires double adjustable chamber.

457130. This bullet is same weight as the round ball. Is preferred by some

for light work on account of having groove for lubrication and two bands to hold on to the rifling.

457131. This is the standard factory bullet for the .45-85-285 cartridge. Chambers for .45 Government or .45 Winchester do not seat this bullet properly.

457132. This is a special bullet used by some military sharpshooters for long range target work.

457193. Is the regular .45-70-405 Marlin. The difference between it and the .45-70-405 Government is the flat point.

457194. Is a special tip for bullets 457124 and 457193. These tips may be cast of soft, pure lead for mushrooming or upsetting, thus increasing the killing powers; or they may be cast of a very hard mixture to increase the penetration. Any one having a mould for the .45-70-405 Government or Marlin, or for the .45-70-500 Government may use these tips. The tips are cast from soft or hard metal as desired and then set in the moulds mentioned and the balance of the bullet run from the regular mixture.

457195 is a bullet for the Webley Mark 1 (English) and the Colt's and Smith & Wesson revolvers.

.509 is the proper diameter of bullets for the .50 Sharp and Remington sporting rifles, also for many English arms using the Eley .50 caliber cartridges.

509133. These bullets are in shape like the .50-70 Government. No. 3 special tool required.

509134. This is a round point bullet of lighter weight than standard. No. 3 special tool with double adjustable chamber.

509135. This makes a fine light weight grooved ball for above rifles. No. 3 special tool with double adjustable chamber required.

509136. Round ball. This is for light charge of powder, small game or short range.

.512 is the proper diameter of bullets for all arms using the .50-110-300 express, .50-100-450, .50-95, etc. The points of all these bullets are of the same shape.

512137. This bullet, 350 grains, is similar to 512138, with four grooves only. One band shorter will make a bullet weighing about 300 grains, which bullet is thought well of by many.

512138. This bullet was first made by Mr. Barlow for a heavier ball for the .50-95 Winchester. It was afterwards adopted as the standard bullet for the .50-110-450 Winchester.

512139. This is the standard .50 Winchester express bullet. See Winchester Arms.

512140. Round ball, for very light charge of powder, short range, etc.

512197. This is a special bullet made for the New York Seventh Regiment. Very favorably reported.

.515. This is the standard size for all arms using the regular .50-70 Government cartridges.

515141. This is the regular standard .50-70-450 bullet, and has an excellent reputation.

515142. This is a special bullet made for the New York Seventh, Thirteenth, Twenty-second and other New York regiments. Shells are supposed to be crimped over the second band, making the cartridge over all longer, allowing more room for the powder. It is used for long range target work. No. 3 special tool is required.

518144. This is a special grooved bullet made for short range, gallery or armory practice. It is made a little above the Government size, but used in those rifles. Has met with great favor among the New York militia for short range or gallery practice. No. 3 special tool required.

518145. This is the same shape as 518144, is one band longer to suit those who desire a medium range bullet. Requires same tool as above.

538146. This bullet is for some of the old style rifles called .58 caliber, but is seldom seen in use at the present time.

POWDER.

The incorporation, or grinding together, of the three ingredients that form gunpowder is by far the most important process in the whole manufacture, for unless the minute particles of the ingredients be thoroughly blended and brought into the closest contact with each other, all subsequent operations—however well performed—will not compensate for the error. The incorporating mill consists of two large and heavy "hard chill" cast-iron edge runners, revolving on a circular cast-iron bed; the peculiar action of these runners or rollers is well adapted for thoroughly grinding and incorporating the several ingredients; their great weight is for crushing the ingredients; which are also ground together by the twisting action produced by the rollers traveling round in a small circle. Each roller travels over the bed in a separate track, and is assisted by the plough, which mixes the material, so that it is subjected to crushing, grinding, and mixing by the one operation. The composition attains a body in about one hour after the runners are set in motion, and the action of the ploughs in moving the whole of the material on and across the bed thoroughly mixes it, and subjects every particle to the same amount of pressure. Each pair of runners is provided with a telltale dial, which shows the attendant the time that the mill has to run, and enables him

to judge the condition of the cake from time to time. From three to four hours is the period a charge should be on the mill, providing the engine or water-wheel is maintained at its proper speed. The cake should be of a blackish-gray color, and, when broken, of a uniform appearance, without any white or yellow specks in it; the presence of these would indicate insufficient incorporation or grinding. Furthermore, it should not be more than half an inch in thickness, in order to be thoroughly incorporated, nor should it be less than a quarter of an inch thick to insure safety, because if the runners are allowed to come in contact with the bed, the friction caused by their twisting action is so great that an explosion would almost certainly be the result. For fine sporting gunpowder the operation of incorporating is continued in some cases for as long as eight hours, and with heavier rollers, but it is doubtful whether the powder is much, if at all, improved thereby.

When grains of powder are united to form a charge, and fire is communicated to one of them, the heat and expansive gases evolved insinuate themselves into the interstices of the charge, envelop the grains, and unite them one after another. This propagation of ignition is called inflammation, and its velocity the velocity of inflammation. It is much greater than that of combustion, and it should not be confounded with it. When powder is burned in an open train, fine powder inflames more rapidly than coarse; such, however, is not the case in fire-arms, owing to the diminution of the interstices. If a charge were composed of mealed powder, the flame could no longer find its way through the interstices, and the velocity of inflammation and combustion would become the same. Now, supposing one grain or particle alone be ignited, it will be inflamed over the whole surface, and the progressive combustion will take place from the exterior to the interior. Its rate of combustion will therefore depend upon both its shape and size, leaving out entirely for the present, the question of density and hardness. A particle of spherical or cubical form will expose less surface to ignition in proportion to its volume than one of an elongated or flat shape, and will consequently require a longer period for the combustion of its entire mass; the larger the particle, also, the longer will be the time required for its combustion. Looking, then, at one grain of powder by itself, we may say that the larger it is, and the more nearly its form approaches a sphere, the longer will its combustion take, and the slower will be the evolution of the gas. When, however, we come to regard the action of an aggregation of such particles, as in the charge of a gun, the rate of ignition of the whole charge is also affected by the size and shape of the grain. The part of the charge first ignited is that near the vent, and the remainder is inflamed by contact with the heated gas generated by the combustion of this

portion, so that the rate of ignition of the whole mass will be regulated by the greater or less facility with which the gas can penetrate throughout the charge, which is itself dependent upon the shape and size of the interstices between the grains. If the grains be spherical and regular in form, the interstices will be comparatively large and uniform, and the gas will penetrate the mass with facility; again, the larger the grains, the larger the interstices between them. If, on the other hand, they be flat or flaky and irregular in shape, the passage of the gas will be more difficult, and the rate of inflammation of the charge reduced. We see, therefore, that the considerations which affect the more or less rapid combustion of an individual grain of gunpowder, also affect the rate of ignition of a charge of such grains, but in an opposite direction; so that a form of grain which individually burns rapidly may offer an increased resistance to the passage of the heated gas through the charge, and thereby retard its ignition, while a grain which will burn more slowly may allow of the charge being more rapidly ignited. By varying the size and shape of the grain alone, a powder may therefore be obtained, a charge of which shall be ignited rapidly throughout, but burn comparatively slowly, or one which shall be ignited more slowly, but when once inflamed burn very rapidly. It is necessary to draw a clear distinction between a rapidly igniting and a quickly burning powder. The heat developed increases with the charge, and as the velocity of the gases increases with their temperature, it is therefore evident that a large charge is consumed quicker than a small one; it is also true that the loss of heat absorbed by the surface of the bore is much less sensible when the charge is greater than when it is small; that is, the quantity absorbed is proportional to the surface of the square of the caliber of the gun and the heat developed increases as the cube of the caliber.

The various black powders, every variety having its merits peculiar to itself, have served us long and well; but, with the appearance of the multiple loading rifle, smokeless powder is coming into extensive use for military and hunting purposes. The advantage of smokeless rifle powder is, that the products of combustion being entirely or mainly gaseous, the solid or unconsumed residue is very small, leaving the bore of the rifle comparatively clean after firing. The smoke produced is almost nothing, generally, only a slight puff being noticeable and that dissipating immediately. The chief advantage from the sportsman's or hunter's standpoint is the high chamber pressure of from fifteen to twenty-five tons per square inch, giving to the bullet very high muzzle velocities—2,000 to 2,500 feet per second, which consequently give very flat trajectories. A flat trajectory has always been insisted on by sportsmen for hunting rifles, even that resulting from heavy charged military arms not sat-

isfying them, and rightly so, for it almost eliminates or at least greatly simplifies the calculations of distances, and the constant manipulation of sights common to the black powder high trajectory rifles.

Compared with chamber pressures developed by black powder the difference is remarkable, as with black powder the pressures were probably never over fifteen tons per square inch, whereas with smokeless powder, using a charge to impart 2,000 feet velocity, the chamber pressure runs up to twenty or twenty-five tons per square inch, and to give 2,500 feet velocity pressures run up from twenty-five to thirty tons for regular charges and for excessive charges sometimes as high as forty tons per square inch.

Such enormous pressures require greatly increased strength and solidity in the breech mechanism, and a corresponding increase in the strength of the barrel. Both barrels and action are now made of a superior grade of steel, costing five times as much as the machinery steel used for black powder rifles, and the barrels are increased in thickness over the chamber and to keep down the weight reduced in thickness toward the muzzle. The jacketed bullet being so much harder than lead would wear out the rifling rapidly were not the barrels made of hard material, as hard as can be properly worked. All of which add greatly to the cost of the present rifle.

The chamber pressures in nitro charged shot-guns do not compare with the intensity of pressures in rifles, they averaging generally not over five or six tons per inch. Nitro powders as used in shot-guns should never be used in rifles; nothing but smokeless rifle powder should be used, following carefully the directions for loading, and no experimenting with excessive charges should be indulged in.

The high chamber pressure giving great velocity to the bullet, necessitates, in order to secure steadiness of flight, a more rapid twist to the rifling, say one turn to six and a half to twelve inches, instead of the sixteen to twenty-four in the rifles made for black powder. Leaden bullets fired with high velocities through such barrels will not follow the rifling, but will strip and override the lands, for which reason the surface of the projectile is made of some harder metal, but to retain the high specific gravity of the lead with the consequent ability of the ball to better overcome the resistance of the air, the greater portion of the bullet is made of a lead slug and then coated or jacketed with a covering, about 0.02 inch thick, of some hard metal, as steel, copper, nickel, or German silver.

The soft lead bullet of the old rifle is made of about the same or even less diameter of the bore, and then under the effect of its inertia and the blow produced by the combustion of the charge was set out into the grooves of the

rifling. With the jacketed bullet the maximum diameter exceeds that of the bore by a difference nearly equal to double the depth of the grooves and the bullet is forced through rather than set out into them.

The largest game in the world, the royal Bengal tiger of India, the elephant and the rhinocerous of Central Africa, are now being successfully hunted and slain by men using the .303 caliber Savage rifle. Sportsmen who have never tried the small-caliber rifles and smokeless powder ammunition are somewhat skeptical as regards the killing or stopping power of the small metal-covered expanding bullets. The secret of the deadly effect of these small projectiles lies in their expanding qualities and extraordinary velocity, which impart a percentage of their energy to the otherwise inert flesh and bone; and these substances being acted upon by so quick a blow, become themselves projectiles, following a well-known mechanical law, lacerating the surrounding tissues and bone, and leaving a path of destruction which is widened by resistance encountered by the bullet.

RELOADING SHELLS.

In 1866, when the manufacture of the service-cartridge was commenced at Frankford Arsenal, Philadelphia, Pa., little or nothing was known as to how a good reliable cartridge could be made. To explain the difficulties which had to be overcome at every step, the machines to be invented to do the work uniformly, accurately and economically, would fill a large volume. It can be said, however, that through the combined efforts of the officers in command of Frankford Arsenal, Philadelphia, and the National Armory, Springfield, Mass., a cartridge was produced which would reflect credit upon any nation. Up to the present time this cartridge, perfected and modified, has been the service cartridge for breech-loading small-arms and machine guns. With the invention and adoption of breech-loading small-arms and metallic cartridge shells, heavier and more uniform charges of powder were introduced, giving greater range and accuracy. This was followed by a desire and necessity for soldiers becoming trained marksmen. To meet economically the demand for an increased expenditure of ammunition thus produced, reloading shells were used. Until this demand came such shells had not been made to any extent at Frankford Arsenal, although a plan for making them had been worked up at that post which has since been quite generally adopted by all manufacturers, of reloading shells in this country, and also abroad by several nations, viz., making a pocket in the head of the shell formed in the continuous metal from which it is drawn, and into which a primer could be inserted from the exterior. Reloading shells have generally been made of

brass, and are now so made to a great extent. This metal possesses sufficient elasticity, but is wanting in durability, as experience has proved.

The Bridgeport tool for exterior extraction of the exploded primer, and specially adapted to the "Berdan" shells, may be used for all cartridges; but the primer punch for central-vent shells is the more simple and positive in its action. If the wire of the extractor should break, extra ones are supplied with each set of tools, and are put in by unscrewing the plug in the head of the extractor, driving out the broken pin with the new one in the direction of the head, the hole being tapered, dropping in the new pin at the head, and replacing the screw plug.

The shells, whether old or recently fired, should always, if possible, be cleaned of the powder residue, etc., by immersion and agitation in hot water. Cold water will clean them, but hot water is a better solvent, and the shells dry more quickly when taken out of it. When circumstances render it impossible or inconvenient to use water, the brush wiper may be used for brushing out the residuum left in the shell by the combustion of powder and fulminate. After cleaning, examine the shell to ascertain if it shows signs of rupture. These may generally be seen at the head, the mouth, or as transverse or longitudinal marks on the body. The shell is next forced into the die for resizing, using the mallet if necessary, striking fairly and squarely on the head of the shell, so as to avoid bending or distorting its flange. The outside of the shell or inside of the die should be oiled to facilitate the entrance of the shell and prevent abrasion. It is driven out by means of the punch inserted in the die and shell. This last operation is likely to cause a bur on the mouth of the shell, which would deface the bullet if not removed. For this purpose the scraper is supplied. Insert it about 0″.5 into the shell, held in left hand, scraper in right; give the shell and scraper a half-turn in opposite directions, bearing with the scraper only hard enough to take off the bur. The handle of scraper and axis of shell should be kept nearly parallel to each other to avoid thinning the mouth of the shell. Although the shell may be fired several times without resizing, this operation is considered necessary after each round, otherwise the shell will be unduly expanded by successive rounds, and eventually fail to enter the gun-chamber; after which the extra force required to resize it might prove injurious to the metal.

The shell is next inserted in the loading die, the primer entered into the pocket, and the safety socket placed over it, large end down; the primer may then be driven home with the primer-punch and mallet. Considerable loss of primers by premature explosion in this operation has occurred, and a tool is supplied for setting primers by pressure, which is used as follows:

The shell is placed in the tool for inserting primers—the primer having been previously just entered in the pocket—and the primer pressed home by means of the lever and screw. The end of the screw is so formed as to insure the primer being below the surface of the head at least 0".005. It should be slighty lubricated to avoid wear of the projection on the end and abrasion of the primer. The Bridgeport tool may also be used to set the primers of all shells but the "Lowell," which has, intentionally, a primer to fit the pocket tightly, and requires considerable force for its proper insertion. The screw tool will set the "Frankford Arsenal," "Berdan," "Lowell," and "Winchester" primers equally well. The shell is now ready for reloading. It is inserted in the loaded die, the latter into the safety-socket, and the powder-funnel into the mouth of the die. A level measureful of powder is then poured into the shell through the funnel, after which the bullet, or shot, is inserted and driven home with the punch and mallet until the shoulder of the punch touches the end of the die. This insures proper and uniform length of cartridge.

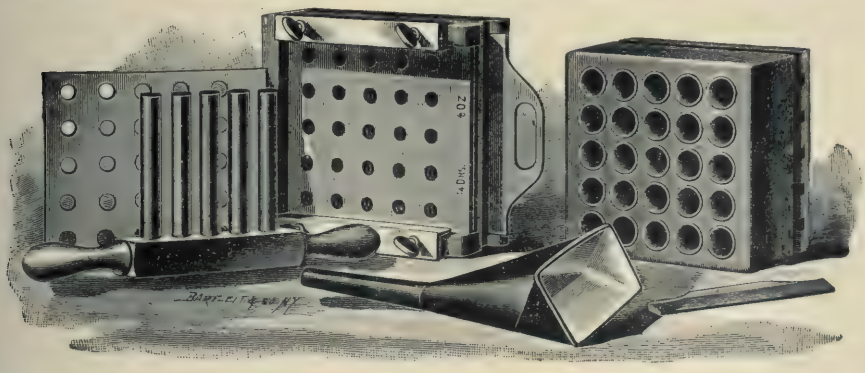
The reloading die may be used as a gauge for determining whether cartridges are of the proper dimensions for entering the chambers of guns. As a rule, any cartridge that will enter the reloading die will enter the chamber of the gun freely. It is, in fact, a combined reloading die and gauge for cartridges. To use it as a gauge insert the punch in the small end and the cartridge in the opposite end. If the cartridge enters fully without moving the punch, it is of proper length and diameter.

When shells are reloaded for immediate use they may be fired after the foregoing operation. But if loaded for storage for any length of time, the crimping die should be used to secure the bullet in position. To perform this operation, insert the loaded cartridge into the die, then set the head in the recess of the safety-socket, the latter resting on a bench or table, and drive the cartridge in with the blows of the mallet on top of the die. The safety-socket has a central hole concentric with the counter-bore. In extracting the primers it supports the head of the case and forms a receptacle for exploded primers. It also supports the head of the shell on opposite ends in the operation of loading and crimping, and the central hole protects the primer from severe shocks in driving home the bullet, and it also guides the punch in setting the primers. Particular care should be taken to free the exterior of the shell from grit or dirt before resizing, to protect the die and shell from scratches; also that neither water nor oil gets into the case or primer, as either will injure or destroy the powder or fulminate. No excess of oil should be left in the chamber of the gun or on the cartridge, as it would tend to rupture the case in firing and also temporarily disable the gun. A slight amount

of lubricant on the cartridge or chamber throughout their length seems to prolong the life of reloaded shells. The tendency of the shells to tear apart appears to be due to their unequal expansion in the chamber; the front end being thin is more quickly expanded, and in the absence of the lubricant is held by pressure and friction against the walls of the chamber, while the thick rear end of the shell is forced backward by the pressure of the gases. As a rule, sufficient lubricant from the bullet finds its way into the chamber to answer all purposes. These tools are made as simple and strong as possible. Some of them, particularly the dies and punches, require to be used with great care, so as not to injure their surfaces or alter their dimensions, where such would affect the cartridge. They are cheap, durable, and quite rapid in operation if the work be divided among several operators or be done by one person performing each operation separately on a number of shells.

All our prominent gun manufacturers realize the fact that two guns made practically alike, so much so that the closest measurements with most delicate instruments fail to disclose the slightest difference between the two, do not give like results with identical loads when tested. One of these guns may show superior results with No. 8 shot, another with No. 7, and still another with No. 9. As with the shot so with the powders used. A charge of three drams may prove the best with one arm, while it takes the fraction of a dram more to ensure like results in the other. Hence it is exceedingly important that gun and load harmonize, in order that the best shooting of each particular gun may be brought out. In the old days, when this matter was even thought of by the general sportsman, guns were condemned as being useless as shooting weapons, when, had the knowledge of such things been as good as it is to-day, a change of ammunition in its quantity might have made the shooting of such supposed worthless arm satisfactory in all respects.

The secret of loading to get good shooting from a shot-cartridge, is a



system of uniform measurement of the charges of powder and shot; the even

distribution of these charges level in the shell, so that the wads may lie horizontally on both powder and shot, and in placing them with uniform pressure each time, so that all shells will be loaded precisely alike. These results are only obtainable by the use of proper charging and loading tools, being graduated by actual weight of whatever powder the sportsman desires to use. The system of measuring with brass plates as used in the combination chargers is positive, each one being stamped for the charge for which it is to be used. There is not the slightest danger of mistake as these plates are specially flattened and rolled to a uniform thickness, not varying one-thousandth of an inch, so that all the plates and holes are exactly alike. With these outfits 25, 50 or 100 shells can be loaded at one time, and will not show any variation one from another.

One of the requirements of a good cartridge is the use of a first-class wad or wadding, particularly over the powder; and to protect powder from the injurious effects of contact with a chemically prepared or greased felt it is advisable first to place over the powder a cardboard wad, or waterproof wad if preferred, of the exact size of the internal diameter of the shell and over this wad one or more felt wads one size larger than the bore. Good results are attainable in different guns with several methods of using wadding, and this can be ascertained by experiment some preferring to use one cardboard and two felt wads over powder, and others one felt between two cardboard wads. It is a question, however, whether the cardboard on top of felt wads is of any benefit. All that is necessary is to establish a complete gas-check by good wadding of some kind, made of a close, firm texture that will not permit gas from the powder charge to get to the shot. Over the shot it is considered better to use a material that will easily crumble to pieces. To hold this top wad in place, the shell should be carefully and evenly crimped down on the wad.

There is just as much depending upon the uniformity and perfection of the

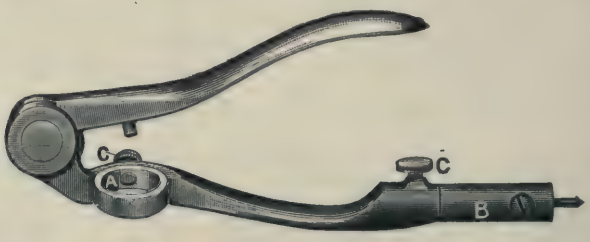
crimping of a paper shell to produce accuracy and regularity in the shooting as there is upon any one feature in making perfect ammunition. To perform this

correctly the Ideal Manufacturing Company's Star Crimper, shown in the drawing, is used. It works positively on a straight line and permits of interchangeable heads, followers and pins, and that will turn both the square and round crimp. Only one Star frame is required for 10, 12, 14, 16 and 20 gauge shells. The square crimp is preferred by users of single and double barreled shotguns, as that form is said to meet the expelling force of the powder with greater resistance, not straightening out as easily as the round crimp. The users of the repeating shotguns, however, find that the square crimp will at times catch on entering the chamber, when being inserted by the mechanism, therefore the round crimp is required to obviate that trouble. Uniformity is the one thing desirable in cartridges. Without it there cannot be accuracy. There must be a uniform charge of powder and shot; there also must be a uniformity of wadding and ramming; and lastly, though not the least, there must be uniformity in the crimp and the pressure

brought to bear upon it. A difference in conditions must naturally bring about a difference in results. Uniform and regular shooting cannot be insured unless there is uniformity and regularity in loading the shells. Many have an idea that to get strong shooting the whole charge must be rammed very snugly, and the powder, shot and wadding forced extra solidly and crimped as snugly as it is possible to force the loaded shell up against the crimping head, the shortness of the lever on the crimping tool only preventing the cartridge from being crushed.

An excellent implement for loading shotgun shells has been lately invented. It is a very compact, complete and perfect working combination of instruments, arranged in such a manner that each part can be operated for its specific work without causing any inconvenience from the others, so frequently found in combination tools. It is four distinct implements in one, viz.: a de-capper, re-capper, rammer and shell extractor, so arranged as not to be any larger than a common rammer.

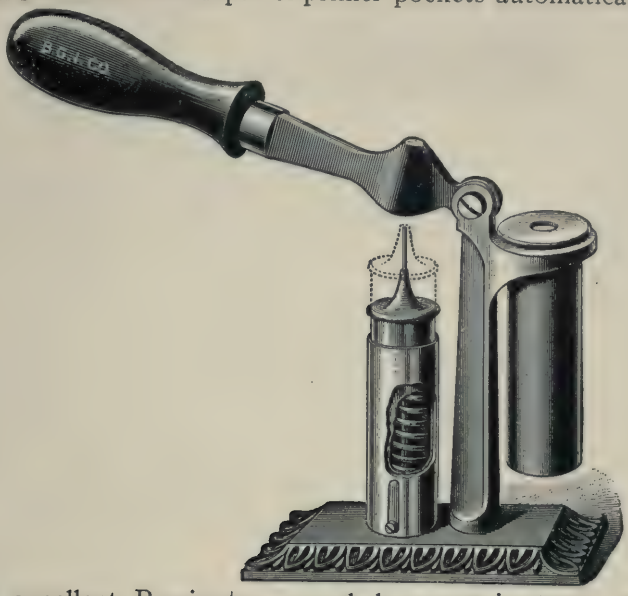
The Ideal diamond crimper, the successor to the well-known Spangler closer, has frames, cranks and levers made of semi-steel castings. The lever is furnished with a pivotal crucible steel grip, making it a practical straight line feed for standard length of shells. The improved crimping-head permits the use of interchangeable pins, to form the square and round crimp. Sportsmen who use a single-shot rifle and do not desire to crimp their shells, but seat the bullets in the barrel in advance of the shell, will find the Ideal re- and de-capper a most handy tool. It opens on the side. The die "A" rests upon a perfectly machined seat, and is held in place with the screw "C." The de-capping plug



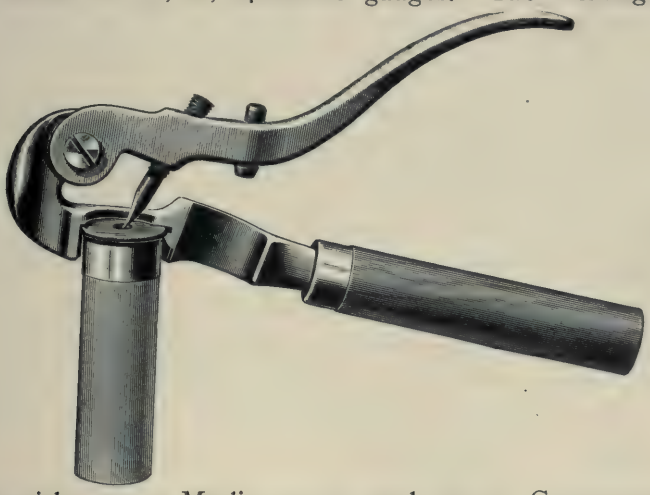
"B" is also interchangeable, being securely held by the knurled set screw "C." Re-capping dies and de-capping plugs for any caliber from .22 to .50 can be furnished to fit the same tool. The levers are polished and nickel-plated. The implement weights complete but five ounces. The Ideal "straight-line" re- and de-capper will de-cap and re-cap all shot-gun shells with a central fire hole, brass or paper, domestic or foreign make, whatever the inside shape may be, high or low base. It will seat any and all sizes and shapes of primers, straight in the pocket of the shell, positively all the same depth, without concaving the head, or disturbing the fulminate, which causes miss-fires.

The "Common Sense" re- and de-capper made by the Bridgeport Gun Implement Company has a wide reputation. It is a combination 10 and 12 gauge, and will re-cap and de-cap any of the new high grade paper shells of any make. After inserting the bushing for 12-gauge shells, bend the ends slightly to prevent coming out when withdrawing the shell. It has been so constructed that the needle adjusts itself to whatever shell the sportsman may desire to extract the primer from. If the needle needs to be long for one shell, or short for another, this length is regulated automatically without any adjustment by the user. The needle being protected by a movable sleeve adapts itself to the desired length required for extracting a primer the moment pressure is brought upon it. It is so protected by this movable sleeve that there is no danger of breaking the needle, as would be the case on any of the old style de-cappers should one attempt to take off a primer requiring a short needle with an extracting needle that was too long. This movable sleeve

or holder is supported by a spiral spring, which enables it to adjust itself to the different lengths of shells and depth of primer pockets automatically.



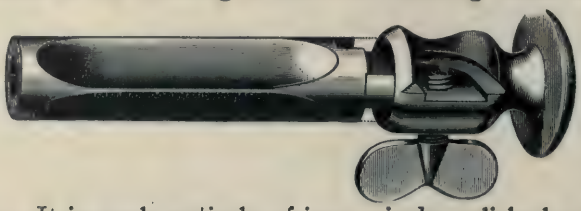
The very excellent Remington re-and de-capper is strong, simple and effective. It is made for 10, 12, 14 and 20 gauges. The Remington reloading



tools (.45 Spanish, .45-70 Marlin, .45-70 and .50-70 Government complete) consist of bullet mould, ball seater, re-capper, de-capper, powder measure and wad cutter.

An ingenious tool for reloading empty cartridge shells has been recently patented by Walter H. Gripman, of Sioux Falls, South Dakota. By means of this tool the old primer is rapidly expelled, a new primer accurately inserted, the shell and bullet resized, the mouth of the cartridge expanded, and the bullet securely fastened in the charged shell. An excellent brass shot shell

loading tool, shown in the drawing is made for loading brass shot shells Nos.



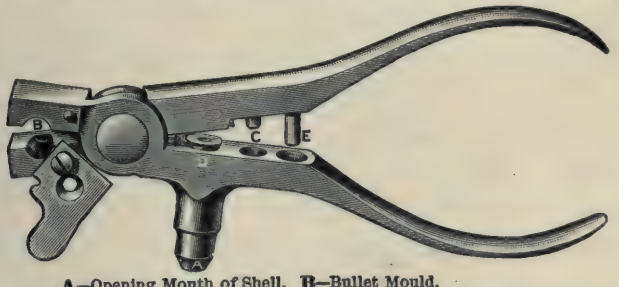
10 and 12 gauge. It is made entirely of iron, nicely polished and nickel plated, and will last a life-time. It is a capper. de-capper and rammer.

Winchester reloading tools are made in two styles—the lever tool and the Model 1894 tool. The lever reloading tool removes the exploded primer, straightens the shell at the mouth, inserts the new primer, and fastens the ball in the shell. The Winchester Model 1894 reloading tool was devised to make the reloading and resizing of large sporting ammunition more easy. By a strong lever, a small motion (not more than .03 of an inch) is imparted to the slide. The cartridge is contained in the die. The die screws into the frame. The shell, with its charge and bullet, is put together by hand and put into the die. The die is screwed into the frame as far as it will go readily. A motion of the lever toward the die will force the cartridge into the die through a short distance. The backward motion of the lever releases the pressure on the cartridge, and the die can then be screwed up through a part of one turn. The repeated motion of the lever and the continued screwing up of the die bring the cartridge its full length into the die, insert the bullet to the right distance, crimp the cartridge around the bullet, and reduce the shell to its original size, so that it will go freely into the gun. With this tool it will be found possible to easily reload the largest cartridges, compressing the powder, putting the bullet to place, and reducing the shell on the outside to its original form. By the reverse motion—that is, by lifting the handle of the lever away from the die—the slide is lifted, and the cartridge, by means of the extractor, is drawn a slight distance out of the die. When the handle is returned to the die, the latter can be unscrewed a corresponding distance. Another motion of the lever draws the cartridge still further out of the die, and with a few motions it becomes so loosened in the die that the latter may be easily unscrewed. As soon as the cartridge isloosened in the die, the extractor loses its grip, and the die and cartridge are taken from the frame together. This tool permits, with the use of little force, the most exact reloading, including the resizing of the shell.

Extensive experiment has shown that the best possible results are obtained with rifle, powder and bullet when the bullet is seated into the barrel about 1-32 of an inch ahead of the shell. The bullet is thus well in the rifling

before the explosion takes place, obviating any possible chance of its being started in a tipping or crosswise manner. The shell is then filled with powder (a wad on top or not as desired), and inserted in the chamber after the bullet. The Ideal bullet seater has an adjustable plunger that can be set with a check nut to seat the ball any depth desired, and they will be absolutely the same depth, which must be, to insure uniform shooting. The implement weighs but four ounces, and is made for all calibers from .22 up. It is supposed by some that the chamber of a reloading tool should be shaped so as to re-form a shell that is swollen or expanded, and at the same time force the bullet in, pack the powder and crimp the shell. This process is impracticable for several reasons. First—The shells are made of elastic metal, and must be compressed beyond the desired size, so as to allow for the springing back of the metal. To do this requires more power than is consistent with the construction of a practical, portable hand tool. Second.—As the shell is primed and the powder is in, there is more or less danger attending this operation. Third.—The bullet is composed of non-elastic metal, and as the shell is being compressed with the bullet in, it, of course, compresses the bullet which being non-elastic, remains to the size comprssed, and the accurate diameter of the bullet is lost, and it would be loose in the shell were it not for the crimping of the shell into it, and the powder pressing the bullet up against the crimp. Experience has proven that the shell, if expanded, should be reformed while empty, and in a separate tool. Fortunately the majority of shells do not expand so as to interfere, and loading tools as constructed are all that is required.

The popular reloading tool, No. 4, made by the Ideal Manufacturing Co., and shown in the drawing, is complete in itself. It has no extra pieces to get



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

lost or carry, it performs all the operations required, as constructed, it moulds the bullet a trifle above the standard size, which after they are lubricated, can be forced through the sizing die, which packs the grease firmly in the grooves, removes the surplus and makes the bullet perfectly round and of the correct diameter.

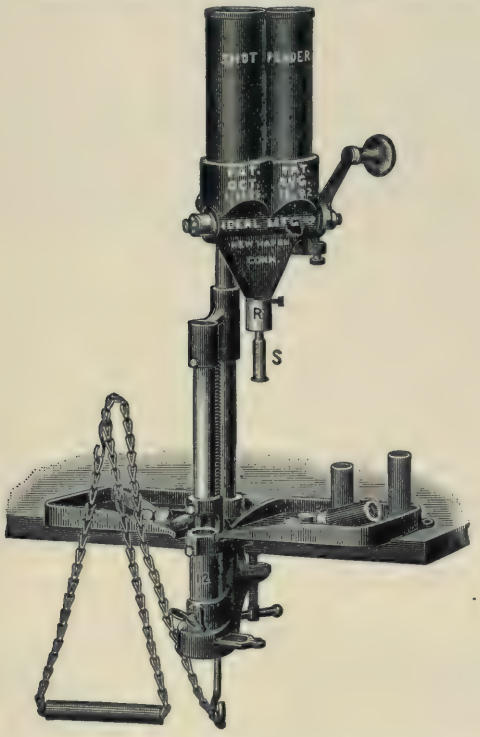
The Ideal bullet sizing tool is largely used by those who have arms of

different calibers, or those who may desire bullets of a special diameter. It is made so that dies of any caliber can be used in it. The die swings upon centers, which are located near the top of the die, the presser punch is also swung upon a pivot, which, while forcing the bullet through the die will keep it in perfect alignment with the pressure. This construction also permits the placing of the die near the joint, thereby giving the required power with shorter levers, which makes the tool a handy and convenient length. The tool is the same for all calibers. The die only being made for the caliber desired, they will be interchangeable, and for all standard sizes, from .22 to .50 caliber.

The best and perfection in powder measures has been recently patented by the Ideal Manufacturing Company. These measures will handle all kinds of powders for rifles, pistols or shot-guns—black, nitro or smokeless, fine or coarse, whether the granulations be angular, round, cylindrical, flat or leaflet, measuring all from the smallest to the largest charges required, from one grain up. The small measure will accurately measure from 1 to 35 grains, which is its fullest capacity. The graduations for this measure will be found on a slide, and are for one grain each. When set at the desired mark, it is to be fastened with a set-screw. The large measure will measure powder accurately from 30 to 140 grains. The graduations on this measure are on a round sliding plug, on the opposite side from the slide. There are two sets of graduations for this measure, one for grains, the other for the old drachm measurement; the grain divisions are for five grains each from 30 to 140 grains. The drachm divisions are for 1-4 drachm each, from 1-2 to 5 drachms. When set at the desired mark, the plug may be fastened with a set-screw. When using the measure for small charges be sure and positively close the large measure and securely fasten it in that position with the screw. Operate the slide only, for all measurements from 1 to 35 grains. Fasten where desired with the screw. When large charges above 30 grains are desired, first close both measures, see that dirt or a grain of powder does not prevent their being entirely closed; then be sure and fasten the slide in that position at the zero mark and use the round plug together with the slide as one, setting at the graduations on the plug, and fasten where desired with the screw. The extreme end of the brass tube is the indicator for the graduations for both measures.

The improved loading machine patented by the Ideal Manufacturing Company is shown in the drawing. In this machine variation is entirely done away with by simply moving the measure, after it is accurately and uniformly filled, to the cut-off stop, thus cutting off all communication between the measure and the powder in the reservoir, before the wadding takes place; so that all the jarring and shaking

of the machine for whatever purpose, does not change the charge of powder one atom. In this machine there are double graduations on the powder measures—one graduation being for drams and fractions thereof, from one-half dram to five drams, in graduations of quarter drams, this being the old method for measuring powder for shotguns. The other graduation is for grains, measuring from ten to one hundred and forty grains in graduation of five grains, this for measuring powder for rifles and pistols. These two graduations in connection with a table newly compiled comparing black with the various nitro and smokeless powders, will enable the user to measure accurately any of the various powders now on the



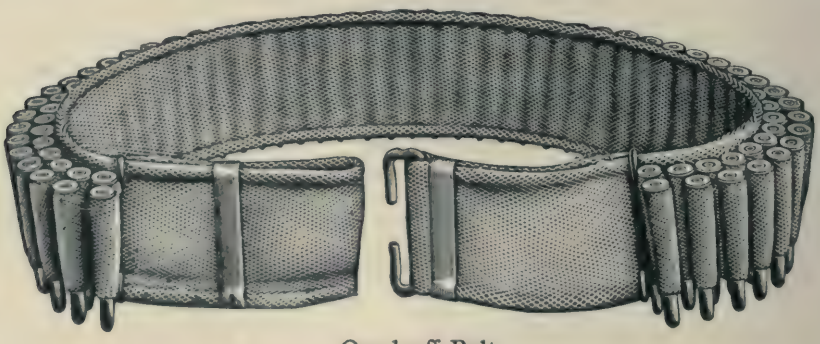
market, for either rifles, pistols, or shotguns. Attention is called to the turned nozzle at the apex of the hopper where it connects with the rammer slide. This feature will be appreciated by all who desire to charge rifle and pistol shells as well as to load shotgun ammunition. It is a new and distinct feature not found in any other machine. The head or hopper and reservoirs that hold the powder and shot may be disconnected from the lower part of the machine as shown in the illustration. The head is made to turn on a swivel and may be fastened with a thumbscrew at the rear side at any convenient angle that is handy for filling the small metallic shells. "R" is an extra funnel or powder conductor that fits on the turned nozzle. The funnel has an inverted cone-shaped mouth for receiving the shell as shown at "S." Another valuable feature is that the powder and

shot are deposited into the shell in a direct straight line through the center of the wad plunger, instead of passing through a side opening in the shell receiver, as is done in some other machines. The powder and shot are thus deposited evenly, not packed high on one side of the shell and low on the other, leaving an uneven surface for the wads to rest upon, neither are the wads forced past a slot in the shell receiver, which tends to tip them and squeeze them out of round. The proper wadding of shells is as essential to accurate shooting as is the accurate measuring of the powder.

CARTRIDGE BELTS.

Numerous belts and devices for the safe and convenient carriage of cartridges have been invented. The Pooler-Jones belt has cartridge holders attached to it, suitable for either paper or brass shells. These holders can be easily attached to any hunting vest, coat front, or belt. An ordinary vest will hold from 36 to 50, each holder weighing about one-third of an ounce. The belt can be perfectly adjusted by wearer to fit either a slim or large man, with waist measuring from thirty inches to forty-one inches. It can be worn over or under a coat, and it is impossible to lose the cartridges. The belt is intended to be worn or put on with the buckle behind. The cartridges are nearly all to the front and can be easily reached.

The Mills cartridge belt was invented in 1866 by Captain (now Brigadier-General) Anson Mills, of the U. S. Army. His purpose was to provide an acceptable substitute for the clumsy box then used for carrying fixed ammunition. He first made belts of canvas, forming loops by sewing additional strips to the body of the belt. It was difficult, however, to make these loops uniform in size, or cylindrical,

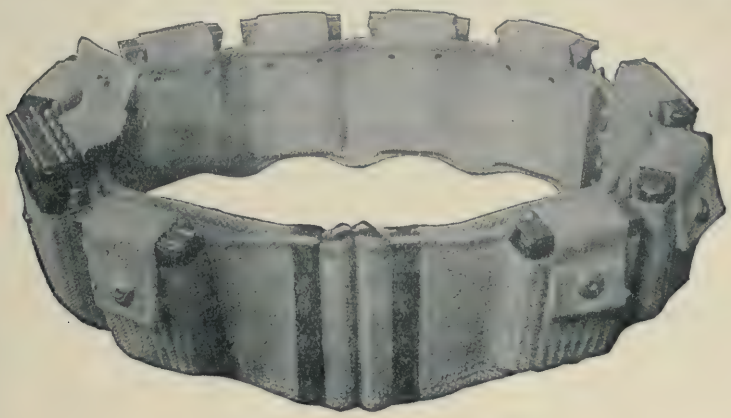


Orndorff Belt.

and after many experiments the inventor perfected a method of weaving the belt and loops in a homogeneous fabric of cotton. The loops thus formed are cylindrical, affording perfect friction at all points on the circumference of the shell, and they are also uniform in size and equidistant from each other, giving the belt a neat

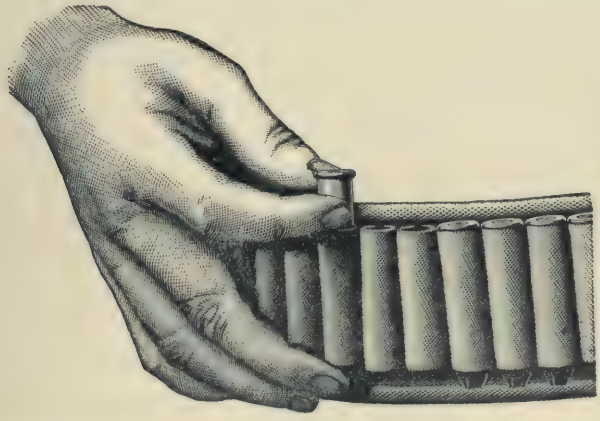
and attractive appearance. The belt thus formed is exceedingly durable, and, by reason of its flexibility, more comfortable to wear than any other belt. Not only in the Army, but among sportsmen and all others who have occasion to carry fixed ammunition, the belt became widely popular as soon as it was introduced

The adoption of the belt by the United States Army, Navy, and Marine Corps,



Clip Bandoleer.

as well as by the National Guard of the several States, and by many Foreign Governments, followed its introduction in due course. For many years the manufacture of the Mills belts was conducted by Thomas C. Orndorff, who invented the method of weaving one loop above another so as to produce what is generally



known as the Orndorff, or double-loop belt. This belt is now used exclusively by the United States Army and the Army of Great Britain. It is essentially a military belt, for use where it is desired to carry a maximum of ammunition. For sporting purposes the single-loop Mills belt meets every need. The belts vary in depth from 3 inches to 2¼ inches, with loops from 2¼ inches to ¾ inch.

In wearing this belt, care should be taken to have the cartridges well set down

in the loops. The belt should never be thrown about upside down, but always worn with the larger mouth of the loop upwards, and the cartridges extracted as is illustrated in the drawing. The wearer should start the cartridges from the bottom with his second, third and fourth fingers, and withdraw them by their heads from the top with the thumb and forefinger. If care is taken to conform to these instructions, there is no reasonable possibility of loss of cartridges, but, of course, if the belt is worn upside down or thrown about carelessly the cartridges will fall out, just as the contents of a soldier's pocket would escape if he hung his trousers up by their legs.

MARKSMANSHIP.

To become skilled in marksmanship, one must possess a thorough knowledge of the rifle, the principles of its construction, its capabilities, and the care required to preserve it always in a condition of greatest efficiency, the laws governing the flight of the bullet, and the causes which tend to impress upon its motion certain irregularities; an understanding of the best positions for firing; a readiness for estimating distances; and the experience required to make allowance for the force of the wind, or the motion of the object aimed at. The acquirement of the requisite skill to fire accurately is one of the most important duties of the sportsman; not only his own safety but that of his companions may often depend upon his ability to deliver his fire with effect, and the greatest proficiency in the manual of arms cannot atone for a want of dexterity in this particular. Any man having perfect vision can, through perseverance, become a fair marksman. Long practice with cartridges is not necessary; but a strict compliance with the rules for pointing and aiming, and a careful study of the causes modifying the accuracy of fire, will be sure to lead to more than average skill in firing.

When firing in vacuo, the trajectory is easily traced and its properties simply discussed. Considering its position with reference to the line of sight it will be seen that near the muzzle it is below the line of sight for some distance, then it cuts it; beyond this point it rises above the line of sight for some distance, then falls and cuts it again. This second point of intersection is the point blank and determines the point blank range. With a good rifle, up to 175 or even 200 yards, the line of fire will not cut the line of sight; or, in other words, it will not shoot high.

The progressive velocity of fall of the bullet being so much less than its initial velocity, the air resistance opposed to its descent will be inappreciably small in comparison with that in the direction of its motion of translation (the resistances being proportional to the squares of the velocities). Hence,

when the bullet would have been at certain points, in vacuo, it will in reality be at points below and in rear of them, by distances increasing from the point of departure (since the resistance of air causes the spaces passed over in equal times to become progressively smaller and smaller), thus causing the trajectory in air to be constantly below and in rear of its place in vacuo and changing its curvature, so that the left branch presents a flattened form while the right branch approaches the vertical. From thus destroying the symmetry of this curve, there results that the angle of fall is greater than the angle of ascent, and more considerably so as it is distant from the origin, that the point of culmination is lowered, and that the range is greatly diminished. In practice the object aimed at has a certain height; hence, it will not only be struck when at point blank, but also when at points in rear or in front of the point blank where the vertical distances of the trajectory from such points shall be equal to or less than the height of the object. This distance between these two points, known as the dangerous space, is greater as the trajectory is flattened or as the height of the object is greater. An object may also be struck when in rear of the point blank. The sum of the distances in front and rear of the point blank, at which the object could be struck at its bottom and top, is the dangerous space. This permits us to make slight errors in estimating distances; we can either over or underestimate them so long as the errors do not exceed the limits of the dangerous space. In hunting, or when firing at an enemy over an unknown distance, the importance of a flat trajectory is evident—but it is still important even where the distance is definitely known. When firing at long range a delicate estimation of distance is necessary to obtain accuracy of fire, even when using the best and most accurately graduated sights. Any ordinary man can be drilled to estimate distances up to 600 yards with great accuracy and dispatch. Distances may be appreciated by the eye alone or by the aid of instruments. The latter method is of no practical value in the field before an enemy, and should only be employed on the drill ground as an aid. The writer's stadiometer the principle of which is based on the proportionality of the corresponding sides of similar triangles and an application of the plummets, does good work on an undulating and broken drill ground, where actual chain measurement would be impracticable if not impossible. Prolonged practice and experience in the appreciation of distances are necessary to give the coup d'oeil that insures sufficient accuracy. The practice should be conducted over smooth, broken and undulating ground, and frequently from elevated points. The distances should also be estimated in all directions as regards light and the condition of the atmosphere.

The following are the important causes which vary the direction and intensity of the forces acting on the bullet, and which may be greatly obviated by carefulness and an understanding of the subject:

1. A frequent cause of inaccuracy of fire is a false or defective barrel, short swells and long depressions being often found on its interior. These swells or ridges, by increasing the friction, may so effect the recoil as to have an injurious effect on the fire, or so affect the exterior form of the bullet as to produce an irregularity in its motion. The depressions or swells change the interior lines of the piece and give the bullet a false direction.

2. Another cause of inaccuracy of fire is the vibration of the barrel when firing, caused by the want of a homogeneous distribution of metal about its axis, and often to binding bands. These vibrations tend to alter the direction of the bullet as it leaves the muzzle.

3. Recoil causes the man to turn to the side from which he fires, and produces deviation in that direction. It is supported by pressing the butt firmly against the shoulder with the right hand, the left hand supporting the weight of the rifle, and varies with the position of the rifle relative to the horizontal, being a maximum when the shot is fired vertically upward. The shock of the recoil against the shoulder is diminished by the bend in the stock, serving to decompose the force into two components, one acting through the stock against the shoulder the other in the direction of the axis of the barrel, tending to raise it. Whatever lessens the recoil theoretically increases the range.

4. When the bullet reaches the muzzle of the rifle, it will revolve about its axis nearly 800 times in a second, and a point on its exterior side surface will have an axial velocity of about ninety feet per second. This in connection with the resistance of the air produces a lateral drifting of the bullet in the direction in which the grooves have a turn. This is known as drift, and is greater in the descending than in the ascending branch of the trajectory. It increases as the diameter of the bullet, the angle of fire, the velocity of rotation and the range increase, and as the velocity of translation decreases. The drift in the Springfield rifle (caliber 45, seventy grains powder) at 500 yards is two feet.

5. The pull of the trigger should not be too great, a three-pound pull being the minimum. It should be pressed by a steadily increasing pressure of the finger in the direction of the axis of the barrel, without communicating motion to the rifle, the breath being held until the hammer falls. If the trigger is too hard and is pulled convulsively, the muzzle will be turned to the right. There should be a quick and decided connection between the mind and finger. Few men can pull off the trigger of our average service

rifle with the first joint of a single finger. I have frequently supported the whole weight of the rifle, at full cock, on the trigger, without pulling it off, and I consider this a very serious defect. Every man should invariably fire his own and the same gun, in order to become acquainted with its defects of construction, and learn how to make allowances for consequent deviations from the theoretical trajectory.

6. The principal cause of the inaccuracy of most rifles is that they are sighted too coarsely. Without apparent movement, the rifle may be sighted on any object within a horizontal radius of many feet. I think it best to replace the ordinary bead sight by the Beach Combination Sight, which is such that it forms either an open bead or a globe sight with cover, according as the leaf is turned up or down, thus adapting it either to hunting or target use (and if I mistake not our frontier field service is more on the order of hunting than range practice). The globe of this sight is so constructed as to permit the use of all descriptions of sights, detachable pieces of the various forms in use being slipped into a slot in the globe and held by a screw.

The Lyman sight is a most excellent one when the target is a moving object. When aiming, it has the appearance of a ring or hoop which shows the front sight and the object aimed at, without intercepting any part of the view. Its rim may be instantly changed to give it a large aperture with a narrow rim, or a small aperture with a wider rim. For all quick shooting the large aperture should be used. It possesses the following advantages: it allows an instantaneous aim to be taken—the object being sighted as quickly as if only the front sight were used; it readily permits one to shoot moving objects, running or flying, with both the eyes in use; it is also very accurate, simple and strong. Any kind of front sight may be used with it, and it may be put on any rifle in the same way that a peep sight is attached and adjusted for shooting any distance up to 1,000 yards.

7. It will be readily seen that a defective position of the line of sight will cause an inaccuracy of fire, and this may be occasioned by a false position being given to either the front or rear sight. If the front sight be to the right of its proper place, the bullet will go to the left and vice versa. The bullet will also be raised (range increased), since the top of the sight is lower than it is when in its proper position. If the rear sight be to the right or left of its true place, the bullet will go to the right or left, and will be lowered (range diminished), since the top of the sight will be lower than when in its true position.

8. A very frequent cause of inaccuracy of fire is the incorrect graduation of the rear sight. Of course, if the elevations corresponding to certain

ranges are not accurately marked, the fire will be wild. In determining the graduation for any particular rifle, avoid all proportions and make a series of experiments with the greatest care. With a properly made arm and cartridge, and the elevating sight accurately graduated, any one can, by care and practice, become a good marksman.

9. A serious cause of inaccuracy, originating with the firer, is the faulty position that he gives to the musket in firing, by inclining to the right or left, which tends to carry the bullet to the side to which the rifle is inclined, and to diminish the range. When firing at long ranges a trifling inclination to the right or left will throw the bullet very wide of the target.

10. To prevent inaccuracies while aiming, in addition to keeping the sight vertical, the firer should observe the following: The eye should glance from the sights to the target, being constantly on the target. If the particular rifle carries higher or lower than the average, it must be remedied by aiming with a fine or a coarse sight. In aiming raise the rifle. Upward motion acts against gravity, and has a tendency to prevent any lateral motion of the muzzle. Hold the butt firmly against the shoulder, and do not turn the head away at the instant of pulling the trigger. Fire low rather than too high.

11. After firing a few shots on a dry, hot day, the bullets gradually fall lower and lower, in consequence of the fouling of the barrel. The barrel should be kept clean and, as far as possible, not over-heated.

12. The condition of the atmosphere noticeably affects the course of the bullet. The more moisture there is in the air, the less elevation required. The bullet is frequently noticed to fall immediately after a rain. Warm air offers less resistance to the bullet than does cold air. A fall of 20 degrees in temperature will cause the bullet to lower ten to eleven inches at 300 yards range. In firing over water the elevation must be increased, in consequence of the lower temperature of the air over the water. In ascending the mountain the air becomes more and more rare, and consequently the resistance to the bullet is less on the mountain than at its base. Mirage, an optical illusion occurring in level districts on very warm days, causes the target to apparently rise in the air and become distorted in shape. This materially affects such objects as are near the ground, and engenders a tendency to shoot too high.

13. The influence of light and shade on the firing is very remarkable. On a bright day the target is refracted so as to apparently stand higher, which would theoretically require a lower elevation than on a very dull day. When the light shines directly on the target, when the target is against a light background (so that the details are better brought out), when the sun shines on the firer's back, when the atmosphere is clear, when the ground is level and

uniform in appearance or when it gradually rises toward the target, the same will appear much nearer, and will theoretically require a higher elevation. The best shooting is invariably done on cloudy days when the sun's light is evenly diffused. It is very difficult to shoot well when passing clouds intercept portions of the sun's light and heat. It is readily seen how this disturbance might set up currents in the air which would tend to carry the bullet from its course, and how the rays of light deflected from their course before reaching the eye would cause the target to apparently occupy a false position. It will be well to diminish the elevation should the sun suddenly appear and light up the target while the firer still remains in the shade, and to increase it should the target remain in the shade while the sun shines on the firer.

14. Bright sights and barrels are obviously objectionable. The reflection of the sun's light on the sights causes them to appear as brilliant points and precludes the possibility of an accurate aim. If the sun's rays come laterally, the trouble will be yet greater, inasmuch as they will brighten the rear side of the front sight and the opposite side of the rear sight notch, and cause a tendency to shoot away from the sun. The refraction of the sun's rays from the polished barrel causes the target to become indistinct and to assume the appearance of motion. The sights and barrel about the muzzle should be blackened with smoke if nothing better is at hand.

15. The effect of the wind upon the trajectory and the allowance to be made therefor are most troublesome questions for the marksman. Inasmuch as the wind is continually changing in intensity and direction, it is almost impossible to make tables of allowances for it. The best skill and judgment of the marksman are brought into play when firing in mountain districts, where there are many cross-currents with which to contend. All winds, except toward the target, retard the bullet and render a higher elevation nccessary. A wind from the rear helps the bullet and tends to high shooting. Experience has shown it necessary to alter the wind-guage twelve or more feet between two consecutive shots over a range of 1,000 yards, in order to make a bull's-eye each time when the wind was too high or variable. The inclination is generally to under-estimate for wind allowance, nearly every one disliking to aim far away from the target.

I believe that any one with a good mind and clear sight, possessing nerve, coolness, and a quick connection between will and finger, can, by practice and endeavors to correct the inaccuracies pointed out, do good shooting. The men in our service are anxious to learn how to shoot well, and in the majority of cases are very apt scholars. It is only necessary that the officers teach them the practical correction of errors, which they are to investigate

theoretically. In Busk's "Hand-book for Hythe" it is stated that "one hour a day of private practice in aiming drill will, in a few weeks, make a man a first-class shot." I believe this, for the position and the aiming drills constitute the very foundation of any system of practice. It is an absurd mistake in our service to have recruits fire off-hand at a target one hundred yards distant when they scarcely know the difference between a rifle and a shotgun, and cannot hit a barn-door thirty paces distant with either.

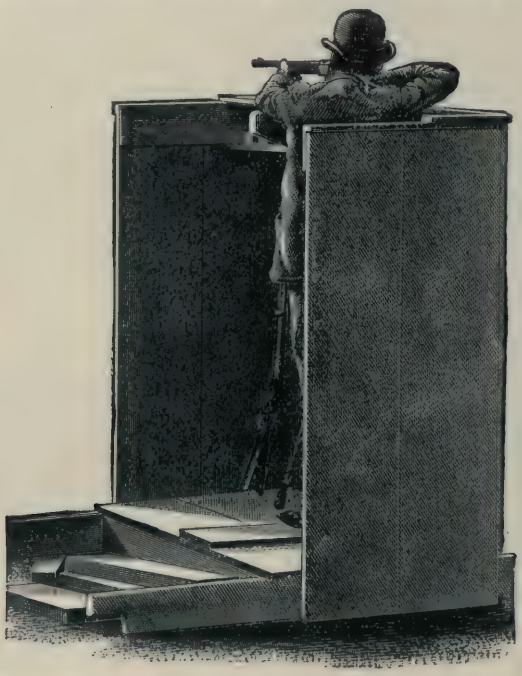
Having thoroughly mastered the principles of aiming, experience only can teach the best positions under various conditions and circumstances. The regulation position, "firing standing," is generally preferred. Many find an easier and firmer position by bringing the left shoulder well to the front, and resting the rifle over the lower part of the left thumb. The advantage of this position is that it brings the left elbow directly under the barrel without any strain on the muscles. Its disadvantage is that, in a side wind, the body is apt to sway sideways, which must be avoided by placing the feet further apart. The Hythe School directs that the rifle be pressed against the shoulder with the left hand, the right holding the stock lightly; but most marksmen prefer while grasping the barrel firmly with the left hand, so as to keep it steady, to hold it well against the shoulder with the right. In all cases, it will be found that the pull-off of the trigger will be lightened by a firm grip with the right thumb. The standing position depends so much on the personal equation of the marksman as to prevent that extreme nicety of aim required in long-range firing. It also renders the rifleman liable to be swerved by the wind, and offers the enemy a better target. Kneeling is open to the same objection, but to a less extent. In the English army, when the fire is in two ranks, the front rank kneel, not only to obtain a steadier position, but to get them out of the way of the rear rank, and thus secure a more rapid and accurate fire. The favorite position for long-range firing, particularly with a military rifle, is that of the Skirmisher Lying. In taking this position, the legs should be well separated, the toes being turned outward, so as to cause the body to hug the ground as closely as possible. The left elbow should be kept almost straight under the rifle (if placed too far to the left, it strains the wrist), and the barrel grasped firmly with the left hand. The right elbow should be placed a little to the right. To prevent the elbows separating, as they are naturally inclined to do on hard ground, a depression may be made in the ground with the heel of the boot, or something soft placed under them. The hips should be twisted to the left, and the right shoulder well raised, to keep the collar-bone out of the way and afford a firm seat for the rifle butt, which must be held closely against it. Many of the best shots at Creedmoor and Wimbledon shoot, ly-

ing on their backs. Some lie slightly on the right side, resting the rifle barrel over the left leg, the left hand grasping the piece at the small of the stock, and pressing it against the shoulder. In this position, the distance of the rear sight from the eye requires a larger aperture than usual. The following is a favorite back position. The marksman lies on his back, his legs crossed, the left leg under the right knee, and firmly held by the right calf, the muzzle of the rifle resting in the crotch between the knees. The left arm is placed behind the head, the hand firmly grasping the butt of the rifle, the back of the head resting on the left forearm, and the right cheek touching the side of the butt. The right hand holds the small of the stock with a firm grasp, the elbow resting on the ground. In this position, not only the piece, but the entire person of the shooter is perfectly supported, and absolute steadiness is secured. Gildersleeve, Coleman, and other Americans have adopted this position, and

Sir Henry Halford and others at Wimbledon concede its advantages. It is doubtful whether any advantage is gained by lying on the back, in shooting with military rifles. The position, Face Downwards, is certainly preferable for military reasons, enabling the soldier to rapidly advance or retreat, to shelter himself behind cover or to entrench himself. Whether the rifleman shoots standing, kneeling, sitting, or lying, after having once tested and become satisfied as to the position best suited to himself, he should practice it until it becomes perfectly natural and easy.

The Lyman off-hand rifle rest, shown in the drawing, designed for sighting and testing rifles, is most useful for beginners in rifle shooting. It consists of a platform about five feet long by three feet wide placed lengthwise with the target. This platform is boarded up on three sides, viz.: On the right hand side (facing the target) and at both ends to the height of about five feet. From the top of these sides a covering of boards is so placed that when the shooter stands on the platform the right arm and the left hand rest on this covering, allowing the shooter to take the same position as when shooting off-hand. There are so many riflemen who learn to shoot in bad positions that this rest will not

be comfortable to some. Those who will appreciate it most are the riflemen who shoot with the left hand well out on the barrel, the right elbow elevated and the butt of the rifle against the shoulder (not on the arm), or, in other words, those who hold a rifle about the same way they hold a shot-gun. With this rest it is easy to take the right position and keep it when firing. One can learn to tell where the bullet strikes before the marker shows it. It is espe-



cially good for the beginner in rifle shooting, for he is not liable to fall into that most common and worst of all faults, flinching. This habit of flinching comes principally from the fear of the report and recoil. When the rifle is held properly, the recoil is felt very little, even with heavy charges; and if one is to be a successful shot at any kind of shooting, he must have the courage not to consider the noise and kick of the gun, for any danger to the shooter is simply imaginary.

The Pope double or machine rest, with attachments is excellent for testing purposes. More information can be derived from its use in a few hours, than can be had by ordinary rest shooting by an ordinary shooter in as many weeks, as it has no human errors of holding and pulling. The results are those due to rifle, ammunition and weather. It is made in several styles.

In use, two stout posts are set deeply in the ground, the firmer the better; these are braced together, and a smooth, level plank fastened on the top; both posts are firmly braced in two directions, the stop is fastened on the top plank in proper

position and the rear rest to the rear post so as to give approximately the correct elevation. Front rest and scope mountings are clamped to the barrel, the same loaded and slid gently to the stop; adjust the rest or telescope or perhaps both, so the gun points where you wish, cross hairs being between each pair of pasters; let the rifle rest naturally, hold the right hand about 6 inches behind the butt, touch the set trigger with the left hand and catch the rifle on recoil. If the gun has a heavy pull, pinch the trigger and guard with the thumb and forefinger so as not to disturb the rifle in the rest. In setting up, it is often convenient to set the rest, so the rifle will point on the target before the telescope is mounted, using the ordinary sights, then mount the scope and adjust it to the pasters, and shoot the group, then move the rest a fair amount, that depending on how close the gun will shoot, then bring the scope again to the pasters and shoot again. A telescope sight is not a necessity in double rest shooting, though it is a great convenience. With it you can shoot from a bench that is not firm, as the sight gives you a chance to correct the aim each time; for all that an absolutely firm bench is best, and if you shoot from double rest without a scope, it is an absolute necessity.

Many German-Americans use and highly recommend a palm rest, attached to the rifle to aid in holding. Such an appliance may be proper for target shooting, but cannot become popular in the field. The "Universal" palm rest, shown

in the drawing, fits all guns and is adjustable to any position. It is quickly attached (or detached) to the trigger guard or lever without using any tool. Its position on the lever or guard enables the marksman to hold perfectly firm and rigid and at the same time to obtain a body rest, free and natural breathing, relaxation of the muscles and increased accuracy which naturally follows.

The Pope palm rest is made so as to be unscrewed for carrying without changing the adjustment. It swings away from the lever for loading, and from recoil (can be put on the reverse way, if desired). The shank is adjustable for length by the telescoping tube and taper nut, and for position to or from the body, by changing the position of the check nuts on the shank, so as to allow the shank to come against the stop at different angles, thus affecting the distance. Many off-hand shooters prefer a hip rest and thus be less obliged to sacrifice position

or use a light rifle. The author has used, with some satisfaction, a hip rest constructed in sections and attachable to a palm rest base. One section is so constructed as to admit of several inches adjustment.

A great variety of heel-plates and recoil pads are used by sportsmen at the present time. The Piffard heel-plate, consisting of a soft rubber pad or cushion about half an inch in thickness, is popular. It is applied to the butt of the gun (after removal of the iron heel-plate), and is retained in position by a skeleton plate. The latter is attached to the stock by using one of the original screws, and in addition a small screw inserted near the toe of the heel-plate. The stock of the gun is not altered in any manner, and the original butt-plate can be reapplied at will. Experience has shown that, when using this contrivance, the effect of recoil has been greatly modified, and a charge of as much as 110 grains of powder, with 420 of lead, can be shot without discomfort. The benefits accruing from the lessened recoil are: Beginners will not become "gun-shy," and contract the habit of flinching; increased accuracy from absence of flinching; target practice can be more continuously and efficiently carried on than is practicable without the elastic-plate, owing to the bruising and other injuries attendant on the use of the service cartridge; and, the powder charge for ammunition could be materially increased, thereby flattening the trajectory, and in other respects rendering the weapon more effective. It is evident that the use of this description of heel-plate insures greater safety and increased accuracy. The dropping of a loaded gun (cocked or half-cocked), butt downwards, on a stone or hard ground may result in breaking the point of the sear or one of the notches of the tumbler, causing a premature discharge. This heel-plate would diminish the force of the concussion and lessen the liability to accident. In repeating rifles, in which the cartridges are arranged in the magazine with the bullet of one pressing on the primer of the one in front of it, the dropping of the gun might cause an explosion in the magazine. The liability to this accident would be

diminished by the use of the plate. Practical marksmen have found that when using this heel-plate the butt of the rifle is retained in proper position against the arm with less exertion, the rubber not slipping from the arm as readily as the iron butt-plate. By a resolution of the directors of the National Rifle Association, the use of this heel-plate was permitted in all competitions held under

their auspices. The Winters 1902 model leather-covered pneumatic recoil pad is made to fit any gun-stock, and is an absolute guard against bruised shoulders. The Rowley cheek pad is a simple and effective device to straighten any gun-stock to the desired bend without the expensive method of steaming the same. It is easily put on and taken off again, and besides making a too crooked gun fit,

protects the high polish and finish of a fine gun stock against scratches and dents. All these devices and many others, like the Heikes hand protector, are regarded as necessities by many sportsmen, and are in a measure comforts for various kinds of shooting.

IMPACT.

In order to arrive at a clear understanding of what takes place when the motion of a projectile is arrested by any resisting medium, it is necessary to recall some of the elementary principles upon which these phenomena depend. The manner in which a projectile acquires its velocity, is a good illustration of the manner in which its motion is destroyed. If the mean pressure of the gas be multiplied by the space passed over by the projectile while acquiring its velocity, the result will be the measure of the work done by the charge of powder; and it will also be equal to the work of stopping the same projectile, no matter how or by what means it may be brought to rest. The same result is generally arrived at by measuring the velocity imparted to the projectile under the circumstances mentioned, and multiplying the square of the velocity by one-half of the mass of the projectile. The following are the different effects produced by the impact of a projectile upon any solid body; some of these being so connected as to render their relative importance extremely doubtful.

Compression.—The first effort of impact is to compress or drive back those portions of both projectiles and target first coming in contact upon those immediately behind them; the amount of this compression depending upon the material and velocity of impact, as well as upon the form of the projectile.

Elongation.—The greater part of the work of the projectile in penetrating wrought-iron and similar materials is expended in overcoming the tenacity of the material, or in elongating the fiber. This is evident when we consider that punch-

ing or shearing consists not so much in cutting the fiber, as in bending it, and afterwards pulling it in two lengthwise.

Shearing.—This, as just stated, consists chiefly in the two strains already mentioned.

Bending.—This also implies tension and compression; the back of the target being elongated, and the front compressed.

Pulverizing—a portion of the material. This takes place only in case of hard materials, as a stone or cast-iron, and it then absorbs a very great amount of work. Like bending and shearing, it involves compression and elongation, the material being compressed until it yields laterally to a tensile strain.

Motion.—While the work is being expended, a certain amount of time is allowed for the force of the projectile to impart motion to the target, especially that portion immediately in front of the projectile.

Friction.—The friction is very great, especially in the case of the more pointed form of projectile, and varies inversely with the velocity of the projectile.

Heat.—This is due to friction, both external and internal, that is, of the projectile and the fragments against the target, and against each other during the distortion of the material, from compression, bending, etc. The suddenness with which this heat is generated is almost unequalled by any known source of heat.

PENETRATION.

The most common substances encountered by projectiles are arranged in the following series, in the order of their resistance to penetration: *air, water, sand, wood, lead, copper, wrought-iron, soft steel, cast-iron, chilled-iron, hardened steel,* etc. All other substances may be arranged between these, or in continuation of the series. *Air* opposes the motion of a projectile by its inertia, elastic force, and the pressure due to its weight. The projectile compresses the air in its front and disperses it laterally, while the rear of the projectile is relieved by its motion of the normal pressure of air. A small amount of resistance is also met with in the shape of friction. In the case of *water* these resistances are increased by the greater density and weight of this substance, and there is also a slight additional resistance due to the cohesion among the particles. *Sand,* being a solid, or at least made up of solid elements, presents the additional resistance of "crushing-strength." It cannot be penetrated at a high velocity without crushing some of the grains, and the higher the velocity the greater the amount of work expended in this manner. This resistance to crushing implies a continuation of the elastic force beyond the elastic limits, and involves indirectly tensile strength, since a solid in being crushed must enlarge laterally and finally yield to a strain of tension.

In penetrating *wood, lead,* or any of the other materials, "tensile strength" forms the chief element of the resistance, while inertia and friction become of minor importance.

The office of elasticity in all these cases is to transmit the effect of the projectile from those particles first acted upon to those more remote, and thus calling into play their inertia or tensile strength, as the case may be; and were it not for this property, the statical resistance of a plate of any material to perforation would be entirely independent of the thickness of the plate; a thick plate would offer no greater resistance than a thin one, since each layer or unit of thickness would be perforated without receiving any assistance from its neighbors. The *work* of penetration would then vary directly with the distance penetrated, or the thickness of the plate; elasticity, however, has its maximum point of usefulness in resisting penetration, and beyond this it becomes a great disadvantage. While increasing the number of fibers or elementary portions of the material broken at once, thereby increasing the statical resistance, it diminishes the time during which this resistance opposes the motion of the projectile in like ratio; and the amount of motion destroyed or generated increases with the time as well as with the force or resistance. For this reason hardened steel and chilled iron are less efficient in stopping projectiles than soft iron, although they offer a much greater statical resistance to penetration. There are many reasons for believing that a general formula for the penetration of projectiles in all materials may be deduced, when experiments have been sufficiently extended.

The respective motions of a flat and pointed headed projectile on oblique impact are explained as follows: It is asserted that the flat-headed projectile, on striking, cuts out a portion of the face of the plate, which it carries along in front, thus increasing the thickness to be penetrated; and, remaining nearly parallel to its original direction, it has to pass through the plate obliquely. While, if the projectile has a pointed head, the point enters at first more deeply into the plate than the flat head, and the center of gravity moving forward, the projectile turns around more readily than with the latter, so that its axis becomes perpendicular, or nearly so, to the face of the plate, having then only the least thickness to penetrate.

It is difficult to obtain for comparison the results of practice with the flat and pointed headed projectiles of the same material fired at targets inclined to the line of the range; the former having been so little used, as its form is so objectionable, both as regards accuracy and velocity. On the whole, it may be said that in the case when the projectile ought to be capable of piercing the plate or target,

there is little difference between the effect of a flat head and a hemispherical head; but when the target is beyond the power of the projectile, the hemispherical head makes the deepest indent.

The impact of a projectile, in addition to indenting or penetrating a target, produces more or less bending, tearing, and other damage at a distance from the point of impact; which effects may be classed under the term "Concussion." The effect of concussion is transmitted from the point of impact in all directions, in the same manner as sound-waves, and increases with the elasticity of the material. Whatever tends to diminish the elasticity of the structure, as dividing it into many pieces, or using soft ductile material to receive the projectile, will diminish the effect of concussion. This effect is expended in two ways—*First,* in giving motion to the structure or in developing inertia; and, *Second,* in overcoming the tenacity of the material, either in bending or tearing those portions first acted upon from those more remote. Both of these components increase with the whole amount of work expended by the projectile, other conditions being equal.

Generally speaking, the penetrative effect depends on the shape and material of the projectile, on its energy and diameter, and the direction with which it strikes the target. It is quite impossible to accurately determine the coefficients of resistance for the different materials of projectiles and plates; but practically the amount of penetration, whether for iron or steel plates, or masonry, or earth, may be determined by experiment. Various empirical laws suffice to give approximate results; but they do not stand the test of any general application. In consequence of the varying qualities of resistance both in projectiles and targets, the variation in shape of the projectile on impact, the possibility of the projectile breaking up, and the amount of heat developed on impact, strictly analytical investigations cannot be made.

TARGET PRACTICE.

In the United States, as in the Armies of other Countries, no instruction of any importance was given the soldier in the use of his arms, before the introduction of the rifle-musket. The old smooth-bore in fact, in its method of sighting, actually stood as the exponent of the inaccurate firing of the weapons of its day; with no rear sight the front sight alone did not permit of any accurate aim; yet sufficient perhaps for the very limited precision of the aim itself. When the rifle-musket was generally issued in 1854, it was recognized that the Army required careful instruction in its use before the capabilities of the arm could be properly developed; General Scott therefore published in General Orders in December of that year, for the information and guidance of the troops, a letter from

the Chief of Ordnance, in which that officer stated, that as all the sights were marked for ranges of 200, 300, 400, 500, 600 and 700 yards, he would suggest that the practice be held at those distances, five shots to be fired at 200 yards, seven at 300 yards, nine each at 400 and 500, and 10 each at 600 and 700 yards. Other practice was recommended at intermediate distances for which it was suggested that the slide on the sight might be adjusted, or in case of slight difference, by the soldier taking a finer or coarser sight. That it was presumed that targets would be employed, is evident from the letter, though as to their size, shape and any details of construction the order is silent. No method of instruction was prescribed, every detail being left to the discretion of the company officer, who, in the general lack of knowledge on the subject, was no better informed than the War Department. As might have been presumed under these circumstances, very little instruction of any nature was imparted, and it soon became evident that further measures were necessary. Fifteen months later, or in March, 1856, the General-in-Chief issued a circular stating that from the representations made to him of the lack of skill on the part of most of the men then in the ranks, and with a view to their improvement in firing with ball cartridge, he proposed ordering a more general practice in that important branch of military instruction. Officers were therefore required to communicate to him at an early day, their views on the subject, and to state whether in their opinion the practice should be weekly, monthly, or quarterly; what number of rounds per man should be allowed under ordinary circumstances at each practice; under what regulation should the practice be conducted and what inducements to acquire skill should be held out, together with such further suggestions as their knowledge and experience should enable them to furnish.

The replies to this circular, from their great dissimilarity, slight comprehension of the subject, and paucity of practical suggestions, did not afford sufficient material upon which a system of instruction could be based, and no further progress was immediately made.

In October, 1857, Captain Henry Heth, 10th Infantry, was directed to draw up a system of "Target Practice with Small-arms." Captain Heth was furnished with the replies received under General Scott's Circular of the preceding year, and with the different foreign publications on the subject. The system which he submitted was adopted by the Secretary of War on March 1, 1858. In his preface, Captain Heth states that his system is chiefly a translation from the French "Instruction provisoire sur le Tir," which, in fact, he would have recommended with little or no change if schools similar to the French Schools of Musketry had existed in our service. He also used the reports on the subject that had been

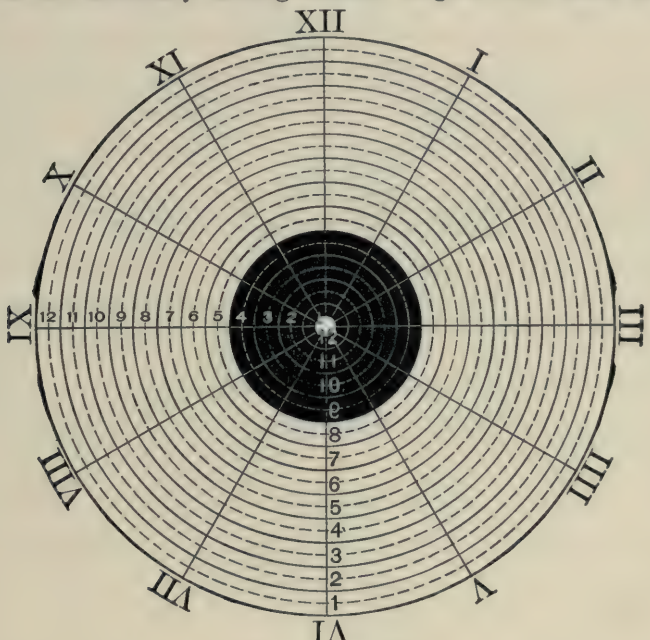
rendered by Major T. Williams, 4th Artillery, and Brevet Major Fitz-John Porter, Adjutant-General's Department, and further acknowledged valuable aid and assistance from Lieut. Julian McAllister, Ordnance Department.

The methods prescribed contemplated, first, aiming and then position drills, subsequently firing with caps or candle practice, and finally estimating distance, drill as all preliminary to regular target practice. For ball practice it was prescribed that the targets be placed at 150, 225, 250, 300, 325, 350, 400, 450, 500, 550, 600, 700, 800, 900 and 1,000 yards, at all ranges; the surface fired at was 6 feet high, and either 22 inches wide or some multiple of that dimension at 600 yards, for instance, being 110 inches (9 feet 2 inches) in width; the targets being divided by a horizontal and vertical line, of a width depending upon the distance at which they were used, varying between 4 and 20 inches. Four rounds were to be fired at each distance. After practice at the first seven ranges, the Company was to be divided into three classes of about equal size, the first comprising those men who had hit the target the greatest number of times, the second class of those who came next in order, and the third class of the poorer shots.

Three exercises in skirmish firing were contemplated, 10 shots being fired at each drill, five when advancing, and five when retreating. The number of targets was only limited by the circumstances of the ground; for the first practice they were 6 feet high and 22 inches broad and placed six yards apart, fire was opened when the Company had arrived within a range of 350 yards, the point where the advance was to cease and the retreat commence was not stated. In the second practice the size of the targets was doubled and fire opened at 600 yards. In the third practice the width of the targets was increased to 88 inches, the Company commenced to fire when at a distance of 800 yards. Both file and volley firing were also required, at the distances, 300, 400 and 500 yards, two cartridges being fired by file and two by volley at each distance.

In the first prosecution of target practice, the Army was greatly aided by the "Manual of Rifle Firing," of General George W. Wingate, the General Inspector of Rifle Practice of the State of New York. General Wingate through his personal efforts, succeeded in introducing rifle practice as a part of the military instruction of the National Guard, and his system, undoubtedly at that time the best extant, was very generally consulted throughout the Army. In some particulars, it was not, however, deemed the best that could be devised for Army use. About this time the author, having returned to Washington from several year's active field service in Oregon and Idaho, conferred with General Wingate, and as a result, Wingate and Farrow's System of Target Practice was prepared and submitted to the War Department. The author, who had been in command of In-

dian scouts and had just gone through the Nez Perce and several other hard fought Indian campaigns, contributed to the System many valuable features and suggestions, based on his actual experience and observations in the field. This System was appropriated bodily by the War Department, and after some changing and remodeling, appeared as a "Course of Instruction in Rifle Firing," by Col. T. T. S. Laidley, in accordance with directions given by the Chief of Ordnance, and by a General Order, was announced as the System allowed in the Service for the Instruction of the Army in the use of the Rifle. The order further prescribed that the necessary aiming stands, targets, etc., were to be obtained



RING TARGET

from the Ordnance Department, and the labor and expense of setting them up and preparing the shelters, etc., borne by the Quartermaster's Department. This System placed the instruction of the men at each Post in the hands of an Instructor of Musketry, aided by such assistants as the size of the command required. Company officers, while required to be themselves instructed, and to fire annually a number of cartridges, yet only participated in the education of their men as Assistants to the regular Musketry Instructor. The course comprised exercises in which the soldier was taught successfully to take the best position for holding the rifle, to aim it accurately, hold it steadily and pull the trigger without deranging the aim. In firing, standing or kneeling, only the tactical positions were permitted, while for firing lying, the prone or tactical position was not alluded to, but a special side-position required. For range practice the targets used by the Na-

tional Rifle Association were adopted, and the practice commenced at 100 yards, each man firing five shots, or additional single shots in cases when each succeeding shot showed an improvement over the last. The most expert were then to be advanced to 200 yards, where firing was held in a similar manner. Each man was, however, prohibited from firing more than 15 shots, or from practicing at more than two distances in any one day.

In March, 1882, General Alfred H. Terry, commanding the Department of Dakota, issued an order requiring all Company officers to practice with their commands, and also further requiring the presence for instruction of all the extra and daily duty men of the Company. He prescribed that all firing should commence at 100 yards, each one firing at least one score of five shots; firing in a similar manner was to be conducted at the other ranges, the soldier being advanced from range to range as he exhibited proficiency, but not sooner. The percentages, which, as a general rule were to be considered as a necessary requisite for advancement, were also established. In December of the same year, General Terry, in announcing to his Command the result of the year's labors, remarked as follows: "No one can doubt that the average capacity of the men to learn how to use their arms effectively is the same in all Companies and at all Posts. Nearly all the men enter the Service without previous experience in the use of arms, and the number of those in any organization who have had previous experience, is too small to affect its character. Moreover, the experience of that small number is seldom such as to be of value in the prescribed course of Rifle Instruction. It cannot be supposed that there are any essential differences in the averages of either physical or mental qualification in the different parts into which the Army is divided. This being the case, the different results obtained in different organizations must be due to the officers who command them, and to the officers alone. Where officers are obedient and carry out in good faith the orders which prescribe the course of rifle practice; where they are intelligent and zealous; where they not only demand obedience from their men, but seek to awaken their interest in this, the most important part of their instruction, and especially where they endeavor to excite emulation by practicing with their men and by becoming good shots themselves, excellent results will assuredly follow."

In 1884, an improved System was prepared by Captain S. E. Blunt, of the Ordnance Department, who had sent interrogatories throughout the Army asking suggestions pertinent to the subject on which the opinions and recommendations of the officers addressed, were solicited. As compared with the former Systems, the most marked features were the recognition it gave the Company Commander, as the appropriate Instructor of his men; the definite rules prescribed for

conducting the various steps of instruction from the recruit stage through all the phases of range firing up to that for the grade of sharpshooter; the incorporation of the most approved orders; the simplification of reports and records; the adoption of targets, both for range and skirmish firing, which would most promote the education of the soldier in the direction for which the knowledge acquired would prove most efficacious in war, and especially the measures taken to insure careful attention to the skirmish firing; and to further and increase the control of the officer over his men on the line of battle, perfecting thereby the most essential of all the features of musketry instruction, the fire discipline of the Company.

The National Rifle Association of America was founded in Nov. 1871. The following year a bill was passed in the New York Legislature contributing $25,000 to the support of the Association, and the sum of $13,000 for trophies; the City of New York donated $5,000 and the Association itself raised $5,000. Land was purchased at Creedmoor, L. I., and a range built. The first meeting was held in the Spring of 1873, 18 local teams contested four matches at 200 and 400 yards, on iron targets with square bull's eyes. All four matches were won by the 22d Regiment, N. G. N. Y. team. In the Fall of that year the first international match was shot at this range between teams representing Ireland and America, and was won for the American team by a member of that team making a bull's eye on his last shot. In June of the following year the Association sent a team to Ireland to shoot a return match, which also resulted in a victory for the Americans. In 1876 the Association held a great international tournament at Creedmoor at which the teams from Ireland, Scotland, Australia and Canada competed with an American team for the Centennial "Palma" trophy, emblematic of the world's championship.

The result of these international contests was that a great craze for rifle shooting swept over the country. Rifle associations and clubs were formed throughout the land, ranges were built and many States adopted courses of instruction in rifle shooting, a branch of a soldier's duties which had always been sadly neglected. The different States began also to take an interest in the annual meetings of the Association and to send teams to compete for the valuable bronze trophy, the "Soldier of Marathon," a gift of the State of New York to the Association in 1875. New Jersey, Connecticut, Massachusetts and California were among the first to enter the lists. Three years later the "Hilton" trophy, valued at $3,000, the gift of Henry Hilton of New York, was put up for competition. This trophy is the most coveted of America's prizes and stands for the team championship of the United States.

In 1880 the Army began to send teams from the different military divisions, now departments, to compete for this trophy, and were three times successful. The presence of these army teams was a great incentive for the volunteers to try and excel, and there was universal regret expressed among the citizen soldiery when, after 1885, the army teams were withdrawn from these contests.

The pinacle of success was reached by the Association in the year 1878, when the number of prizes amounted to 317, with an aggregate value of $13,000. This success and popularity lasted for about five years longer, when the meetings began to wane. From the inception of the Association, the arms and ammunition manufacturers, the leading newspapers, business houses and many individuals had been donating rich prizes yearly. To this fact more than anything else was due the success of the meetings.

New sports now began to amuse the fickle public and gradually the supporters of rifle shooting withdrew their patronage. With the decrease of the number of prizes, the attendance of riflemen from other States grew less and less, until it became rare to see more than a couple of nearby States represented. Finally the finances of the Association reached such a low ebb that the repairs necessary to keep the range in shape for the National Guard practice could not be made and the State authorities stepped in and took possession of the range.

The last meeting held on the Creedmoor range was in 1891. The following year the officers of the Association arranged with the New Jersey State Rifle Association to incorporate in the programme of its annual meeting, the three matches, the trophies for which were to be shot for annually. These three

SOLDIER OF MARATHON

WIMBLETON CUP TROPHY

HILTON TROPHY

matches, the "Hilton Trophy," "Soldier of Marathon," and "Wimbledon Cup," have since been shot for at Sea Girt. The liberal and wide-awake policy of the New Jersey State Rifle Association for the last few years brought about a great revival of the sport of rifle shooting, so much so that it was recently decided to organize a new Rifle Association to control it, and arrange for international contests.

Later it was found that it was practicable to get together a quorum of the life members of the National Rifle Association to perfect a re-organization. When this had been done the new board of directors adopted the by-laws and elected the officers of the new Association and then resigned, leaving the management of the re-organized Association in the hands of the new people. The new National Rifle Association of America started out in life with four trophies, no debts and plenty of new life and enthusiasm.

The Association will own no ranges; it will not be a commercial enterprise; its aim will be the advancement of the art of rifle shooting throughout the nation. It will formulate rules and regulations governing competitions; determine the proper targets to be used; decide how matches shall be conducted, etc. Its grandest object will be to promote and encourage the use of the national arm, and to make the public as well as the National Guardsmen, familiar with the rifle that they would be called on to use in case of war, besides demonstrating its merits or demerits, and how it can be improved.

Target practice constitutes a branch of military instruction peculiarly fitted for the National Guard, and in which they will always excel. The *"position"* and *"aiming drill"* which constitute the foundation of the system, can be acquired in their armories, and even at their homes, while the high state of intelligence existing among them enables them to soon apply upon the range the instruction they have received. While every inducement should be made to attract and develop good individual shots, so as to constitute a good regimental "team," and for this purpose individual emulation should be encouraged in every way, yet Regimental Commanders must bear in mind that the true object to be attained is to secure the *general efficiency* of the rank and file as riflemen. More credit should attach to an organization making high average shooting than to one having a champion team, and all influences possible should be exercised in that direction. Nor will this course interfere with the selection of a good team. Nothing has been more clearly demonstrated at Creedmoor than that shooting is a matter of education, and it will be found that a thorough course of instruction will not only make the regiment efficient as a whole, but invariably develop a number of "crack" shots from among those who supposed themselves to be without the qualifications requisite for a "Marksman," and the more "Marksmen" the better the chances for a strong "team."

Candle practice is specially to be recommended for the National Guard. It gives almost the same results as armory target practice, and, as it may be performed simultaneously by an entire company, the saving of time is a great desideratum. Calculating on a basis of one shot a minute, five shots by 30 men at a

single target require two hours and a half, while at candles they could all be fired in 10 minutes. In this practice, a gas pipe with small jets is preferable to candles. Some regiments place a miniature tin target in front of the lights aimed at, having the bull's-eye cut out, the flame appearing just behind its center, so that a "bull's-eye" extinguishes it. When candles are used, it is an advantage to insert them in a tube with a spiral spring, so as to always keep the flame in one position, as in a carriage lamp. Some regiments have a bench like a carpenter's horse to place the candles on, so as to admit of their being moved to different parts of the room to suit the light. In this practice the primer used on the regular cartridge does not contain sufficient fulminate to extinguish the flame at a distance of three feet with certainty. In order to meet this defect, special primers can and should be always obtained containing an extra quantity of fulminate. Better effects are also found to result from enlarging the aperture into the cartridge. The shells made by the Union Metallic Cartridge Company are unsuited to this practice. The cone-shaped anvil used in them blows out, when used without powder, at the second discharge, spoiling the shell, and thus making the practice expensive. Neither the Remington shell nor that made by the United States Cartridge Company is liable to this objection, and in both, the opening for the fulminate can be enlarged. As a piece of the cap is frequently forced through the barrel by the explosion of the primer, care must be taken in this practice never to aim in any direction where injury could be caused by it. The main drill of the National Guard (in the cities at least) must take place at their armories, and practice at the range be but occasional, "not to learn, but to test what has been learned." Officers should, therefore, devote all the available time to the sighting, position, and aiming drill, which form the foundation for the whole system. As these are apt to prove monotonous, candle practice should be frequently indulged in, this portion of the drill being always interesting to the men. It is, therefore, recommended that the men should be practiced in firing at candles at the conclusion of each aiming drill. With men of the intelligence of those composing the National Guard, the improvement that will be found to result from a little careful practice of this description will be found surprising; and a Company that at the beginning could not extinguish more than two or three candles at a volley, in two or three months will put out nine out of 10; and it is frequently observed that those who have had the least previous practice as sportsmen will prove the best shots. This (candle) practice will also prove valuable as a substitute for ball practice in judging the efficiency of the men in those cases where the latter cannot be had; and none should be practiced in target firing who have not averaged extinguishing five out of 10 candles at a previous drill.

SHORT RANGE, GALLERY OR ARMORY PRACTICE.

Many shooters derive as much pleasure and enjoyment from the use of their arms at Short Range Practice, and shooting small game, as they do at the regular range, or when on their hunt for larger game. This they can participate in at a much less expense, and in the off-season, which not only keeps them in practice, but affords many hours of keen enjoyment. There are a great variety of bullets of all weights, shapes, and calibers, so that the most critical shooter should be able to find what he desires for whatever rifle he may have.

Armory or Gallery Practice is also becoming more popular every winter, and great efficiency is attained with light charges and round ball, or special short range conical bullets. It is a cheap, pleasant, enjoyable pastime. The marked improvement in the shooting at the range is in a great measure credited to the Armory and Gallery Practice. The use of the same rifle at Armory or Gallery Practice that is used at the range will accustom the shooter to it, and tend to perfect him in the proper handling of the arm. This feature is recognized by the leading military shooters, and Armory Practice is now permanently fixed as a part of the duty of the military shooter, if he expects to become proficient at the range. The U. S. Marine Corps officials at Washington, recognizing these facts, tested the special 45-210 grain bullet for their short range work, after which they gave orders for a quantity of the Ideal Armory moulds for that bullet, which are now being used in the Service. The whole of the New York State Militia, and numerous other military organizations, who use large quantities of bullets, are served with these moulds cut for the round, 210 grain special, and other bullets as desired.

If using black powders, select the fine grade, which is quicker. The high-grade shotgun black powders, which would not be good for full charge rifle cartridges, work well for small charges from 5 to 15 grains, according to size of bore and distance to be shot. Some of the Smokeless shotgun powders, such as Hazard's, DuPont's, "E. C.," Schultze, King's, Oriental and Walsrode, are not proper for full charge rifle or pistol cartridges, yet they are fine for short range, if used in quantities not greater than from 5 to 10 grains. King's F. F. F. G. semi-smokeless powder is also good. In the factory short range cartridges, the powder is loose in the shell, and the bullet, if grooved, is seated in the shell just deep enough to cover the lubrication. The air space between the ball and powder is unfilled, and very good work is ordinarily secured from this ammunition, but if the shooter thoughtlessly holds his rifle with muzzle down before bringing it to his shoulder, the powder falling from the base of the shell may cause hang-fire. We, therefore, advise a little soft cotton wad, pressed lightly upon the powder, with the end of a lead pencil, simply to keep it at the base of the shell. The round ball is for the

shortest range with smallest charge of powder. They should be made considerably hard, and as large as can be forced in the muzzle of the shell, without expanding it. The round bullet presents but very little bearing surface to the rifling, so it should be as large as possible, to prevent escapement of gas, and if hard, instead of soft, they will be more liable to hold to the rifling. If too much powder is used with round ball, they will be apt to jump the rifling and lead the barrel. The cause of dissatisfaction to many who have tried the round bullet has been the use of too much powder, and the bullets too soft. Insert the bullet in the shell about one-eighth of an inch below the muzzle, and run a drop of melted lubricant around the bullet and the shell where they come in contact.

Some shooters believe the bullet should be seated away down in the shell on a small charge of powder, while others prefer loading as described above. We think, in many cases, the accuracy may be impaired by having a bullet seated too far in the shell, for it necessitates the movement of the bullet the length of the shell before it strikes the rifling, and it may not enter on a true axis with the barrel, especially if there is a space to jump between the end of the shell and the rifling. It is an acknowledged fact that a bullet, perfectly seated in the rifling before discharge takes place, approaches nearest to perfection. Hence, the use of the barrel bullet seater for fine target work. We think the nearest to that method would be to keep the bullet as close to the rifling as possible.

The target here illustrated is actual size, and it bears strong testimony on the subject in hand. Number of shots, 26; distance, 100 feet; rifle, .30 cal. Govt., Winchester model '95; twist, 10 inches; powder used, DuPont's smokeless rifle

No. 1; quantity, 10 grains, no wadding; primer used, No. 2½ W. Winchester; bullet used, .32 S. & W., as cast in Ideal Mould; size, full .313. The bullet being .313, could not be set within the .30 cal. shell, which is snug for a bullet .308, so it was simply placed on the muzzle of the shell, and tapped lightly, so as to make it hold, while being inserted in the chamber. Lubrication on the outside. Bullet was cast of metal, one part tin to 19 of lead. Shot from a rest.

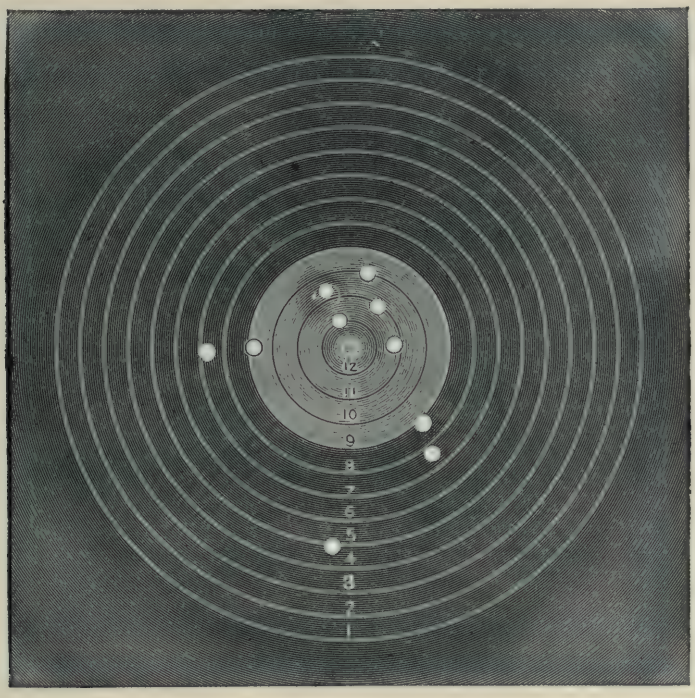
There is no portion of rifle practice more important than understanding how to estimate distance, but the question of how such a knowledge shall be acquired and imparted, forms a very difficult problem for an officer of the National Guard. In the country, facilities for the purpose can be easily obtained; but in the cities, officers, in addition to requiring their men, when upon the range and not firing, to practice in this exercise must urge them to accustom themselves to judge distances the best way they can, impressing upon them that, no matter how accurate marksmen they may be at a fixed target, they are worthless if they cannot calculate the distance of an enemy. In estimating distances, the following suggestions may be valuable: At 50 yards the observer can name any one of his comrades readily, as the age, complexion, height, and figure can be determined at that distance. At 100 yards he should notice those parts which are clearly visible, and his attention drawn to the indistinctness of other portions. The lineaments of the face are no longer visible, the buttons down the front of the coat appears one continuous line. The movements of the men individually, and the form and color of the uniform, are, however, perfectly visible. At 225 yards, the colors of the uniform, cartridge-boxes, etc., are still visible; but the face now resembles a light-colored ball under the cap. At about 250 yards he can distinguish only the different parts of the body and the rifle. At about 450 yards, the direction of the line of march and the movement of the rifles can be detected, and in cavalry the helmet, cuirass, bright colors of the uniform, etc. At 600 yards the head looks like a small round ball, and the shoulders sloped off. At 700 or 800 yards the body has a dwindled appearance, but the legs of men in motion or extended arms are still distinguishable. At 900 and 1,000 yards the separate files and direction of march are still apparent. At 1,200 yards infantry can be distinguished from cavalry. At 2,000 yards a man, or even a horse, looks like a mere speck or dot.

Individual practice should be encouraged by all officers, and particularly in the case of the National Guard, to whom every inducement should be made to visit any available range for private practice. To prevent accidents and insure the enforcement of the prescribed rules, every man should be required to enter his name on arriving at the range; those men who are the first to arrive should have the right to determine the distance at which they wish to fire. As the men arrive, they will form themselves into squads, each squad electing a captain, who will keep the score and enforce the rules of the range. All arriving subsequently are to obey his orders. If no markers or look-out men are employed, each captain must make a detail from his squad for such purposes, and see that those detailed are properly relieved. The firing is to be conducted according to the principles above laid down, and every shot fired in rear of the firing point, whether accident-

ally or otherwise, unless fired into the pit provided for the purpose, shall be entered as a miss. The men last at the ground must see that the danger flag is hauled down, and the appurtenances belonging to the range replaced where they belong, or returned to the keeper. Practice upon the range is only intended to find out and apply what has been learned at drill, and acquire a practical knowledge of elevations and the allowances required for wind and weather. In all cases, therefore, extreme deliberation should be used. No advantage is gained by firing more than 10 shots at a distance; and the habit beginners have of expending all the ammunition they can procure as fast as possible, is a positive detriment. Each shot should be fired with a definite purpose, and its results noted and remembered. The captain of each squad, or of a team, should give special attention to this subject, as not only will the expense of the practice be greatly reduced, but the quality of the shooting greatly improved.

The first point to consider in regard to a range is its safety, and too much pains cannot be taken in the selection of the ground in order to protect the public from danger, as well as to prevent unnecessary expense in the erecting of butts, etc. While it is impossible to lay down precise rules for every feature of a country, the following suggestions will be found sufficient under ordinary circumstances. No ground is to be selected which does not afford a range of at least 300 yards, and it is most important that the ground behind the targets should be thoroughly commanded from certain points sufficiently clear of the line of fire to insure safety to the look-out men who are to be placed there in order that the fire may be easily stopped when necessary; hence a range down hill is generally to be preferred, as being more easily commanded to one uphill. The targets upon a range should, where the ground permits, be established by pairs, with an interval not less than 10 yards between each target, and with a margin of at least 40 yards at the sides; the minimum breadth of ground for a pair of targets should be 90 yards, and all the targets should be on the same line. When, however, the number to be exercised in rifle practice is large, and the breadth of ground limited, a number of targets may be established, with an interval of 10 yards between each, to be used as if for a pair, a margin being left at the sides of the outer targets of at least 40 yards. In these cases the number of each target should be conspicuously placed upon the butt in rear of it so as to be plainly seen from the firing point, and the firing should be stopped at all the targets whenever the danger signal is shown at any target within 40 yards. The breadth of ground in rear of the target at each side of the outer ranges, should gradually increase from 40 to 80 yards, in those cases when the ranges are parallel; but when they converge toward the targets, the breadth may or may not be required, according to the degree to which

the ranges are made to converge. The distances at the targets must never be less than 10 yards between ranges in pairs, and 80 yards between pairs of ranges, whether they are laid out parallel to each other or converge toward the targets. If no butts are erected, and the ground is level, the space behind the targets should be about 1,500 yards. A less distance may, however, answer, if butts are erected, or if a steep hill rises in rear of the targets. Before steps are taken to procure grounds for ranges, it is essential to secure the right to fire over the land behind the targets to the extent required, should it not be desirable to purchase it. Generally this distance cannot be obtained, and a butt must be erected in rear of the



LYMAN TARGET FOR RAPID FIRING

targets, to arrest stray shots. The height of this must differ according to the nature of the background. If the range be on a plain, the regulation size of the butts is from 35 to 40 feet high, provided the distance behind the target is less than 1,500 yards. Under ordinary circumstances, however, the height of the butt need not be more than 20 feet, and when firing toward water a butt of 12 feet in height will be sufficient. On some ground there are found natural butts for the targets to rest against. To be of use in stopping stray bullets and thereby insure the safety of the public, the hill should incline 45 degrees, at least; if a smaller angle than this, it would, instead of acting as a stop, incur the chance of a rico-

chet, and therefore be unsafe. A few furrows from a plough will requently lessen the chances of ricochets. The length of the butt for a pair of targets should not be less than 45 feet, measured along the top. They are far inferior to natural obstacles, and are expensive to erect and keep in repair. The number of each target should be placed on the butt directly over it in large figures, so as to be conspicuous from the firing points. Where there are a number of targets these numbers should be painted red and black alternately. At long ranges Roman figures, made by laying rails on the butt, are more easily discerned than numerals. In crowded localities, where the range is short, and the danger of injury to the public great, a series of shields or screens may be thrown across the practice ground at different distances containing apertures of such a height and width as to permit the passage of all properly directed bullets, and to arrest random shots. These are sometimes high arches of cast-iron, and sometimes upright barriers of stout plank. Two or three sheds with plank roofs, made to slope *toward* the target, form a cheap and convenient screen, provided the ground between them is furrowed so as to prevent the ricocheting of the bullets which strike the sheds and glance downwards. In the longer ranges, these shields are objectionable, not only because the high trajectory of the bullet makes it difficult to place them properly, but because they confine the firing to a single distance, and render the appearance of the target as visible through the apertures so different from what it presents in the "open" as to deprive those using them of many of the advantages that should be derived from target practice, and particularly from acquiring a practical knowledge of distance. If care be taken that none be allowed to practice with ball who have not been through a course of *"position and aiming drill,"* the danger of random firing will be reduced to a minimum, and the prescribed butt be found amply sufficient for all practical purposes. Every range is to be carefully and accurately measured, and the distances defined by a line of small pegs, at intervals of 50 yards, commencing at 100 yards from the target, and continuing to 900 yards, or to the extent of the ground, if under that distance. These pegs also serve as guides to prevent firing on a wrong target—a fruitful source of accidents. To avoid the sun, the targets must be placed at the northern end of the range; or if that is not practicable, at the eastern. In using the ranges the firing parties commence their practice close to the targets and gradually retire. Consequently, as there is not likely to be as much practice at the extremely long ranges as at the shorter ones, a piece of ground, of a triangular shape may be selected for an extensive range, the targets being placed at the broadest part, and the firing points being reduced as the distance is increased. Several flag-staffs should be placed in such positions upon the range as to make the danger signal conspicuous.

RIFLE TELESCOPES.

While the application of the telescope to the rifle is by no means a new idea, it is, however, more necessary in this age of high-power rifles, whose killing ranges are beyond the accurate perception of the unaided vision. It is, therefore, obvious that the application of the telescope to arms of this type renders them at once serviceable to the extreme limit of their power. The universal employment of smokeless powder in all guns of this sort has opened the way to the adaptation of the telescope to them. A great advantage gained in using the telescope in shooting is the elimination of the opaque or metallic forward sight, which increases in apparent diameter as the distance between the marksman and the target increases, often more than covering the entire object at long ranges.

The principle of the rifle telescope is the same as that employed by the surveyor, who, through the medium of his telescope, equipped as it is with delicate cross-hairs, is enabled to make accurate observations when sighting upon objects at great distances. To be of value, the telescope must be both water and dust proof and always in focus for any range; the field of vision large, flat and

Figure 1.

clearly illuminated throughout; the cross-hairs must intersect one another at the exact center of the illuminated field and be sharply defined. The mountings securing it to the gun should be universally adjustable, and so made that repeated firing with heavy charges will not jar the telescope, or in any wise alter its relationship with the bore of the gun, and yet leave no parts protruding to catch the clothing or underbrush. The telescope must be so mounted upon the gun that it can be set quickly and easily for the required ranges and to compensate for errors due to wind.

The fact that these telescopes are practically universal in focus renders it possible for those who in a moderate degree are either near or far sighted to use them perfectly without the presence of glasses. Those after big game in the mountains or on the plains, where distances are great, will find the telescope

invaluable in locating and killing it,: the wide, clear field allowing great range in sighting moving objects. The different varieties magnify from three and one-half to twenty diameters, and have such marked illumination that in feeble and uncertain light objects which would otherwise escape the notice are quite distinctly seen. Objects invisible to the naked eye after dusk are thus rendered clearly visible. For target shooting with the modern, high-power guns at long

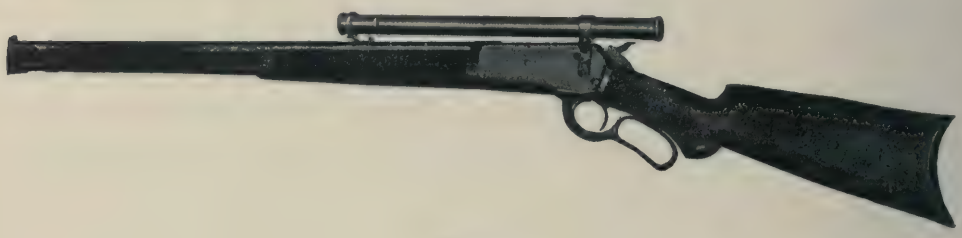


Figure 2.

range, the stronger powers are most suitable, while for hunting, the lower ones are preferable.

The telescope mounted on the United States military rifle—the Krag-Jörgensen—does not consist solely of a corrected objective and a simple glass eyepiece, but contains a thoroughly corrected achromatic objective and complete achromatic eyepiece as well, which features fully develop the optical properties of the glass and give to the telescope an exceptionally large, flat and fully illuminated field, together with a remarkable long focal relief. The lenses forming the achromatic refracting systems are all made from the highest quality of optical

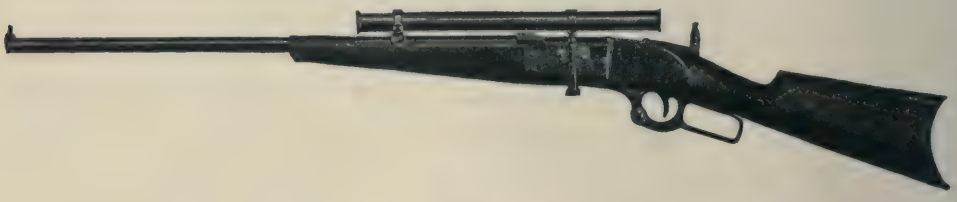


Figure 3.

glass, and so ground and arranged as to admit of no loss of light, thereby greatly increasing the illumination and definition. The non-breakable cross-hairs are placed exactly within the focus of the eye lens of the eyepiece and are distinctly seen under all conditions. All of the lenses are securely burnished into their cells, which are held in such a manner as to prevent the slightest movement from the sharpest recoil.

The Cataract Tool and Optical Company make three styles of mountings, two

side and one center, all of which are adjustable, and are designed for holding the telescope either directly upon the top of the gun or on the left side, as required. The side mountings can be used on any style of rifle; the top or central mountings on single-shot. breech-loading rifles and those which eject on the side. When the side mounting is used, the open or Lyman sights need not be removed; but when the central mounting is used, other sights must be taken off. By the introduction of the ball and socket ring a reliable means for attaching the telescope to the gun has been perfected. Heretofore various imperfect devices used for this purpose were a serious drawback to the employment of the telescope, inasmuch as none of them would admit of universal adjustment without cramping in some parts, and, as a result, the telescope would quickly alter its position with relation to the gun after firing a few times, no matter how tightly the binding screws might be set up. These mountings hold the telescope close to the gun,

Figure 4.

giving extreme rigidity and wide range of adjustment, together with a compact and symmetrical appearance. In mounting the telescope on the top of barrel, the telescope is made to exceed the length of the gun barrel, irrespective of the power. Thus the forward end of the rifle does not obstruct the view when the telescope is raised for increased ranges. On the top-ejecting and most repeating rifles the telescopes are mounted on left side of gun, and when thus mounted any tube length may be used in keeping with power required, for in elevating the telescope for increased ranges the gun barrel does not, in this instance, come into view. Telescopes mounted in this way are more compact, lighter and more easily adjusted, and admit of the use of regular sights also. Figures 1, 2 and 3 show the telescope mounted on the German Mauser sporting rifle, the Winchester magazine rifle 45-90, and Savage sporting rifle, respectively. Figure 4 shows the rear

mounting, designed for holding the telescope upon the side of the rifle as close as possible. It allows for elevation for increased ranges, by means of a micromter screw graduated to 1-600 of an inch. The front mounting allows for windage adjustment by means of the same form of micrometer screw graduated to 1-600 of an inch.

The Duplex rifle telescopes, manufactured by Lawson C. Cummins, Montpelier, Vt., in different styles, suitable for use on any model of rifle, are highly prized by sportsmen. They are achromatic, in seamless browned steel tubes, with steel hangings that confine them closely and firmly to the rifle barrel, the elevations being obtained by adjusting the cross-line with a thumb-screw. The wind-gauge consists of a vertical line adjustable by a thumb-screw. A central point is placed at the top of the field of vision. When no wind or mirage exists the vertical line is set at this central point, but when the target shows that the bullet is being deflected by gravity and atmospheric conditions, while the central point is on the bull's-eye, set the vertical line to the point of deflection and the correction is exact. With this telescope the balance of the rifle is not perceptibly changed,

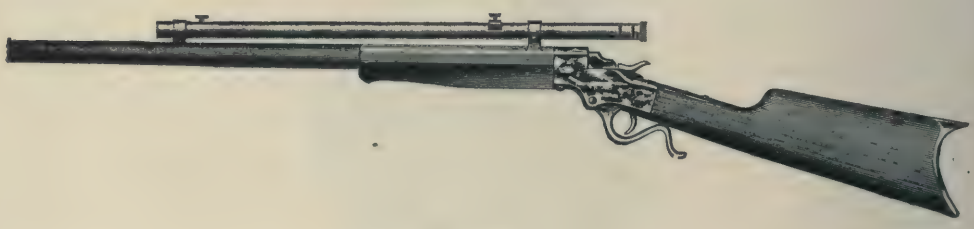


Figure 5.

the symmetrical appearance of the arm is unimpaired, the fragility not increased. The microscopic vision of the sight avoids all blur and diffraction which are forever brooding on metallic sights, and the telescopic view of the game or target, almost annihilating distance, makes the directing of a rifle shot a simple act, performed with ease and certainty. The signal advantages of these telescopes over many others consist in the sustantial nature of the telescope itself, and in its rigid attachments to the rifle barrel, its wide field of vision and high illumination, making it easy to do accurate work in a light so dim that nothing at all can be done with any open sight. Figure 5 shows a rifle mounted with an 18-inch, achromatic, duplex telescope sight. A practical method of setting the telescope where no special tools are at hand, is this: Place the rifle in a vise and arrange a blank bullseye on a white ground about thirty yards in front; have the bullseye almost, but not quite, as large as the field vision through the rifle bore, and place a white center, one-fourth of an inch in diameter, on it. Point the bore of the rifle exactly at this bullseye; now place the hangings on the telescope, and be sure to

put the one with the lightest base in front, and turn the screws just barely sufficient to hold the telescope in position. Now place the hangings containing the telescope on top of the barrel and mark the position for the slots and look through the telescope. If the fixed globe on the vertical line points at same height as the white center in bullseye, cut the slots of equal depth; if it points above, cut the front slot deepest; if below, cut rear slot deepest. To ascertain how much, put a slip of metal under one hanging just sufficient to cause the globe to point at the white center and use it for the difference gauge. Care must be taken in filing the slots to secure a nice fit and have both hangings in line. When the hangings are set in the barrel, insert the telescope and arrange it so that the vertical line exactly corresponds with a plumb line in front and pinch it with the two screws in the rear hanging. While it is thus held in this position, bore and tap the holes in the front end of telescope and insert the screws through the front hangings and the work is complete. It sometimes happens that rather steady shooting rifles do not shoot where the bore points; and should occasion require the changing of the direction of the telescope after being set, it is better to move the rear hanging, which should be fitted very close in the slot, as the barrel being heavy at that point gives it strength for a stronger grip than further forward. The hangings should be placed as far apart as is consistent with surrounding circumstances. All rifles shoot under the point at which the bore is aimed considerably more than the fall of the ball from gravity. This is owning to the crook in the stock and other reasons, but in this matter each rifle has its own peculiar habit. Perhaps an approximate average of a seven pound, 32-40-165 rifle would be three inches at thirty yards, and if it is desired to use the fixed globe for short-range shooting it is well to make allowance when setting the telescope. However, that is not material, as the cross-line is adjustable both above and below the globe. By raising or lowering the checknut on the elevating thumbscrew, the tension may be adjusted to suit any taste. The focus thumbscrew should be screwed in very tight to prevent the recoil from slipping the glass out of focus.

An excellent telescope sight manufactured by the Julius King Optical Company of New York, shown in Figure 6, is made in three styles and is optically arranged to be always in focus for objects distant from 10 to 5,000 yards, rendering them perfectly clear and distinct. The field presented to view is unusually wide, clear and flat, allowing wide range in sighting running game. The focus is such that objects are only visible through it when the eye of the shooter is at about two and one-half inches from the eye piece; this prevents any injury to the eye from the recoil of the gun, and does away with the old-fashioned slide. The lenses are accurately ground, centered, and, together with the cross-hairs, are mounted in brass cells, which are held at proper distances from one another by seamless brass

tubing which is then inserted and screwed from both ends into a blued steel tube fourteen inches long and seven-eighths of an inch in diameter, making the sight dust, light and waterproof. The objective is thoroughly achromatic throughout

Figure 6.

and is placed one and one-half inches back from the forward opening of the steel casing, to protect it from the danger of being broken and from oblique rays of light, making the telescope both a day and night glass. The mountings employed in fastening the telescope to the gun are designed for attaching it to the center or side of the barrel, the latter being most frequently usd to admit of the use of the open, Lyman, or telescopic sight. The mountings are adjustable so that the gun may be quickly and accurately sighted to any desired range. This telescope sight magnifies an object and makes it appear from four to twenty times larger than it really is. The result is obvious. They have such fine illumination that an object is distinctly seen in feeble and uncertain light that otherwise would be practically invisible to the naked eye.

The Malcolm rifle telescope, manufactured by the Malcolm Rifle Telescope Manufacturing Co., Syracuse, N. Y., and shown in Figure 7, attached to a Win-

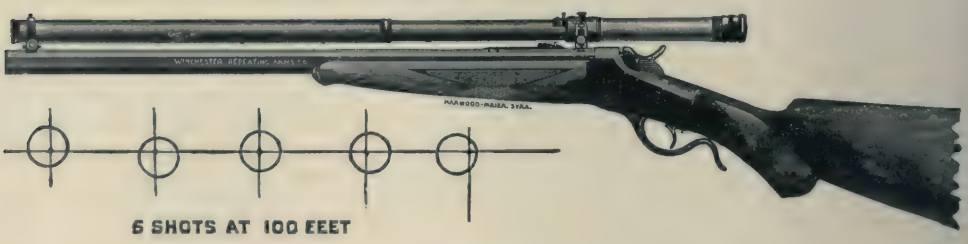


Figure 7.

chester rifle, is made of all grades, high or low power, long or short tubes. Special attention is given to the construction of short glasses, from 12 to 20 inches. They are made of two sized tubing, neatly joining the two sizes together, thereby

getting a larger tube in front for a large obstructive and a smaller tube in rear for the eye piece. In so doing we not only produce a neat looking telescope, but also gain otherwise, in producing a very large field with sufficient light for the glass to be used in very dark days and in all kinds of places, such as dense woods and other dark places, making it an excellent hunting sight. There is an unique arrangement with these glasses. It consists in cutting two slots at the rear end of the glass to adjust and correctly focus the cross-hair. In looking through the glass at an object, observe whether the cross-hairs are perfectly stationary or whether they move when you shift your eye up or down. If perfectly stationary they are in correct focus with your eye. If they move you must unloosen both little screws which hold the cross-hair setting, and move the setting forward or the other way until you strike the proper spot where the cross-hair stands still and without any motion. No matter how much you shift your eye, tighten down the screws and that part is corrected. Now, to focus the glass correctly for distance, the other single slot in the glass indicates where that is done; by unloosening the screw the object lense setting can be shifted forward and back, as the case may require. The glass only needs adjustment for distances less than 50 yards; beyond 50 yards, no alteration is necessary except in glasses of very high power, which require focusing for almost any change in distance. These glasses are made to fit all prominent rifles.

An excellent rifle telescope, manufactured by L. N. Mogg, Marcellus, N. Y., and shown in Figure 8, on the Savage rifles, has the split sleeve, and its advantages are that it gives more adjustability and allows one to use the glass on dif-

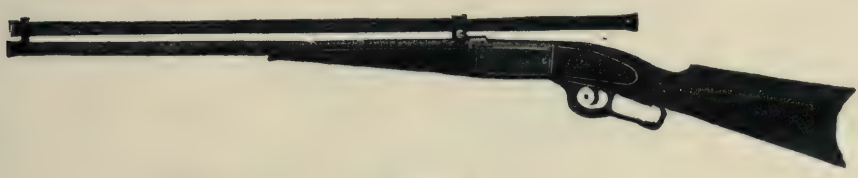


Figure 8.

ferent rifles where the frame differs in length. If a change is desired all one has to do is to loosen two screws and slide the sleeve, then tightened up where it is wanted. The principle is similar to the "clutch" used in transmitting power. These telescopes are made adjustable for various eyes. Towards the front is a screw in a slot that controls the object lense, and by loosening that it can be moved to accommodate the eye of the young or aged as well as for near and far distances. Figure 9 shows the mounting, with the split sleeve and telescope tube in position. Figure 10 shows the latest style of split sleeve used on the higher grades of telescopes.

The John W. Sidle rifle telescopes have been conspicuously to the front since their introduction and are in use by many of the finest rest shots of the country. Most carefully made in all respects, with special reference to rest target shooting, they represent, each in its class, the very highest grade of achromatic telescopes now made. In illumination and sharpness of definition they leave nothing to be desired. The "snap shot" telescope, designed mainly for hunting purposes, shown in Figure 11 on a repeating rifle, is very satisfactorily used in the deep woods,

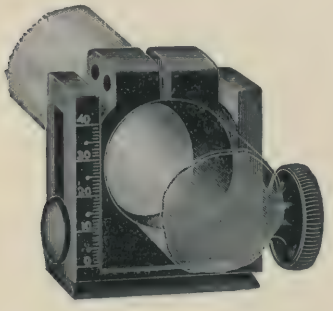


Figure 9.

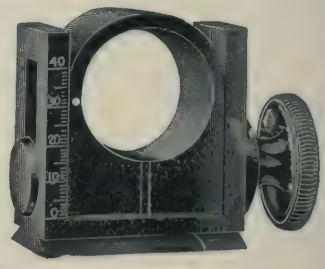


Figure 10.

and, by reason of its large field, for game on the run. These qualifications, adapting it particularly to hunting and off-hand purposes, have deservedly insured its popularity, and they are in use in great numbers by hunters of all kinds of game. from the squirrel and woodchuck to the moose. It is also particularly adapted to off-hand target work where this is desirable.

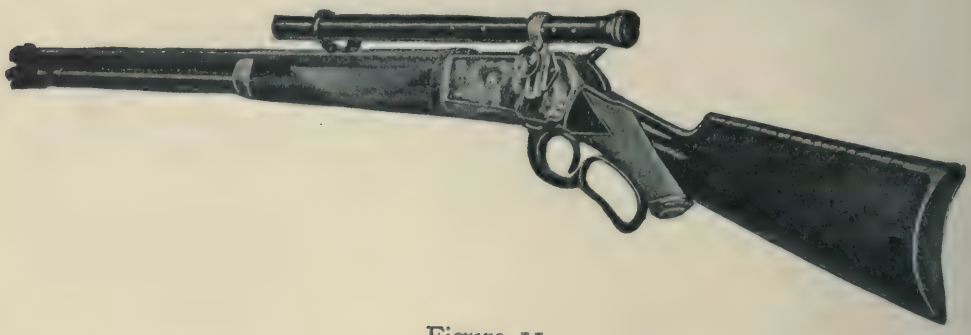


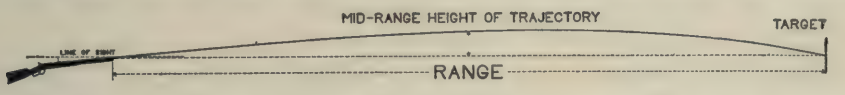
Figure 11.

The Leopold combination snap shot telescope is, primarily, a first class hunting sight, but includes a combination of interchangeable object-glasses, adapting it to rest shooting at the target, and when fitted with the higher power, about nine diameters, it will spot shots at all ranges up to 200 yards. When the short focus object-glass is used, the power is three diameters.

SIGHTING RIFLES.

On most long-range rifles, the rear is made with a vernier scale operated by a screw, by which an alteration of one-hundreth of an inch, and even of half that amount, can be made in the elevation, the result being exact, and recorded in figures—the only way in which a correct record of elevations can be kept. On the Remington rifle the divisions on the vernier are termed degrees and minutes, and on the Sharps decimals of an inch. On the former each minute is 1-92 of an inch, and corresponds upon a 34-inch barrel with 1 1-18 of an inch, at each 100 yards. On the Sharps rifle each sub-division is 1-100 of an inch, corresponding theoretically to 1 1-2 inch to every one hundred yards. As no man can hold or sight a rifle at 1,000 yards within ten inches, the elevation on both rifles is practically the same, or about two inches to each 100 yards for each sub-division on the vernier that is, twenty inches at 1,000 yards. The sub-divisions upon the wind-gauge of both the Remington and Sharps rifles are about 1-40 of an inch, and are equivalent in practice to two inches at each 100 yards, or 20 inches at 1,000 yards, on the 34-inch barrel.

As the errors incident to aiming at long range will, in most cases, increase the effect of any alteration in the sights, care should be taken to keep well within the elevations which would be mathematically correct. It must also be recollected



that the velocity of a bullet decreases with the distance, and as it loses its velocity it becomes more likely to be affected by currents of air. Consequently the effect of any change upon the sights is greater proportionately at long than at short range. The effect of wind, etc., increases in a still greater proportion, that which would require an alteration of 2 points in the elevation at 800 yards, requiring 2 1-2 at 900, and 3 at 1,000. The proportions of the trajectory represented in the above sketch are exaggerated with respect to the size of the rifle. In estimating the carrying power of any bullet, it is customary to give, as the measure of its trajectory, the mid-range height of the bullet above the straight line from the muzzle of the rifle to the point where it strikes the target. The best riflemen prefer to have the peep-hole of the rear sight of considerable size, as affording more light, and consequently allowing a better sight to be taken. In the Metford rear sight, discs having different sized apertures may be used; and it has been stated by some of the Irish team that they have, in foggy or dark weather, done good shooting by removing the disc entirely, so as to leave an aperture of nearly a quarter of an inch. Every rifleman should, therefore, have an extra disc, with a large aperture, to use in dusky weather. The vernier sight is usually placed upon

the small of the stock. General Dakin and others who shoot on their backs, have it placed upon the heel of the butt. When the latter is the case, it makes the distance between the two sights nearly a third greater than when placed upon the small of the stock, and consequently a proportionately greater allowance both for elevation and wind will be required.

In order to acquire a correct manner of aiming with the various sights adapted the following directions given for Winchester repeating and single shot rifles should be observed: The rifle should be held with its butt placed firmly against the shoulder, yet not so tightly as to cause any muscular strain or tremor, and its muzzle brought to point in the direction of the target, but somewhat below the bull's-eye; care being taken to keep the sights perfectly upright. The center of the notch in the rear sight should then be brought into direct alignment with the front sight; and when correctly held the tip of the front sight should appear about 1-32 of an inch above the bottom of the notch of the rear sight, or so much as may be distinctly seen without blurring. With a bead or pin-head front sight the whole of the bead should be seen. Keeping the sights in this same relative position, the muzzle of the rifle should be raised until the tip of the front sight reaches the bottom edge of the bull's-eye, but does not quite touch it; a small space intervening just perceptible to the eye without straining. With aperture front sights, the aperture in the bead should "ring" the bull's-eye, allowing a thin white ring to show equally around the bull's-eye.

When using a graduated peep rear sight of the Winchester or Lyman pattern, the front sight should be held on the bull's-eye in the same manner as described above, the difference being that the front sight only is seen, the eye being held as nearly as possible to the center of the hole in the rear sight. These peep rear sights are customarily fastened to the tang of the rifle, or to its receiver; and, as most of the V notched rear sights stand so high from the rifle barrel as to interfere with a clear view through the hole in the peep sight, it is recommended that they be removed whenever a peep rear sight is put on the rifle, and replaced with a blank piece especially made for this purpose.

A variation in the position of the grouping of shots upon the target, due to a difference in the manner of holding the sights, is often found to exist among shooters. This is sometimes caused by imperfect vision: astigmatism, far-sightedness, or near-sightedness. Astigmatism, or defective eyesight due to a spoon-shaped form of the lens of the eye, and which causes lines in certain directions to be seen more clearly than in others, will distort the appearance of the sights in various ways, dependent on the character of the defect, thus producing an incorrect holding, both with respect to lateral alignment and elevation. Far-sightedness will cause a blurring of the rear sight, while near-sightedness will affect the accu-

rate drawing of the front sight upon the bull's-eye. It, therefore, sometimes becomes necessary to alter the alignment of the sights to accommodate the rifle to the shooter's own manner of sighting. When this is done, it should be remembered, as a general rule, that, however the adjustment of the rear sight may be changed, the effect will be to cause the rifle to shoot in the direction towards which the rear sight has been moved, while any alteration of the front sight produces an opposite effect. For example, if the rear sight is moved towards the right, the rifle will shoot further to the right on the target; if the front sight is moved towards the right, the rifle will shoot to the left; if the front sight is filed off, or a lower one put in its place, it will cause the rifle to shoot higher, and so on. This



rule for adjusting sights must not be confounded with the manner of drawing the front sight in the rear sight notch when aiming, for in that case the higher the tip of the front sight is held, the higher will be the grouping of the shots on the target. When shooting in a bright light, the grouping will be lower than on a dark or cloudy day. It will be found advantageous, when using an ivory bead or other light colored front sight, to smoke the tip with a match, when shooting on a bright object. When firing either from a prone or kneeling position, a rifle shoots higher than when shooting from a standing position. To alter the elevation of the sporting rear sight, the slide on the front of the horn can be raised or lowered by easing the adjusting screw.

The graduated scale on the leaf of the Winchester peep rear sights is laid off in decimal parts of an inch, having no reference whatever to the range, and can, therefore, be used as a range-sight only after the rifle has been targeted at the various standard ranges and the reading of the scale noted or marked on the leaf. The vernier on the mid-range vernier peep sight, enables this sight to be adjusted to the one-hundredth part of an inch.

All front sights, rear sights, or blanks fitting into a dovetailed cut in the barrel, should be driven into place from the right-hand side of the barrel, and driven out, if necessary, from the left. Much force, or a heavy blow, should never be resorted to, as the sight would not only be mutilated, but the barrel dented or thrown out of line so as to seriously affect its shooting. If it is found that the sight drives in too tightly, its base may be sufficiently reduced by careful manipulation with a fine file. The slot in the barrel should, however, never be enlarged. If the sight is so loose as to render it apt to be jarred out of place, a piece of thin tissue paper may be inserted under its base before driving it in, or the dovetail on its base may be

slightly dented near its center, thus throwing up a burr which will hold the sight in place.

The Pope rear wind gauge and elevating sight is most convenient and accurate. Wind and elevating movements are entirely separate, so moving one can not disturb the other. One hole movement of either elevating nuts or wind screw equals 1 *inch on a 200-yard target.* The two elevating nuts are operated by a small lever pin, which can be carried in the head of the sight, or worn upon the watch chain, as preferred. These nuts bind against *opposite* sides of the solid frame, therefore looseness of fit from wear *can not affect the accuracy* of adjustment. These nuts are usually set firmly, so they can not be accidentally moved, but may be left so as to move with the fingers if desired. The wind screw differs from the ordinary construction by passing through a bearing at both ends of the frame and by having a shoulder on one end and a jam nut on the other; when wear occurs, all that is necessary to correct it is to screw the nut up a little firmer, filing off a trifle from end of screw if necessary.

For over half a century hunters and sportsmen have used Buckhorn sights on their rifles, which do not permit of any side adjustment for drift or windage, while for elevation the steps are very coarse, impossible of being finely adjusted. Many rifles are condemned by shooters because they do not get satisfactory results, when in most cases it is the fault of the sights not being properly aligned. Every user of a rifle should finally adjust the sights to suit his own eyesight and particular cartridge he intends to use. However carefully rifles may be sighted and adjusted

in the factory, it is a well known fact that the eyes of no two persons are focused exactly alike, therefore to secure the most perfect results it is necessary for the user himself to finally adjust his sights. The Savage Micrometer Sight, shown in the drawing, is the invention of Arthur W. Savage, the inventor of the Savage Rifle. It is scientifically designed, being the result of much practical shooting experience. Every part of the sight is well constructed of the finest materials; strong and simple. It can be adjusted in any direction to one thousandths of an inch, and has considerably more elevation than the regular Buckhorn sights. All adjustments are obtained by finely threaded screws, this being the only perfect method for adjusting sights. It is constructed for Savage, Winchester, Marlin, Colt, Remington, and all rifles having a rear slot in the barrel.

The inventions in sights and contrivances for more accurately sighting shotguns

are numerous. The Barger sight, which in a measure, revolutionizes wing shooting, consists of a steel ring or aperture, which is so placed upon the muzzle of the gun, that it clearly defines the killing field to the eye of the sportsman. When the bird is visible through the sight and is not out of range, a kill should be a certainty. A charge of shot at a distance of 40 yards, will scatter over a circular space some 36 inches in diameter. In a pattern of this size, it will be found that there is a space of perhaps 30 inches in diameter, in which the shot are so thick that a bird at any point in this 30-inch circle cannot escape. This sight is made of such size, that it clearly defines this killing field at all ranges. In other words, the killing field and range of vision through the sight practically coincide at all points. A gun should have sufficient elevation at the breech to bring the entire killing field within the range of vision, and that by clearly defining this killing field, the gun, if properly charged, is at its maximum efficiency. For it is evident that if half the charge occupies a space that is invisible to the eye, owing to the fact that it is obscured by the muzzle of the gun, the aiming is 50 per cent. more difficult, for the reason: that the object aimed at must be brought into the visible or upper portion of the killing field. The only way to determine whether or not a gun has the proper elevation is to target it. The following simple method is sug-

gested: Remove the old sight, place the Barger sight in position half an inch from the muzzle, being careful to adjust it properly. On a white paper target describe a circle the same size of the circle exposed through the sight at a given distance; for example: if the sight will cover a circle of 30 inches in diameter at 40 yards range, describe a circle 30 inches in diameter for that distance, or one that is one-half that diameter for one-half that distance, etc. After the target is in position, place four pieces of black or colored paper three inches in diameter, so that they will just touch the inner side of the circle, one at the top, one at the bottom and one at either side, to serve as a guide while aiming. Then, at the proper distance from the target, rest the gun and make sure that the sight surrounds all the colored pieces when you fire. If the charge is evenly distributed over the target, with the thickest portion of the shot at or near the center, the gun is right and has the proper elevation. But should there be more than a quarter of the charge below the circle, and but few shot in the upper portion, the gun is not right, and the elevation should be corrected. This sight can be used on guns

with low breech without using any elevation and still have a great advantage over the old sight, for it serves as a guide to prevent shooting to one side, gives a little more elevation owing to the removal of the old sight and also gives an unobstructed view of the object aimed at. This sight ranges in diameter from 3-4 of an inch to 1 inch, according to the length of the gun.

FOULING.

Every sportsman knows the value of keeping his gun carefully cleaned and in smooth working order. No gun will do good work with the inside of the barrel fouled with the residuum from burned powder, and rust-pitted from neglect and failure to use the proper cleaning implements. It is true that in these days of nitro and high powders gun barrels are not so greatly affected and do not become so heavily clogged with residuum as when the cheaper grades of black powder were in such universal use. There is no explosive made, however, that will not to a greater or less extent leave its coating of burned substance upon the highly polished interior of a gun barrel; and even the slightest amount of residuum so remaining, retaining, as it does, chemical properties destructive to even the finest qualities of steel, will in time pit and rust the barrels. The sportsman who takes care of his gun as carefully as he would take care of his watch is the sportsman who gets the best work out of it and whose arm will serve longest. Neglect or indifference to the condition in which a gun is set away in the rack after a days' shooting will affect, not only the life of the barrels, but their shooting qualities as well. Particularly is this the case where shore-bird and other water-fowl shooting is indulged in. Salt or damp air will always affect metal disastrously, unless measures are taken to protect the metal against it; and where the evil effects of burned powder residuum is increased by moist or salt atmosphere, the effect upon gun barrels is much more rapid and destructive.

The interior of a rifle barrel will yield more readily to the chemical effects of residuum from burned powder, either nitro or black, than will the barrels of a shotgun. The grooves of a rifle barrel offer far better opportunity to the destructive chemical effects of burned powders than does the comparatively intact interior of a gun barrel. And, for obvious reasons a pitted rifle barrel will affect the accuracy of the marksman to a much greater extent than would be the case with a trap- or field-shooter. In the rifle the barrel is so constructed as to have a direct bearing upon the bullet from the moment it leaves the cartridge until it arrives at the muzzle. Any imperfection, however slight, will therefore adversely affect the passage of a rifle ball where it would not materially affect a charge of shot in a smooth-bore gun.

Revolvers, like rifles, owing to the grooved interiors of their barrels, retain resi-

duum to a greater degree than is the case with a weapon of smooth-bore barrel. No better evidence of the fact that a foul revolver barrel will affect the marksmanship of the shooter is needed than the frequency with which the expert target shot will clean his weapon while at practice or in competition. The limited length of the barrel requires that it shall exercise undisturbed control of the bullet from the moment it leaves the chamber until it passes beyond the muzzle, and there is but little opportunity for the recovery of that control, should it be lost or affected at any period of the bullet's passage as the result of a foul or pitted barrel. It is important, therefore, not only that the parts of a revolver be kept well oiled and free from foreign substance, but that the barrel be frequently cleaned when in use and that it be kept absolutely free from pits.

The Gun Bore Treatment Company of New York city, has devised an absolutely effective and permanent protection against the rusting, pitting, fouling and leading of the bore. The treatment is chemical, and changes the color of the bore to a dark blue or black, making the surface hard and smooth, and penetrating the pores of the metal, filling them and preventing the entrance of ravaging agents. The treatment cannot fill up pits and rust spots (metal once gone cannot be replaced), but all further pitting or rusting is arrested. It does not change the resisting power of the metal or its tensile strength. The treatment requires from five to six days, according to the character of the metal, and may be equally well applied to the exterior of gun barrels with the most satisfactory results.

Scores of barrel cleaners are now on the market. The Budd-Petmecky and those made by the Bridgeport Gun Implement Company are excellent. Recently what is known as a "wick plug" has become popular. It is made on the same plan as a lamp wick, except that it is round. A hook is fitted to one end of the plug, to which a string cleaner may be attached, the weight dropped through the barrel, and then the wick, after having been saturated with oil, pulled into the barrel so as to completely fill it from one end to the other.

GUN SAFETIES.

Among the wonders which have been accomplished in all lines of invention and manufacturing during he last 30 years, although some may have been more remarkable, certainly none have been more interesting to the enthusiastic sportsman than the evolution of the modern shotgun. All of the older members of the sportsmen's fraternity did their first shooting with the old double-barrelled, muzzle-loading, cylinder bore, and doubtless thought it a perfect shotgun. In that comparatively short term of years they have watched step by step the introduction of the breech loader, the rise and fall of various grips and actions, have seen the pin fire give way to the center fire, and the cylinder bore to the choke, and

lately have laid aside the hammer gun to take up the hammreless and the black powder for the nitro. In the endeavor to ascertain what constitutes a safe gun it may be well to consider the causes of various accidental discharges which may be laid to faulty construction of the gun. Going back to the old muzzle loader we had a fruitful source of accident in the fact that after discharging one barrel, the shooter would neglect to lower the hammer on the second, which in various ways was accidentally discharged while reloading the first. With the introduction of the breech loader accidents of this kind were rendered impossible, but there still remained the most numerous class, those connected with the hammers to guard against. Accidents were frequently caused by carrying the hammers down on the firing pins (and there were some who foolishly insisted that this was the safe way to carry a gun) when if the gun was dropped or anything struck the back of the hammers, it was discharged almost as surely as though it were intentionally fired. The rebounding lock removed this danger and another step in the direction of safety was accomplished. There still remained the greatest danger, and that was the hammers catching on brush, clothing, or other objects, and drawn back so that when suddenly released the gun was discharged. This was more liable to occur when the hammers were down, or at half cock, than when full cocked, for the reason that in some guns the hammers would not raise far enough back of full cock to slip past the notch when released.

This fact was one reason advanced by that contingent who always carried a gun empty, or loaded and at full cock. Another was that it was easier and quicker to break the gun as a temporary safeguard, or even unload it, than to lower the two hammers separately, also avoiding the danger of a hammer slipping while lowering it, or getting onto the wrong trigger. The best point they advanced was that it always required one to be very careful with a loaded gun, as it was always cocked, maintaining that there was no real safety in half cock as one was apt to be very careless with a gun when half cocked, believing it to be perfectly safe, and sometimes would think they had lowered the hammers when they had neglected to do so.

So it is evident that in the breech loading hammerless the sportsman has the safest gun he has ever handled, and the question now before him is which of the numerous makes now on the market is the safest, and therefore the gun he wants. Although always called hammerless, strictly speaking they are hammer guns with internal hammers, which are automatically cocked by opening the gun. With such guns an accidental discharge may take place in two ways, by the trigger being pulled unintentionally, or by the hammers being released through a break in the mechanism of the lock, or jarred off through rough handling, a blow, or a fall, or one hammer jarring off when the other barrel was fired. To prevent ac-

cidents of the first description the gun is usually provided with an automatic safety which blocks the triggers as soon as the hammers are cocked, so that they cannot be pulled until the safety is pushed up or off safe. Safeties are obviously the most important point in the make-up of the hammerless gun, and in selecting a gun should receive the first and most careful attention.

The common automatic trigger safety such as is described above caused great annoyance from the fact that at any time, and especially when firing rapidly, one was very apt to forget to push up the safety and lose his shot thereby, which brought down unlimited wrath on the safety that was altogether too safe. Some remedied this by removing the safety entirely, and soon the manufacturer endeavored to meet the demand by supplying a safety that was rendered independent, that is, thrown out of automatic action by the turning of a screw or a third notch in the safety slide. Here we had "confusion worse confounded," the shooter sometimes having his safety automatic and sometimes independent, and the more he changed it about the more confused he became. The chances were that some day he thought it was automatic and on safe when really it was independent, and the thing went off unexpectedly and perhaps some one got hurt. In the majority of cases the safety was soon turned into the independent notch and left there, defeating the object of the automatic safety, and in some guns rendering the safety entirely useless. When in the field and momentarily expecting a bird to rise, the gun must be carried cocked and the safety up, or the shooter stood no show. At such times the gun is carried in front at a "ready," and the only way the trigger could be accidentally pulled is by some object, such as a brush, entering the trigger guard. Whenever there is any danger of this, one will instinctively place his hand around the guard in such a way as to prevent it. When not expecting a shot, and still not wishing to unload the gun, the triggers may be blocked and released again quite as easily and quickly with an independent as with an automatic safety.

While for years manufacturers had racked their brains for the best method of blocking the triggers, they had totally ignored the danger in the only other direction, that is, from jarring off. No gun had any protection in this respect until the introduction of the *New Baker Hammerless*. The makers of this gun had evidently watched the development of the hammerless very closely, and profiting by what experience had proved to be the mistakes of their competitors, overcame the difficulty by their ingenious automatic firing-pin safety. This automatically blocks the hammers so that they cannot fire the gun until the safeties are automatically withdrawn by the act of pulling the triggers. No matter by what means or with what force the hammers might strike the firing-pin blocks, the gun cannot be discharged unless the triggers are pulled. Thus danger of accidental discharge

is in one way absolutely prevented by automatically blocking the hammers, and when the triggers are also blocked by using the independent trigger safety, the gun is as safe as any gun will ever be with powder in it. In fact it seems impossible that it could be accidentally discharged. On account of the danger of jarring off, sportsmen have been afraid to order, and manufacturers did not like to put out guns with light trigger pull, a quality essential to good shooting with some and desired by many others.

As a matter of quicker or more convenient reference, the most prominent American arms are herewith presented under alphabetical arrangement. The reader can make comparisons and draw his own conclusions. The author refrains from an expression of opinion or indorsement of any special guns, cartridges, etc.; for that would be treading upon dangerous ground and possibly elicit protests and contradictions. However, under FARROW ARMS, the author's ideas are set forth at some length. His ideas as to requirements for the best military or sporting arms have been acquired by actual experience in the field in Oregon, Idaho and Montana, where for many years he commanded Indian scouts, served with his command through numerous Indian campaigns, and extensively hunted game of all varieties.

AMERICAN ARMS COMPANY ARMS.

The new hammerless double gun, made in 12-gauge, is noted for simplicity, durability and convenience. The barrels can be attached to the stock whether the gun is cocked or not. The gun cocks easily and can be readily taken apart for cleaning and oiling without the aid of a lock-vice. The triggers are secured by

Figure 1

a positive lock, not by springs. The makers of this gun acnieved a high reputation as manufacturers of the Fox double gun, and the well-known semi-hammerless single gun, shown in Fig. 1. This gun has a top snap action, pistol grip and rebounding lock. It is cocked by simply pressing down the little lever with the thumb of the hand holding the gun. It is made in 10,- 12- and 16-gauge.

The single, double-action and hammerless revolver combined, shown in Fig.

2, made by the American Arms Company, in 32 and 38 caliber, is noted for its safety and perfect action. It can be changed from absolute safety to active use

Figure 2

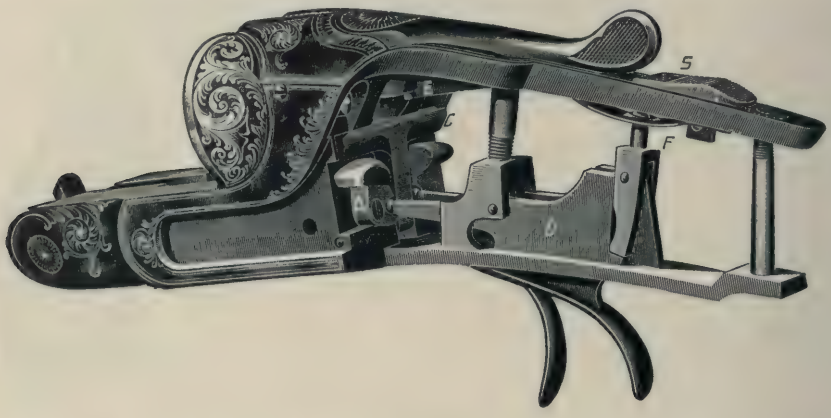
in an instant, and while drawing from the pocket. It can also be changed to single action for target practice with equal facility.

BAKER GUNS.

The Baker hammerless guns have two distinct safeties operating independently of each other. They are the safest hammerless yet made. They cannot be discharged in any other way than by pulling the triggers. They cannot jar off. If the notch or sear breaks, letting the hammers down, they will not fire the gun because of the intervening firing-pin block. The hammerless guns will admit of the barrels being removed from the frame independently of the position of the hammers. If the gun is cocked it can be taken apart and put together. If the gun is not cocked it can be taken apart and put together again without cocking it. The hammers can be let down with absolute safety without snapping, as in the act of firing, thus relieving the main springs from the tension. In this position the hammers rest on the firing-pin block safeties, permitting the firing-pin springs to assume and retain their normal position, and not permitting the points of the firing-pin to project beyond the face of the breech, and thus be in contact with the primer. If desired, the hammers can remain cocked without injury to the main springs. The ease with which these guns can be cocked is one of their desirable points.

The drawing is three-fourths full size and shows the firing-pin block *A* in posi-

tion of safety, being between the hammer and back of the frame. In this position, should the hammer fall, it would strike the block *A* and rest on it, preventing the hammer from reaching the firing-pin *B*. Should the sear, or notch break while the firing-pin block *A* is in this position, or the hammers be jarred out of bent, the solid steel block *A* would receive the full force of the blow and prevent the hammer from coming in contact with the firing-pin *B*. *C*—Cocking lever in the



position it will assume while the gun is opened, as in the act of putting shells into the barrels. *D*—Triggers, the forward end of which operates the safety *A*. *F*—Non-automatic safety, used to block the triggers. This drawing shows this safety in position, blocking the triggers so they cannot be pulled off, either accidentally or on purpose. When this safety *F* is in this position, it renders it impossible to pull the safety *A* out of position of safety. *S*—Thumb-piece on top of the tang and which is used to operate the non-automatic safety *F*. *E*—Top-lever spring.

The firing-pin block safety is absolutely automatic in its action and will go to the position of safety every time, just as soon as the hammer is raised from the firing-pin far enough to permit it to do so, and will remain in this position of safety until the trigger is pulled to fire the gun. This automatic safety is always in place at the point of greatest danger on any gun, viz: the firing-pin; effectually and completely blocking the firing-pin and remaining so under all conditions until the trigger is pulled, at which instant it is removed, permitting the hammer to strike the firing-pin. These guns cannot be discharged even though a sear or notch breaks or wears through long use or neglect, so as to permit it to jar off; while other hammerless guns not provided with the firing-pin block, will do so under the above circumstances, even though the triggers are locked by an automatic safety, and the gun cannot be fired by pulling them. It should be borne in mind that the safety *F* operated by the thumb-piece *S* on top of the tang, is not automatic, and that it does not go to safety when the gun is opened. The firing-

pin block safety is absolutely automatic in every sense of the word; that is, it goes to the position of safety every time the gun is opened.

The shooting power of the Baker hammerless gun is of a high order. The patterns are regular and even, yielding averages from the cylinder to the full choke bores that should satisfy the most fastidious shooter. In this respect they sustain the reputation of the Baker hammer guns that for so many years have found universal favor. The gun has fine lines; it is symmetrical and well-balanced. It is *built* and fully equipped for continuous service at the trap, on the uplands and for water-fowl shooting. It has great strength of frame, simplicity of action and few working parts, and those all of good size and strength. It has rebounding locks, and no sticking of the firing-pins in the primers.

Many sportsmen desire a strong and well made gun which will compare favorably with the fancy-priced imported guns. In deference to this class of sportsmen the Baker Gun and Forging Company brought out, some years ago, the Paragon grade gun. Before starting to construct this gun, the company concluded it must conform to the following specifications: 1st—It should be built of best material and so accurately fitted in all parts, that it would stand continuous use, with any reasonable charge of either nitro or black powder. 2d—It should have good penetration and make just the pattern, whether open, medium, or very close, that the customer desired. 3d—The engraving and checquering should be as near perfect as skilled workmen could make it, and the general finish should be such as to compare favorably with any gun which costs twice as much; and last but not by any means least, it should be a safe hammerless gun.

The Baker hammer gun of model 1897, was built especially for the use of nitro powder. It has all of the latest improvements, including lock plates, forward action locks, bridle on lock, low circular rebounding hammers, cross-bolted extension rib, top snap action, best English twist or Damascus barrels, solid plungers, compensating fore-end, and is a hammer gun in which it is safe to use nitro powder as well as black. It cannot be excelled for close, hard, long-range shooting in the field or at the trap. This gun is made in 10,- 12- and 16-gauge and of the following dimensions: 16-gauge, 28-inch barrels, weighing from 6¾ to 7¼ pounds; 16-gauge, 30-inch barrels, weighing from 6¾ to 7½ pounds; 12-gauge, 28-inch barrels, weighing from 7⅛ to 8 pounds; 12-gauge, 30-inch barrels, weighing from 7⅜ to 9 pounds; 12-gauge, 32-inch barrels, weighing from 7½ to 9½ pounds; 10-gauge, 30-inch barrels, weighing from 8¼ to 10 pounds; 10-gauge, 32-inch barrels, weighing from 8¾ to 11 pounds.

To relieve the tension on the main springs, the hammers should be let down without snapping. This can be done most easily on the Baker by simply pressing the triggers when the gun is open and holding them back while closing the gun.

Loaded shells should be removed during this operation to prevent any accidental discharge through not handling the gun properly.

BALLARD RIFLE.

This excellent American rifle is no longer made, being superseded by the Marlin. It is noted for its simple and effective breech mechanism. The extractor is positive and cannot fail to work, as it acts on the same pin with the lever. When the lever is thrown down it withdraws the breech-block, at the same time throwing the hammer to the half-cock notch. After inserting the cartridge, pushing up

the lever causes the lock to move forward and upward, closing tightly on the head of the cartridge. There is no possibility of an explosion, as the hammer is at half-cock, and there is nothing which might slip through careless handling. Nothing short of firing the gun voluntarily can set it off, thus making it in every respect safe. This rifle was a great favorite with the Indians of the West, they

being much pleased with its shooting and non-fouling properties. The characteristic styles of the arm are shown in the drawings.

The Ballard rifle was, for many years, approved and recommended by the best shots in the leading clubs in the United States, Great Britain, France and Germany. See *Marlin Arms.*

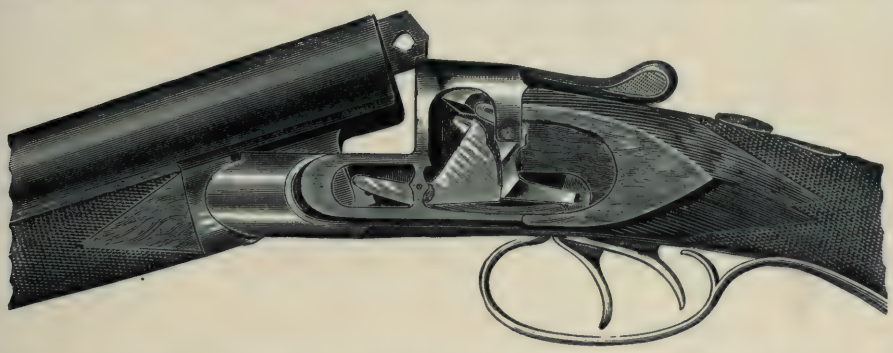
BALTIMORE HAMMERLESS GUN.

This gun appeals particularly to trap shooters, for the reason that it does not shoot loose. It is so constructed, with a strong, positive, circular bolt (which is the strongest form of construction), having a bearing over its entire surface, that the locking remains a good fit. This bolt is unique and stands as the strongest,

most positive, and most durable locking mechanism in use. The cocking mechanism is simple and positive. The gun is made in 12-gauge only, and is bored full choke for close, hard shooting. The following are the weights for the 28,- 30- and 32-inch barrels:

Weights, 28-inch	6½	to 7½	lbs.
" 30-inch	7	to 8¼	"
" 32-inch	7¼	to 8½	"

The sectional drawing shows the working parts of the gun. Its simplicity will at once be seen. It is composed of the following few parts: The frame, which is not cut away to a mere shell to accommodate a complicated mechanism, but has solid metal left, especially where it is most essential, across the angles of the



frame; the hammer (one piece of drop forged steel), whose cocking-arm comes in direct engagement with the cocking-bolt, thereby insuring ease of cocking, and is positive and durable; the sear, which is one piece of drop forged steel; the locking-bolt, circular in form, strong and mechanical in its construction, fastened to in fact by construction made part of a top lever, and made of the best material. These few parts, together with a main spring, a sear spring, and triggers, comprise the working parts of the gun. From the drawing it will be seen that the cocking-bolt comes in direct engagement with the cocking-arm of the hammer, which pushes the hammer into position to receive the sear in the notch. The main spring operating directly on the hammers in the manner illustrated, insures firing the cartridge every time the trigger is pulled.

BARNEKOV-GREENE GUN.

This rifle, tested by the inventors with satisfaction, is a breech-loader, having a fixed chamber closed by a movable breech-block, which slides in the line of the barrel by indirect action, being moved by levers from above. Its distinguishing characteristic is a short sliding block, back of which is a pair of links, secured at their forward end to the block, and in rear to the frame. The rearmost one of them contains the hammer, in cocking which the combination is bent upward and

so withdraws the block. The cartridge-shells, when extracted, drop through a hole left for the purpose in the frame.

BATAVIA GUN.

This well-known hammerless gun, made by the Baker Gun and Forging Company, differs materially from Baker hammerless guns. It is made without lock plates. The lock work is simple, and the stock is cut out but very little, leaving it extra strong. All the metal parts, including the frame, lock-work, guard, front circle, etc., are forged from the best steel. There is no cast or malleable frame or parts in this gun as there are in some of the cheap hammerless now being offered, but every part is of the best material and well adapted to the work it has to do. The twist barrels are of the same quality used on the Baker hammerless and are of the best quality twist made by any of the barrel makers of the old country. The Damascus barrels are fine four-blade and of good quality. *

The mainsprings of a loaded and closed hammerless gun are constantly straining all their energy to liberate the strikers and drive the firing-pins against the primers. In a gun not provided with the firing-pin block system there is danger ever present that the sear or some other part of the mechanism for restraining the mainspring will slip or give way, without the intervention of the trigger, and the gun be discharged. A little gummy oil or dust may prevent the sear from going home on the notch, or a defective sear spring may fail to seat the sear. In either case a premature explosion of the gun will take place, probably the instant the barrels are closed, or on the slightest subsequent shock. In an unblocked gun the ordinary discharge of one barrel is liable to jar off the opposite sear where the trigger pull is light, or a fall, etc., will have the same effect. See *Baker Guns*.

BEALS RIFLE.

This rifle is a breech-loader, having a fixed chamber closed by a movable breech-block, which slides in the line of the barrel by indirect action, being moved by levers from below. It is opened by pressing the lever; this brings down the rearmost of two folding-wedges, which form the breech-block, by means of a toggle or link, and at the same time withdraws the upper section of the block to its full extent and then drops it out of the way of the cartridge. The hammer is simultaneously brought to the half-cock. The piece is closed by reversing the action of the lever, when the sections of the block are brought into place. The last movement of the upper section being in the line of the barrel, thus tends to press the cartridge into the chamber if it be not already completely inserted. The piece is locked by the position of the breech-block, and is fired by a tang-lock of the usual pattern. Extraction and ejection are accomplished by a sliding extractor on the side of the barrel, impelled backward by a spring.

*This gun, without safety blocks, and formerly known as Model C, is not now regularly manufactured.

BERNER RIFLE.

The Berner in its time was considered a most effective weapon. It was two-grooved and fired a belted ball. The Lancaster rifle is a modification. It is rarely seen at the present day. The author has one among his collection which he captured from one of the Nez Perce Indians in Idaho, and which did much damage at the battle of the Clearwater, in Idaho, in 1877, the firer occupying a commanding position in a distant tree.

BERTHIER RIFLE.

This rifle has a bolt action, and gives its bullet a muzzle velocity of 2,071 feet per second. The breech mechanism is of very simple type, and consists of very few parts, none of which are at all liable to get out of action. The magazine is quite separate from and is not attached to the rifle at all; it is simply a metal clip, and in it four cartridges are packed. Of such packages the soldier or sportsman carries as many as desired, each one thus constituting a separate magazine.

To use the magazine it is simply dropped into the breech of the rifle, and the cartridges in it are fed up one by one, as its predecessor is extracted, by means of a spring which forces each cartridge vertically up into the chamber. When the fourth and last cartridge is pushed into the chamber, the magazine falls through automatically, and another can be dropped in its place.

To use the rifle as a single-loader, the magazine is not put in, but the single cartridge is simply inserted in its place behind the chamber, the top of the feeding-up spring for the magazine affording an ample bearing for the whole length of the cartridge.

BISLEY REVOLVER.

This modification of the Colt single action army revolver is regarded with much favor.

The peculiar form of the hammer makes it easier to manage with the shooting hand, and the reduced length of pull adapts it especially for fine work. It fires

six shots and is made for the following cartridges: .45 Colt, .44 Russian, .38-.40, .38 Colt, .38 S. & W. gallery, .38 S. & W. gallery and target, .32-.20, .32 Colt, .32 S. & W. self-lubricating and gallery, .32-.44 gallery and target. The special target model has a barrel 7½ inches long and weighs 42 ounces. See *Colt*

BLAKE RIFLE.

The Blake rifle has attracted considerable attention on account of its packet. It is a magazine rifle that by the use of the "cut off" can be used as a rapid single loader, with magazines holding seven cartridges in reserve, available as a repeater whenever the cut off is thrown in. Single loading fire can be resumed at any time, holding the remaining cartridges in packet in reserve. As a repeater the sustained rapidity of fire is probably greater than any known rifle. The distinctive feature of the system is that of the cartridges being carried in the belt or pockets in a revolving cylindrical packet, holding generally seven cartridges. These packets are charged into the magazine, which lies under the receiver and just forward of the trigger guard, in one movement and "en bloc," as if the packet were a single cartridge. The cartridges are fed into the chamber by a positive movement, dispensing with the heretofore universal magazine spring. When the cartridge packet is empty the magazine door is opened, the empty packet drops out and a full packet is recharged. An empty packet may be re-

FIGURE I.

filled with cartridges many times if desired; the packet weighs less than two ounces.

The rifle holds eight cartridges, one in the chamber and seven in the magazine. Two more packets may be carried in a vest, or shooting jacket, lower pocket, which would give a supply of twenty-two cartridges. If it is thought desirable to carry more cartridges, more packets may be carried in the pockets, or in loops on the cartridge belt as those now in use, the loops merely being larger. A full belt would hold fifteen packets. A belt may have a smaller number of loops, the rest of the belt being looped to carry single cartridges. The packet system is simply the last stage of the evolution of the combination of the various elements necessary to load the rifle in the minimum of time. It was not so very long ago that the powder, bullet and primer were each placed in the rifle separately; then came the metallic cartridge which made the breech loader possible, and now the packet system which makes the final success of the magazine or repeater.

The action of this rifle is very strong and simple. It is merely a hollow cylinder of steel with a handle near the rear end, which, when bolt is locked, turns down at the side of the gun, and has four locking lugs at the forward end; these lugs

slide through two grooves in the receiver of the gun, and on the bolt being rotated lock behind four projections in the breech, constituting an interrupted screw, and is very much like the breech closing system used in heavy ordnance. The strain of the explosion is thus borne by the front of the bolt and the breech of the barrel, about half an inch in rear of cartridge, and is not transmitted through the body. The shank of the handle also locks behind a shoulder at the rear of the receiver. Few rifles have the breech closed in as strong a manner as this and can like it withstand the firing of ten excessive charges of 40 grains of Wetteren smokeless powder, which throws a strain on the breech mechanism from four to six times as great as black powder. Smokeless powders having come into extensive use in shot guns and army rifles, it is to be expected that powder manufacturers will soon be able to furnish these powders, giving reliable results for sporting purposes. The greater velocity, with consequent flatter trajectory, with greatly reduced recoil, make these powders very desirable.

The rifle Model 1899, designed for practical use, is made in two calibers, the

FIGURE 2.

.30 caliber U. S. Army, and .400 caliber, both of which cartridges may be obtained of any of the cartridge companies, or, when away from civilization, at any army or naval station. The .30 caliver is supplied loaded with smokeless rifle powder, giving a muzzle velocity to the cupro-nickel jacket 220-grain bullet of 2,000 feet per second, and chamber pressure of about 20 tons per square inch. Both cartridges are supplied also loaded with 55 grains black powder and jacketed bullets, which makes a good charge for target work and small game. The .30 caliber is supplied with smokeless rifle powder and half mantled bullets with soft lead or express points. All lead bullets, alloy about 10 to 1, can also be used.

The magazine is recharged with the action closed thus allowing the last cartridge to remain in the chamber ready to be instantly fired if shooter is surprised with magazine open and fumbling for a packet. The magazine is tightly closed on the bottom at all times, keeping out dust, rain or mud if rifle is laid on the ground, or the shooter uses it lying prone. It is found, by experience in the Northwest, that the effects produced on large game by the .30 caliber express bullet is equal to that of the 45-90-330. Figure 1 shows the .400 rifle, with 30-

inch barrel, Lyman peep, Lyman mid-barrel sight, swivels and sling strap. A packet of seven cartridges is shown hanging from the magazine. In Figure 2

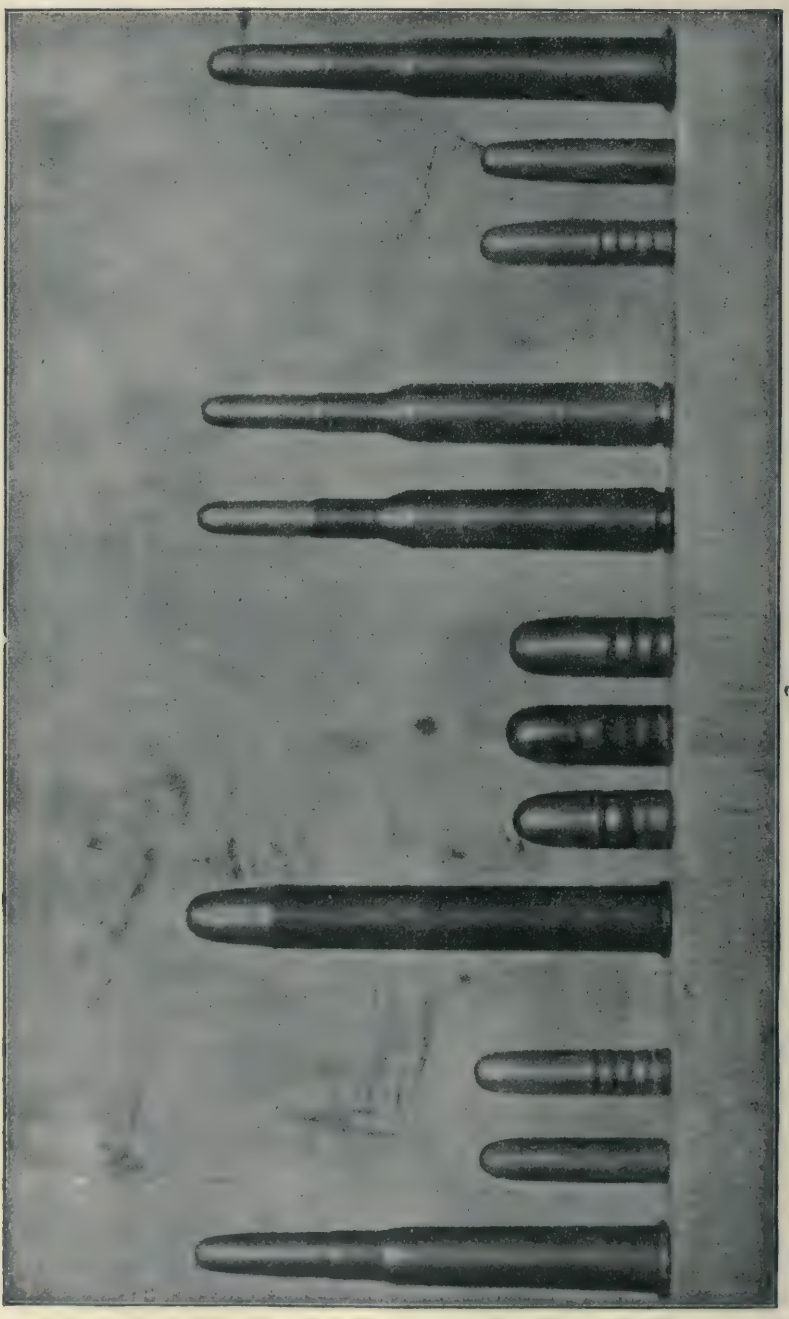


FIGURE 3.—BLAKE AMMUNITION.

is shown the Blake carbine, 20-inch barrel, Lyman peep sight detachable, shot-gun butt. The Blake ammunition is shown in Figure 3.

BOCH MAGAZINE GUN.

This gun is the exponent of that system in which a fixed chamber is closed by bolt by direct action, and in which the lock is concealed. The stock is in a single piece, extending nearly to the end of the barrel, and secured to it by bands held in place by springs. The tang-screw and the screw which passes into the receiver secure the latter to the stock. The trigger-guard is fastened by screws. The receiver has two longitudinal holes, one on each side. The opening on the left side is for the ejection of empty shells, and the one on the right side is for the introduction of cartridges, whether used as a magazine gun or as a single-loader. The latter opening has at its ends two projections, which fit to corresponding surfaces on the magazine when the latter is attached. The receiver is perforated at its rear for the reception of the breech-bolt. The latter consists of three parts, viz., the rear piece through which the firing-pin passes, the projection of the pin fitting into a cut; the locking-tube, including the handle, and the bolt-head or body, through which the firing-pin passes, and which supports the cartridge at the instant of fire. The firing-pin having been introduced into the rear piece is then passed through the firing-pin spring; the movable shoulder is then, by sufficiently pressing the spring, introduced over the head of the pin, and by giving it a quarter turn is retained on the pin bearing against the shoulders of the latter. The spring is then held compressed between the ends of the rear piece and the movable shoulder. The firing-pin and spring are passed through the locking-tube, and then through the bolt-head, which is screwed to the rear piece. The locking-tube has two projections which, when the handle of the bolt is turned down in the receiver, fit into two recesses in the latter, and the bolt is thereby held in position. The bolt-head is prevented from turning by a projection perfectly fitting into a groove in the receiver. The sear is notched for the nose of the trigger. The sear-spring is attached to the under side of the tang by a screw. The trigger when pulled releases the projection of the firing-pin, and the cartridge is exploded. The extractor hooks on the rim of the cartridge when the bolt is closed, and, when it is withdrawn, throws out the empty shell through the left side hole of the receiver by deflecting it from the axis of the chamber. The magazine is attached to the right side of the receiver, and is operated by a wheel which, when a cartridge is to be introduced, is turned so that a cartridge can drop into the receiver, when the bolt pushes it well into the chamber. The magazine holds 20 cartridges.

In another pattern of the Boch gun the stock is in two parts, the butt and the tip; these are joined together and to the barrel by a band which passes around the ends of the two parts, at their junction, and the barrel. Another band fastens the front end of the tip-stock to the barrel. In the right side of the butt-stock is a longitudinal opening coincident with a similar one in the receiver. Through this

hole cartridges may be introduced on the carrier. The butt-stock is grooved to fit the barrel and cut through for the receiver, which is fastened to the stock by means of a tang-screw, passing through the stock into the trigger-guard plate.

The butt-stock is also perforated by a hole continuous with one in the tip-stock, through which the magazine-tube passes, the latter being fastened to the receiver by a screw-thread. This gun carries nine cartridges in the magazine and one in the chamber. As a magazine gun, three motions are necessary to operate it, viz., opened, closed, fired; as a single-loader, four motions, viz., opened, loaded, closed, fired.

BORCHARDT RIFLE.

This automatic rifle and pistol combined shoots cartridges loaded with Walsrode smokeless powder. It requires a .31 caliber full metal patch or mushroom bullet, and has an effective range of 300 yards. The magazine holds eight cartridges. The only operation necessary is to throw back the bolt the first time, which cocks and loads the arm. After this the arm works automatically. The recoil of the first cartridge unloads, cocks, and loads the arm, and as fast or slow as the trigger is pulled the arm is discharged. Owing to its light weight and small size, it makes both an excellent pistol as well as a first-class rifle for game as large as deer.

BRIGGS-KNEELAND MAGAZINE GUN.

This highly praised magazine rifle, lever action, is loaded with a "clip" containing five cartridges. It has a breech-block of very superior design and great strength. The magazine is placed back of the trigger-guard and does not interfere with the symmetry of the arm.

BROUGHTON GUNS.

Several varieties of excellent arms bearing this name have been invented and tested, three of which compare favorably with the well-known arms of their respective systems.

No. 1 is a breech-loading rifle having a fixed chamber closed by a movable breech-block rotating about a vertical axis at 90 degrees to the axis of the barrel, and not in the plane of the axis of the barrel (all to the right and in front). This piece is opened by drawing back the firing-bolt to cock the piece, and pressing down on the thumb-piece to liberate a spring-catch in the breech-block from its notch in the receiver, and to allow the block to swing outward and forward until nearly parallel to the barrel. The guard is connected with the receiver by an undercut groove in front and a spring-catch in rear, and when detached from the gun carries with it the lock complete.

No. 2 is a breech-loading rifle having a fixed chamber closed by a movable

breech-block which rotates about a horizontal axis at 90 degrees to the axis of the barrel, lying above the axis of the barrel and in front.

No. 3 is a breech-loading rifle having a fixed chamber closed by a movable breech-block which rotates about a horizontal axis at 90 degrees to the axis of the barrel, lying below the axis of the barrel and in front, being moved from below by a lever.

BROWN MAGAZINE GUN.

This rapid-firing gun, weighs about eight pounds. It uses a "clip" which holds five cartridges, and is inserted in the grip of the gun immediately behind the trigger-guard. These five cartridges can be discharged in two seconds, as the gun need not be taken from the shoulder for throwing out the expended cartridge and putting another in its place. Throwing down the guard lever and returning it to place does all the work. The breech-block is solid, and moves down to allow removal of the discharged shell and reloading. An absolutely new feature of this gun is a level and quadrant attachment which allows it to be set at any desired angle, so that it can be used as a mortar.

BROWNING AUTOMATIC SHOTGUN.

This newest of shotguns combines many good features. It is a hammerless, automatic ejector, single trigger, repeater, with greatly reduced recoil. It is entirely automatic in its action excepting only that the trigger has to be pulled for each shot. All the operations—opening the breech, ejecting the empty shell, inserting a cartridge, cocking the hammer, closing and locking the breech—are performed by the recoil, leaving the arm ready to be fired again by a pressure on the trigger. In consequence of its being utilized to operate the mechanism, the recoil, which in other guns is worse than wasted on the shoulder, is largely absorbed, and the shooter is spared the discomforts that otherwise result from the "kick." It is, in effect, a single trigger, five barrel gun with but one barrel to aim, carry and clean.

BRUCE MAGAZINE GUN.

This rifle was invented by Mr. L. F. Bruce of Springfield, Mass. The magazine lies beneath the receiver and is a hinged box revolving down and to the rear; its capacity is five cartridges. The magazine can be cut off and held in reserve while the gun is used as a single-loader.

BUFFINGTON MAGAZINE GUN.

This gun belongs to the system in which a fixed chamber is closed by a movable breech-block, sliding and rotating, and operated by a lever from below. The receiver, to which the barrel is attached in the usual way, has a vertical slot en-

tirely through it for the reception of the breech-block, and two grooves, at right angles to each other, on the inner surface of each side. In these grooves the flattened ends of pivots passing through the breech-block slide. The various points of the breech-block not in the axes of the pivots, thus describe arcs of ellipses when the block is opened or closed. The block is hollowed out to receive the hammer, mainspring, etc. The hammer is slotted to receive one branch of the mainspring which abuts against a pin. The other branch bears against a similar pin through the breech-block. The piece is locked by lugs projecting from pieces screwed to the sides of the receiver, partly across its top and entering grooves on the hammer. The firing-pin is retracted, when the block is unlocked or the hammer cocked, by a slot which receives the head of the pin. The extractor is a bent-spring hook secured at its rear to the breech-block by a pin and supported at its front by a pivot. In order to open the block, it is necessary to draw back the hammer to a point a little beyond the full cock, and then control the motion by a lever. Should the hammer be let down while the block is open, it is cocked in the act of closing by the edges of a surface striking on projections on the inner rear surface of the receiver. The magazine is in the tip-stock. It is provided with two cartridge stop-springs. The carrier is made of sheet steel brought to a spring temper, and is secured to the breech-block by a pivot. When the breech-block is closed the carrier-block descends, its spring keeping it in contact with the breech-block, bears down on a stop-spring, and slides under the end of the magazine-tube. As it passes under the tube inclined planes raise the ends of a cross-piece riveted to the top-spring, when a cartridge is forced by the magazine-spring into the carrier. A cut-off enables the piece to be used as a single-loader. As a magazine gun, three motions are necessary to operate, viz., opened, closed, fired. As a single-loader, four motions are necessary, viz., open, loaded, closed, fired. This gun carries six cartridges in the magazine and one in the chamber.

BULLARD RIFLE.

This repeating rifle was introduced by Mr. Bullard, who was for some years master-mechanic at the Smith & Wesson works. The action of this rifle is positive and not dependent upon springs. It is self-cocking, with a solid breech-block behind the bolt, which must be in place and securely locked before it is possible for the hammer to reach the firing-pin. It is possible to fire this rifle with very great rapidity from the fact that it works easily and smoothly by reason of its direct leverage on the work to be done, the heaviest work being done with the best leverage, as in extracting the cartridge, which is started when the lever is in position to exert the greatest strain. Cocking the hammer is also done by direct leverage inside the receiver or frame, instead of a sliding motion of the bolt or fir-

ing-pin, on and over the top of the hammer, which is very often liable to grind and always makes the arm work hard and unpleasantly. This rifle has been fired 12 shots in five seconds, using the U. S. Government cartridge. The magazine is charged from the under side, and it can be done with equal facility by a right or left-handed person. As there are no holes or spring covers on the side, it is not possible to have it clogged by passing through brush or laying it on the ground or in trenches, etc. It is also much easier to load on horse-back than any other gun, as there is more choice of position than when the opening is on the side. It can be loaded as a single-loader either top or bottom, leaving the magazine full at all times for an emergency.

BURCHARD REVOLVER.

This convenient revolver is 11 inches in length, and weighs 12½ ounces. A steady fire is gained by the grip being placed at the center of gravity. Parallel with the barrel runs a magazine capable of holding eight cartridges. By using a light adjustable stock it can be transformed into a cavalry carbine. In a recent exhibition it showed very effective penetration at a range of 500 metres.

BURGESS MAGAZINE GUN.

This gun belongs to that system in which a fixed chamber is closed by a bolt, sliding in front along the axis of the barrel, and operated by a lever from below. The bolt is a single piece, the rear of which serves as a guide to its motion by sliding in grooves on the inner surface of the receiver. The bolt is locked by the interposition of a portion of the breech-block lever, between its head and the rear of the receiver. The firing-pin, which is in this portion of the lever, passes through the pivot and prevents it moving either way. The firing-pin is retained in the lever by a screw. The ejector lies in a groove across the front of the bolt, just below the firing-pin hole; its rear terminates in a split spring, which, by friction against the side of an under-cut groove in the side of the bolt, retains it in position. The ejector is driven forward against the under side of the head of the cartridge, when the lever is thrown open by its rear striking against a shoulder on the inner rear surface of the receiver. The bottom opening in the receiver is closed by a plate, called the lever-guide; its rear is terminated by a piece, the tenon of which enters a corresponding mortise in the plane. An elongated hole in the tenon, through which passes the pin connecting the pieces, permits motion of the smaller part to and from the plate. A spiral spring is comprised between the two pieces. The motion of the lever in opening and closing is a sliding one. The carrier is pivoted on two short screws through the sides of the receiver. It is operated by a hooked projection on the bolt-head, which, sliding under it, supports it until the forward motion of the lever is nearly completed, when, by striking

against the surfaces, the carrier is rotated about the pivot-screws, its front descending opposite the mouth of the magazine, which is in the tip-stock. The hammer is cocked by the backward motion of the bolt when the lever is thrown forward. The piece is fired by a center lock of the usual pattern. The magazine is loaded through a side cover in the receiver. No wiping-rod is provided, and there is no cut-off to the magazine. As a magazine gun three motions are necessary to operate it, viz., opened, closed, fired. As a single-loader four motions are necessary, viz., open, loaded, closed, fired. This gun carries 10 cartridges in the magazine and one in the chamber.

BURGESS REPEATING SHOTGUN.

This gun is semi-automatic and extremely easy to manipulate. The left hand has nothing to do but support the gun and assure the aim. The handle locks independent of the breech bolt, and has "lost motion" by which it unlocks the bolt. The handle unlocks by the shock of recoil in firing the gun, and with proper charge and natural pull of the right hand, the "counter recoil" will start the shell and operate the handle to open the breech, and the motion of the right hand and handle, being between the two points of support (the shoulder and left hand), and the sliding motion substantially on a line between the supports, the position of the gun is so well maintained that in double shots two hits in one pattern can be made in one-eighth of a second, and six hits in less than two seconds. The gun is continually being pressed to, and in contact with, the shoulder while firing. In this position its operation is easy and natural, and it is never pulled away to return in changed position on the shoulder and spoil the aim.

The trigger is carried by the handle, and cannot reach the sear to pull off the hammer until the breech is closed and locked; also the firing-pin has a solid cam by which the locking brace engages to pull it back, so the firing-pin cannot be forced forward to striking position, except when the bolt is locked by the locking brace.

The double extractors engage each side of the head of the cartridge, pulling evenly and with great strength. They also have down projections, which grasp the head of the cartridge in the magazine, and as the breech opens pull it back into feeding position in the frame, and when raised by the carrier, hold it from rising too far, or from flying out.

The extractors continue their grip on the cartridge as it moves forward into the chamber, and only release it when it is being expelled from the frame.

BURNSIDE RIFLE.

This rifle was formerly used in the military service. It has a movable cham-

ber which opens by turning on a hinge. A brass cartridge case is used which packs the joints and cuts off the escape of the gas. The advantages of this arm are its strength, waterproof cartridges, perfectly tight joint, and working machinery. Its disadvantages are the cost, and difficulty of getting the cartridges. When first made, the metallic case of the Burnside cartridge (either of brass or steel) was capped at the larger end with a lead ring. The case was slightly conical, with a small hole at the smaller end. The manner of inserting the cartridge and extracting the shell after firing was similar to that employed at the present time.

BURTON MAGAZINE GUN.

In principle this gun does not differ from the Ward-Burton. The points of difference in construction are as follows: The joint between the body of the bolt and its head is transferred in this gun to the rear, so that the body of the bolt takes the place of the head, while the rear portion serves simply to lock it. As the body of the bolt does not rotate, the sear-bolt slot at right angles to its axis is dispensed with, giving, it is claimed, a stronger bolt. The extractor, though called a lever-extractor, is a spring hook pinned to the bolt near its front. The rear of the extractor is thickened so as to bear against a cam on the firing-pin, which prevents a descent of its rear with the corresponding rise of its front. In withdrawing a shell the spring can only be from the front portion alone. The trigger spring serves also to hold the carrier in place. The carrier is composed of two principal parts separated at front by a flat spring. The lower portion, which is pivoted at its rear to the upper, has on its front a sort of finger, which may be made to pass through a slot in the upper portion so as to project partly across the mouth of the magazine, cutting off the escape of cartridges by simply turning a set screw in rear of the pivot. The motions are the same as in the Ward-Burton. This gun carries eight cartridges in the magazine and one in the chamber. See *Ward-Burton Magazine Gun.*

CHAFFEE MAGAZINE GUN.

This gun belongs to that system in which a fixed chamber is closed by a movable breech-block, sliding and rotating, and operated by a lever from below. On the inner surface of the receiver are two circular guides which enter grooves in the breech-block and over which the breech-block slides. The block is a single piece hollowed out to receive the hammer and the mainspring. At the front of the block is the firing-pin, limited in its motion by a screw. The breech-block is operated by a lever. The front of the lever is hinged to the front of the breech-block; its middle is hinged to two arms which are in turn hinged to the sides of the receiver. The hammer is cocked when the breech-block lever is thrown open

by the pressure of the lever-hook on the face of the hammer, which forces the latter back until the nose of the sear—which is a part of the trigger—enters a notch. Reverse motion of the lever closes the block, which is locked by a projection on the lever, entering a recess in the block and in the sides of the receiver. The extractor is not rigidly connected with the breech-block, but has a longitudinal motion along its side. It does not begin to draw the shell until the breech-block has moved to the rear nearly an inch, when a shoulder on the extractor strikes a corresponding one on the block, after which both move together. The object of the extractor projecting so far in front of the block is to support the cartridges as they leave the magazine on their way to the chamber. A shoulder on the bottom of the carrier serves as an ejector. Its effect is to rotate the empty shells through the opening in the bottom of the receiver to the ground. The magazine is in the butt-stock. The shape of the inner surface of the carrier at its front is such that the point of the cartridge as it leaves it is opposite the center of the chamber. An inclined rear surface of the carrier prevents the rear of the cartridge from rising while on its way to the chamber. When the lever is thrown open a spring at the front of the carrier causes its rear to descend opposite the mouth of the magazine. In this position it serves as a cartridge-stop, preventing the escape of other cartridges. There is no cut-off to the magazine, nor can there be, each motion of the lever being accompanied with a corresponding motion of the ratchet. As a single-loader, the piece is loaded through the carrier, the rear of which is opened by depressing the front; this should be done before the lever is opened. The trigger is locked by a set-screw when the piece is carried at full-cock. As a magazine gun three movements are necessary to operate, viz., opened, closed, fired. As a single-loader, four motions are necessary, viz., loaded, opened, closed, fired. The gun carries six cartridges in the magazine, one in the carrier and one in the chamber.

CHAFFEE-REECE MAGAZINE GUN.

This arm, an improvement on the Chaffee magazine gun, belongs to that system of bolt-guns in which a fixed chamber is closed by a movable breech-bolt sliding and rotating. The magazine is in the butt-stock. The cartridges are held in the magazine by two ratchet-bars, one fixed and the other sliding, and operated when the bolt is turned back and closed. The magazine having been loaded, the bolt is thrown open and each tooth of the sliding-bar passes behind the head of the cartridge next in its rear. The closing of the bolt moves the ratchet forward, bringing each cartridge its own length further to the front. The cartridges are firmly held in position, so that they are not and cannot be in contact with each other, which is positive prevention from accidental explosions.

The frequent accidents and loss of life from premature explosions by magazine arms induced many gun mechanics, among the number Mr. Chaffee, to undertake to invent a magazine arm that should be free from that objection, and after several years of study and hard work, and a large outlay of money, he produced this arm, which upon a test trial, before a board of army officers, has demonstrated the fact that he has succeeded in doing it. This arm can be used as a single-shooter until occasion requires the delivery of shots more frequently than would be possible if the arm had to be loaded after each discharge, when, by the turn of a button, seven extra charges will be available which can be delivered in four seconds or less.

CHARLEVILLE MUSKET.

The first regulation arm used by the United States army was the Charleville musket. This was the French national arm, model 1763. Marquis de la Fayette brought a large number of them to this country during the Revolutionary War, and they were duplicated to some extent by our best gun makers. They carried an ounce ball. It was not until 1814, that the first rifle was manufactured by the United States Government at Harper's Ferry. This was a flintlock rifle, with half octagon barrel; it had a short fore-stock, hooked butt-plate and a patch-box in the stock. The arm had brass mountings, and was more of a sporting pattern than military. This rifle shot a half ounce ball.

CLEMMONS MAGAZINE GUN.

This gun is an adaptation of a magazine to the Springfield rifle. The alterations are as follows: The left side of the receiver is cut away nearly to the bottom of the well. The portion removed is replaced by a piece the interior of which is somewhat the shape of the half-cartridge. This piece is open at the rear in order to receive cartridges from the magazine. A groove is cut in the left side of the butt-stock for the magazine-tube and is covered by a brass plate. The magazine-spring and cartridge-follower are of the usual form. To the rear of the follower one end of a piece of tape is attached; the other end is wound up, drawing back the follower and compressing the magazine-spring. On the inner surface of the piece attached to the receiver is a spring, pivoted at its front. This spring has a thumb-piece, which may be locked back by a spring catch. The split spring serves as a magazine cartridge stop. The magazine-spring having been compressed by winding up the clockwork, the magazine is filled with cartridges by backing them down from the receiver. A pawl is then released from a ratchet, by means of a slide, and the magazine-spring bears on the column of cartridges. When the breech-block is closed it strikes the thumb-piece, presses it back and lets

in a cartridge from the magazine. By pressing on this thumb-piece, the breech-block having been opened sufficiently to overcome the spring-catch, the cartridge is thrown into the receiver; it must be then pushed into the chamber in the usual way.

As a magazine gun, six motions are necessary to operate it, viz., cocked, opened, loaded (two motions), closed, fired. As a single-loader, the usual five motions are necessary to operate it, The gun carries five cartridges in the magazine, one opposite the receiver and one in the chamber.

COLT ARMS.

The Colt's Patent Fire Arms Manufacturing Company's product is too well known to require a lengthy or detailed description. After a careful description of the latest achievement—the automatic Colt pistol, a brief mention and illustration of the models, at this time manufactured, will follow. The new automatic pistol possesses features which are strikingly novel and original and which place the weapon in the front rank of small arms. It is made in 38 caliber, using a special rimless cartridge having a jacketed bullet. The cartridge gives a muzzle velocity of about 1,300 feet per second and a penetration of about 11 inches in pine. The magazine contains seven cartridges,* and any desired number of the magazines can be carried with the pistol, which can be fired at the rate of seven shots in 1 2-5 seconds. The accuracy of the pistol is remarkable, and the design of the arm is such that the recoil is in a great measure absorbed, so that the marksman has no annoyance from this cause. Further than this, and a characteristic of the construction of the greatest importance, is the ease with which the pistol can be taken apart for inspection or cleaning.

The action of this pistol is automatic, with the exception that the trigger has to be pulled for firing each shot. The cartridges are automatically supplied to the pistol from a detachable magazine, which, after being filled with cartridges, is inserted into the handle of the pistol. After thus charging the pistol with a full magazine, one opening movement is made by hand, after which the loading of the cartridge into the barrel, the firing on touching the trigger, the extraction of the empty shell after firing, and the reloading of a new cartridge into the barrel, all take place automatically, without any manipulation whatever. The automatic operation of the pistol is actuated by the recoil of the moving parts, and the recoil, being thus utilized and absorbed, has no disturbing effect.

The operation of the pistol is as follows: When a charged magazine is inserted into the handle the slide is once drawn to the rear by hand, thereby cocking the hammer. In this position of the slide, the magazine follower and follower spring raise the topmost cartridge so as to bring it into the path of the bolt. On releasing

*The Military model 38 caliber and a Pocket model 32 caliber, rimless, smokeless, have magazines containing eight cartridges.

the slide it, with the bolt, is carried forward by the retractor spring, and during this movement the bolt forces the topmost cartridge into the barrel. As the slide approaches its forward position the front of the bolt encounters the rear end of

the barrel and forces the latter to its forward position. During this forward movement the barrel swings forward and upward on the links, and thus the locking ribs on the barrel are carried into the locking recesses in the slide, and barrel and slide are thereby positively interlocked and the pistol is ready for firing.

A slight pull on the trigger now serves to move the sear so as to release the hammer and fire a shot. The force of the powder gases driving the bullet from the barrel is rearwardly exerted against the bolt and, overcoming the inertia of the slide and the tension of the retractor spring, causes the slide and the barrel to recoil together. After moving rearward together for a distance, enough to insure the bullet having passed from the barrel, the downward swinging movement of the barrel releases the latter from the slide and stops the barrel in its rearmost position. The momentum of the slide causes the latter to continue its rearward movement, thereby again cocking the hammer and compressing the retractor spring until, as the slide arrives at its rearmost position, the empty shell is ejected from the side of the pistol and another cartridge is raised in front of the bolt. During the return or forward movement of the slide, caused by the retractor spring, the cartridge is driven into the barrel and the slide and barrel are interlocked, thus making the pistol ready for another shot. These operations may be continued so long as there are cartridges in the magazine, each discharge requiring only the slight pull on the trigger.

The pistol is provided with a safety device, which makes it impossible to release the hammer unless the slide and the barrel are in their forward position and safely interlocked. This safety device also serves to control the firing and to prevent more than one shot being fired for each pull of the trigger. The safety device consists in a small vertical piece mounted in front of the sear in the receiver, and in its raised position finds a corresponding recess in the bottom of the bolt, when the latter, with the slide, is in the forward position interlocked with the barrel. In this raised position the safety piece does not interfere with the operation of the trigger, but when the slide is moved rearward the bottom of the bolt depresses

the safety piece, which, in that position, prevents the movements of the trigger from operating the sear, and thus the hammer cannot be released until the slide is again in its forward position, locked to the barrel.

The locking of the firing pin by the firing pin lock, so that it cannot reach the primer of the cartridge eyen if struck by the hammer, insures the safe handling of the pistol when not in use. The fact that the firing pin lock is also the rear sight of the pistol prevents ineffectual attempts to shoot the arm without first having released the firing pin lock. The sighting notch in the top of the firing pin lock is cut at such an angle that when the lock is depressed the notch cannot be brought into line with the front sight.

The solid frame which is the ideal construction for a revolver that is to stand rough usage, was originated and perfected by the Colt's Company, and they regard the adoption of this arm by all branches of the Government service as the ultimate test of the success of their labors. It is made in a variety of sizes and styles to suit all shooters. A line of these revolvers is called the "Swing Out" cylinder, the cylinder being hung on a hinge which permits it to be dropped to one side so that all of the cartridges may be simultaneously ejected and all the chambers re-loaded with great rapidity before the cylinder is again returned to the shooting position.

The "New Service" revolver is a heavy frame double action revolver, made in a great variety of calibers and used largely in the English Army by officers and men for whose use it is adapted to the 450, 455, and 476 Ely cartridges. This

model with special construction and sights is also the ideal target revolver for shooters desiring a double action arm, and has been the winner of many prizes, not only at the Bisley Meet in England, but at all the Revolver Tournaments of the world ever since its introduction.

The arm which has been adopted by all branches of the United States Government Service, is very similar in its construction to the arm just described, although it is not quite so heavy. A "New Service" with 5½-inch barrel weighs 35 ounces, while the Army and Navy revolver with 6-inch barrel weighs 32 ounces. This model is made in two calibers only, the .38 center fire which uses

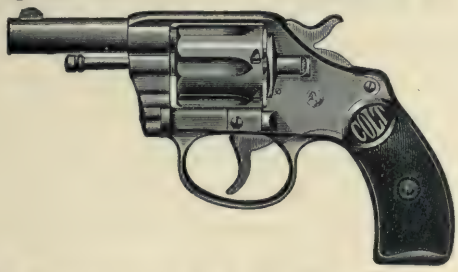
the long (U. S. Service cartridge) or the short Colt, and the .41 center fire using

the .41 long and short Colt. There are three lengths of barrel in this as in all other models.

Somewhat similar to the preceding is the "New Police" revolver, constructed with the idea of providing a strong serviceable effective arm of small enough size to be conveniently carried in the pocket, and yet with the firm grip and strong features of the best target and military arms. It is made only in the .32 caliber,

and may be adapted to the use of the long and short Colt cartridges or the .32 long and short. The weight with a 4-inch barrel is only 17 ounces. The shortest barrel applied to this model is 2½ inches; the longest, 6 inches. A special police cartridge is supplied for this revolver where it is intended to be used for heavy work, the square nose construction of the bullet giving it an effective stopping force as though the caliber were much greater.

An arm very similar in all respects to the one just described, is the "New Pocket" revolver. The weights, dimensions and ammunition are the same. The prin-



cipal difference in the two arms, is that the New Pocket has a smaller handle which makes the revolver particularly useful as a light pocket arm.

Built on this same model, but made only with a 6-inch barrel, and supplied with target sights and adjustment, is the "New Police" target or ladies' target revolver, made only in the .32 caliber like its relatives just described.

This arm is the most desirable high grade weapon obtainable for all kinds of target and gallery work.

The so-called double action model is made in the .38 and .41 caliber, adapted in each instance to the use of the long and short cartridges. To the 4½-inch and 6-inch barrels there is affixed a "Rod Ejector" by means of which the empty

cartridges may be one by one driven out of the cylinder without removing the cylinder from its seat. The 2½-inch and 3½-inch barrels are not supplied with this device.

The single action Army and Frontier revolver is the heavy arm which in one or the other of its many calibers is invariably the companion of the pioneer and cattle-man, because it is always serviceable and may be used as a weapon of offence

or defence in any one of several ways. It is simple in construction, and adapted to hard work in places where gun shops are not to be met with. Its weight with 7½-inch barrel is 39 ounces.

A close inspection of the drawing of the Bisley revolver will show that it is the same weapon as the one just described with certain modifications, these being principally in the form of the hammer which makes it easier to manage with the shooting hand; the form of grip which many experts regard as more convenient, and comfortable in taking an exact and steady aim; the shape of the trigger; and reduced length of pull which is adapted especially for fine work. The target revolver of this model is the same weapon, with extra fine adjustment and target sights.

No description of the product of the Colt's Company would be quite complete without a mention of the Derringer, a vest pocket weapon, weighing but 6½ ounces, with 2½-inch barrel, and shooting a 41 caliber rim fire cartridge, loaded with ten grains of powder and 153 grains of lead.

The well known Colt rifle is made at present in the 22 caliber only. It shoots the long and short 22 caliber rim fire cartridges, and they may be loaded indiscriminately one after another into the magazine. Except when the hammer is

down the handle is locked in its forward position. The rifle weighs about six pounds and can be fitted with the adjustable hammer which serves the same purpose as a set trigger.

COMBLAIN RIFLE.

This arm, although not strictly American, has embodied in its manufacture several American patents. It is a breech-loader and very much resembling the Sharps rifle. The mountings, receiver and breech-block are made of Phosphorus-bronze; the barrel is made of steel. The militia of Belgium are armed with this rifle, while the regular troops have the Albini-Brandlin gun.

CONROY RIFLE.

This breech-loading arm has a fixed chamber closed by a movable breech-block, which rotates about a horizontal axis at 90 degrees to the axis of the barrel, and lying above the axis of the barrel and in rear—being moved from below. This arm is provided with a falling breech-block, moved by a sliding trigger-guard, the withdrawal of which retracts the firing-pin, brings the hammer to the half-cock, and drops the block, which strikes in its descent and operates the usual bent-lever extractor. By pushing the trigger-guard forward again the block is raised, when by bringing the hammer to the full-cock, the piece is closed and ready to be fired. The blow of the hammer is not delivered directly upon the firing-pin, but on an intermediate lever pivoted below its point of impact on the firing-pin, and striking it so as to impel it forward in the line of the axis of the bore. This gun has been modified by substituting for the sliding-guard the more powerful motor found in the usual swinging guard-lever, the angle formed by which with the stock when the piece is opened being about 30 degrees.

CULLEN RIFLE.

A magazine-gun carrying a great number of cartridges, as many as 40 or 50. This arm has been used to some extent in the United States, but has not met with any considerable success.

CHARLES DALY GUNS

These guns are made by Mr. Charles Daly, of New York, in his factory in Prussia. They are made entirely by hand, and are considered by many sportsmen the finest hand-made guns in the market. They have a number of special features that are peculiar to them, and which are said to be very important, as they increase the strength as well as the shooting qualities. These guns are made in Suhl, as Mr. Daly has found that he can get better mechanics in that country than any other to work on fine firearms. This town produces only high grade guns, and there are probably more fine guns made in this place for the aristocracy of Europe than in any other city in the world. Thousands of satisfied customers testify to the shooting qualities, fitting, balance, and beautiful lines of Charles Daly guns.

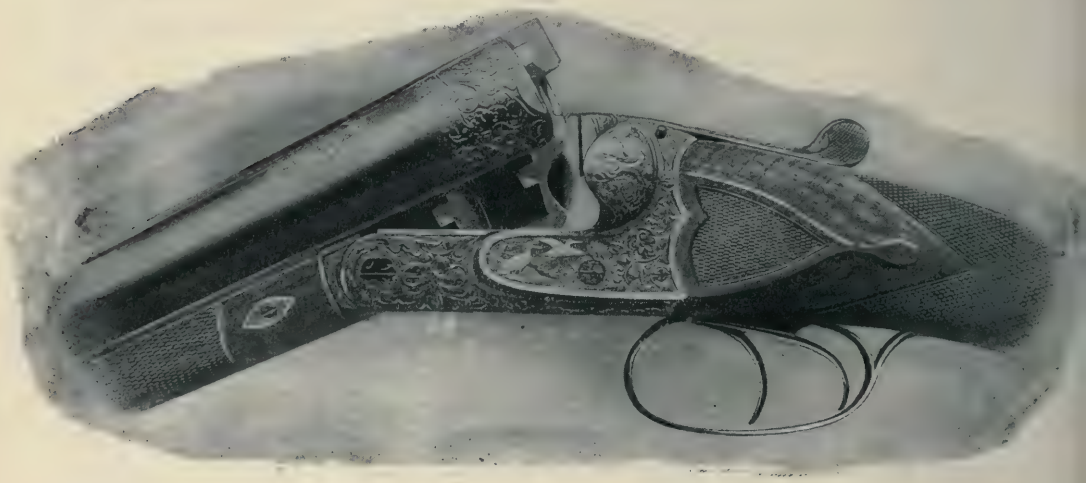


Fig. 1.—View showing Action and Engraving of the CHARLES DALY DIAMOND QUALITY GUN No. 375.

It is conceded that no gun makers give more attention to details, such as inside lock work, fitting, finishing of barrels, etc., than does the Charles Daly factory. The writer has used these guns with much pleasure and satisfaction. Figure 1 shows the hammerless, made in 8, 10, 12, 16, and 20 gauge; weight, 5½ to 14 pounds; length of barrels, 26 to 34 inches. Figure 2 shows the three-barrel hammerless guns, with open front sight and folding peep sight. It is made in 12 or 16 gauge shotgun barrel, .30-30 or .38-55 rifle cartridges; weight, 7½ pounds; length of barrel, 28 inches. The general idea of a three-barrel gun is that it must necessarily be clumsy, heavy and ungainly. This notion vanishes on seeing the Daly three-barrel gun. It balances, handles, and weighs the same

as any high grade double barrel shotgun. The shooting of both shotgun and rifle barrels is equal to the best shotgun or rifle. There is no more desirable gun

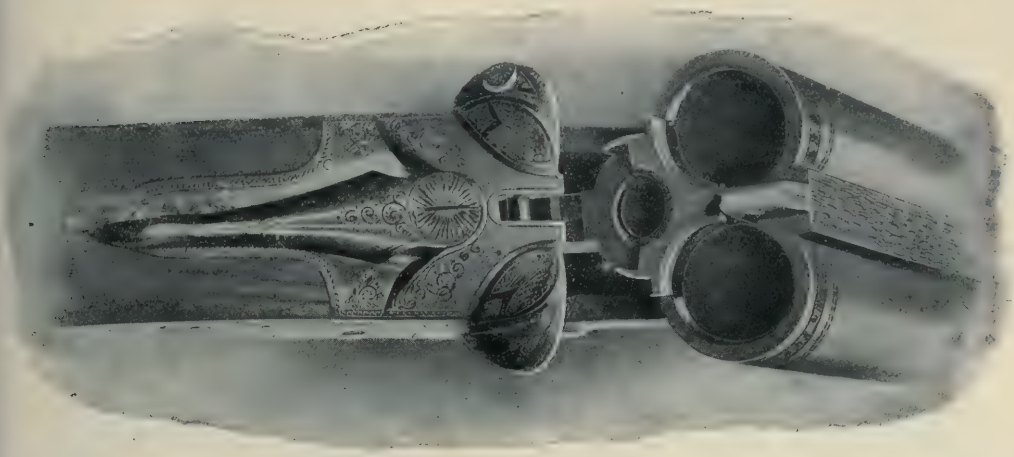


Fig. 2.—Breech View of the Charles Daly Three-Barrel Hammerless Gun.

made for use in countries where both large and small game abound. Charles Daly guns are high grade only—prices ranging from $90.00 to $500.00.

DAVENPORT ARMS.

All Davenport single guns and rifles, thoroughly high grade in material, workmanship and construction, combine in a marked degree the elements of safety, durability, utility and convenience. In 1894 the makers introduced the first automatic shell ejecting device ever used on single breech loading shot guns. This was perfected and patented in 1895, the later improvement making it the only positive and reliable ejector used on guns of this kind. It never fails to work satisfactorily, and was the first gun of its class provided with an automatic ejector. In this gun the screw key, besides being the means of securely fastening the frame and barrel together, and affording a ready means of taking them apart, serves also as the hinge pin in operating the gun, and being slightly tapering, acts as a compensator in case of wear, thereby always insuring a tight joint when the gun is closed.

The automatic ejector is simple and durable in its construction and forcible in its action, and with no more liability of getting out of order than any other part of ordinary gun construction, besides being automatic in its action, is provided with a positive attachment, making failure to eject to a serviceable limit impossible. The construction of the gun throughout gives strength of mechanism, rapidity of fire and ease of manipulation; is easily and quickly taken apart and put

together, easily cleaned, and very compact for transportation. This model shown in Figure 1, is the standard pattern for this grade, having the barrels taper choke bored, a system that insures the strongest close shooting qualities. The lock parts are made of fine tempered steel, and are interchangeable. The gauges are 12, 16

Figure 1.

and 20, and barrels from 28 to 36 inches in length. The Elita and Goose guns are specially designed for light and heavy shooting, respectively. In the latter the weights run from 11 to 11½ pounds. An extra heavy taper screw key hinge

Figure 2.

pin is used in these guns. The barrels, frames and stocks are all proportionately heavy and strong. This secures not only a large gun for heavy charges, but a well balanced one. The positive extractor on these guns brings the shell well out

of the chamber where it can be handled readily. The Acme gun, shown in Figure 2, has been on the market for several years, and has given universal satisfaction. The parts are few and simple, and not likely to get out of order. On this gun we find the taper screw hinge pin, which takes up wear and insures a tight joint. The barrels are tapered choke bored for long close shooting. The extractor used in this gun is one of the best positive extractors in use on single guns; it is simple and strong, two features that make it positive in action.

The Brownie rifle, now made to replace the model of 1891, shown in Figure 3, with shortened barrel, has the perfected automatic ejector, which feature of merit is readily recognized by shortness of small caliber rifles. It is also fitted with the

Figure 3.

taper screw fastening, which readily permits detaching the barrel from the stock for packing or thorough cleaning. The gun is chambered for standard long and short rim fire ammunition, carefully rifled, and fitted with fine open sights.

DAVIS GUNS.

The N. R. Davis & Sons' guns are cross bolted, with combined automatic and independent safety. The hammerless, shown in Figure 1, is choke bored

Figure 1.

for nitro or black powder, has extended matted rib and double bolt, one on

lug of barrel and square cross bolt through the extended rib. The gun cocks by the opening of the barrels, and the seres and triggers are both blocked by a positive motion, thus avoiding all danger from jarring off or premature pulling off, by trigger or otherwise. The Safety can be used as automatic or independent, a very desirable feature for rapid firing. The gun can be put together or taken apart with the hammers in any position and without any extra operation. The hammers may also be let down without snapping. To let the hammers down, move the safety slide back as far as possible when the gun is open and cocked. Then holding the triggers out of their notches in the hammers close the gun. 12 guage, 28 to 32 inches long, weighs 7 to 8 1-4 lbs.

The hammer gun, shown in Figure 2, has the popular top snap with straight matted rib; full pistol grip stock with rubber cap, grip and for end checked; and low circular hammers, square cross bolt through extension rib. The gun is made on the interchangeable system with rebounding bar locks. Solid and straight large head plungers, choke bored for close and hard shooting,

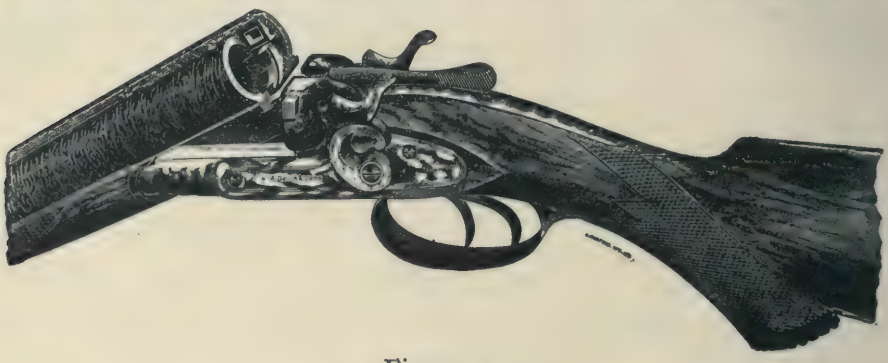


Figure 2.

with nitro or black powder. The gun is both 10 and 12 bore. The 10 bore hammerless, especially designed for sea fowl and large game, is now being discontinued.

DEAN MAGAZINE GUN.

The breech-block of this gun is operated by a small lever, through the intervention of two links, the latter of which causes the recoil block to descend while the former forces the breech-block to the rear, when the lever is thrown to the front. The lock is of the usual outside pattern. Two magazines are provided, one in the butt and one in the tip-stock. The carrier, which is open at both ends to receive cartridges from either magazine, has a vertical motion at right angles to the axis of the piece. It is operated by the lever in the same general manner as

the Winchester repeater. This gun carries ten cartridges in the tip-stock magazine, six in the butt-stock and one in the chamber.

DEXTER RIFLE.

A breech-loading small-arm possessing a fixed chamber closed by a movable breech-block, which rotates about a horizontal axis at 90 degrees to the axis of the barrel, lying below the axis of the barrel and in front—being moved from above by a thumb-piece.

The arm is opened by half—or full—cocking the hammer, and then swinging down the breech-block by depressing the thumb-piece on the right side of the frame. This pushes back the firing-pin and the locking-brace, by the cam acting on the firing-pin retractor and locking-brace retractor respectively. It is closed by raising the thumb-piece, so as to swing the breech-block up into place. In so doing, the locking-brace is thrown forward by its spring into place under the breech-block, as soon as the latter is closed.

The piece is locked by the position of the locking-brace, the lower end of which abuts upon the guard, and is fired by a center-lock of the usual pattern. Both extraction and ejection are accomplished by a revolving extractor, pivoted near the breech-block pin, and struck by the block in its descent. In opening the block the locking-brace is forced against the trigger, and is held there by the block; the hammer, therefore, cannot be made to fall while the piece is opened.

DURST GUN.

This magazine gun has a magazine cylindrical in shape and having a capacity of ten cartridges, directly below the receiver. It can be loaded with single cartridges or they can be stripped from a clip, as with the Mauser gun. The gun has a cut-off.

EARNEST GUN.

This breech-loading rifle has a fixed chamber closed by a movable breech-block, which rotates about an axis parallel to the axis of the barrel, and on the left side. The block is in two sections, the foremost of which revolves with a screw motion on that in rear, which alone is fastened to the hinge. They are both perforated for the firing-pin and striker. The forward section is provided with a handle by which the breech is opened and closed, receding from and approaching the barrel alternately. The lock is peculiar, involving a device for causing the striker to rebound after delivering its blow upon the firing-pin. The arm is especially designed to prevent the escape of gas from defective cartridges.

ELLIOT BREECH-LOADER.

This gun has a fixed chamber closed by a movable breech-block, which rotates

about a horizontal axis at 90 degrees to the axis of the barrel, lying above the axis of the barrel and in rear, being moved from above. By cocking the hammer it operates as a lever on the breech-block pawl, and at each movement alternately pushes and pulls against the lower arm of the breech-block and opens and closes the piece. After opening the piece, the hammer falls forward, and resting upon the pawl prevents any motion of the block until the piece is closed, which is done by again bringing the hammer to the full-cock, where it is held by the rear end of the trigger. The piece is locked by the position of the breech-block and by its friction against the head of the cartridge when firing. It is also braced by the hammer falling behind a shoulder on the pawl, to prevent its movement as in opening. It is fired by the usual center-lock and a firing-pin in two sections, one of which moves with the block and the other remains in the frame. Extraction is accomplished by a lever pivoted below the chamber, and worked through the intervening extractor-link by the movement of the hammer on the pawl. Ejection is effected by an auxiliary spring playing on a friction roller eccentrically placed in the extractor. The guard is hinged at its rear end so as to afford a ready means of inspecting or cleaning the mechanism, and the lock is so constructed that the hammer cannot be let down slowly upon the firing pin with the thumb.

This arm has been modified so that extraction may be caused by a bent lever of the usual form, and opening by the descent of the breech-block. In this modification the breech-block pawl is single and works within the cheeks of a slit hammer.

ELLIOT MAGAZINE GUN.

This arm is provided with a reciprocating and rotating bolt for closing and locking the cartridge-chamber by means of a handle in the usual way. It is also provided with a tubular magazine, located in the butt-stock, the tubular chambers being arranged one over the other and each provided with independent cartridge-propelling devices. The upper end of the revolving-pawl is bent inward, and works in a longitudinal groove cut in the side of the bolt; and when the bolt is rotated in locking and unlocking the arm it gives a vertical movement to the revolving pawl, which, being actuated by a suitable spring, causes the disk or ratchet to revolve one notch. On the face of the disk and over each alternate ratchet-tooth there is a cam. These cams and the free ends of a double feed-pawl are so arranged in relation to each other that the cams pass under and raise the ends of the feed-pawl alternately. Each time one of the ends of the feed-pawl is raised, the line of cartridges under it is permitted to move forward until the ball of the first cartridge lodges in the recess between the carrier and the bolt. In this position of parts the head of the first cartridge remains a little way in the mouth of the magazine, and the second one has not yet engaged the point of the feed-pawl.

When the bolt is drawn back after firing, the magazine-spring forces the whole column of cartridges forward until the feed-pawl engages the head of the second one and the first one is landed upon the carrier. When the backward movement of the bolt is completed the first cartridge is raised into the receiving-chamber by the carrier-spring. By this arrangement of parts the shock of arresting the forward movement of the column of cartridges is taken upon the carrier and bolt. In addition to the ordinary spiral-spring there is an auxiliary spring in the bottom of each tubular space, the object of which is to cushion the blow of the column of cartridges upon the bottom of the magazine in case of heavy recoil or jolting when the magazine is full or nearly so, and thus prevent accidental explosions. The tubular spaces are provided with projections or shoulders on each side. These projections are so arranged that the cartridge-heads strike them alternately on each side, which causes the heads to vibrate laterally and prevents the cartridges from moving, from any cause, with dangerous rapidity, whereby accidental explosion is avoided.

EVANS MAGAZINE GUN.

This novel rifle, no longer manufactured, differed from most magazine guns in having no spiral spring for the purpose of feeding the cartridges through and from the magazine to the breech-mechanism, and in having its magazine located in the stock of the arm. The magazine consisted of a cylinder of forged iron, running from the breech to the butt-plate; around the inner circle of this cylinder was affixed, in the form of a spiral, a flat wire of the proper conformation. Into this cylinder with its fixed spiral was introduced a shaft of fluted or grooved wire, this shaft being revolved by movement of the lever in the breech-mechanism. The cartridges were introduced into the magazine through the butt-plate; with the introduction of each cartridge the breech-mechanism was moved, thus carrying forward the cartridges until the magazine was filled. The cartridges in the magazine were in separate cells, and could not come in contact with each other, thus precluding any possibility of discharge; while in all spiral-spring magazine-guns the cartridges press one against the other, thus rendering a premature discharge possible.

The system of feed in this gun strongly resembled the Archimedean screw. The magazine carried 26 rounds of cartridges of 2 inches in length, and could be loaded in one-half a minute, and the entire magazine of 26 rounds discharged at will, in from 15 to 20 seconds, thus embracing a very great repeating capacity. This arm could be fired 20 rounds per minute, while used as a single-loader, introducing the cartridges into an aperture at the side of the receiver at the breech; or it could be fired 20 rounds per minute, holding the magazine full and in reserve, by introducing cartridges into the magazine at the butt, as each cartridge was dis-

charged. The weight of the gun was 9½ pounds, and length of barrel 30 inches. The carbine weighed 8¼ pounds and had a barrel 22 inches in length.

EXPRESS RIFLE.

This modern sporting-rifle of great killing power takes a large charge of powder and a light bullet, which gives a very high initial velocity and a trajectory practically a right line up to 150 yards, hence the term *Express*. To increase the killing power of the bullet, it is made of pure lead and has a hollow point. Upon striking the object, the bullet spreads outwardly, inflicting a fearful death-wound. This arm is well-adapted to meet the wants of those who hunt large game at short range. It is a modification of the Winchester, model 1876, and differs from it only in caliber (.50), and in the cartridge to which it is adapted. This last contains 95 grains of powder and a bullet weighing 300 grains. The cartridges may be loaded with hollow-pointed, solid or split-pointed bullets, as may be desired. All

these bullets weigh 300 grains each, and their shooting qualities are about equal. The primer is the No. 2½ Winchester. The powder used in loading the cartridges at the factory is United States Government Musket, but any of the approved brands of powder suitable for large cartridges can be used. As has been noticed, the bullet having a high initial velocity, a very flat trajectory is obtained, and no change in sighting is required up to 150 yards, thus enabling the hunter to avoid missing the game through error in calculating distances. The recoil is not greater than that of a 12-gauge shot gun using ordinary charges; the model, as made up for the English market with a 22-inch barrel and with full length magazine, weighs but 8½ pounds. If desirable, a small explosive cartridge can be dropped into the cavity in the point, making it an explosive bullet. A caliber as large as .57 is much used in England, but the .50 caliber is considered sufficient in the United States.

FARROW ARMS.

During an extensive period of active service in the Northwest, while an officer in the United States Army, commanding Indian Scouts, and while Tactical Instructor at the United States Military Academy at West Point, the author made a searching study of fire-arms hoping he might discover or invent an arm thoroughly suited for military service in the field. During his association with the Umatilla Indians and when he captured the tribe of hostile "Sheepeater" Indians,

in the Salmon River Mountains of Idaho in 1879, he had a great variety of arms at his disposal for the purpose of making comparisons. No two Indians possessed arms of the same pattern and caliber; and, yet with few exceptions each thought his arm possessed special features of merit. At that time the Springfield, caliber .45, was the Service arm. It had numerous features of merit, and with the possible exception of its large caliber, was in every way superior to the Krag-Jorgensen rifle, the arm at present used by the United States Army. A good military arm is a good sporting arm and for the purpose of selecting the best or most effective the two classes may be considered together. The author's models of rifle, carbine and revolver embrace the same features and differ only in calibers and minor features. In selecting or contriving the best arm, the following considerations are of first and vital importance:

1—For safety, it is important that the working parts of the gun be made strong; that the breech-bolt be well supported and completely locked before the firing-pin can reach the primer; that the firing-pin be well backed, or supported, to prevent the same from being blown out to the rear, by the escape of gases from defective shells or primers. The firing-pin should be retired from the front face of the breech-bolt in the first movement of the extracting mechanism, at each discharge of the rifle, and held back from the front face of the bolt, until the gun is loaded and the action completely closed; the action of the firing spring should be strong and quick.

2—The magazine mechanism should be arranged so that double loading from the magazine be made impossible; the magazine feeding mechanism should be simple, and free from tendencies to jam when the gun is being operated; the feeding mechanism should be such that jamming or clogging of the rifle when in use, is rendered impossible.

3—The extracting mechanism should be powerful; the extractor hook should be so arranged that the hook will not ride over the cartridge heads under a heavy pull; and the hook should have sufficient purchase on the shell to extract the same from the gun when it is heated. The extracting force should be multiplied at least one to ten; that is to say one pound exerted on the bolt, to exert a force on the empty shell, or cartridge, equal to ten pounds.

4—The ejecting mechanism should be so arranged as to positively expel the shell before the loaded cartridge can be fed up from the magazine; or before the loaded shell can be inserted in the breech opening. The mechanism of the gun should be so arranged, that when the action is opened, and the cleaning rod inserted in the barrel, the cleaning rod cannot produce any disorder in the operating mechanism of the gun.

5—The gun should be so constructed as to be capable of being used alternately,

as desired; either as a single loader, or as a magazine gun, at the will of the operator; and should also be arranged so that the gun can be used as a single loader, while the full magazine is held in reserve. The magazine should be so constructed, that a single loaded shell, or a succession of single loaded shells can be inserted in the magazine at the will of the operator, without the necessity of completely filling the magazine with loaded shells. The gun should be capable of being instantly used, at the will of the operator, as a magazine gun or as a single loader or as a single loader or magazine gun alternately.

6—Indicators should be provided to show at all times the number of cartridges in the magazine.

7—The loaded cartridges in the magazine should be held by their rims from end thrust, to prevent the bullets from being jammed on to the powder, thus creating dangerous pressures.

8—Mechanism should be provided to prevent gases in case of defective primers, or defective shells, coming back into the face of the operator; or driving any of the firing mechanism into the face of the operator in case of accidental explosion.

9—Simplicity always results from a small number of parts, with as few screws, springs and small pieces as it is possible to have.

10—Since the conditions of military service are such that the soldier may desire to replenish, or complete the loading of the magazine, from which loaded cartridges may have been drawn or used, it is important that the magazine can be partially charged with loaded shells; so that the gun may be alternately used as a single loader, or as a magazine rifle at the will of the soldier. Mechanism to show whether the gun is cocked, or in safety position should be provided.

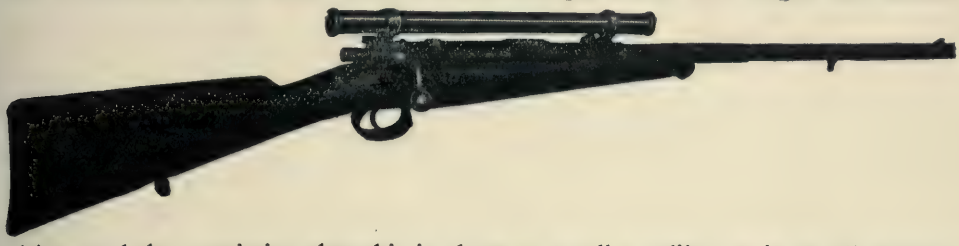
11—The gun should be arranged so as to be protected, as much as possible, from inclement weather and dust; and so built as to be capable of being dismounted and assembled with ease.

The intensity of the pressures developed in the modern army rifle by the use of the now well-established "smokeless" powders, ranging as they do from 35,000 to 50,000, and even at times with some of these compositions up to 60,000 per square inch, compels the adoption of a much more resistant and resilient material for gun barrels than was required with the older small arms. An elastic limit of approximately fifty per cent. higher value and a tenacity of correspondingly greater amount are desirable, united with no less ductility and resistance to erosion than are displaced by the other steels. These qualities are exceedingly difficult of attainment with the carbon steels of even the best qualities and produced by the best makers.

It is singular that, as reported by the Chief of Ordnance, the steels passing the tests and actually employed in making barrels were, one a Bessemer steel, the other

an open hearth, and that none of the crucible steels submitted at that time were satisfactory under test. Of the two used, the Bessemer was rather better than the open hearth, which is quite opposed to former experience in other fields and to the accepted views of metallurgists, manufacturers and engineers.

The author advocates a .38 caliber, although a .30 caliber has been adopted by substantially all the nations of the world, recently adopting new guns for their armies. Consultation with experts and others familiar with the subject, confirm the conclusions which seem to have led to this particular size of gun and ammu-



nition, and the conviction that this is about as small a caliber as is on all accounts desirable. Many experienced military men besides the author, question whether we have not actually gone too far in reduction of caliber, securing range and penetrative power at a sacrifice of "stopping effect" of greater value.

When the Savage .303 caliber expanding bullets first appeared, they excited some little derision among old sportsmen and hunters, who had always considered the large caliber bullet necessary to secure effective results on large game. Their experience was only with black powder, and their deductions were correct, under those conditions. The immensely increased velocity imparted to these small bullets by modern smokeless powder is the secret of the enormous smashing powder of the modern small caliber bullet. The soft nose of the expanding bullet expands on impact with the softest tissues, splitting the jacketed portion, deforming the whole bullet to such an extent that the wound made covers a larger area than ever before seen.

Broadly considered the "bolt system" employed in the author's arms is essentially foreign; the "lever system" is distinctly American. The "straight pull system" is also an American invention. In this gun the trigger-guard and attached working parts slide in a deep channel underneath the rear portion of the stock under and behind the trigger, backward and forward as the breach bolt is opened or shut, with a downward straight pull when it is opened and an upward push when it is closed. This novel invention presents new points of unusual interest, but as yet it has not been adequately proved and perfected.

Careful experiments have been made in foreign armies with the use of the "cut-off" in military magazine rifles, and the decided opinion of many leading experts is that the use of the "cut-offs" which call for two classes of fire is con-

fusing and undesirable in a crisis. *Where the magazine can be kept filled, with cut-off worked automatically, and a steady fire as an effective single loader sustained, the utmost power of a military arm is obtained for general service.* The main point to be secured is an unfailing single loader, and to have this quality supported by a magazine charged with say five cartridges, always ready when called upon in an emergency for instant and unfailing delivery. Such a magazine rifle in its perfection very closely reaches the ideal.

A principal feature in the author's System, is the accessibility of the action and magazine for cleaning and examination. The entire arm may be dismounted and assembled in two minutes, the only tool needed being a screw-driver. All the excellent features of the Blake rifle in conjunction with numerous other patents and improvements will be noted in the System as follows: 1. The handle of the bolt turns down at the side of the stock and is out of the way in handling the grip. 2. The working of the bolt is more convenient and easy than any method of handling a repeater. 3. The arm may be cocked by simply raising the handle and returning it without withdrawing the bolt. 4. There is no end spring pressure setting up the bullets or shortening the cartridges, as in rifles with tubular magazines. 5. Cartridges may vary in length to the extent of a quarter of an inch, enabling the user to vary the weight of bullet and charges of powder. 6. Bullets with round or pointed ends may be used, as the cartridges are not disposed in front of each other and liable to have their primers exploded by the point of the bullet in the rear. 7. The combination of all the advantages of single shot rifles and repeaters into one arm. 8. When the bolt action is removed from the receiver, which can be done almost instantly, the breech is open so that the rifled bore of the barrel can be readily examined and cleaned. 9. The empty shell when extracted and ejected, is thrown to the right and away from the operator. 10. The breech mechanism can be taken apart and a new main spring and extractor substituted and replaced in a few seconds between shots, without the use of any tools. 11. Great simplicity and great strength of breech closing, there being but one piece to resist the strain of firing. 12. The packet is large enough to give a good finger-hold, and in cold weather, with gloves or mittens on, may be readily put into the magazine. 13. The magazine may be quickly opened to examine, fill or remove the packet, or to replace any cartridges that have been fired. 14. The flanged base of the shell is completely surrounded by the cup shaped end of the bolt at the firing position, so that in case of a ruptured shell or primer pierced by the firing pin, the gas is prevented from blowing back in the face of the operator. 15. The mechanism being so accessible, dirt or sand getting into the action may be removed and the arm cleaned by the hands alone, if necessary. 16. Accuracy in shooting is assured by the strain of firing, being properly distributed in the breech. 17. Not

liable to explosions in the magazine. 18. The barrel and receiver may be removed from the stock in three minutes by the use of a screw-driver. It may be mounted in the same time. 19. Carrying seven cartridges in the rifle; more than any modern rifle. 20. Fifty shots may be fired by an expert in one minute. 21. In case of jammed cartridges due to double loading, the jam may be instantly removed by opening the magazine door. 22. Double extractors. 23. No slight of hand performance is required to load the rifle, and no artful dodging to prevent the ejected shell striking the eye. 24. A number of loaded packets may be carried, or the same packet may be kept in the magazine and refilled many times with single cartridges. 25. The arm may be fired from the shoulder easily and rapidly. 26. No danger of cutting or jamming the fingers as with lever actions. 27. The entire arm is so simple that any gunsmith or mechanic can put it in order or make any extra parts.

The mechanism is extremely simple. The receiver has on its left-hand side a broad and deep groove for the passage of the left locking lug of the bolt, and on the right a shoulder for the extractor and right locking lug of the bolt. The bottom is cut away to permit the upward and forward movement of cartridges from the magazine. The forward breech casing contains the grooves for the four locking lugs of the bolt. At the rear the breech casing is closed for a short distance at the top and at its rear has a cam which starts back the bolt when rotating to unlock and open. The bolt, which has a handle turning down at the side of the stock, consists of the body, the cocking piece and sleeve, the firing-pin and spring and the extractor; the firing-pin and striker are in one piece, the shoulder of the striker and the front face of the sleeve form the two bearings for the main spring. The extractor consists of the hook and body. The hook rests between the shoulders of the body to which it is secured by a stud and is easily removed and replaced. A second extractor or shell-starter is used near the front end of the receiver. The ejector is pivoted on the left part of the breech casing and throws out the empty shell to the right by a blow on its side, communicated by the left lug of the bolt. The magazine casing consists of a cylindrical box placed below the receiver. Its bottom is hinged at the left side and when closed is secured by a catch. The cartridge packet has at its front and rear ends trunnions, which rest in beds in the front and rear faces of the casing. When the bolt is operated the cartridge packet is operated by a revolver movement. The "cut-off" is on the left of the stock opposite the bolt handle, and when single loading fire only is desired, depresses an arm so that the bolt will pass over without operating the cartridge packet. If it is desired to load the magazine and hold it in reserve, the bolt must first be closed, then opening the casing, placing the packet with its trunnions in their beds, and closing the casing, the packet will be forced to take proper position. Then with

the magazine cut off, single loader fire can be delivered. The cut-off can be operated when the bolt is open or entirely or partly closed. Presuming the piece to have been fired, turning up the handle throws in consequence of the cam on the rear of bolt the nose, the cocking piece and therefore the firing pin to the rear almost fully cocking the piece. When the upward moving of the handle is a little over half completed, its base by the inclined surface of the shoulder on the breech casing is moved slowly back, starting the bolt to the rear and loosening the empty shell with a powerful screw motion. The upward movement of the handle having been completed, the bolt is now drawn completely back, ejecting the empty shell and the cartridge packet in the magazine is moved through one-sixth of a revolution, bringing another cartridge up in front of the bolt. Reversing the movement of the bolt, the cartridge is pushed out of the packet up into the receiver and then into the chamber of the barrel, and, as the bolt handle is turned down at the side of the stock, the cartridge is firmly seated by a screw motion and the recoil or locking lugs seated in front of the shoulders of the casing. With a little practice the movements of the bolt blend into two only, one back the other forward.

The piece cannot be fired unless fully locked, for if the trigger is pulled before the locking lugs are properly seated the action of the nose of the cocking piece on the side of the cam of the bolt will throw the latter to the right, seating the lugs before the point of the firing pin reaches the primer. The bolt cannot revolve when the trigger is pulled, as an arm of the sear rises into a slot cut on the bottom of bolt, thus preventing its rotation under the strain of firing and preventing the bolt opening by any possibility, as long as the trigger is held back.

When being used as a single loader with a full or empty packet in the magazine, the cartridge may be simply dropped into the receiver and the bolt will push the cartridge into the chamber of the barrel. It is not necessary to push the cartridges home with the fingers. The arm may thus be fired very rapidly as a single loader. The packet in the magazine may be recharged at any time with single cartridges and is the only one that need be used unless continuous rapid fire is desired, when a number of loaded packets may be carried in the pockets or the belt. Packets weigh empty 2¼ oz. For transportation when not carried in loops of the belt, a wire, a band of tin, or a band of tough paper may be placed around front ends of the cartridges in the packet, thus holding them solidly.

The carbine and revolver are convertible after the manner of the Borchardt combination rifle and pistol.

Single cartridges may be charged into the packet or magazine at any time, or the charged packet may be instantly removed. It is claimed that the bolt action with handle at the side, aside from its simplicity and strength and lightness, is superior to a finger lever in rapidity and in power to put in and take out cartridges

from the chamber. It certainly takes up less room, leaves the grip perfectly clear of any obstructions, and can be worked in a more confined space.

FARWELL MAGAZINE GUN.

This magazine rifle has a double bolt action. In its present form it has been tested with satisfaction. With some needed improvements it gives promise of a very effective weapon when carefully developed.

FERGUSON RIFLE.

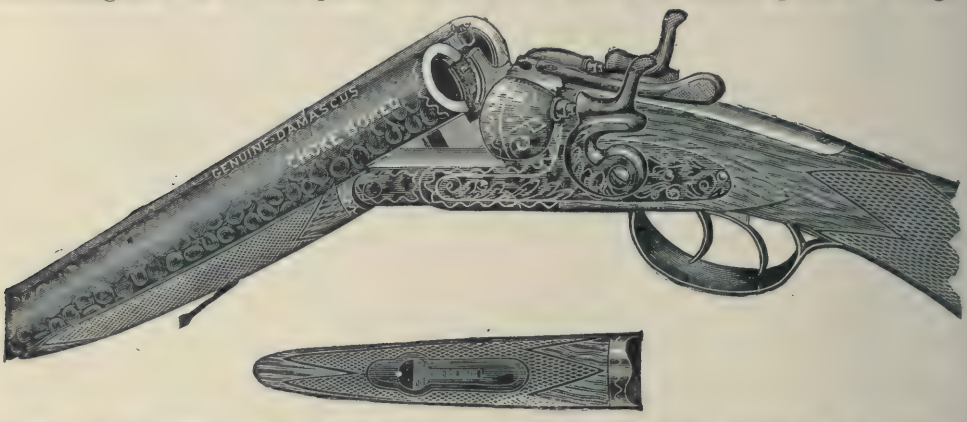
This curious breech-loader, although not strictly of American invention, has become American from the fact that it made its first appearance as a weapon of war on the battlefields of America, and is the first instance of a breech-loading rifle ever having been used on this continent. A few details will serve to explain its peculiarities. The length of the piece itself is 50 inches, weight 7½ pounds. The bayonet is 25 inches in length and 1½ inches wide, and is what is commonly called a sword-blade bayonet. The sight at the breech is so arranged that by elevating it is equally adapted to ranges varying from one hundred to five hundred yards. Its greaest curiosity is the arrangement for the loading at the breech. The guard-plate which protects the trigger is held in its position by a spring at the end nearest the butt. Released from this spring and thrown around by the front, so as to make a complete revolution, a plug descends from the barrel, leaving a cavity in the upper side of the barrel sufficient for the insertion of a ball and cartridge or loose charge. This plug is an accelerating screw, and is furnished with twelve threads to the inch, thereby enabling it, by the one revolution, to open or close the orifice; so that the rifle is thereby rendered capable of being discharged, it has been claimed, as rapidly as the Hall United States (flintlock) carbine. This accelerating screw constitutes the breech of the piece, only, instead of being horizontal, as is usually the case, it is vertical. Were there not twelve independent threads to this screw, it would require two or three revolutions to close the orifice; whereas one suffices. Many of the muskets fabricated in the French arsenals during the last years of Napoleon had bayonets of the shape mentioned herein adapted to them, specimens of which were deposited among the French trophies in the Tower of London.

FOGERTY GUN.

This magazine gun has a tubular magazine in the butt-stock which is charged through a gate on the right-hand side. Its capacity is six cartridges, and there is a cut-off. An oscillating jointed carrier, having also a vertical motion, is actuated by the breech-bolt and lifts the cartridges as they are delivered from the magazine up into the receiver.

FOLSOM NEW AMERICAN GUNS.

The H. & D. Folsom Arms Company, in producing their line of American made guns, have accomplished an enterprise which has been deemed an impossibility. It has always been supposed that cheap guns could not be made in this country because we cannot compete with cheap foreign labor, but this supposition has vanished. This company offers an American made line of guns which are practically interchangeable as to vital parts, etc., at prices as low as similar guns of foreign



make. All these guns have the left barrels full taper choke bored and the right barrels are cylinder bore for good shooting. The lock parts are hardened, which makes them work more easily and last longer than soft parts. They are good sound guns throughout, and give universal satisfaction. The drawing shows the general style. They are made in 12 gauge, 30 or 32 inch barrel, weighing from 7½ to 8½ pounds. They have steel frames and are bored for nitro or black powder.

The *New American* single barrel breech-loaders, under the trade names of "New Field," "New Victor," "New York Arms Company Ejector," "Club Hammerless," "Trap Hammerless," etc., are excellent cheap guns. They are bored for nitro or black powder and will average 275 pellets in a 30-inch circle at 40 yards, with a load of 3¼ drams of black powder and 1⅛ ounces No. 8 shot. They are taken choke bored.

FORD GUN.

This magazine gun has a fan-shaped magazine under the receiver, holding five cartridges, which are arranged in receptacles with separating ribs between. The arm has a cut off.

FOREHAND ARMS.

The guns and revolvers manufactured by the Forehand Arms Company, prior to the absorption of that company by the Hopkins and Allen Arms Company, have been highly commended for having a mechanical construction whereby strength

and simplicty are combined. Figures 1 and 2 show the hammerless gun and its very simple mechanism. The gun is provided with an ejector if desired, uses nitro

Figure 1.

powder and is bored for 12 and 16 gauge wads. The hammerless single gun has

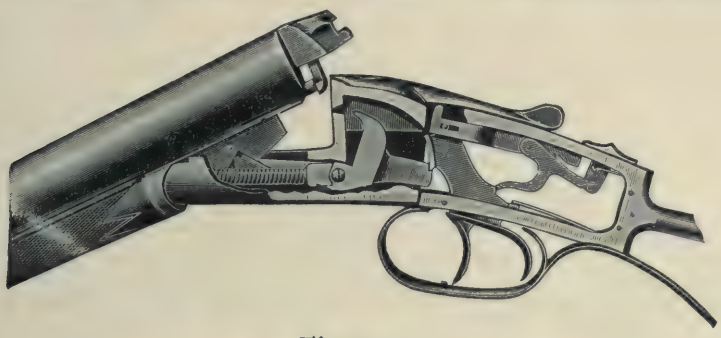


Figure 2.

all the features of the double gun and follows the lines of the celebrated *Perfection*

Figure 3.

single gun. The hammer double gun, shown in Figures 3 and 4, is made in 12 and

16 gauge, with rebounding locks, extension rib, straight and matted. Great simplicity and durability are apparent. Figure 5 shows the mechanism of the single

Figure 4.

gun, with an automatic ejector. The barrels are plain and twist, 30 and 32 inches in length. The frames are all in case hardened finish, rebounding lock, and half pistol grip. It has a very neat and simple device of a screw and lever combined

Figure 5.

to hold the barrel to the frame, and can be quickly detached, and does not protrude above the surface to object either in appearance or handling. It is made in 12 and 16 bore, and for the use of nitro powder.

One of the best productions by the Forehand Arms Company, in the revolver line, is the hammerless, shown in Figure 6, It is an exceedingly smooth working and attractive revolver, having all the latest improvements, automatic shell extracting, double action, positive stop on cylinder and automatic hammer block. It is made in .32 calibre, small frame, 3-inch barrel, and .38 calibre, large frame, 4 or 5 inch barrel, 5 shot, Smith & Wesson cartridge.

The Forehand automatic hammer revolver shown in Figure 7 is attractive. It weighs 12 ounces, has rebounding lock, positive stop on cylinder and is hammer blocked, so that accidental discharge is impossible. It is .32 calibre, 5 shot, 3-inch

barrel, central fire, Smith & Wesson cartridge, automatic shell extracting, and

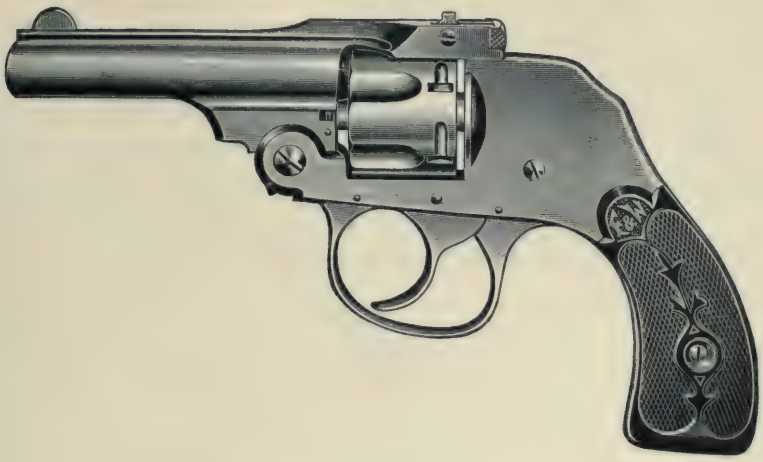


Figure 6.

double action. This revolver is made with a shorter barrel, when desired, weighing only 11 ounces. See *Hopkins and Allen Arms.*

Figure 7.

FRANKLIN MAGAZINE GUN.

This gun belongs to that system in which a fixed chamber is closed by a bolt by direct action, and in which the lock is concealed. The receiver has a vertical slot cut entirely through it for the purpose of receiving cartridges from above and affording egress to the empty shells below. It has also a longitudinal slot through which the handle on the breech-bolt slides, with a side-cut at the front end of the

slot for the reception of the handle when the bolt is locked. The breech-bolt is composed of three parts, viz., the locking-tube, the bolt-head and the cocking-piece. To the latter of these, the firing-pin, which extends the whole length of the breech-bolt, is secured by a screw. The bolt-head, which supports the cartridge at the instant of fire, is secured to the locking-tube by a pin at right angles to its axis. The firing-pin spring which is held between the shoulder on the front of the firing-pin and that at the bottom of the locking-tube, serves by its tension to hold in contact the locking-tube and cocking-piece. By means of the spiral surfaces of a projection on the cocking-piece, and a corresponding recess on the locking-tube, the cocking-piece is cammed back, withdrawing the point of the firing-pin within the face of the bolt-head when the piece is unlocked. Accidental explosions are thus avoided in closing the bolt. The form of the cut in the receiver is such as to cam back the handle, and with it the bolt, during the unlocking, starting the empty shell. When the bolt is returned to its position the stop-spring is returned to its first position by means of a spring operating its lever; at the same time the inclined face of the stop-spring bearing on the side of the cut in the receiver is pressed out of the way, and a cartridge issues from the magazine into the space above the breech-bolt. It follows, therefore, that a cartridge always occupies a space above the breech-block when the piece is locked, provided the magazine has been previously filled. When the bolt is withdrawn, this cartridge, under the influence of gravity alone, falls into a position in line with the axis of the bore. The bullet is supported by a shelf in rear of the chamber. The base of the cartridge is prevented from falling below the line of the axis of the bore by the shape of the slot in the receiver, which is only wide enough for the shell to fall through when its head is behind the extractor. This condition only obtains when the shell is being withdrawn. When the bolt is returned, the cartridge is forced into the chamber and another one enters the space above the breech-bolt. A lid covers the opening at the top of the receiver. A catch serves to keep the lid closed except when the breech-bolt is unlocked. If the lid be raised during that time, a shoulder on its interior bearing against a lever prevents a stop-spring returning to its original position. The lid remaining, the piece may be loaded and fired as a single-loader. No ejector is required with this gun, gravity again being called on to effect the fall of the empty shell through the opening to the ground. As a magazine gun, three motions are necessary to operate it, viz., opened, closed, fired.

FREEMAN GUN.

This breech-loading rifle has a fixed chamber closed by a movable breech-block, rotating about a vertical axis at 90 degrees to the axis of the barrel, and lying in the plane of the axis of the barrel. It is opened by cocking the piece and pulling

back the horn of the breech-block; and is closed by pushing the horn forward with the right hand, a bevel on the left face of the breech-block, pushing the cartridge home. When locked by the position of the breech-block it is also kept from turning by the front segment of the hammer engaging with a corresponding groove in the back of the block. It is fired by a center-lock of the usual pattern.

Extraction is accomplished by a bent lever pivoted below the chamber and struck by the ejector-cam, which, turning with the breech-block in opening the piece, rides over the curved horn of the extractor or draws back its upper end, carrying with it the cartridge-shell. Ejection is caused by a flat-spring riding on a cam formed on the hub of the extractor, and thereby accelerating its action on the cartridge-shell when the latter has been started from its seat in the chamber in the act of opening the piece.

This arm has been modified so that the horn of the breech-block, instead of being solid with the block, is pivoted to it on a vertical axis, and has its lower portion cam-shaped, with a bearing on the side of the frame, so that a lever-power is obtained in the first movement of opening the piece, when, if at all, the block is likely to stick. The hammer also has a projecting-tooth on its forward surface which engages with a notch in the under side of the firing-pin and retracts it when the hammer is cocked. The point of the firing-pin may thus be withdrawn from its impression in the cartridge-head, in order to allow the block to open freely.

GARDINER MAGAZINE GUN.

In this arm the barrel and tip-stock slide forward and backward on ways connected with the butt-stock. They are released to move forward, and secured when back by a hook into which the forward end of a trigger-guard is formed. This guard revolves, to a sufficient extent for this purpose, on a pin passing through it, at the forward end of the guard-bow. It locks the piece automatically, when it is closed by the action of a spring at its rearmost end. In moving out the barrel the hammer is cocked by an internal connection between the barrel and the tumbler. A cartridge having been expelled backward from the magazine by the action of the magazine-spring, it is raised by the striking of a projection on the lower end of the barrel against the forward end of a bent lever, the rearmost end of which lies beneath the cartridge. This passes it up a pair of guides on the face of the frame, so shaped as to hold within their jaws the head of the cartridge by the rim. When it arrives opposite to the mouth of the chamber it is passed into it by closing the piece. By repeating the movements as described, the succeeding cartridge will pass up the guides as before, and striking from below the empty one just fired, will throw it up the guides with sufficient force to send it clear of the gun. The magazine is charged through the trough into which the space between

the ways is formed. The issue of the cartridges from the magazine is limited to one at each forward motion of the barrel by the interposition of the spring-stop, which is pressed out of the way by the barrel at the end of its stroke. The magazine can be cut off and held in reserve by a revolving eccentric stop, moved by a thumb-piece on the outside. The arm can then be used as a single-loader by inserting the rim of the cartridges into the guides at each opening of the piece. By a cam-motion of the movable trigger-guard power is obtained to start the barrel slightly away from the butt, and thus to overcome the chief obstacle to the removal of the empty shell, viz., its sticking at the start.

GLENWOOD GUN.

The Glenwood single barrel shotgun shown in the drawing has a top snap, is choke bored and is fitted with an automatic positive shell ejector. The only way to discharge the gun is to pull the trigger. The hammer cannot be made to strike the shell in any other way, and thus prevents accident. By means of a small

thumb-screw, the barrel can be easily detached or put together without removing the fore-end. This gun has been highly recommended for field or trap shooting. Its mechanism is so simple that it seldom gets out of order and its safety features are quite meritorious. It is made in 12 and 16 gauge, with 30 or 32 inch barrel and weighs about 6½ pounds.

GREENE GUN.

This breech-loading rifle has a fixed chamber closed by a movable breech-block, which slides in the line of the barrel by direct action. This piece has a concealed spiral-spring lock. It is loaded through a mortise cut in the side of the receiver, and is locked by projections on the bolt engaging with corresponding cavities in the receiver. The handle of the breech-bolt is so formed as to lie close to the stock, when turned down and closed. A detachable magazine or pannier made of tin can be connected with the right side of the receiver, and is worked by canting

the gun to the left, and allowing a cartridge to roll into the receiver in front of the bolt, when it is withdrawn to load.

HALL RIFLE.

This early breech-loading flintlock rifle had a fine reputation in its day. In 1816 one hundred of these rifles were made and issued to a company of riflemen for trial. The report on this trial was favorable, and in 1825 troops stationed at Fort Monroe were equipped with them. They were used with much satisfaction in the Black Hawk and Seminole wars, and it is said in the Mexican war. This arm was very popular up to the beginning of the Civil War, but was finally superseded by the Sharps rifle.

HAMILTON RIFLE.

This very light weight rifle, having a barrel only 8 inches long, chambered to take either short or long .22 caliber cartridges, combines great accuracy, strength and durability. The frame is constructed of steel and brass. The barrel, a double steel jacket with a brass lining, thoroughly and accurately rifled, is attached to the upper rod of the frame by the muzzle and breech parts, and is adjusted with a taper nut at the muzzle, this nut being locked by a set screw; also by a double lock nut on the lower rod, which holds the breech portion securely on the rod with the aid of a spring catch. This method of attaching the barrel, while a departure in gun construction, not only secures perfect adjustment and alignment, but also absolute safety. The shell is exploded by a long firing pin, which locks into a sear or trigger-dog, and the shell cannot be exploded when the firing pin is free. The rifle may be loaded without setting firing pin, and may be carried safely in this position without the liability of accidental discharges which surrounds the ordinary style of trigger mechanism.

HAMPDEN GUN.

This magazine gun has a capacity for five cartridges and a cut off. It possesses the peculiarity that the magazine mechanism, including the cut off, is entirely contained in the cartridge packet, which is placed in a receptacle to the left and above the receiver; the construction of the latter is thereby made very simple.

There is no safety lock, but the cocking-piece can be left down until the sear engages in the half-cock notch; or the same engagement can be obtained by (after loading) partly turning up the bolt-handle and then returning it to the firing position.

From the position and form of the cartridge packet, by simply using larger packets, a greater number than five cartridges can be introduced into the magazine, the number being limited only by the convenience of handling the packets and the amount of projection above the gun which it is desired not to exceed.

HARRINGTON AND RICHARDSON ARMS.

These excellent revolvers and guns are noted for simplicity of construction, qualities of safety and good shooting. The automatic double action revolver, shown in Figures 1 and 2, is made in all desired calibers. These are the stand-

FIGURE 1.

ard—32 caliber 6 shot, 3¼ inch barrel, weight 16 ounces, using center fire Smith and Wesson cartridge: 38 caliber 5 shot, 3¼ inch barrel, weight 15 ounces, using center fire Smith and Wesson cartridge; in these a 4, 5, or 6 inch barrel may be substituted. In the "Police" pattern, the thumb piece is cut away to prevent catching in the clothes when withdrawing from the pocket. To enable the user to thumb-cock the revolver, if he desires, the inner and upper part of the hammer is concaved. By pulling the trigger until the hammer catches on the sear at the half-cock notch, the cocking can be completed with the thumb. The 22 caliber, 7 shot, 3 inch barrel, weighs 13 ounces, using a long or short cartridge, rim fire, with a possible substitution

FIGURE 2.

of 4 or 5 inch barrels. The small frame 32 caliber, 5 shot, 3 inch barrel, using center fire Smith and Wesson cartridge, weighs only 12 ounces; 4 or 5 inch barrels may be substituted also in this revolver. The 22 caliber, 7 shot, 2 inch barrel, weight 12 ounces, rim fire long or short cartridge, and 32 caliber, 5 shot, 2 inch barrel, weight 11 ounces, center fire Smith and Wesson cart-

ridge are especially adapted in all cases where a small, light weight, effective weapon is desired. The automatic shell ejecting is seen in Figure 2.

The automatic hammerless revolver is shown in Figure 3. The latest production of this class is the 38 caliber, 5 shot, 3¼ inch barrel, weight 17 ounces, center fire Smith and Wesson cartridge, with a substitution of 4, 5 or 6 inch barrels. Figure 3 shows a lighter frame, 32 caliber, 5 shot, 3 inch barrel,

FIGURE 3.

weighing 13 ounces. It is also made with 2, 4, 5, and 6 inch barrels. This revolver is remarkably safe and automatic shell ejecting.

The *American* double action revolver (with regular or safety hammer) 32 caliber—16 ounces, 38 caliber—15 ounces, 44 caliber—18 ounces, with barrels 2½, 4½ or 6 inches, are well known and favorites. Likewise the *Young America Bull Dog*, the *H. and R. Bull Dog*, the *Young America Double Action* and the *Young America Safety Hammer*, in every practicable and desired variety of caliber and weight, have excellent records and are generally quite popular.

The following directions should be observed in removing and replacing the cylinder and ejector. First open the arm to its full capacity; then with the

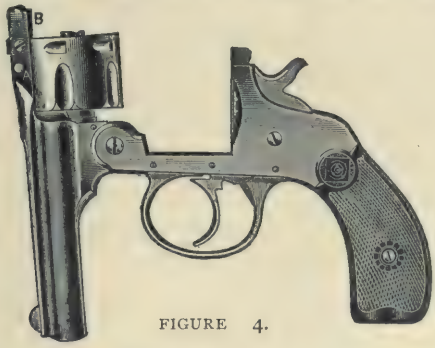


FIGURE 4.

thumb nail of the left hand, press in the cylinder catch bolt *A* as seen in Figure 4, and holding it there, raise with the forefinger of the left hand, both the barrel and cylinder catches *B*; then, releasing hold on cylinder catch bolt, the barrel and cylinder catches remain open at full height, and the cylinder and ejector may be withdrawn from the arm. To replace the cylinder and ejector,

the barrel and cylinder catches being opened or raised, as before described, the cylinder and ejector may be returned to place on the quill; then, press hard the cylinder catch bolt, which will allow the barrel and cylinder catches to return to their usual positions.

The Harrington and Richardson Arms Company have a knife attachment on their revolvers of 32 and 38 caliber designed for export trade. Thus the weapon is effective without noise, with the cartridges in reserve, or as a last resort after the cartridges are fired. The knife blade folds down under the barrel when not in use. To extend the knife, with the thumb and forefinger of the left hand swing the blade to the evtended position, where the spring will hold it firmly in place. To close the knife hold in the right hand, butt down and guard toward you, release the blade by pressing the checked ends of the spring toward the axis of the bore with the thumb and second finger of the left hand, and at the same time swinging the blade downward with the forefinger.

This Company's automatic ejecting single gun,* Fig. 5, 12, 16 and 20 guage, barrels 28 to 32 inches, very recently put on the market, has achieved a good reputation among sportsmen and military men. It is very simple in its

FIGURE 5.

action. To dismount it, first unhinge the barrel and remove the butt plate and stock in the usual manner. Drive out the trigger pin when the guard and trigger can be removed. While holding the hammer at full cock insert a small pin in the main spring guide at rear end of spring; release the hammer, and the spring and guide can be readily taken out. Drive out the hammer pin and the hammer is free to be taken out.

To assemble, place the hammer in position and insert the hammer pin. Place the main spring and guide in position, hold the hammer at full cock, remove the small pin, and let the hammer down. A pin not longer than the thickness of the guard is necessary to be used in holding the trigger in position in the guard. Insert the front end of the guard, and while holding the trigger back, complete the placing of the guard in position, then drive in the trigger pin. Replace the stock, butt plate, and barrels in the usual way.

*Also made non-ejecting.

HENRY RIFLE.

This early and excellent magazine gun, largely improved, is now generally known as the Winchester. It may be used as a single loader or a repeater. As a repeater, the motion of the lever withdraws the spent shell of the previous charge, raises the hammer, recharges the gun and relocks the breech mechanism. With single loading, the cartridge is placed in the carrier-block, and a single motion puts it in order for firing. See *Winchester Arms.*

HELM GUN.

This breech-loading gun has a fixed chamber closed by a movable barrel, which rotates about an axis parallel to the axis of the barrel. The peculiar feature of this arm is the connection of the tumbler with a movable butt-plate, so arranged that by pressing the piece against the shoulder, in aiming, the hammer may be simultaneously cocked. The cylinder also can be conveniently removed from the side, and replaced by a loaded one, if desired. This gun has been tested with considerable satisfaction.

HEPBURN-REMINGTON RIFLE.

This rifle, designed especially for long range target shooting, has a solid breech-block with direct rear support, side-lever action and rebounding hammer, so that the arm always stands with the trigger in the safety notch, thus rendering premature discharge impossible.

To take the gun apart: Remove the upper-screw in the left-hand side, and the breech-block may be taken out. To take out the hammer, remove the next upper screw and slip the hammer forward into the breech-block hole. To take out the extractor, remove the forward screw on left-hand side. The lever which operates the breech-block passes through the rocker-sleeve with a square stud, and is held in place by a set screw directly under the fore-stock, which must be removed if it is ever desired to take off the lever. If necessary to remove the guard, it can be done by taking off the butt-stock, and taking out the side-screws in the usual way. The barrel should not be unscrewed from the frame, except by experienced hands and proper appliances. When necessary to unscrew the frame, the extractor should be taken out, and the breech-block and guard put back in place. before putting on the wrench. If at any time the primer should be driven back into the firing-pin hole, so as to make the breech open swiftly, it can be relieved by snapping the hammer against the firing pin. The military long-range rifle was adopted by the National Rifle Association. It has a heavy barrel, chambered for 2 6-10 inch, .44 caliber, straight shell, using from 80 to 100 grains of powder. See *Remington Arms.*

HOPKINS AND ALLEN ARMS.

The rifles, single shot guns and revolvers of this make are carefully tested for the use of smokeless and nitro powders and with strength combine many desirable features. The system of detaching the barrels is very simple and effective, Figure 1. By simply

Figure 1.

loosening the thumb screw, the barrel may be taken out of the frame for cleaning or packing away. To eject the shells, it is only necessary to start the lever by pressing on it with the thumb, then let it snap down, Figure 2. In this way the ejector will throw

Figure 2.

the empty shells clear past the breech and leave the chamber ready to be reloaded. The *Junior* plain rifle weighs 4½ pounds, has round barrel and rebounding lock, and requires a 22 caliber, rim fire cartridge, 22 inch barrel; or 32 caliber, rim fire, 22 inch barrel. The *Junior* fancy rifle has an octagon barrel, 22 caliber, 26 inch. The *Sporting* rifle* weighs 6½ pounds; 24, 26 and 28 inch barrels: 22 and 32 caliber,

Figure 3.

rim fire: 32, 38 and 44 caliber, Winchester: 32.40 and 38.55 Marlin. The Sporting rifle with an interchangeable shot barrel, Figure 3, weighs about 10 pounds. The shot barrel is 16 and 20 gauge and 30 inches in length. These rifles have set trigger and solid breech block.

The new target rifle weighs 6 pounds, with 26 inch octagon barrel, caliber 22, long rifle rim fire. It is a compact rifle for target use, is made after the style of the take-down

*Not manufactured at present.

guns and rifles, and is especially adapted to the 22 caliber long rifle cartridge. The single shot guns are well built. The 16 and 20 gauge weigh 5½ pounds, with 30 inch barrel and rebounding lock. The X. L. pattern is 44 caliber, center fire, weighs 5 pounds and has a 24 inch barrel, and is specially designed for small game. The 12 gauge is choke bore and weighs 5½ pounds with a 30 inch barrel.

The advantages of the Hopkins & Allen folding hammer lie in its compactness and neat appearance. No hammer to catch when withdrawing weapon from the pocket, but still, when needed, the hammer can be brought into use, giving the arm the advantage of either single or double action. No possible danger of accidental discharge by hammer striking against an object. As a further safeguard, the heavy lip on sear (*A*), Figure 4 prevents *any possibility* of explosion, as the hammer *can not be released* so as to let the firing, pin come in contact with the cartridge, *except when the trigger is pulled back in position for firing*, when it raises the sear and lets the hammer pass by. The lever spring (*B*), which is embodied in the solid trigger, gives a durable and effective spring, which cannot slip

Figure 4.

out of position or break. The rebounding lock further adds to the safety of the arm.

The automatic hammerless hinge revolver, Figure 4, possesses all the advantageous features of an *absolutely safe* hammerless revolver. The catch, which is thrown in back of the hammer by means of turning the knurled nut (*C*) forward, prevents any possibility of the hammer being drawn back, and thus any possibility of an accidental discharge. This revolver, as well as other models, is furnished with rebounding lock to serve as a further safeguard, and possesses the advantage of *heavy lip on sear*, and patent lever spring.

The automatic hinge revolvers are made in three styles—regular hammer, folding hammer and hammerless. Fgure 5 shows the action. To eject the shells hold the arm naturally in the right hand, lay the left over the barrel, placing the thumb and forefinger on the checkered parts of barrel catch. Press upward on catch as far as it will go, and then

bear down on front end of barrel so as to tilt it, thus ejecting the shells. Place load in chambers and return barrel to its natural position, when the arm is ready for use. These are very superior arms. The 32 caliber is made with special small frame for pocket use,

Figure 5.

and with long barrel for target practice. The 38 caliber can be furnished Police size and with long barrel and swivel ring for holster.

The *Acme* hammerless and *Czar* revolvers* are excellent and serviceable revolvers at a low price. These are furnished in two sizes of frames, the small specially made for pocket use, and a regular large size frame. *These* patterns do not have automatic ejectors. Figure 6 shows the *Acme* hammerless, weighing 11 ounces, with cartridge 22 cali-

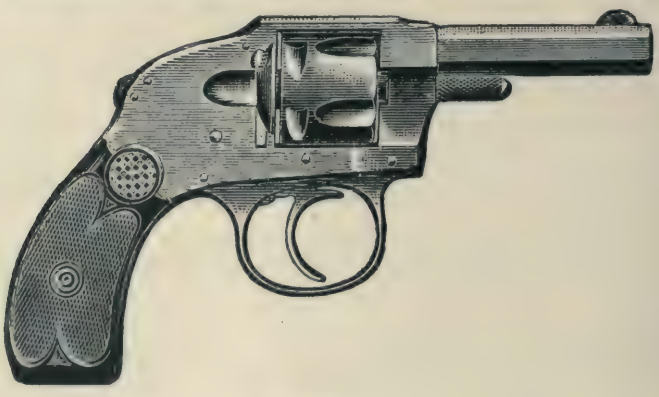


Figure 6.

ber rim and 32 caliber center fire, barrel 2¾ or 4½ inches. The trigger can easily be locked to guard against accidents. A larger pattern weighs 20 ounces, 38 caliber, center fire, with barrel 3¼ or 5 inches. The No. 5 single action revolver is a hard shooter, weighs 15½ ounces, 38 caliber, rim or center fire, 5-shot, with barrel 3, 5, 6, 7, or 9 inches. The *Czar* weighs 7¾ ounces, 22 caliber, rim, long or short, is 7-shot, regular hammer and 3½ inch barrel.

* Neither one manufactured at present.

The Hopkins & Allen Arms Company have recently purchased the business of the Forehand Arms Company, formerly conducted at Worcester, Mass., by the Forehand Arms Company, Forehand & Wadsworth, and originally founded by Ethan Allen. They will carry on the manufacture of most of the Forehand line, making such changes or omissions as may be necessary to meet present conditions, and for use with nitro powders. See *Forehand Arms.*

HOTCHKISS MAGAZINE GUN.

This gun was first exhibited in the spring of 1876 at the Centennial, at Philadelphia. It has since been much improved. Its operation is simple. 1. To open the breech-bolt: Hold the stock firmly with the left hand a little in front of the receiver; and with the right hand raise the handle, and draw back the bolt, making but one motion. 2. Close the bolt by an inverse motion. This operation cocks the piece. 3. To cock the piece without withdrawing the bolt: Raise the handle as before, and immediately turn it down. 4. To load the magazine: Raise the handle, and draw back the bolt. Take a cartridge between the thumb and middle finger, placing the point of the forefinger on the bullet; insert the head of the cartridge in the receiver, just in front of the point at which it narrows down, and press it back in the magazine until a distant click—the head passing the cartridge-stop—is heard. Repeat the operation until five cartridges have been inserted. Another may then be placed in the chamber.

The magazine cut-off is found on the right of the piece, just in the rear of the bolt-handle. It serves to lock the magazine so that the arm may be used as a single loader while the contents of the magazine are held in reserve. When the thumb-piece is pushed forward, however, the arrangment of the mechanism is such that no cartridges can escape from the magazine to the chamber, and the weapon is practically a single loader. The bolt-lock is placed on the left side of the receiver, opposite the magazine cut-off, and serves at the same time to lock the bolt and the trigger in such a manner that the bolt cannot be turned or drawn back, nor the arm fired. To lock the bolt and trigger push forward the thumb-piece of the bolt-lock; this can only be done when the bolt is closed and the gun cocked. To unlock the bolt, push back the thumb-piece of the bolt-lock.

HUNT MAGAZINE GUN.

This gun belongs to that system in which a fixed chamber is closed by a bolt, by direct action. The receiver has a slot in its upper surface for the purpose of loading the chamber direct when the piece is used as a single loader; it is also bored through at the rear for the reception of the breech-bolt. The latter is composed of two parts, the body and the locking-tube, which are connected by a left-hand

screw-thread. The bolt is locked by two lugs, turning in corresponding cuts in the receiver. These lugs are so shaped on their rear surfaces as to cam the bolt against the base of the cartridge during the locking. A cam on the inner surface of the rear end of the locking-tube forces the bolt slightly to the rear, starting the shell, during the unlocking. The opening of the joint in the breech bolt (the thread being left-handed) during the locking aids in the camming forward of the bolt, while the closing, by drawing the forward portion to the rear, aids the starting of the shell. When the bolt is withdrawn the extractor, which is of the spring-hook pattern, pulls on the upper side of the head of the shell while the under side abuts against a forked post. By this means the shell is thrown clear of the gun. In order to insure the ejection of the shell a quick motion of the bolt is necessary. The forked post acts also as a guide for the breech-bolt. A slot in the rear of the bolt receives the nose of the hammer, allowing it to strike the firing-pin only when the piece is locked. A slide prevents the hammer being pulled back by catching of clothing, etc. It must be moved back before the hammer can be cocked. The magazine, which is in the tip-stock, is loaded from the side of the receiver, or from underneath, by first raising the carrier by the withdrawal of the breech-bolt. The carrier has two grooves, one on each side, on its inner surface. In these grooves projections on the breech-bolt enter. As the bolt is withdrawn the projections travel in the upper horizontal portion of the grooves until they reach inclined faces when, by the pressure against them, the carrier is compelled to rise, bringing a cartridge opposite the chamber. When the bolt is returned, the projections travel in the lower horizontal portion of the grooves until they reach other inclined faces, when the carrier descends opposite the mouth of the magazine, so that cartridges cannot escape until it is in position to receive them. No magazine cut-off is provided. As a magazine gun, 5 motions are necessary to operate it, viz.: cocked, opened, loaded, closed, fired. The gun of caliber .44, carries 13 cartridges in the magazine, 1 in the carrier, and 1 in the chamber.

ITHACA GUNS

These guns are noted for strength and great wearing qualities, are popular for all nitro powders and have become famous for their shooting qualities. The drawing, Figure 1 with stock removed, shows the steel breech or frame, which is forged whole. The breech is exceedingly strong through the angle of the frame, a point where strength is most needed. The drawing also shows the location and arrangement in the frame of the few parts which compose the forward action locks. The central draft interchangeable main spring lies in the frame extending under the barrels, and its power is applied direct to the tumbler. As the working parts of the locks are wholly contained within the frame, in a

simple and compact form, it avoids the necessity of cutting away and weakening the stock. In addition to the full strength of the stock at the wrist, it is still further strengthened by the tang extending nearly the whole length and secured by two heavy tang screws, which makes its strength and durability beyond a question. The automatic compensating forend is held in place by the action of a spring, and is taken off, or replaced, by lifting at the end. This spring

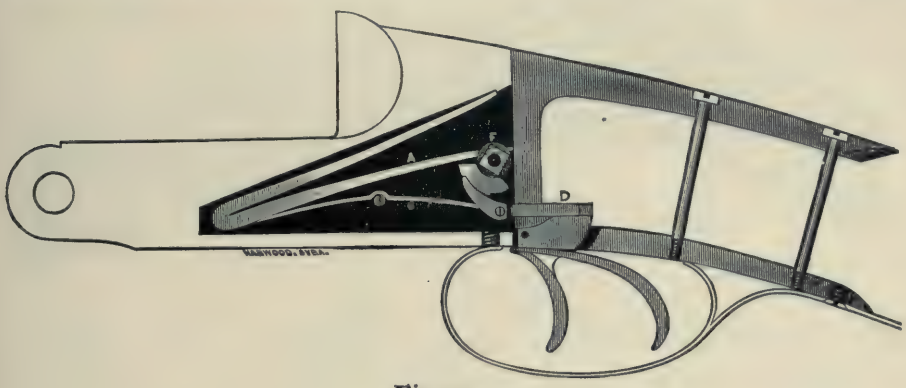


Figure 1.

acts as a cushion in opening the gun, relieving the strain at the hinge joint, and also compensates for all wear at the joint in such a manner that the gun can never get loose or shaky in the joint by rough usage or hard shooting.

All Ithaca guns are choke-bored, have extension rib, rebounding locks, self-fastening, compensating forend and rubber butt plate; they are self- compensating, taking up wear at every point, and with hammers so low that the top lever swings completely over them, giving all the advantages of a hammerless gun when taking aim.

With a view to the requirements and demands of the sportsman, the Ithaca hammerless gun has been produced. The No. 3 and No. 4 guns, shown in Figures 2 and 3, are leaders. These guns are free from faults and disadvantages and are conspicuous for strength, simplicity, durability, mechanical construction, ease of manipulation, neat and attractive appearance. The few parts composing the locks and cocking device, are made of steel and arranged in the frame in a compact form, which avoids cutting away and weakening the frame and stock and at the same time enables the use of a frame no larger than that of an ordinary hammer gun, retaining a more graceful outline and greater strength of metal. One of the many improvements in the manipulation of the Ithaca hammerless gun is the attachment of the cocking device, which enables one to put on and remove barrels at all times, same as a hammer gun, without reference to the gun being cocked or not, thus avoiding the necessity of the con-

tinued tension on the main springs when the gun is not in use, or oblige one to cock it before replacing the barrels. The locks are rebounding, thus avoiding

Figure 2.

the danger caused by firing pins pressed upon the primers with full force of the main spring, when the gun is not cocked. This gun is also provided with a combined automatic and independent safety, which can be changed from auto-

Figure 3.

matic to independent by a touch of the thumb, and vice versa, which enables one in rapid firing to use his gun independent of the safety if desired.

Ithaca guns are provided with an automatic ejector, very capable of its work and ejecting from the barrel fired only. This device is placed in the lug, works directly upon the extractor, independent of the main spring, detracts nothing from the gun locks, and at the same time gives the strongest, most durable and best ejector made.

IVER JOHNSON ARMS.

The Iver Johnson safety hammer and hammerless automatic revolvers are so constructed that it is impossible to explode the shell unless the finger is on the trigger at the point of firing. The rebounding firing pin is a late improvement. It rebounds of itself, and is entirely independent of hammer, trigger or action. This device allows the hammer to lie always in its natural position, and no unsightly opening is left by the rebounding of the hammer. Besides this vitally important and original improvement there have been incorporated many other valuable devices, such as the barrel catch, cylinder lock, and extractor cam; no spring has any tension upon it except when in operation.

The safety hammer comprises three essential parts; the hammer, firing pin, and intervening lever, or what is termed the raiser. In firing the revolver, the

Figure 1.

hammer strikes the raiser, and that, in turn, the firing pin. To illustrate the safe qualities of this weapon:—should the hammer catch in the pocket, or should the hammer, by any accident, be knocked off while at full cock; or should the sear be released in any other than the natural way, it is utterly impossible for the pistol to discharge. In order to explode the cartridge, the finger must be on the trigger at the point of firing or when the trigger releases the sear. Drawing the hammer back with the thumb to almost full cock, the

raiser is carried up to a relative position with the firing pin; on releasing the hammer it drops, but no discharge, as the raiser, being controlled by the hammer, is drawn down and out of line of the firing pin. If, however, we pull the trigger, we repeat the action of the thumb; but, at the point of firing, or as the trigger knocks off the sear, it releases the raiser from the hammer, and the trigger holding the same in line of the firing pin, the hammer strikes in the natural way. After releasing the trigger, the raiser drops down, leaving a receptacle for the rebound of the firing pin. This revolver, Figure 1, is made in 22, 32, and 38 caliber, with barrels 3, 3¼, 4, 5, and 6 inches long. The chamber is 5 shot and takes S. & W. center fire cartridge. In the 22 caliber, the barrels are 3, 4, and 5 inches long. The chamber is 7 shot and takes a rim fire cartridge.

The Iver Johnson safety hammerless revolver embodies all the principal features of the safety hammer revolver, viz.: the action, barrel catch, and rebounding lock, together with the device for locking the cylinder, safety catch, etc. It demands recognition of the following advantages: fewer parts than any of its kind; an easy and accessible way to the action, by a top-plate; a quick and effective cylinder lock; and the new safety catch on the trigger, new in itself, and the only catch that will lock the revolver safely. Most revolvers of this class lock the hammer by complicated devices arranged in such a way that, by a slight accident, the safety becomes disarranged, and it is impossible to operate the revolver. The only source of danger to a hammerless revolver is the trigger, and to overcome this the safety catch has been placed in the trigger, operating against the guard and independent of any action of the revolver. Thus we have a safety on the trigger and a safety hammer. This excellent revolver is made in 32 and 38 caliber. The lengths of the barrels are 3, 3¼, 4, 5, and 6 inches. The chamber is 5 shot, and takes a S. & W. center fire cartridge.

The Cycle revolvers, 32 caliber, with a barrel 2 inches long, were originally designed for cyclists as a protection against vicious dogs and highwaymen; but they are now in use by thousands of people desiring a light, handy pocket weapon. They are constructed on the same principle as the regular hammer and hammerless revolvers, from which they are modeled. The same safety features are used, and accidental discharge is impossible.

The time honored American and Boston Bull Dog revolvers, of which more than 1,500,000 have been sold during the last twenty years, have now given way to the Iver Johnson Model 1900 double action, which is noted for its small number of parts, its new locking device, its fluted cylinder to accommodate long or short cartridges, and its very neat guard and trigger owing to the use of drop forgings. It is made in 22, 32, and 38 caliber, with barrels 2½, 4½ and 6 inches long. The

chamber is 5 shot and takes a rim fire cartridge for the 22 caliber, a center or rim fire cartridge for the 32 caliber and a center fire cartridge for the 38 caliber.

The Iver Johnson semi-hammerless automatic ejector single gun is new in principle, having neither top nor side action. It is easy to load and fire and is absolutely safe in any position, without the use of bungling safety devices. It can be opened, closed and fired without changing the position of the hands. This is accomplished by the barrel catch, which is made with a loop or ring, as will be seen in Figure 2, and which is easily operated. This catch locks the hammer,

Figure 2.

and the hammer, in turn, locks the barrel catch; therefore, the gun, when at full cock, can not be opened until the trigger is released and the catch operated. If the hammer should be at full cock and the barrel open, the latter could not be closed. This prevents accidents; for should the barrel fly open when the gun is discharged, an accident would happen. Again, if the hammer should be at full cock and the barrel open, a shell might be inserted, the gun closed and the trigger touched, also causing accident. This can not happen, however, as the hammer must be down before the gun can be closed. The only way to discharge the gun is to pull the trigger. The hammer can not be made to strike the shell by any other means. The barrel catch is so constructed that it will take up all wear automatically and the gun will remain tight. It is not necessary to remove the front stock to take the gun apart, as a neat and ingenious device, consisting of a flush head locking bolt, which is easily operated, holds the barrel in place; removed, the gun is apart.

The automatic shell ejector is positive and quick in action, and automatically throws the shell from the gun after firing. The hammer and trigger are operated by the same spring, the hammer getting the full force of the spring and rebounding only after the trigger is released. In many guns the spring has to be heavy and stiff to overcome the rebound, and the action is hard in consequence. Other features are the single-locking bolt; rebounding lock; center

hammer; and fewness of parts. The 12 gauge has a 30 or 32 inch barrel and weighs 6½ pounds. The 16 gauge has a 30 inch barrel and weighs 6¼ pounds.

The new trigger action gun, Figure 3, is a very recent production. It is neither top snap, side snap, nor ring action, the gun being controlled by a single trigger which becomes effective whenever the gun is closed and the hammer down; or, in other words, when the hammer is cocked, the trigger is effective only with relation to the firing mechanism, and when the hammer is down it is only effective with relation to the action of the gun.

Figure 3.

This gun, like the others, is very simple and has few parts; the main spring operates the hammer and rebounding lock; the barrel catch automatically takes up wear, and by reason of the action described is absolutely safe.

JOSLYN GUN.

This very effective and serviceable gun was made about fifty years ago and used in the Civil War, requiring a .54 caliber linen cartridge. It could be loaded from the breech or from the muzzle. The stock was shaped like the oldest U. S. muskets. The heel-plate, guard and bands were made of solid brass. This gun, although an effective weapon, is not used to any great extent at the present time, but is preserved as a relic.

JOSLYN-TOMES GUNS.

This breech-loading rifle has a fixed chamber closed by a movable breech-block which slides in the line of the barrel by direct action. It is opened by cocking the hammer. In so doing, a hook-shaped shoulder on its forward portion is disengaged from a corresponding recess in the receiver; and the whole bolt con-

taining the hammer and lock is free to move backward to its fullest extent. The firing-pin being linked to the hammer is also positively withdrawn from the face of the bolt. The piece is closed by reversing the motion of the bolt. It is held closed by a spring-catch (friction-pin) on its side. It is locked by the descent of the hooked portion of the hammer into the recess of the receiver, when the piece may be fired by a back-action lock concealed in the bolt, the trigger alone being detached. The firing pin descends with the hammer along an inclined groove in the face of the bolt leading to the site of the fulmintae in the center of the cartridge-head. Extraction is accomplished by a spring-hook recessed in the side of the bolt, and riding over the rim of the cartridge when the piece is closed. Ejection is caused by the cartridge-shell being quickly withdrawn on two longitudinal guides, one on each side of the receiver, and ejected by the head striking first a stop on one guide; and then almost simultaneously a stop to the rear of the first, on the other guide.

KEENE-REMINGTON MAGAZINE GUN.

This gun has the magazine located under the barrel and all of the motions are direct and positive. The cartridges are held securely in position while passing from the magazine over the carrier to the chamber in the barrel, in which respect it has a decided advantage over other magazine arms. The cartridge does not pass on to the carrier until the gun is opened for the purpose of loading, so that there is no danger of a cartridge being exploded in the carrier in case a defective cartridge is fired in the gun.

The arm is always left at half-cock, and the breech locked so that it can not be jarred open and the cartridge lost out. From the half-cock it can be brought to the full-cock readily and quickly while the arm is being carried to the shoulder, and without removing the finger from the trigger; in this last respect differing from many other magazine-guns, which can only be cocked by removing the hand from the trigger.

The parts are all large and strong, and can be readily removed and replaced for the purpose of cleaning or inspection. The magazine is so arranged that it can be charged while the breech is closed, thus avoiding the entrance of dirt into the working parts of the gun. The gun may be held either barrel up or reversed for this purpose.

To charge the magazine.—Hold the arm in the left hand, the butt-stock under the right arm. Grasp the cartridge between the thumb and the forefinger of right hand, and press it forward, bullet first, into the magazine with the end of the thumb, which may be held sideways for that purpose. The magazine may be charged with the breech either open or closed, and with the cut-off lever in its

forward or backward position; but it is more convenient to do so with the breech closed and the cut-off lever back.

To load from the magazine.—First. If the arm has been fired or the hammer is down, unlock and draw back the breech-bolt quickly and with sufficient force to bring it clear back, thereby locking and raising the carrier and bringing up a cartridge. Shove the bolt forward and lock it; the hammer will remain at half-cock. If it is desired to fire, the hammer may be brought to full-cock while the arm is being lifted to the shoulder, the forefinger remaining on the trigger. Second. If the arm has been closed and left at half-cock, lower the hammer and then proceed as before. After the cartridge has been transferred from the magazine to the chamber, it should either be fired or removed from the gun before another cartridge is passed through the carrier.

To use the arm as a single loader, with the magazine in reserve, push the cut-off lever forward. This cuts off the passage of the cartridge from the magazine. The arm may then be used as a single loader. This gun is so made as to be left at half-cock after loading; but if it is preferred to have it left at full-cock, it is only necessary to remove the hammer fly, which is let into the tumbler to carry the trigger over the full-cock notch. See *Remington Arms.*

KELTON GUN.

This .45 caliber gun is adapted to the old Army service cartridge (70 grains black powder, 500 grains bullet). It is not a magazine arm, but carries underneath the stock just in front of the trigger guard, as a quick loading device, a wooden block bored to receive ten cartridges. In apearance like the Springfield, the breech block is modified to contain a spring which, by the action of a hinged lever, is compressed as the block is opened. The cam is the same as in the Springfield gun.

KENNEDY RIFLE.

This novel repeating or magazine rifle, developed and introduced by the Whitney Arms Company, has the magazine placed under the barrel, and is operated by a lever, the backward and forward movement of which cocks the hammer, opens the breech, throws out the empty shell, and brings a new cartridge into place, ready for discharge.

The following may be noted as the advantages of this arm: It has all the requirements requisite to a first-class magazine gun. It is of simple construction, and has fewer parts than any other magazine rifle operated by a lever. The parts are of such size and form as not to be liable to break or get out of order. It is very easily manipulated, and can readily be understood by any person who is at all familiar with fire-arms. It is safe, accidents from premature discharge being

impossible. The resistance to discharge is in direct line with the bore of the barrel. The firing-pin can not reach the head of the cartridge until the breech is fully closed—consequently the piece can only be fired when the breech is locked. The cartridge used is the 45-caliber center-fire, United States Government standard, containing 70 grains of powder and 400 grains of lead. When a lighter charge is desired, the United States carbine cartridge—the same length as the above—but loaded with only 55 grains of powder, may be used. The magazine is charged through the side of the receiver when the breech is closed, and the rifle can be used as a single loader, the charged magazine being held in reserve.

The arm is made in three styles: The musket weighs 9 lbs. 4 ozs. The barrel is 33-inch. It carries, when loaded, 11 cartridges. The carbine weighs 7 lbs. 8 ozs. The barrel is 22-inch. It carries, when loaded, 7 cartridges. The sporting rifle weighs 9 to 10 lbs. The barrel is 28-inch. It carries, when loaded, 9 cartridges. See *Phoenix Rifle* and *Whitney Rifle.*

KENTUCKY RIFLE.

This old rifle, excellent in its time, was made for the U. S. Government about the year 1850, at Harper's Ferry, Va. It has a heavy steel barrel, 32 inches long, well rifled and adapted for .54 caliber cartridges. The bands, guard and butt-plate are solid brass. The stock has a brass patch-box in the side for holding cleaning rags or musket caps. These arms are largely used at the present time, although their manufacture ceased many years ago.

A curious arm, labeled *Kentucky Deer Rifle,* in the collection of the Holland Purchase Historical Society, Batavia, N. Y., weighs 8 lbs. 15½ ozs., and has a barrel 42 inches long. Its total length is 58 inches. It was a flint-lock originally but changed to pill percussion lock. The lock-plate is stamped R. Hyslop, New York.

KIRK RIFLE.

This breech-loading arm has a fixed chamber closed by a movable breech-block, which rotates about a horizontal axis at 90 degrees to the axis of the barrel, lying below the axis of the barrel and in front—being moved from below by a lever.

This piece is a modification of the well-known Spencer repeating-rifle, containing in an unwieldly stock-butt, six magazine tubes.

KRAG-JORGENSEN RIFLE.

This rifle, model 1892 with some improvements, is the present arm of the United States Army. It is not American, but was invented by Captain O. Krag, Director of the Royal Manufactory of Arms at Kongsberg, Norway, and Mr. E. Jorgensen,

Kongsberg, Norway, and is made by the government under royalty with them of one dollar for each rifle manufactured. The author does not consider this arm in the same class with several superior American rifles, is dissatisfied with results, and is entirely convinced that it is unfit for service work. The United States Ordnance Board complacently boasts that it is one of the best in the world, and that its accurate range is 2000 yards. Expert riflemen have demonstrated that the cartridge provided for the Army is unreliable at half that range. Experience has shown that the judgment of Ordnance Boards is not to be depended upon, and that the best test of arms is the work of expert marksmen on the range. Great Britain a few years ago discovered through its National Rifle Association that its ammunition was almost worthless, and this, too, after it had passed the inspection of the ordnance experts of the government, who pronounced it perfect. The participants in the Bisley meeting said it was defective and dangerous, and a few hours after the meeting was opened it was proved so, necessitating its withdrawal and being called back from Great Britain's dependencies, where it had been sent for service.

As this rifle is not American, the author will not make a detailed description of it; but will refer the reader to the Government booklet on "The Description and Management of the United States Magazine Rifle and Carbine." From this all desired information may be gleaned. The contradictory left drift is explained, clear as mud, by a statement that the "passage of the ball through the bore deflects the barrel, causing it to shoot to the left." The reasons for this anomaly are many, and the main causes and their effects are given. The bolt is supported only on the right of the bore. The recoil is not met symmetrically by the mass, but to the left of the center. The overhanging ounces of bolt handle and magazine set up a double whip action seconding the impetus given by the left thrust of the bolt at discharge. The motion given to the barrel by the different forces acting upon it is extremely difficult to analyze. In practice, recoil starts the piece backward in prolongation of the bore initially; this is met by the resistance of the shooter's shoulder, and the underhang of the stock at a point averaging 4½ inches below the axis of the bore. The inertia of the muzle holds it momentarily still while the barrel buckles at the weakest point. The forward travel of the ball emphasizes the rebound. The left thrust of the right hand bolt lugs and overhang on the right of the piece contribute a left whip simultaneously aided by the spiral vibration and wave action set up by the torque of the ball impinging against and passing through the sharp pitch rifling. This last effect is cumulative as the ball starts at 0 and reaches 2,000 feet per second at the muzzle. We have one force exerted in the plane of fire; recoil. Another an upward whip from the recoil being met 4½ inches below the axis of bore. A left whip from the right hand support

of the bolt and overhanging parts on the right of the recoil lines, while the spiral vibration alters and blends the effect of all.

These compound motions will inevitably bell the muzzle. The bullet at a revolution of 144,000 times a minute has enough gyrostatic stability to act as an anvil which will bruise away that edge of the barrel presented against it at the final flip in the war dance of complex flexures. Plug tests for truth of bore so far have found tight and loose spots of greater or less degree as well as some bell muzzles; no perfect barrel has yet been found. The stock is ridiculously weak under the magazine. On account of the peculiar magazine system, no packet or charger can be practically used.

LAIDLEY MUSKET.

In the construction of this gun the same form and motions of loading and firing as in the Springfield rifle have been retained as nearly as possible, consistent with a moderate expenditure in its production. An old smooth-bore musket is taken, reamed out for a length of eleven inches, for the reception of a coil ribbon-spring, on one end of which a closely-fitting piston is placed, having a stem of about five inches attached to its center; a hole is bored through the breech-screw and a cut made on its under side to receive a spring; a circular disk with a flaring hole through its center is secured in the barrel just in front of the end of the breech-screw; a short lever crosses the end of the barrel just in front of this disk, and is held in position by the spring already referred to; the hole in the cone is enlarged and receives a small spindle with a collar at its middle, which prevents it from coming out. About twelve inches from the breech a horizontal cut is made through the top of the barrel, leaving an opening of 2 inches in length; a cylindrical plug, having a hole through its axle, is inserted in the barrel at this place, and a handle screwed in. An inner barrel, having a bore of .22 inch and a length of 17 inches, its upper end counter-bored, is inserted in the barrel and secured by a screw; the length of the block is such as to close the space between the chambered recess and the end of the inner barrel. A hole is bored through the side of the stock to communicate with the hole through the breech-screw.

LANCASTER RIFLE.

This rather unique arm has a slightly oblate bore. The twist, as found by experience to be most advantageous, is one turn in 52 inches. The approved diameter of the bore is .498 inch, the length of the barrel being 32 inches. An eccentricity of .01 inch in half an inch is found sufficient to make the bullet spin on its axis to the extreme verge of its flight. The length of the bullet found to answer best with these rifles is 2¼ diameters in length with a windage of.004.

The four barrel Lancaster hammerless pistol is occasionally used, though the revolver has, of course, nearly supplanted it. In general construction it much resembles the early Sharps four barrel pistol made in this country, and like it, accuracy for all four barrels is impossible to attain.

LARSEN GUN.

This magazine gun holds five cartridges. The magazine can be cut off by sliding the box bodily down until a stud engages in the upper notch on the rear of the box.

LEE GUN.

This gun is practically the arm known as the Lee-Speed, and as regards the principle of its bolt and magazine mechanism, does not differ from that system.

In the bolt, the bolthead is made longer, and the bolthead screw which engages in the slot in the shank of the bolthead is replaced by a lug on the bolthead, which turns a groove on the guide rib, which is given a projection over it for that purpose. A channel on the side of the bolt and bolthead, intended to permit passage over the ejector-stud, is made necessary in consequence of a slight change in the walls of the receiver.

The magazine is made broader and slightly shallower, permitting the cartridges to be arranged close together and increasing the capacity of the magazine to ten cartridges. The shape of the cut-off slide and its catch is slightly altered. See *Lee Straight Pull Rifle.*

LEE-METFORD GUN.

The embodiment of all improvements in the Lee gun. The English Secretary of State for War says this arm is superior to any rifle in course of manufacture by any foreign government. Americans must congratulate Messrs. James P. Lee, C. M. Dally and Hartley & Graham upon this verdict of approval.

LEE STRAIGHT PULL RIFLE.

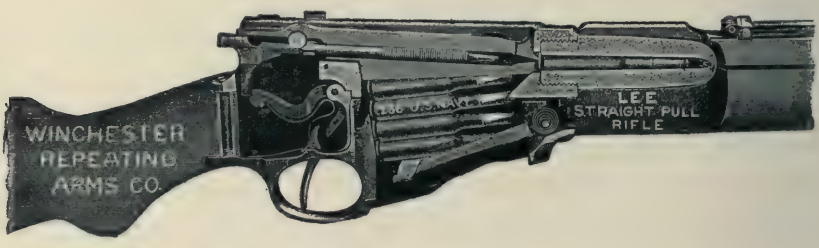
The superiority of this rifle rests on the fact that the operation of opening and closing is by a "staight pull," instead of the customary "up turn" and "pull back." The fact that this gun is a rapid fire repeating rifle should be borne in mind. It is always ready for rapid fire, as the time consumed in opening the breech and inserting a clip is very short, when five shots are instantly ready for delivery. These five shots may be delivered without taking the gun from the shoulder, and it may also be loaded in this position, as it need not be brought down to insert a clip unless desired. This gun may be used as a single loader, and at the same time retain a magazine charged with five cartridges, it merely being neces-

sary to place a sixth cartridge under the extractor; on closing the bolt the cartridge will be pushed into the chamber; this mode of firing may be continued as long as desired, and yet the gun will be ready for any emergency with its magazine charged. Another important point in favor of this rifle is its adaptability as a single loader. It may be operated with single cartridges with great speed, as no special care is necessary in inserting them in the gun—they may be placed either directly in the chamber, in front of the extractor, or under it—and this can be done without taking the gun from the shoulder. In this gun, the recoil from the discharge has the effect of locking the breech mechanism. The bolt has on its under side a recoil shoulder, which, when the bolt is closed, lies against a corresponding shoulder in the receiver. This recoil shoulder, being below the line of recoil, causes the thrust of the discharge to be slightly downward, tending to more securely lock the bolt, and yet offering no resistance to the opening of the breech by the operator. The gun is furnished with a brush cleaner, carried in a recess in the butt closed by a sliding cover.

The gun is manipulated as follows: The trigger having been pulled, grasp the cam-lever handle, and pull the bolt smartly to the rear. Grasp a clip or pack, containing five cartridges, between the thumb and first two fingers of the right hand, and, pushing the extractor to the left with the lowest cartridge, insert the pack in the magazine, either side up, keeping the clip close to the face of the bolt. With the thumb on the pack near the head of the top cartridge, push it down until the cartridges are released from the clip, which will drop out through the bottom of the magazine in the course of firing; the cartridges are then raised by the follower until the top one touches the under side of the extractor, and the upper portion of its head is in front of the bolt. Close the gun by pushing the bolt forward smartly, thus entering a cartridge into the chamber. The gun is now ready to be discharged, and the bolt can not be drawn back unless the bolt release is pushed down, or until the trigger is pulled, which of course discharges the gun. If it is not desired to fire the gun at once, the firing-pin may be rendered inoperative by pulling up the firing-pin-lock, on the left of the receiver, until it clicks. The firing-pin-lock must be pulled up with some force, in order to overcome the tension of the mainspring. Pushing the firing-pin lock down releases the firing-pin striker, and, if the trigger is pulled, the gun will be discharged. After firing, draw the bolt back smartly, the empty cartridge case being extracted and ejected to the right. On again closing the bolt, another cartridge is pushed into the chamber. If it is desired to use ammunition without clips, the magazine may be charged with single cartridges, which should be inserted under the extractor, with their heads at the rear of the magazine and in front of the clip-release-ways. In cleaning the gun, enter the weight of the cleaner into the muzzle and let it

run through the barrel. Draw the brush through the bore and chamber. If the bore appears dirty after two or three trials, insert a small piece of soft cloth, saturated with oil, in the loop of the cleaner, and again draw it through the barrel. To clean the chamber, put a small piece of cloth in the loop of the cleaner, and thrust it into the chamber from the rear. The brush end of the cleaner is made sufficiently long for this purpose.

To dismount the gun, the trigger being pulled, press outward and downward on bolt stop thumb piece, and pull out bolt to the rear, keeping thumb on end of extractor to prevent its dropping. Push firing-pin striker out from bolt until



SYSTEM CLOSED

notch on its lower end is freed from nib of cam lever and turn cam lever clear of striker; then let go of striker. Remove cam lever, then firing-pin striker. Drive out firing-pin stop-pin, and shake firing-pin and firing-pin spring out from bolt. Remove collar from firing-pin striker, and take off mainspring by unscrewing to the front through slot at point of striker. Unscrew trigger guard screw and

SYSTEM OPEN.

receiver tang screw, and remove trigger guard. Place finger on rear end of follower, and push down until lugs are opposite clearance cut in magazine wall; spring right hand lug out through cut, and allow elevator arm to rise, turning completely over; then remove elevator arm from its seat. Remove sear spring and sear fly. Unscrew trigger spring screw. Remove sear and trigger by driving out pins securing them. Take out band screws, and remove bands. Raise rear sight leaf to its vertical position, sight slide at top. Press barrel cover forward

to clear bevel under front end of rear sight base, and remove it from barrel. Lift barrel and receiver out of stock. Press out on bolt stop thumb piece to clear stop slot, and push bolt stop down and out. Remove lock pin, located in rear of firing-pin lock or under side of receiver, by means of notch in front side of head. Spring out checked end of bolt release, to clear stop pin from slot, and take out bolt release. Push firing-pin lock down until lug at its lower end clears guide; then turn it outward, and remove through slot in frame of receiver. *To assemble the gun,* enter the firing-pin-lock through slot in side of receiver, and turn it up, and in, until lug at its lower end clears guide; then press it up into place. Put in bolt release and spring it into position. Force in lock pin, with lug bearing against firing-pin-lock. Enter bolt stop and slide it into place. Place barrel and receiver in stock. Put on barrel cover and bands, and screw in band screws. Place sear, trigger, and trigger spring in trigger guard, securing them by their pins and screw. Enter sear fly in its seat on sear, and put in sear spring. Place elevator arm in its seat, follower down, engaging hole in elevator spring with pin; swing elevator arm over, holding point of follower up, and push lug through clearance cut; then allow elevator arm to rise into place. Place trigger guard in stock, and screw in trigger guard screw and receiver tang screw. Enter square end of mainspring into slot at point of firing-pin striker and screw it on. Put collar on firing-pin striker so that square end of mainspring rests in notch on its front end. Place firing-pi spring on firing-pin and enter them into bolt, securing firing-pin by stop-pin. Put firing-pin striker in bolt, and enter cam-lever in its seat. Turn handle of cam-lever back until nib engages notch on firing-pin striker. Hold rear end of extractor against small lug on left side of bolt; then enter bolt and extractor into receiver. Put up bolt stop and thumb piece to lock bolt in receiver. See *Winchester Arms.*

LEFEVER GUN.

The Lefever automatic hammerless gun, model 1898-99, with or without the automatic shell ejector, Figure 1, has good points all around, symmetry of proportion, finish, balance, wear, penetration and general shooting qualities. It is built with compensated action to take up the wear in every direction. Especial attention is given to boring for trap and wild fowl shooting. All grades of the gun are bored on the taper system, giving the greatest penetration and even distribution of shot, are built for both black and nitro powder, and handle both with equally good results. The improved cocking hook dispenses with many small pieces contained in the former models. The new cocking hook actually performs the work of ten pieces thus displaced. The cocking hook by one operation raises both hammers to full cock, ejects the shells and forms a check hook that takes the strain entirely off the hinge joint. This cocking hook allows the gun to open more

easily than formerly, the hook being ½ inch longer and allows the gun to be thrown open with one hand, leaving the other free to insert the shell. With only

Figure 1.

one piece required to operate every movement of the mechanism it makes an action absolutely positive, one that will not get out of order. These advantages are worthy of the careful consideration of the sportsman.

The compensating features of the action are shown in Figue 2. F, is a compensating ball and socket joint. If, after a long use and heavy loading, the gun should become open at the breech and allow the gas to escape, by closing the gun and turning this screw to the right as far as possible, the barrels are forced back against the face of the frame and joint made as tight as when the gun first left the factory. The ball is made of fine cast steel and tempered. C, is a cast steel bolt with bearing cut on level of 15 degrees. B, is a top fastener with notch cut to correspond with bolt bearing. In case of wear on either the bolt or top fastener, the bolt will enter farther, thus taking up the wear without aid of a screw. A

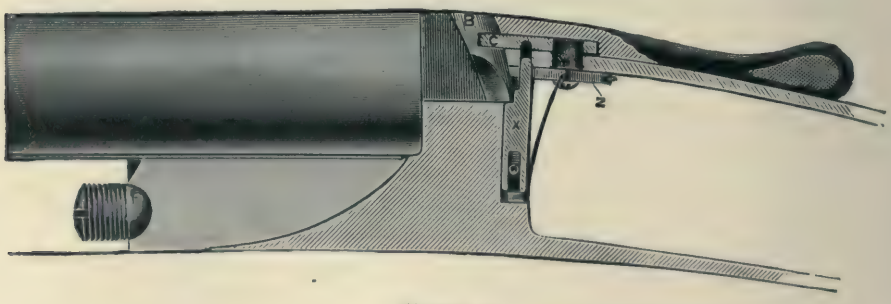


Figure 2.

square shouldered top fastener B, is used, having by experience found that the round head top fastener fitting down into the breech has a tendency to spread it.

This top fastener has a bearing on each side of the neck one-eighth of an inch in thickness and three quarters of an inch in depth. This in connection with the self-compensating bolt, makes it utterly impossible for this action to be shot loose by gunpowder. The new bolt does away with several pieces and accomplishes the compensation by simply cutting the bearings of top fastener and bolt on an angle of 15 degrees, thus allowing the bolt to enter further as the wear takes place.

As shown in the perspective view, Figure 3, the improved ejector movement consists of only two pieces, one in the frame and one in the hammer. This con-

Figure 3.

struction does not in any way change or interfere with the action of the gun, thus leaving the square shoulder top fastener and compensating features intact. A, is a lever pivoted in the frame with projections on the front end and notch on the rear end and is actuated by the upper arm and main spring. B, is a hook pivoted in the hammers and is always in contact with the notch in the end of the lever, so when the hammers lift, in cocking, the rear end of the lever is forced down. When the hammers reach the cock notch, the hook B is released, thus forcing the front end of this lever A, which is in contact with the lever in the lug, thus forcing out the extractor and shells.

The following advantages of the Lefever hammerless gun are apparent. 1. Very strong and simple action. 2. Compensated action to take up wear in every direction. 3. Long frame, increasing strength of action. 4. No thicker frame than an ordinary hammer gun, avoiding the clumsy and "out of proportion" appearance of the majority of hammerless guns. 5. The locks and action can be taken apart and cleaned as easily as a hammer gun. The gun can be taken apart and put together with the hammers up or down. 6. The position of the hammers can be ascertained by the indicators as readily as with a hammer gun. 7. Hammers cannot be jarred off, even with a trigger pull as light as two pounds. 8. The only action with one piece to raise hammers, extract shells and form a check to take the strain off hinge joint. 9. The action of the locks is twice as quick as a hammer

gun, thus increasing the chances of the sportsman when firing at quick-moving objects. 10. No hammers to obstruct the sight or catch on twigs or bushes. 11. The safety can be made either automatic or non-automatic. 12. The use of gas-tight, independent plungers prevents any chance for escape of gas into the locks. 13. The locks are rebounding. 14. Both hammers being raised by a single lever, need no adjustment screws or pins to make them cock together. 15. The ease with which the gun is opened, there being but little friction to overcome, as only one piece is employed to raise the hammers. 16. Little liability to misfire because no levers or cocking rods obstruct the fall of the hammers. 17. Interchangeable main spring. 18. Self-compensating bolt. 19. Cocking device has only one lever to raise both hammers. 20. Can be taken apart or put together with the hammers in any position. 21. Has a powerful check-hook which takes all strain off of the hinge joint.

LEWIS-RICE MAGAZINE GUN.

This gun belongs to that system in which a fixed chamber is closed by a movable breech-block rotating about a horizontal axis at right angles to and below the axis of the barrel and in front. The cam is held in position by a spring, one branch of which serves as a trigger-spring. The breech-block is simply a box containing the firing-pin, a bell crank lever, one arm of which controls the motion of the firing-pin, the mainspring, trigger-spring, etc. The box is closed by a cover in a slot in which is situated the extractor. In operating the lever, so as to open the block, a point bears against the surface of the cam, presses it forward, and unlocks the piece. During the unlocking, the lower arm of the firing-pin lever is so moved by the nose of the cocking-lever as to cause the upper arm to retract the firing-pin. When the lever has been rotated sufficiently, the trigger-spring causes the nose of the trigger to enter the full-cock notch; at the same time the shoulder of the cam rides over the point of the trigger. The piece cannot then be fired until the cam is in its seat. The extractor is a flat blade, turning on the same axis as the lever, and operated by the shoulders of the slot in the cover of the breech-block in which it lies. The magazine is in the butt-stock. It is loaded at the side, near the rear.

LOVELL REVOLVER.

This revolver designed by Captain Eben Swift, of the Fifth United States Cavalry, and Mr. Lovell is .38 caliber and double action. It is an extremely well-made arm, combining all the best features of the standard revolvers of its class. The terrific recoil of the old Army .45 caliber Colt revolver made it an object of dread to most officers and men. To avoid this recoil and at the same time produce the maximum stopping power were considerations which led Captain Swift in his co-operation to produce this new model.

LYMAN RIFLE AND SHOT GUN SIGHTS.

The optical principle involved in the Lyman rear sight is new in its application. When aiming it has the appearance of a ring, which shows the front sight and the object aimed at, without intercepting any part of the view. Figure 1 gives an approximate idea of how the sight appears when aiming. It will be noticed that the top of rifle barrel and front sight are seen as distinctly as if no rear sight was used. Figure 2 shows how the common open sight appears when aiming. The most important part of the view is shut out, besides the great difficulty of quickly getting the front sight in the notch of the rear sight. The aperture of the sight, being very near the eyes, is greatly magnified as compared with the notch in the common open sight. This feature gives many an impression that an aperture which looks so large cannot allow of an accurate aim; whereas, the larger the aperture looks, the more accurate the aim. The aperture could be made considerably larger and still be accurate. Many prefer the large aperture reamed out to be 5-32 inch in diameter for wing shooting. The center of this large aperture has a degree of light the same as the light which is present outside of the sight. This light slightly, but gradually, diminishes as the rim of the sight is approached.

Figure 1.

Figure 2.

This center of stronger light partly explains the fact that the eye takes care of itself when no attention is paid to the sight, and why it naturally finds the center of the aperture. With this sight there is no difficulty in using both eyes, which is always a help in shooting when one has acquired the habit. When both eyes are used the right eye does the aiming, while the left eye sees everything except the rear sight. The distance from the Lyman sight to the front sight is nearly twice as great as from the ordinary open sight to the front sight, which, in itself, doubles the accuracy. The great feature of this sight is that the eye is guided without any change of focus or effort to see more than is seen when shooting without a rear sight. This is accomplished by a slight, but sufficient interference of the vision of the aiming eye by the rim of the sight. The reason that the view is not obscured in any direction is that the pupil of the eye is about the same diameter, in ordinary lights, as the rim of the sight is wide, and the

eye sees nearly around it. With ordinary sights the eye has to observe or look at three things—the rear sight, the front sight, and the object; and in aiming it changes its focus at least once. The eye can see only one of these objects distinctly at a time, but as it has the power of accommodation, i. e., changes its focus by flattening or thickening its lens at will, it first observes the relation of the front sight with the rear sight. Then it must look ahead, changing this focus to observe the front sight and the object, and when in this last position the front sight and the rear sight are seen together more or less indistinctly against the object which then has the eye focus. Old eyes lose the power of accommodation and cannot change the focus of the lens, which has become hardened and flattened. They then have accurate far sight only. Such eyes cannot use the ordinary sights at all. The following are some of the advantages of this sight over other rear sights: 1. With this sight almost instantaneous aim can be taken, for the object is sighted as quickly as if only the front sight were used. 2. This sight cannot shut out the view of the front sight, nor the object to be aimed at; while, with any other rear sight, the chief difficulty in aiming is to bring the sights and object quickly into line without interfering with the view of the front sight or the object. 3. This sight can be used when the light becomes too dim to use any other rear sight, hence its great value in the woods or late in the day. 4. Old eyes that can no longer use the crotch sights can use this sight and shoot better than they ever could with the common sight. 5. With this sight it is a hundredfold easier to shoot moving objects, running or flying, and both the eyes can be used as well as one eye; it is also far more accurate than any other open sight, and, in most respects, is better for target shooting than the peep sight. 6. Any kind of front sight can be used with this, and it is so simple and strong that there is no danger of it being injured. 7. This sight is indispensable for a hunting rifle, and makes it possible to bring to bag much game that is on the wing. 8. Breaking glass balls from the trap is made easy; no "guesswork" about it when this sight is used. 9. It can be put on any rifle in the same way that a peep sight is attached. 10. It can be adjusted for shooting any distance up to 1,000 yards.

Figure 3 shows the sight stem removed from the sleeve, with the small pin at the end. After the sight is attached to the rifle, it should be tested at fifty yards for "point blank" shooting; when the sight is adjusted for this distance, mark the sight stem at the top of the sleeve. Then turn it out and drive the pin into the hole at the end. Screw the sight stem back, and if it is above the mark remove it again and file the pin shorter, until it is right for shooting at fifty yards. The stop pin is quite important, as it prevents the sight from ever being too low for "point blank" shooting. By holding the front sight high on the object when

taking a long shot it is not often necessary to elevate this sight when hunting. Figure 4 shows the sight folded down. The Lyman combination sight, with cup disc, is shown in Figure 5. It has a large detachable disc and is intended for Match rifles and Gallery rifles. It is not as good for "all around" shooting as the Combination sight. Many target shooters like it, however, for it is much

Figure 3.

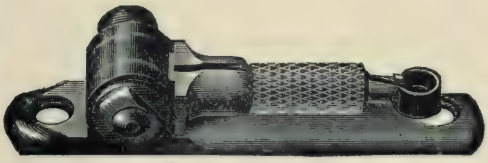


Figure 4.

Figure 5.

better than the ordinary Vernier peep sight. The disc of this sight is easily removed, and the shooter will find that for most practice better work can be done with it off. The Wind-gauge target sight with this sight makes a good outfit for a Match rifle. Those who use it for Gallery shooting can improve the disc by enlarging the aperture to 3-32 inch diameter, or 1-16 inch at least.

On most rifles the rear combination sight can be screwed directly to the tang

Figure 6.

by anyone not a mechanic. As some rifles, however, have no screw-holes in the

tang for a rear sight, it will be necessary to make some. After screwing the base to the tang, turn the sight up, so that the spring in the joint holds it in position for shooting. Figure 6. If the spring does not hold it quite perpendicular with the barrel, take a round piece of iron about the size of a lead pencil (a large nail will do), and put one end into the loop-hole at the right and turn the spring screw a trifle, either to the right or left, as may be required to hold the sight perfectly upright. This can be done by anyone without loosening the set-nut on the left side of the joint, and when once done it remains in its place. Do not spoil the spring by pinching it together in a vise. It is hardly ever necessary to take it out of the base. For Double Express rifles and shot guns having a rifle barrel, the sight sometimes requires to be screwed to the wood part of the stock, when the tang does not extend back far enough. On some rifles the sight should fold down forward instead of backward when not in use. The middle, i. e., the rear open sight, should always be removed from the rifle barrel. A large proportion of those using the Lyman sight do not get one-half the benefit from it that they should, for the reason that they will not take off the middle sight, which stands directly in the way of a large part of the view. This stationary sight can be replaced by the folding leaf sight, or the slot on the barrel can be filled with a blank piece, when the middle sight is taken off, so that the looks of the rifle will be improved. Sight the rifle at a target by adjusting the front sight sideways and the rear sight by its elevation. The graduated scale which is on the sight stem does not indicate particular distances, and, therefore, can be used only after the gun has been tried. The graduated marks are, however, for about 40 or 50 yards, depending on the kind of rifle. Shoot first at nearly point blank range, say 50 yards, noting the graduated marks on scale; then shoot at 75, 100, 150, 200, 300, 400 and 500 yards, and up to 1,000

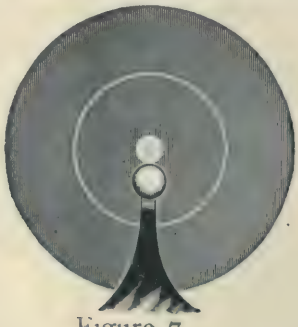


Figure 7.

yards; if possible, noting each distance on the sight, and, if necessary, putting on additional marks, so that the scale will be understood. After marking the sight for point blank, put the short pin in the lower end of the sight stem, so that it can never be turned down below the point blank range. In hunting it is not often

necessary to change the elevation of the sight, for the front sight can be held a trifle high on the object when taking a long shot. When shooting at a running game, such as a deer, the sight can be elevated by a turn of the knurled sleeve without removing the eyes from the game or the rifle from the shoulder. This gives one a great advantage when using a magazine rifle. The sight should be near the eye, as it will naturally come if the rifle is held properly. After adjusting the sights carefully, turn down the rear sight and shoot at some near object, using only the front sight, as one would with a shot-gun. It will become apparent at once how easy rifle-shooting would be if one had to use only the front sight; but, of course, to hit the mark, one must use a rear sight. Now, turn up the rear sight with large aperture and continue shooting, only giving attention to the front sight and the object, and it will be found that aiming is as easily done as it was with the front sight alone, and that there has been obtained what is essential in a rifle—means of using it accurately as well as rapidly. In target shooting the top of the front should be held below the bull's-eye, as seen in Figure 7.

When adjusting the rear sight to muzzle-loading rifles it is desirable to know the measurements for the height of the sight. This is easily done by finding how

Figure 8.

high above the tang or stock the line of sight is for point blank shooting, or when the rifle is sighted for about fifty yards. Figure 8 shows what is necessary.

The Lyman rear Wind-gauge sight, shown in Figure 10, embodies the same principle of aiming as does the combination sight. A detachable cup, however, is substituted for the small aperture which is in the combination sight. The elevation of this sight is rapid, being obtained by turning a knurled sleeve, which has a triple thread. At every one-fourth revolution of the sleeve a spring snaps into a small notch, which enables the shooter to quickly adjust the sight. The Wind-gauge operates from the left-hand side of the sight. The lower graduated marks show the Wind-gauge. The upper part of the sight folds down forward when not in use. Although the sight folds forward, it is not easy to knock it out of position when shooting, for, unless it is pressed forward more than 90 degrees, it will spring back to its place. When adjusting it, screw it to the tang of the rifle as directed for the combination sight. The point blank of the sight is fixed—after testing the rifle at a target—by the adjustable slide on the sight stem.

It is desirable that the sleeve spring should be in one of the notches when the sight is at point blank to prevent the sight from being raised accidentally. This is done by turning the sight up out of the sleeve thread and then turning it back, starting it in one end of the three threads that brings it to the right place when down. It is not often desirable to use the cup, for the large aperture of the sight is much the best even for target shooting.

Referring to Figure 9, "a" shows the Lyman ivory bead front sight. This sight gives the sportsman a clear white bead, which can be seen distinctly against

a

b

c

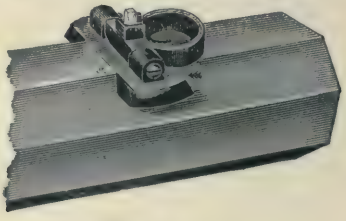
Figure 9.

Semi Jack Sights

Figure 10

any object, in the woods or in the bright sunlight. The contrasting black neck of the sight makes the bead all the more prominent. "b" shows the Lyman ivory hunting front sight. The ivory is so well protected by the surrounding metal that there is no danger of its being injured. It is a very accurate sight, and many prefer it to any other front sight for all around use. "c" shows the Lyman Jack sight. This is an elegant sight for quick shooting, also in poor light or with the

d

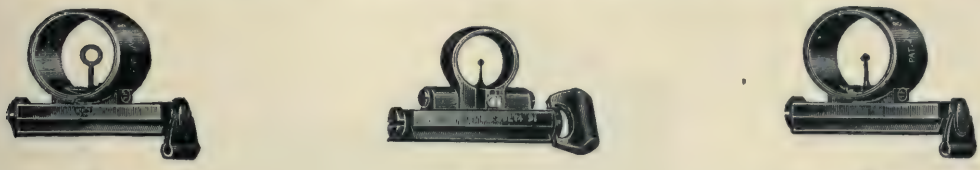


e

Figure 11.

Jack at night. It is very accurate, and fine target shooting can be done when it is used with the tang sights. The Lyman combination ivory front sight is shown in Figure 11. "d" shows it used with globe, and "e" shows it used with ivory. It is an excellent sight for all around shooting. The sight is shown on the rifle. If it should not be firm enough on its hinge, tighten the right hand screw, which is indicated by the arrow. The Lyman Wind-gauge target sight is shown in Figure 12, "f" showing aperture, and "h" showing globe. This is an

excellent sight for a Match rifle. It has a reversible globe and aperture which can be changed quickly. It is compact in form, being close to the barrel. When



f g h

Figure 12.

set for a given point of wind, it is locked by a spring clamp firmly in position. "g" shows the Lyman Wind-gauge sporting sight. It is the combination front sight on the Wind-gauge base.

The Lyman leaf sight is shown in Figure 13. One leaf is a bar, with a triangular ivory center; the other is a wide open V crotch. Many sportsmen who use the Lyman rear sights do so with the ordinary crotch sight on the barrel. This is much in the way, and the shooting is done at a great disadvantage. Lyman's leaf sight can be put in place of it. It folds down close to the barrel, allowing the shooter to use the combination sight in an unobstructed manner and the

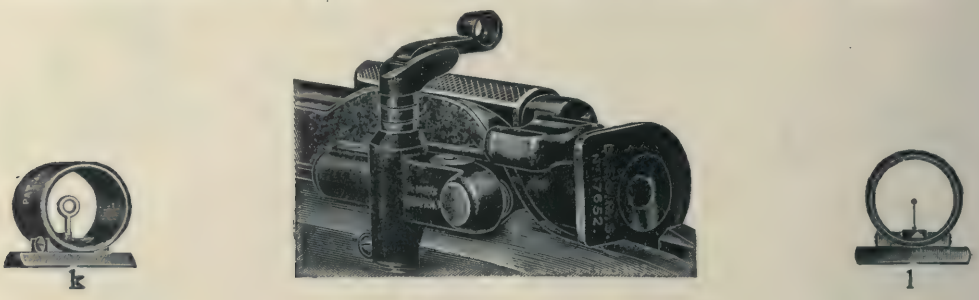
Figure 13.

result is that the shooting is twice as good as when the ordinary crotch sight is on the barrel. Although the shooter should in any case use the Lyman tang sights for nearly all shooting, he has the satisfaction of knowing that, if he wishes to use this leaf sight, that it is the best form of crotch and bar sight in use. The bar leaf is excellent as a twilight sight or when used at night with a jack. The right-hand screw, as indicated by arrow, adjusts the leaves to fold as tightly as desired.

Lyman's rear sight for Mannlicher sporting rifles is shown in Figure 14. It is attached to the side of the arm and is combined with the bolt stop. The aperture is on an oscillating arm which allows the bolt of the rifle to pass forward and backward. This arm is adjustable for alignment, being regulated by a screw on the under side. The sight is elevated by turning it around to the left. Any gunsmith can put it on the rifle in a few minutes.

The rear barrel sight should be removed, or its stationary part should be filed off to allow an unobstructed view when aiming. The sight used for target shoot-

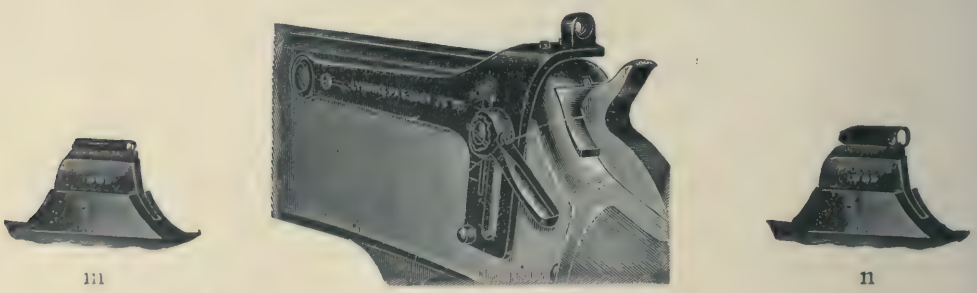
ing at the range and gallery, with best results, is shown in "k" and "l". It has a reversible aperture and globe, which can be quickly changed. The Lyman re-



k l

Figure 14.

ceiver sight shown in Figure 15 is intended for rifles having a long firing bolt (like the '95 model Winchester), which prevents the use of the combination rear sight. It is also good on short stocked repeaters which have much recoil. It is very simple and strong in its construction, and is compact and out of the way. It is made of a flat piece of spring steel, extending along the left side of the receiver, toward the grip. The rear part of this plate extends up over the top. On the top of this extension is the sight aperture. The forward elongated hole in the side of the receiver is for the pivot screw. At the rear of the sight is a long slot. A screw is passed through a thumb lever and a spring pointer and through the slot, screwing into the second or rear hole drilled in the receiver. To elevate the sight, turn the thumb lever up, then lock it by turning the lever down. It is not necessary to lock it, however, as the indicator spring holds it in position.



m n

Figure 15.

"m" and "n" show the Lyman ivory bead front sight for the '95 model Winchester .30 U. S. A., Winchester carbines, Lee straight pull rifle and Remington-Lee sporting rifle.

Figure 16 is a representation of the appearance of the Lyman revolver sights when aiming. The rear sight is quite novel. Accurate aim can be taken in any light on any object. With these sights good aim can be taken in half the time

that is required with any other revolver sights. There has always existed a serious difficulty in aiming shot-guns, and this has increased with the modern choke-bored guns. One of the difficulties of shooting is that the gun is not often used twice from the same position, the shooter often having to take a sharp right

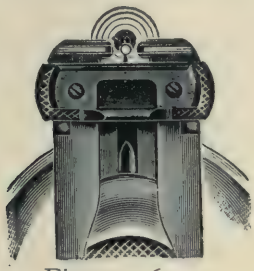


Figure 16.

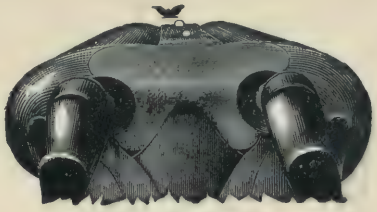


Figure 17.

or left position, which makes it more difficult to align the gun the same. By using a small and short ivory sight, placed well forward on the rib, wonderfully good results are obtained. Not only is the vertical alignment readily got, but, as the two sights are seen quite distinct and away from each other, the lateral alignment is made at the same time. This is a most important point, for one of the common mistakes is aiming too close to the gun rib, which results in undershooting. This system is sufficiently accurate for rifle shooting at short distances. It is on the same principle as sighting over the surveyor's stakes. Figure 17 shows the appearance of the sights when aiming at a straight-away bird. It will be noticed that the muzzle sight is the most prominent, and when the aim is taken should be seen above the rear sight and in a line with it. In this drawing the elevation of the gun is right, but the rear sight shows that the gun is out of line, which would not be discovered if these sights were not used. Figure 18

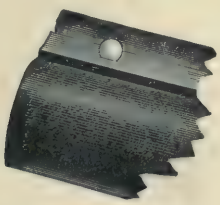


Figure 18.

Figure 19.

shows the large muzzle or front sight. Figure 19 shows the small rear sight, which should be placed in about the center of the barrels, or about 16 inches from the muzzle sight—never more than 18 inches, for it should not be too near the eye.

It is the concensus of opinion that the Lyman sight is the best sight for all forms of off-hand shooting to which a hunting rifle is ever put, and that, when it

comes to a shot which is beyond point blank range, where the rifleman has plenty of time to carefully estimate the distance, it is near perfection. Figure 20 shows some excellent records: No. 1.—Seven shots at 50 yards, at a circle $2\frac{1}{2}$ inches in diameter, Winchester .44, Lyman sight, with extra large aperture. Six of these are grouped in the center of the target and can be included in a circle $1\frac{3}{8}$ inches in diameter; the other shot is at about 4 o'clock, but well inside the $2\frac{1}{2}$ inch

Figure 20.

circle. Nos. 2 and 3.—With same gun and sights; 5 shots each at a circle $1\frac{5}{8}$ inches in diameter, at 25 yards. All of the shots well grouped near center of target in each case. No. 4.—Maynard .40, 5 shots, 25 yards, same sights as above. Target, a white spot $\frac{5}{8}$ of an inch in diameter, in the center of black bull's-eye 1 3-16 of an inch in diameter; four of these bullets have cut the white spot, and can all be covered with the end of the index finger. Nos. 5 and 6.—Winchester .44. same sights, 10 shots each of 2 targets, having a bull's-eye of $1\frac{1}{4}$ inches in diameter.

MARLIN ARMS.

Marlin rifles have for years been celebrated for their strength, easy working and simplicity of action. The solid top receiver and superior mechanism insure absolute safety to the user. In all these arms, the top of the action, which is the portion coming between the cartridge and the shooter's head, is not cut into in any way, but is left as a solid shield, making an accident to the shooter absolutely impossible. In using the old-style system, opening on top, there is always a chance of accident and injury, either from defective cartridges giving out around the head, a "hang fire" (the cartridge not exploding immediately on the blow of the firing pin, but a fraction of time later, when perhaps the action is partially opened), or some one of the many unaccountables for which guns and ammunition are proverbially famous.

In this rifle there can be no accident from any of these causes. Neither can there be a premature discharge. The action is so adjusted that a cartridge cannot be exploded until the action has first been locked, which renders the shooter safe from such accidents. The side-ejecting principal is a source of great comfort, as well as a matter of safety, for the empty shells are never ejected into the face; they never cross the line of sight; never interfere with the aim for the next shot; and the eyes and lungs are never filled with smoke and gases. The solid top also makes it impossible for rain, snow, falling leaves and twigs, pine-needles, etc., to get into the action, as the top is always closed and consequently the action protected; there are no crevices for rain, etc., to leak through, and there is no hollow top to catch and hold the rain. Figure 1

FIGURE 1.

The rifle can be used as a single shot with the greatest facility. It is only necessary to drop the cartridges into the opening left by the breech bolt when the action is open and then close the lever. Bullets will often be jammed down into the shell by continued jolting in transportation, or shells may be reloaded with light bullets to make a short range cartridge. In either case the action will accommodate the cartridge perfectly as long as the regular shell is used. The rifle will take anything varying in length from the empty shell as a minimum up to the full size cartridge as a maximum. A very effective and extremely simple device is introduced to permit this. A projection on the lower

side of the carrier is acted against by the cam on the lever, in such a manner that, as the lever is thrown down and a cartridge enters the carrier, the carrier is slightly raised and partially closes the magazine, and no matter how short the first cartridge may be, the head of the following one will strike against the front of the carrier and cannot enter it until the lever is again closed. Cartridges loaded with round bullets can be used. Very often cartridges which are much alike, as for instance 38 and 44 caliber, get mixed. I have found 44 caliber cartridges among the 38s, having been so shipped from the factory. In most cases a person using a rifle and getting a larger cartridge into it, is in trouble and cannot get out the cartridge without taking the gun apart. With this rifle, if such a cartridge gets into a smaller caliber gun, all you have to do, when you find your lever will not close, with a cartridge in the chamber, is to extract and eject the cartridge by throwing forward your lever, exactly as if it were an empty shell.

This is the only repeating rifle on which a telescope can be conveniently used. A telescope can be fitted to the rifle just as to a single shot, for the action in no way interferes with its being placed as far back as is desired. Many people desire repeaters, but also wish to use them with telescopes for fine shooting. To all such I can recommend Marlin repeaters with the greatest confidence.

The Marlin repeater, model 1892, was designed especially to provide a clean and convenient repeater for rim fire ammunition and is made in two calibers, 22 and 32. Until very recently all rim fire cartridges have been lubricated on the outside of the bullets, and even now, with but very few exceptions, they are thus lubricated. Consequently, when using these cartridges, a certain amount of the lubricant will work off; and further, when the rifle becomes heated, especially with continued firing, the lubricant will melt to a degree, and uniting with the burnt powder, penetrate every recess of the action, hardening as the arm cools. Naturally, after a time, the action will work hard and must be cleaned. This is true even in a single shot, but in a repeater the difficulty is of course multiplied. The action must be taken apart—which heretofore has not been very easy in the case of repeating rifles. In the Marlin model 1892, however, the thumb-screw on the right hand side of the action can be unscrewed and the entire side of the receiver removed. The carrier and breech bolt can be taken out; from the breech bolt may be taken the firing pin and extractor. The finger lever can be slipped off its pin, and in a few seconds the ejector also can be removed from its slot. The whole action is then entirely apart. Not a single tool is used in doing this. To take the rifle apart and put it together again requires but a fraction of a minute.

This feature of the Marlin rifle is a very valuable one, as the action can be thoroughly cleaned in two or three minutes, and naturally when it can be done so easily, the action is cleaned more frequently, and the result is a better working gun and more lasting satisfaction. It is impossible to clean any other make of repeating rifle with such facility. It will be observed, that as

the breech bolt can be removed, this allows the shooter to clean the barrel by inserting the wiping rod and drawing it out through the barrel. It is a very valuable feature in a small bore rifle, to be able to clean the gun from the breech, which is of course the proper way to clean a barrel. It is next to impossible to clean a 22 caliber barrel properly by pushing the rod down and drawing it back, as the doubling up of the rag prevents using one of proper size. Another valuable feature is, that owing to the removable side plate, if the action becomes clogged because of dirt, defective ammunition, a bullet slipping out of the cartridge, etc., the side plate can be unscrewed and the trouble remedied in less than a minute. The magazine of this rifle can be readily removed, allowing the shooter to clean out the inside of the magazine, which may become dirty, owing to the lubricant.

TO TAKE OFF A MAGAZINE.

Draw the outside tube out to the position in which the magazine is filled; then take out the magazine tube stud screw; then remove the forearm tip screws and the entire magazine and forearm can be removed. When the magazine is out in this form, the inside tube (which is of course the only part coming in contact with the cartridges) can be thoroughly cleaned with a cloth and wiping rod, and the outside, which is the part bearing against the inside surface of the outside tube, can also be cleaned. In order to put in the magazine tube, merely reverse the operations. That is, slip in the tube, sliding over it the forearm and forearm tip, push the tube down so the magazine tube stud will come in its right position, and then screw in the magazine tube stud screw. This rifle is operated by a finger lever, and any one using this system for home practice, will find it a great help when he goes into the woods with his larger caliber and finds himself in the presence of game or danger. The throw of the lever is very short and the manipulation exceedingly easy.

The method of loading this rifle is a very important feature. These cartridges are small, and further, owing to the outside lubricant, the fingers would soon become too slippery to load them properly through a loading spring cover. This rifle has two tubes, of which the outer one is a cover, the inner one the magazine. The outer tube is held in position firmly, both when open and closed.

TO FILL THE MAGAZINE.

Take hold of the end of the magazine tube and draw the outer tube straight out until the loading hole is open. Drop in the cartridges; close down the tube. The especially valuable feature here is that the cartridges in the rifle are loaded directly into the inside tube, the outside tube being merely a cover, so that there can be no jamming, no pushing and no cutting of the cartridges in loading this rifle. Every cartridge is dropped in clearly and neatly. This is the most rapid and cleanest loading device as yet introduced.

This rifle has been made until lately as the model 1891, but several important changes have been effected in the action, and in consequence it is now

called model 1892. In the model 1891 the trigger and sear were in two parts—the safety was effected by making it impossible to pull the trigger off, until the lever had pushed up the safety catch which projected from the lower tang, and in this way brought the sear into connection with the trigger as a single part. In the model 1892 the trigger and sear are made one, doing away with all play there. The model 1892 rifle is absolutely safe, because it cannot be fired until the bolt is fully locked. Otherwise the lever is in the way of the firing pin, so that it cannot go forward even flush with the surface of the breech bolt, much less far enough to squeeze the rim of the cartridge. Figure 2, shows the action closed. To clean the action unscrew the thumb screw on the right hand side of the receiver, and lift off the side plate. The carrier, breech bolt and lever also, if desired, can then be taken out. The firing pin and extractor may be removed from the breech bolt, ALL WITHOUT TOOLS.

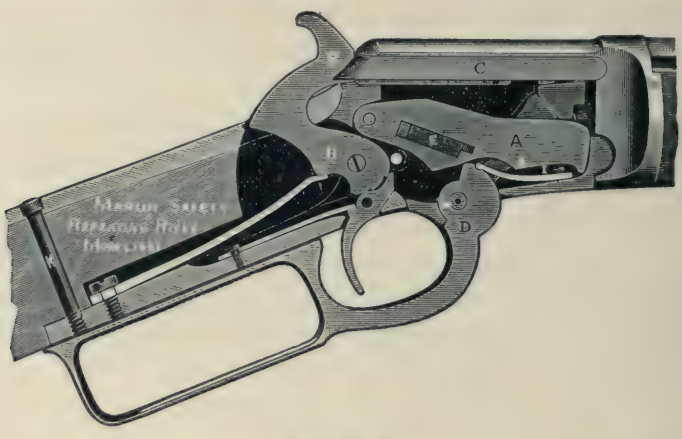


FIGURE 2.

Referring to Figure 2, the parts are as follows:–*A*, the carrier; *B*, the hammer; *C*, the breech bolt; *D*, the finger lever; *E*, the carrier rocker; *H*, the ejector; *I*, the lever spring.

It will be observed that the carrier bears with its lowest point upon the lever, so that as the lever is thrown down and a cartridge enters the carrier, the carrier is slightly raised and partially closes the magazine, cutting off the following cartridge from entering the action. When the action is closed, the projection on the breech bolt holds back the first cartridge allowing it to enter the carrier but a short distance. Consequently when the action is opened by throwing down the lever, the first cartridge slips out, but the second cartridge is held back by the carrier. When the lever is drawn back, raising the carrier by means of the carrier rocker, and the carrier lifts the cartridge to the chamber, the projecting lip on the lower front end of the carrier retains the cartridge in the magazine. When the lever is drawn fully up, there is then a cartridge in the chamber, and one projecting from the magazine a slight distance into the action. Any adjustment in action can be readily made by

drawing down the metal at the lower part of the carrier where it is "V" shaped.*

The 22 caliber repeater uses in one rifle three distinct cartridges,—the short, long, and long rifle. With the choice between black and smokeless powder loads, and also the solid and mushroom bullets, a very complete line of cart-

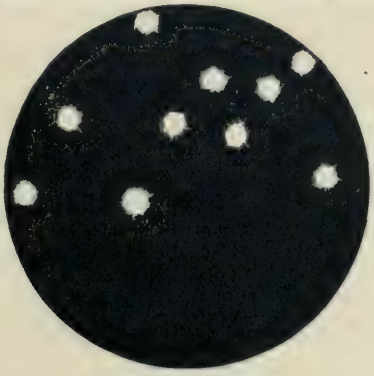


FIGURE 3.

ridges is offered, all of which may be used in one rifle. This rifle takes only rim fire cartridges. Figure 3, shows a target with the 22 long rifle cartridge in a plain Marlin rifle, model 1892, 22 caliber, 10 shots at 100 yards.

The 32 caliber rifle is so constructed that the same rifle uses all of the following cartridges: 32 short rim fire, 32 long rim fire, both inside and outside lubricated; the 32 short center fire, and the 32 long center fire, both inside and outside lubricated. Blank and shot cartridges of these sizes can also be used. Shot cartridges should be used very sparingly in a rifled barrel and the barrel must be frequently and carefully cleaned, otherwise there will be difficulty owing to leading. The rifle as sent out from the factory is adapted to rim fire ammunition, but a center fire firing pin is furnished with every rifle. The firing pins can be interchanged by any one without using a single tool. To change the firing pin it is merely necessary to unscrew the side plate screw and remove the side plate. The breech bolt can then be taken out, when the firing pin may be slipped out and the new firing pin inserted in its place. The breech bolt is then put back in the rifle and the side plate replaced, when the rifle is ready to use the center fire ammunition. This can be done in less than a minute. Of course, when the rifle is adjusted to rim fire ammunition, it will use either the short or long cartridges, without change in adjustment; and likewise when adapted to center fire ammunition, either the short or long cartridges may be used without any change in adjustment. This rifle was made in response to the demand for a repeater of larger caliber than the 22, to use ammunition that was cheap, effective and generally used, so that the shooter could have a rifle taking cheap ammunition, which he could at the same time readily obtain. All the above requirements have been met. As compared with repeaters using the 32-20 or 32 W. C. F. cartridges, the entire cost of the rifle will be saved on

*.22 caliber repeaters are now fitted with a positive cut off at the mouth of the magazine.

the first two thousand cartridges. The ammunition is what costs in the long run. For ordinary purposes get the best rifle made to shoot cheap cartridges. If you do not care to shoot at longer ranges than 100 yards and wish to use a rifle on small game, this 32 caliber will be found thoroughly satisfactory. This is the only repeater using rim fire cartridges larger than 22 caliber. This rifle is fitted with Rocky Mountain rear and front sights; otherwise it is exactly the same in style and finish as the 22 caliber repeater of this model.

The Marlin repeater, model 1897 is a take down repeater in 22 caliber, adapted to use in one rifle without any change in adjustment, the 22 short, 22 long and 22 long rifle cartridges, including, of course, the smokeless cartridges in these sizes, as well as the special cartridges with mushroom bullet, blank and shot cartridges. This is just the gun to take on a summer vacation, or to the woods; it will come in handy for birds, snap shooting, killing time on rainy days, etc.; it takes no room; it weighs next to nothing and can be put together and taken apart in less time than it takes to describe it. Just the thing to take on a bicycle trip through the woods and country. With the short barrel it can be carried handily in a diamond frame. As will be observed, it is the model 1892 in take-down form.

ACTION.

The action is simply that of the model 1892 with, of course, the addition of the take down principle and consequent improvements. The receiver is made of special steel used in high power smokeless rifles, which insures a solid rifle, and is finely case hardened, adding greatly to the appearance and durability of the same. This rifle has the inside of the receiver and all the inner parts finely finished, not only giving a pleasing effect when the rifle is apart, but further improving the action and rendering it especially easy to work. The working parts, viz.:—the carrier, breech bolt, etc., are made of

FIGURE 4.

tool steel carefully hardened, which insures freedom from wear and in consequence a permanent adjustment. Figure 4, shows the left hand side of receiver with breech bolt, barrel and magazine attached. It will be observed that the breech bolt is secure, so there is no danger of its dropping out and being lost, as there is a groove on the under side of the breech bolt in which a projecting lip on the support at the rear end of the receiver fits. Consequently, to remove the bolt it must be pushed back to the limit of its path, when it is free. Except in this position the bolt cannot be removed. All

parts are securely fastened in the rifle, making it impossible to lose any when the rifle is apart, while at the same time they can be easily removed, if desired, although the rifle can be thoroughly and conveniently cleaned without taking out a single part of the action. When the breech bolt is removed the magazine may be readily cleaned, as the wiping rod and cloth can be pushed right up into the inside tube. In this way the grease and dirt from the lubricant is removed, and the spring and the follower will naturally work more easily. Figure 5, shows the right hand side of the receiver with action and butt stock attached. The rifle can be taken apart with the bolt closed by cocking the hammer, unscrewing the thumb screw on the right of receiver, and moving

FIGURE 5.

the butt stock portion to the right, barrel portion to the left. To remove the breech bolt slide it back as far as it will go when it can be lifted out.

TO PUT THE RIFLE TOGETHER.

Cock the hammer; then place the right side of the receiver on the left side so that the lip *A* fits in *a*, a recess provided to receive it. Then as the right side of the receiver is pressed on the left side, the beveled shoulders *B* and *C* fit in the corresponding curves *b* and *c*, figure 4: screw in the thumb screw.

The Marlin repeater, model 1894 is the successor to the well-known model 1889 and is the latest and most improved repeating rifle for the popular 25-20 Marlin, 32-20, 38-40 and 44-40 cartridges. In the model 1894 rifle, every desirable feature of the model 1889, which tended to make that arm the sportsman's favorite wherever it was introduced, has been retained and the improvements suggested by five more years of experience and experiment have been added.

The model 1889, with its solid top and side ejection, was a distinct advance in the manufacture of repeating arms. This was the first of the repeaters with the solid top and side ejection. In constructing the model 1893 to use the 32-40 and 38-55 cartridges, improvements were devised simplifying the action and rendering it much safer, in that with these changes it is impossible to shoot a cartridge unless all the parts are in place and the action completely

locked. No person can by any accident, leave out one or more of the parts of his rifle and then discharge a cartridge with the action in an incomplete state. These improvements incorporated into the model 1889 produced the model 1894.

ACTION.

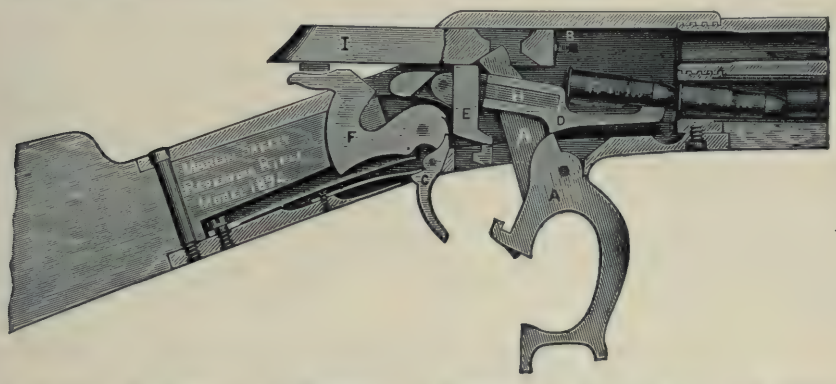
The entire breech mechanism consists of but three pieces, viz.,—the breech bolt, locking bolt and finger lever. The breech bolt is a straight bolt which slides horizontally backward and forward, the sides and top of receiver forming a path for the same, insuring correct motion. The breech bolt is further laterally guided by a rib on the top which fits in a corresponding groove in the top of the receiver. As the barrel is chambered to admit the head of the cartridge and also the front end of the breech bolt, the bolt coming up solidly not only covers the cartridge completely but is itself supported by the barrel. The locking bolt sliding in vertical grooves cut in the sides of the receiver, as will be seen in Figure 6, fits squarely up into the breech bolt. A section of the receiver is directly behind the locking bolt, supporting it solidly, It will be observed that not only is the breech bolt of this rifle securely locked, but that further its position is correct and exact. As the finger lever operates both the breech bolt and locking bolt directly, all connecting links and other weak pieces liable to be broken are thus avoided and there is no lost motion and waste of power. The throwing of the lever is short and easy. The carrier in this arm is to be noted for its simplicity and positive action. As may be seen from the illustrations there is a projection on the lower side of the carrier, which is acted against by the cam on the lever, in such a manner that as the lever is thrown down and a cartridge enters the carrier, the carrier is slightly raised and partially closes the entrance from the magazine. No matter how short the first cartridge may be, the head of the following one will strike against the front of the carrier and cannot enter the action until the lever is again closed. In consequence cartridges with round bullets can be used and the action will pass cartridges varying in length from the empty shell as a minimum up to the full size cartridge as a maximum. Cartridges are often found in which by some accident the bullets have been seated too far in the shell or have been driven down to this position during transportation. Such ammunition causes no difficulty in a Marlin repeater, The carrier is raised and lowered by the action of the finger lever against an automatic rocker pivoted near its rear end.

SAFETY.

The safety on this rifle is very simple in its action and construction. The firing pin, a cylindrical piece of steel, is cut completely in two. When the action is closed and locked, these two pieces are brought up by the locking bolt into a direct line and practically form one solid piece. But the slightest motion of the finger lever draws back the firing pin, the locking bolt is lowered and the front end of the rear piece drops down into the slot in the breech

bolt, where the locking bolt operates. With the firing pin in this position, it is held back positively and it is impossible to drive it forward until the breech bolt is closed and firmly locked by the locking bolt, when the firing pin is again connected by the locking bolt. This can happen only when the whole action is fully locked. If in taking apart and assembling the rifle the locking bolt should be accidentally left out, the rifle cannot be fired, thus effectually preventing any accidents of this character arising from carelessness or ignorance. The lever is held in position by an automatic lever catch placed near the front end of the lever, thus avoiding a projecting safety catch. The locking bolt does not project, being entirely within the receiver, whether the action is open or closed. The rifle is not only improved in appearance, owing to the fact of its being smooth and free from projections; but, there are no links or bolts to interfere with the hand or catch the clothes, and no parts of the action are exposed to catch twigs, dirt, etc.

The trigger is in one piece, instead of being divided into a trigger and sear



A. Lever; B. Ejector; C. Trigger; D. Carrier; E. Locking bolt; F. Hammer; I. Breech bolt; H. Carrier rocker; K. Extractor.

FIGURE 6.

as in the model 1889 rifle. This improvement does away with all play about the trigger and simplifies the action, by reducing the number of parts. The ease with which this arm can be dismounted and assembled is an important consideration. Any person of ordinary intelligence can do this without previous experience. To take the action apart, but one screw-driver is necessary inasmuch as the essental screws are made with practically the same head and slot. Figure 6 shows a section of the rifle with action open. The models 1893 and 1895 rifles have exactly the same action as the model 1894, the only points of difference being in the size of the receiver, breech bolt, carrier and similar parts, which changes are of course necessitated by the differences in the dimensions of the cartridges.

TO DISMOUNT THE ARM.

Take out the tang screw and remove the butt stock. Swing the main spring to one side, thus removing all pressure from the hammer screw; take out the

hammer screw and remove the hammer. Remove the lever screw and lever, the breech bolt can then be drawn out. Take out the trigger plate screw at the front of the trigger plate, when the trigger plate and locking bolt may be removed. As all of these screws have practically the same size head, it will be observed that a single screw-driver is the only tool necessary to dismount the rifle conveniently. If desired, the carrier and likewise the loading spring cover may be removed, as the screws holding these are on the right side of the action.

TO TAKE APART THE BREECH BOLT.

Drive out the extractor pin; the extractor can then be removed. Drive out the pin holding the rear part of the firing pin, which can then be removed; also drive out the front firing pin pin; this part of the firing pin, and the firing pin spring can then be removed. In driving out these pins, drive from the bottom of the breech bolt. In driving in, drive from the top.

TO ASSEMBLE THE ARM.

If the loading spring cover and carrier block are out, put these in first. Slide in the locking bolt, put on the trigger plate and screw in the trigger plate screw. Replace the hammer and screw in the hammer screw. Slide in the breech bolt about two-thirds of the way and put in the lever, being careful to see that it fits up into the breech bolt. Screw in the lever screw. Swing the main spring into position and replace the butt stock.

TO REMOVE THE MAGAZINE.

It is necessary merely to take out the magazine tube stud screw and the two forearm tip screws. The entire magazine, forearm tip and forearm can then be removed.

The Marlin repeater, model 1893 is exactly the same in principle as the model 1894, being merely the same action adapted to the larger cartridges. The model 1893 was devised from the model 1889. Several important improvements were introduced which were found to be so thoroughly advantageous, that they were in turn incorporated into the model 1889, which in consequence became the model 1894. The description of the action of the model 1894 applies equally well to the model 1893, as the two actions are identical except in size of parts. This model was originally made to take the well known and popular cartridges, 32-40-165 and 38-55-255. These cartridges as regards accuracy occupy a commanding position. They are probably the best all-round cartridges for hunting and target purposes. The Marlin Fire Arms Company originated these two cartridges and their experience in making fine Ballard target rifles for these cartridges justifies us in claiming that this repeater is unsurpassed in accuracy by any repeating arm made. The barrels are exactly the same as those used by them in the finest Ballard target rifles. This rifle is also adapted to take the 25-36 smokeless and the 30-30 smokeless cartridges which have been recently brought out and are extremely popular, as well as valuable cartridges for hunting purposes. This

rifle, like those of all the other models, can be used as a single breech-loader with the greatest facility. In so using it, the cartridge is dropped into the receiver, ahead of the breech bolt when the action is open, and then when the breech bolt is closed, the gun is loaded and ready for firing. It can be so used with great rapidity. In case it is desired to hold the magazine in reserve, while constantly shooting, it is merely necessary to load cartridges into the magazine through the side loading spring cover, as fast as one is chambered.

Since the action is the same for all four of these cartridges, (the barrel alone being different,) a *take down* rifle can be obtained, and with extra barrel parts, there will be five rifles using cartridges varying from 25 to 38 caliber. In the case of a rigid repeater any one of these barrels can be fitted if a change is desired.

The action of this model will take all cartridges varying in length from the empty shell as a minimum up to the standard cartridge as a maximum. Consequently cartridges with shorter bullets, whether so loaded to reduce the charge for short range work, or cartridges in which the bullets have settled down through various causes, will work through the action perfectly, and likewise shells loaded with round balls inserted below the muzzle of the shell can be used. Using the rifle as a single shot, cartridges larger than standard size may be used.

The rifle using the 25-36 cartridge permits a very extensive choice in loads, giving an arm which will take a cartridge varying from the light squirrel load, up to the cartridge with its charge of high pressure smokeless powder and 117 grain bullet. The factory cartridge for this rifle is the 25-36-117

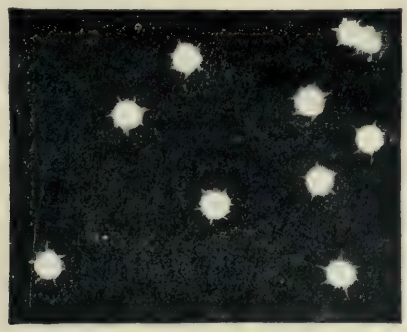


FIGURE 7.

Marlin, loaded with 24 grains of Du Pont's 30 caliber smokeless powder and a metal patched bullet with a soft lead point, 117 grains in weight. The velocity of the bullet is 2000 feet per second. The penetration as measured in dry pine board one inch in thickness, placed 20 feet from the muzzle of the rifle, is eleven and one-half boards. Penetration is not sought, because the bullet is made with a soft lead point to mushroom.

This is an exceedingly accurate cartridge and does fine work at a considerable range. It is an especially valuable cartridge in hunting, owing to the

fact that with its high velocity and flat trajectory the necessity of making great calculations at the longer ranges is removed. For instance, with its high velocity it traverses 600 yards in a second, and it can be readily observed that it is not necessary to hold far ahead of running game, in order to bring it down, even if the game is at a considerable distance. Naturally the flat trajectory is of great assistance in case there should be an error in estimating distance; for an error of 100 yards is not likely to prove very disastrous with this cartridge, while a much greater error can be made without missing the game. For game up to and including deer, this rifle is perfection. It is an extremely fine rifle for shooting geese, wild duck, etc., at long ranges. Figure 7, shows a target of 10 shots at 200 yards with a Marlin, model 1893, using the 25-36-117 smokeless U. M. C. cartridge. Target two-thirds of actual size.

The Marlin repeater, model 1895 is identical in system with the models 1893 and 1894, being merely the same rifle adapted to the larger cartridges. Consequently there is no need of explanation as to system, strength and simplicity. The writer has no hesitation in claiming that this is the strongest and safest rifle on the market for these large caliber cartridges, and shoots safely and accurately, not only the standard black powder cartridges, but also the various smokeless powder cartridges made in these calibers. The rifles are made to the same sizes and guages as the old Ballard and model 1881 barrels. The rifling is deep and clean, which not only adds to the life of a bar-

FIGURE 8.

rel but also renders it much more valuable for hunting purposes. This model can be furnished in all the various styles, that is, with all lengths of barrel up to 32 inches; short, half or full magazine; straight and pistol grip; regular and take down. It is of superior finish and perfect balance. The barrels are all gracefully tapered, being large at the breech, thus giving extra strength where it is needed. The standard rifle with 26 inch barrel and full magazine, weighs but 8¾ pounds, an exceedingly light rifle for these cartridges. This model can be procured in take down form, Figure 8, in all of the usual styles, viz: round, octagon, or half octagon barrel; any length up to 32 inches; full, half, or short magazine; straight or pistol grip.

All the calibers of this model, viz: the .38-56, .40-65, .40-70, .40-82, .45-70 and .45-90 have exactly the same action; thus, we can have, by procuring extra barrel parts, as many as six take down rifles on one action. All of

these cartridges can be procured loaded with shot, so with a smooth bore barrel part, which will interchange on the rifle, we can do very good shooting at close range, and sometimes save carrying a shot gun as extra baggage.

FIGURE 9.

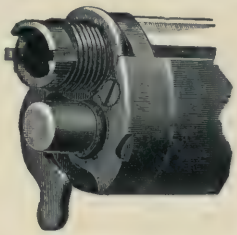


FIGURE 10.

This take down repeater is furnished in models 1893 and 1894 also. Figure 9, shows the forward end of the receiver when the rifle is apart. Figure 10, shows the breech end of the barrel and magazine when the rifle is apart.

The union of the barrel portion to the frame in a Marlin take down contains exactly the same amount of metal, with exactly the same distribution, as in a rigid repeater. Consequently it must be just as strong. A simple and

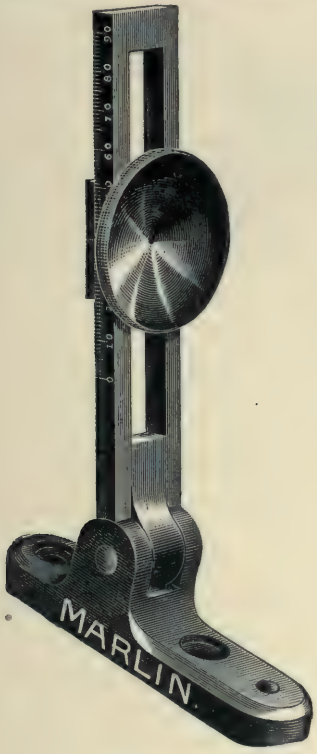


FIGURE 11.

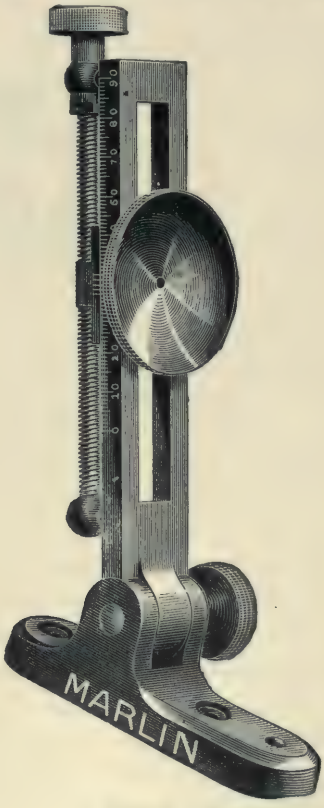


FIGURE 12.

practical adjustment for wear prevents the joint from becoming loose or shaky even with the roughest usage. The cam lever is arranged to take up any wear and make a close union between the barrel and frame. When the barrel

is screwed into the frame the cam lever is then pushed in to make the connection tight. When the cam is pushed in tightly, a certain space is left to be taken up gradually if there should be any wear. Some sportsmen like the projecting end of the cam cut off so as to make the rifle flush at this point. In this case the cam is set down with the screw so as to be snug and remain just at the point up to where the cam has to be pushed to make the union solid. This obviates the necessity of touching the cam when taking the gun apart, as the barrel can be unscrewed and screwed up with the cam adjusted in this way.

All Marlin rifles are finely sighted. Figure 11, shows the Marlin improved graduated peep sight. Figure 12, shows the Marlin improved vernier mid-range peep sight. Lyman peep sights for Marlin rifles have the following distinguishing marks on the under side of the base. B. Ballard, models 1891 and 1892, 32 caliber: E. models 1888, 1889 and 1894; H. models 1891, 1892 and 1897, 22 caliber; J. models 1893 and 1895; M. model 1881.

The Marlin Combination Receiver Sight, shown in Figure 13, gives the greatest possible distance between the front and rear sights without in

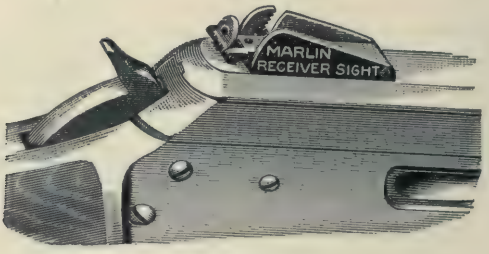


Figure 13.

any way interfering with the grip of the right hand. It allows free and unobstructed manipulation of the hammer. With it there is no danger of injuring the shooter's eye by recoil or hasty throwing of the rifle to the shoulder. It has a folding leaf and may be used a peep or open sight. This sight is intended for use on side-ejecting Marlin rifles having flat top receivers.

The Marlin take down repeating shot gun is the result of an effort to produce a medium lightweight shot gun that should combine the elegance of outline, perfection of balance, ease of taking apart, and quality of finish of the best double guns with the superiority in sighting and shooting of the single barrel, and also possessing the rapidity of fire and magazine capacity of American repeating rifles. The standard gun is twelve-guage, chambered for 2¾ inch shell, and the action handles any twelve-guage shell not exceeding 2¾ inches in length. The barrel, 30 inches long, bored for smokeless powder, is full-choked. The material of the barrel is a very high grade steel, and all barrels are proved in the rough by firing excessive charges in them. They are then, each

and every one, tested at the target by firing from 3 to 5 shots and counting the pellets.

The full-choked barrels are required to target better than 325 pellets in a 30-inch circle at 40 yards, using 1¼ oz. number 8 shot. After the barrels have passed these tests they are finished on the outside and go to the assembling room. When the guns are assembled complete and have passed through a thorough shop inspection they go again to the proof house and the finished gun is proved with special heavy loads. Each gun is then fired from 6 to 10 times with standard factory loaded shells, assorted, and if no fault can then be detected by the final inspection, they are ready for shipment. The standard weight is about 7 pounds, for so simple and compact is the action that they can use a heavy barrel and still get this moderately light weight while making the action extra strong. In the action it is at once noticed that the makers adopt the solid top frame and side ejecting principle that has been used so successfully in rifles for the past ten years. This solid top acts both ways, protecting the head of the shooter from the exploding cartridge and the ejected shell, while at the same time protecting the action of the gun from rain, snow and all foreign substances.

The breech bolt of this gun, when closed, fills the opening in the frame completely, adding to the neat and pleasing appearance of the arm greatly, as well as being of immense service in keeping out sand, dirt, twigs, pine-needles, etc., all of which would tend to make the action work hard and might sometimes disable it entirely.

On top of the frame for its full length is milled a solid rib slightly hollowed and neatly matted, adding an attractive feature and assisting greatly in taking quick aim. The frame has a blued finish. The stock has all the style and shapeliness for which Marlin Arms are famous. The regular length is 13½ inches, with 1⅝ inches drop at comb and 2½ inches drop at heel. All guns have pistol grips, small and oval in shape. Butt plates are rubber, extra thick and special quality for strength. They are strongly cross lined on surface so that they hold firmly on the shoulder with no tendency to slip. The gun has a wonderful buoyancy and balance that must be felt to be appreciated. That dead-weight, clubby feeling believed by some to be inseparable from a repeater is entirely absent. The magazine is loaded by passing the cartridges directly into it under the carrier with the action closed. This may be conveniently done with the gun up-side down. The capacity of the arm is six shots, one in the chamber and five in the magazine.

To take down a trombone action three parts must be disconnected: the action bar, the magazine and the barrel. These operations are performed in the Marlin shot gun with the *action closed*, as follows:

First. To disconnect the action bar, move the fore end and bar to the rear a slight fraction of an inch until the small notch on inside of bar is opposite the action bar stop, then tip over the stop from the notch in the barrel to the

notch in the action bar, when the handle, bar and bar stop can be drawn forward clear of the frame.

Second. To disconnect the magazine, press in the catch at the front end of the magazine tube with the left-hand thumb, at the same time revolve the magazine and then draw the magazine tube straight forward until the tube and follower are clear of the frame, and catch snaps into hole.

Third. To disconnect the barrel, unscrew by turning from left to right. The thread on the barrel is left-handed.

To put together, screw in the barrel. Press in catch and draw back toward the frame the magazine tube until catch snaps into hole: be sure action is locked by pressing upward on front end of locking bolt with fingers inserted through opening on bottom of frame; draw back forearm slowly until action bar stop is opposite notch in barrel; rotate action bar stop from notch in action bar to notch in barrel and the action bar connection is complete. The lock nut on the breech end of the barrel is provided to take up any wear, and by means of this adjustment the barrel can always be made tight and the take down mechanism never need be the least bit shaky. This check nut is practically a movable shoulder on the barrel against which the frame abuts. It is cut through on one side and provided with a clamp screw which tightens it onto the barrel, preventing its turning. If the barrel is ever loose or the union the least bit shaky, unscrew this clamp screw two or three turns or until the check nut is free to turn on the barrel. Then turn the check nut to the right a trifle or until the action is perfectly rigid, when the clamp screw should be tightened to hold the check nut firmly from turning on the barrel when the gun is taken apart. Notice that in this take down the rear end of the magazine tube, which is only a thin shell, is not cut into or cut away or weakened in any manner. The magazine tube in a Marlin take down is just as strong as in a solid gun. Notice also that the thread on the rear end of the barrel which holds the barrel portion to the action is not cut into or cut away, but this most important thread is left complete and perfect, so that *there is just as much metal in the union and exactly the same distribution of this metal in a Marlin take down as in a solid gun.* A large square thread is used not liable to become jammed or crossed, and adjustment for wear and to take up all shake is a simple check nut, an elementary mechanical device that does the work perfectly and cannot get out of order.

Many people will appreciate a gun that can be taken apart by a man who is not an expert. *Taking out one screw allows the entire breech mechanism to be removed from the frame in this gun.*

TO TAKE APART.

With *the action open* take out the carrier screw; then, holding the gun in the ordinary position, move the forearm forward slowly about an inch and the carrier will drop out through the opening in the bottom of the frame. The breech bolt containing the locking bolt can then be drawn out to the rear.

TO ASSEMBLE.

Draw the forearm and action bar forward clear of the frame, disconnecting the action bar as when taking down; insert the breech bolt in its proper channel, sliding forward to its closed position. *To close locking bolt press upward on its front end by inserting the fingers through the opening in the bottom of frame.* Then connect action bar as after taking down. To put in carrier open the action half way; insert carrier through opening in bottom

FIGURE 14.

of frame, being sure that the groove or cam way on left side of carrier passes on to the pin in locking bolt that operates it. Then, supporting carrier so that it shall not slip off from this pin, move carrier and breech bolt back slowly until the screw-hole in carrier comes opposite the screw-hole in frame, when the carrier screw can be replaced.

The breech mechanism consists of a large and long breech bolt, a straight locking bolt lying inside of said breech bolt, and pivoted near its center, so that its ends move through an arc of a vertical circle and each end travels about half an inch. When the action is open, Figure 14, the rear end of the locking bolt is up within the breech bolt.

The Marlin 16 gauge repeater, shown in Figure 15, is built upon very graceful lines, and has a special rolled steel barrel with a tensile strength of about 66,000 pounds to the square inch. The barrels are specially bored for smokeless or black powders, and are proved with excessive

Figure 15.

loads. The capacity of the magazine is five shells, with one additional in the chamber. The weight of the gun, with 26 or 28 inch barrel, is 6 1-8 or 6 1-4 pounds.

MARTINI-HENRY RIFLE.

This rifle combines the Peabody-Martini action and Henry rifling. This excellent rifling gives 14 bearing faces for the bullet. The grooves are 7 in number and are .007 inch in depth. The fabrication of this rifle involves many departures from the usual processes and operations. The barrel is made of soft or mild steel prepared by the "Siemens-Martin" process, this metal having been found to be of a very uniform nature. The barrel bars or molds are obtained by contract in lengths of 15 inches, the diameter for rifle bars being 1 1-2 inch. The barrel bar is heated to a white heat and passed through the barrel rolling-mill, which consists of ten pairs of rolls arranged alternately horizontally and vertically, when it is drawn out in one heat to the full length required (about 36 inches), taper in form and solid. The barrels while being drilled are placed vertically in a machine, where they revolve with a speed of 300 revolutions per minute, the holes already made at each end acting as guides for the set of three drills used in this operation. The method of using these drills insures a long hole of small diameter being drilled perfectly true, and until this method was tried and adopted this was found to be a most difficult task. The drills consist of, first, "the core-drill," for roughly cutting away the metal. This is run in half an inch, when the barrel is taken out and emptied of scarf or cuttings by placing it over a jet-pipe, when a strong stream of washing liquor thoroughly clears out the bore. Another half inch is drilled in the same manner, and the bore again washed out. The second drill or half-round bit is now used. This drill is 0.430 inch in diameter, and having only a cut of 0.05 inch to make in clearing the hole, is run down the one inch the core-drill has cleared without any risk of deviating from the truth. The barrel is then again washed out and No. 3 drill made use of. This has a stock fitting the hole already bored, and ending in a small 3-16 inch drill, which, being supported by the stock, drills away the center perfectly true with the axis of rotation, ready for the "core" or "rougning drill" to start again. If this system is rigidly carried out inch by inch it is possible to drill a hole three or four feet deep with an error of less than 0.005 inch.

The next operation is to support and hold the bore true while the outside is turned perfectly concentric with it. After a number of experiments to find out a means of fixing a *true turned bush* or collar on a rough exterior, the method of running sulphur in a liquid state between the barrel and bush was adopted. By this means the exterior of a barrel can be turned perfectly true with the bore without injury to the inside. The barrel is placed vertically, when two plugs, whose centres coincide with the axis of the barrel are placed in the breech and muzzle; the bush is then held over it and melted sulphur is poured in between

barrel and bush. This gives a bearing for the outside perfectly true with the bore.

The rifling is done with a cutter having a head of suitable form for the rifling required. This is fitted into a groove cut in a box about eight inches in length and fitting the bore. It is drawn through the barrel by a rod fastened to one end of the cutter box, the other end of the rod being coupled into the spindle of the head-stock or traversing saddle. On the spindle is a pinion geared into a sliding rack carried by the same saddle. The end of the rack is fitted to slide backward and forward along a fixed bar, which can be set at any angle necessary to rotate the spindle and cutter box to the amount of spiral required. From four to five cuts are needed for each groove, and the cutter is fed up by a screw tapped into the end of the cutter box, to which a rod is attached, which works through the center boss of a hand wheel. A spiral groove is cut along this rod, in which a feather fixed in the boss of the hand wheel slides, enabling the feed-screw to be screwed in or out by the hand wheel as required. An index is connected with the hand wheel, enabling the operator to read off the depth of cut. The barrel is fixed in a rotating chuck, which is divided so that any number of grooves required can be cut inside the bore. The rifling is of uniform twist of 1 in 22 inches, or one and a half turns in the length of bore (33 inches).

A particular form of emery wheel, called a "rim wheel," is employed for finishing up some of the components. Its use has enabled unskilled labor to take the place of a high class of skilled workmen, and the work is better finished. For instance, the slot of the back-sight leaf is first drifted to its true size. By this it is held in a fixing attached to a vertical axis ,and both edges with cap attached can be passed across the face of the rim wheel, maintaining it perfectly true, and grinding the edges of the leaf and cap parallel to each other. The sides are done in the same manner. See *Peabody Rifle* and *Peabody-Martini Rifle.*

MAUSER RIFLE.

This magazine rifle has become Americanized since having been used in the Spanish-American War, in 1898, and in the Philippine Insurrection. In the 1893 Model, the cartridges are stripped from the clips into the magazine. It is a very strong gun and is operated by means of a sliding breech-block, which, when pulled back, opens the breech and extracts the exploded shell. By means of the magazine spring, a new cartridge is automatically brought into position to be forced into the barrel chamber by the forward movement of the breech-block, which also locks the mechanism. The magazine holds five cartridges and is loaded by means of the cartridge clip. To load the arm, open the breech, place the cartridge clip and cartridges in place at the breech; the cartridges can then be placed in the magazine in one movement by pressing down on the top cartridge. Remove the

clip, close the breech and the rifle is ready for use. The muzzle velocity is 2,000 f. s.—the caliber is 7 millimeters, or .276. The Mauser is also the arm of Argentina, Brazil, Chili, Belgium, Sweden, and Turkey.

MAYNARD RIFLE.

This rifle was popular for some time in the United States on account of its great accuracy of fire. The barrel is pivoted to the stock, the rear end being tilted up to receive the charge. A novel feature in this arm was that it employed pellets of fulminating powder placed at regular intervals between narrow strips of paper; this was coiled in a chamber in the lock, and was fed forward by the action of a wheel that was operated by the hammer in such a manner that a fresh pellet was brought on top of the nipple at each discharge. These rifles were employed to a considerable extent by the rebel sharpshooters in the American civil war. They appear, however, to have been made in the first instance as target rifles.

One valuable and a special feature of the Maynard system is, that it admits of an interchange of barrels of any length or caliber. The manner of attaching the barrel to the stock is very simple and as follows: Push the arm of the lever axis-pin down and forward until it stops against the screw which holds it in place, then withdraw it as far as possible; hold the barrel in the left hand, pass the lever down through the breech-piece, hook the barrel on to the axis-screw at the front end, insert the lever axis-pin through the lever, then turn its arm back to its fastening position. No screw-driver required. To detach the barrel, place the barrel in position as for inserting the cartridge, then reverse the motions for attaching.

This is a capital gun in the field, and especially on marches through a game country, when it may be desirable to use the weapon either as a rifle or shot gun. Either barrel can be slipped into the same stock in a moment. The ammunition is peculiar. The strong brass cartridges are loaded at leisure, costing nothing but for the powder and lead, and may be used over and over again for any number of times. One can carry cartridges in his pocket, loaded with different sizes of shot, and slip in and fire any size wanted, for large or small game. The rifle in itself is confined to the central-fire ammunition in each and all of the calibers, excepting the .22, in which the rim-fire ammunition is used; but, by the application of a simple device, known as the *Hadley firing pin,* rim-fire cartridges may also be used. The device consists of a cap attached to the breech-piece by two small screws, in which is a disk with a firing-pin projecting through the cap at such a point from the center as to strike the rim of the cartridge. This disk plays freely in the cap, and is driven forward by the firing-pin in the breech-piece. To use the central-fire cartridges it is only necessary to remove the cap, change firing-pins, and insert the latter.

McCLEAN MAGAZINE GUN.

This strong and well-built rifle has the straight pull bolt action. It has been tested with much satisfaction by the author and in view of its several novel mechanical actions has a promising future.

MEIGS GUN.

This gun was one of the first magazine arms carrying a great number of cartridges. Some patterns carried as many as forty or fifty rounds. This system, like many of its contemporaries, did not meet with any considerable success.

MERRILL GUN.

This breech-loading rifle has a fixed chamber closed by a movable breech-block, which slides in the line of the barrel by direct action. It is opened by raising the handle of the breech-bolt to a vertical position and drawing it back to its full extent. In raising the handle, the firing-pin is retracted by a lug near its head engaging with a spiral cam-recess in the receiver; it is held back by the lug entering a circumferential groove in the bolt. In withdrawing the bolt, it passes over the hammer and presses it back to the full-cock. The piece is closed by reversing the movement of the bolt. At the end of the forward stroke, the point of the extractor engages with a recess in a ring which surrounds the mouth of the chamber, and against which the bolt is pressed, and turns the ring with it; so that the rotation of the bolt in locking will not cause it to grind against the head of the cartridge. In turning down the handle, the piece is locked by the engaging of a sectional collar on the bolt with a corresponding groove in the receiver. When this is accomplished, the lug on the firing-pin is opposite the deepest part of the spiral recess and is free to move forward when the piece is fired (by means of a center-lock moved by a double mainspring). Extraction is accomplished by a spring-hook lying on top of the breech-bolt; and in drawing back the bolt, the natural spring of the extractor presses down the rim of the cartridge upon the bottom of the receiver, until it is checked by striking against a notch left there for that purpose, and is thereby thrown upward around the hook of the extractor and clear of the gun.

MERWIN-HULBERT REVOLVER.

This excellent arm, patented by the Messrs. Merwin, Hulbert & Company, and now manufactured by the Hopkins & Allen Arms Company, has become a great favorite, and makes the following claims for superiority: Compactness, symmetrical, easy outline, and general neat appearance; no salient points to prevent its ready and easy insertion into or withdrawal from the holster. In handling, not liable to injure the hand; all the projecting parts being rounded and

smooth; cleaning being thereby facilitated. The circular form of cylinder front gives a continuous cover to breech of barrel; prevents sand or dirt entering therein. Accidental unlocking of the parts prevented, as hammer must first be set at half-cock. The front sight forged solid with the barrel; not liable to be separated therefrom or injured. The extractor ring prevents the interior of the lock and ratchet from fouling by escape of gas about the primer when using outside primed ammunition. The hood and collar at front of cylinder covering base-pin and base-pin hole prevents fouling. The flanged recoil plate here covers and protects the heads of the cartridges; prevents sand or dirt entering between face of recoil plate and cylinder, which might clog it and prevent rotation. The cylinder and barrel can be dismounted from the frame and re-assembled thereto without the use of screw-driver or any tool. The construction is not intricate nor fragile, and the extractor is a solid part of the base-pin. Strength, durability and endurance. Simultaneous, positive, and easy extraction of shells; great power obtained for starting the shells before final extraction by the incline screw action on the base-pin. Less lateral escape gas is deflected downward into the works, as no top strap is used. The face of the collar on the cylinder takes against the bracket, prevents forward movement of cylinder when pressed by the ball in rotating; gives a central bearing; prevents abrasion of cylinder face against rear of barrel; gives easy rotation; permits a close joint without friction, reducing the escape of gas; the cylinder is not forced backward on firing, but is held forward by the hood-clutch taking into the recess of the cylinder collars. The lines of recoil and resistance are close together, lessening upward inclination of barrel when fired.

The following are the directions for manipulating the arm:

To load.—Place the hammer at half-cock, press the gate downward and insert the cartridges.

To eject the shells.—Push back the thumb-bolt under the frame, turn the barrel outward, and draw forward, when the shells will fall out.

To take the arm apart.—When the barrel and cylinder are drawn forward, press the small pin in the barrel-catch even with the frame, then press the catch down and draw forward.

The patent folding hammer on double action revolvers has much advantage. There is no hammer to catch when inserting into, or withdrawing from, the

pocket. If used as a single action, when the arm is fired, the hammer returns automatically to its place, closed. Accidents that have occurred by the arm striking upon the hammer when accidentally dropped are entirely avoided by the folding hammer system.

MILBANK GUN.

This breech-loading small-arm, has a fixed chamber closed by a movable breech-block, which slides in the line of the barrel by direct action. The piece is opened by raising the handle of the breech-bolt from its recoil-bearing in the receiver, and then drawing back the bolt. It is closed by reversing the action of the bolt; the hammer-bolt striking a sear-bolt in closing, and thereby compressing the spiral mainspring which surrounds its rear portion. It is locked by the support afforded the base of the handle by its bearing on the recoil-shoulder of the receiver when the piece is closed. The piece is fired by the action of a spiral mainspring surrounding the hammer-bolt. The hammer-bolt is kept from accidentally discharging the cartridge by striking the firing-pin before the breech is fully closed, by means of a transverse stop-pin, which, when the handle is up, passes through the firing-pin and keeps it forced back with its point flush with the face of the bolt. When the breech is fully locked by turning down the handle into place, the transverse pin is drawn back by an inclined surface in the hole of the firing-pin through which it passes, and it leaves the firing-pin free to be driven forward, at pleasure, in the usual way. The rear end of the firing-bolt when drawn back passes through the base of the rear section of the breech-bolt, and indicates the position if cocked. Extraction is accomplished by a hook swinging on a pin passing transversely through the recoil-block near its face. Ejection is caused by the action of a spiral spring, set in the face of the bolt and pressing against the lower edge of the cartridge-head until the shell is clear of the chamber. The shell being then free to turn, is rotated around the hook by which it is held and is thrown clear of the gun. A safety-lever is connected with this arm and serves to dispense with the necessity of a half-cock notch. The accidental opening of the breech may be prevented by turning up the handle part way and pressing down its stop-pin; the point of this passes into a hole in the side of the recoil-block, and thus prevents the revolution of the entire bolt.

MILES GUN.

This magazine gun has a tubular, under-barrel magazine, holding nine cartridges and is provided with a cut-off. It has been tested with satisfaction, but has not been manufactured or used to any great extent.

MILLER MAGAZINE GUN.

This gun is an adaptation of a magazine to the United States Service Spring-

field rifle. The alterations are as follows: The original receiver and breech-pin are replaced by a receiver alone, the tang being solid with it. The upper rear part of the receiver gives the bearing for the cam, while the space ordinarily filled by the breech-pin is utilized as a channel through which the cartridges are fed from the magazine in the butt-stock. The ejector-stud is replaced by one beveled on its rear as well as its front, in order that the cartridges may slip easily over it into the chamber. The magazine, is a tube slotted through its whole length. To the upper side of the side of the tube flat springs are screwed. At the end of each spring and riveted to it is a lug, beveled on its rear service; all these lugs pass through holes cut in the magazine and serve to separate the cartridges. A ratchet works in the slot in the magazine tube. It is operated by a slide attached to the guard-plate. When the slide is drawn back the teeth of the ratchet pass in the rear of the heads of the cartridges. On being returned to position each tooth moves a cartridge forward, the lugs on the springs being pressed out of the way by the cartridges themselves. At the front of the ratchet is a cartridge-stop, held up by a spring. The stop is prevented from rising too far by a pin. When the ratchet is withdrawn the stop-spring yields—since the cartridge cannot move backward on account of the shoulders of the lugs on the springs—the stop descends and is drawn under the first cartridge, which is then free to leave the magazine and enter the chamber, gravity being the motive force, the gun being held muzzle downward. When the ratchet is moved forward the second cartridge occupies the place of the first, the third of the second, and so on. The ratchet is prevented from entering the tube by two pins which bear against the outer surface of the tube along the edges of the slot. It is held in contact with the tube by a spring, which is kept from slipping off the bottom of the ratchet by two forks. The magazine is loaded through a gate in the butt-plate. A projection on the breech-block hooks over a pin and prevents motion of the ratchet when the piece is locked. As a magazine gun, five motions are necessary to operate it, viz: cocked, opened, loaded (by operating the ratchet by the slide), closed, fired. The same number of motions is necessary as a single loader. This gun carries six cartridges in the magazine and one in the chamber. The last cartridge will not feed from the magazine, however, until forced down by others when the magazine is reloaded.

MORGENSTERN GUN.

This breech-loading rifle has a fixed chamber closed by a movable breech-block, which rotates about a horizontal at 90 degrees to the axis of the barrel, lying above the axis of the barrel, and in front. It is opened by drawing back the handle of the firing-bolt until the ribs on its sides are clear of the grooves in the receiver in which they slide. This cocks the piece by compressing the spiral main-

spring which surrounds the firing-bolt, until it is caught and held by a sear lying well in the bottom of the breech-block. The breech-block may then be thrown upward and forward until it is stopped by striking the front part of the receiver. It is held open there by the head of the ejector-spindle, which changes its bearing on the extractor so as, through it, to support the block. The piece is closed by reversing the movement of the brech-block, and is locked by the side ribs of the firing-bolt engaging with the undercut grooves in the rear portion of the receiver. The piece is fired by a concealed spiral-spring lock the firing-bolt being released by the action of the trigger within the receiver upon the sear within the block. Extraction is accomplished by the breech-block striking the lug on the extractor above its centre of motion, and ejection is caused by the acceleration impressed on the extractor by the action of the ejector spring on the ejector-spindle, when, by the motion of opening, the direction of this latter passes below the axis of the extractor. The ejector-spring is then released from the tension caused by its compression in opening, and causes the extractor to rapidly rotate about its axis, carrying the empty cartridge against the beveled shoulders of the receiver, by which it is deflected upward and thrown clear of the gun.

MUIR-MONTSTORM RIFLE.

This breech-loading small arm has a fixed chamber closed by a movable breech-block, which rotates about a horizontal axis at 90 degrees to the axis of the barrel, lying below the axis of the barrel and in front, being moved from above by a thumb-piece. The breech-block of this arm is moved by an outside lever, the interior shaft connected with which is cam-shaped, so that the first motion of opening draws down the breech-block, until a lip on its upper surface is clear of a hook or jaw formed on the under side of a projection of the frame overhanging the mouth of the chamber. By continuing the motion of the lever, the breech is fully exposed by the rotation of the block, the hammer at the same time being brought to the full-cock. By reversing the movement of the lever the breech is closed. The breech-block is locked by the abutment of the frame upon its back. Extraction and ejection are accomplished by a sliding extractor in the lower side of the barrel. Its under side is notched for the upper end of a lever, which is pivoted on the same pin as the hammer. This lever has two horizontal arms, which are struck by corresponding prongs on the lower side of the block, in opening the piece.

MULLINS GUN.

This magazine gun has no cut-off. The magazine is placed below the receiver and has a working capacity of three cartridges; it will contain more, but if they are put in the magazine the mechanism cannot be operated.

NEW WORCESTER GUN.

This well-received hammerless gun, shown in the drawing, is an American production, made on the American interchangeable plan, and is provided to meet the demand for a good, serviceable hammerless gun at a low cost. It is easily taken apart and put together, for cleaning or oiling of the lockwork. The frame, or action, is long and made in one piece. All the lock mechanism is contained in the solid one-piece frame, thus making the action of the gun positive in all climates. The construction does entirely away with the annoyance of the nose of the hammers hanging in the indented primers in the opening of the gun after firing. as by the simple and effective form of the double-locking bolt, the hammers and the firing pins are withdrawn from the primers, thus rendering the opening of the gun for reloading easy. The trigger locking mechanism, or safety, is automatic

and positive in its action. The barrels are subtwist or fine damascus, choke bored, double bolted, with flat matted extenison rib; can be taken off and put on the action without cocking the gun, by simply pressing the small cam on the under side of action. The barrels are provided with an improved check hook on the lug, which sustains the weight of the barrels when open, preventing any strain on the hinge joint, thus adding many years usefulness to the gun.

To open the gun without cocking, press the cam at the bottom of the frame as far toward the muzzle as it will go, keeping the finger on the cam until the barrels are tilted sufficiently for the cam to pass the cocking lever.

To take the barrels off the action, do as described above, and the hammers will remain down. To let the hammers down without snapping when the barrels are up, push the safety forward, pull both the triggers and close the gun.

To take the stock off the gun for inspection or oiling of the lockwork, loosen the upper screw in the butt-plate, taking the lower screw out, swing the butt-plate to one side, then remove the screw rod which runs lengthwise through the stock

This excellent gun and several others similar to it, cheap but good, known under the trade names of "New Field Gun," "National Arms Co.'s Guns," etc., may be procured from Wm. Read & Sons, Boston.

PARKER GUNS.

The Parker shot gun has stood the test in the most satisfactory manner for hard and continuous service in competition with the best guns of both home and foreign manufacture. This gun is presented to sportsmen to meet a demand that exists for a "top-action" gun that combines all the essential qualities of a perfect gun, which are, simplicity of construction, excellence of workmanship, beauty of proportion, balance, shooting qualities, and capacity to resist the strain of long continued use. The locking devices employed are superior to those used by most other manufacturers. The locking bolt holds the barrels positively firm, and being of taper shape, allows the locking of the gun, even when a little dirt is in the way. This locking bolt is supplemented by the top fastener upon the end of the extension rib, which prevents the springing of the breech from the barrels, and any lateral motion of the barrels at the time of discharge. This fastener has its sides cut upon the arc of a circle, with the hinge joint as a center, which gives a perfect bearing along its entire surface when the gun is closed. Most other top fastenings fit on the top only, and are of no benefit as a fastener, because when the gun is slightly opened there

Figure 1.

is no contact along its surface, whereas this fastener has a bearing during the entire operation of opening the barrels. It is the result of experience, that in order to enable sportsmen to use heavy charges, the hinge pin must be removed from the breech a greater distance than formerly. The length of the frame, therefore, has been materially increased, which, although it adds to the expense of manufacture, insures durability to the gun and allows free action of the lever. Figure 1. Particular attention has been paid to the proper shape and distribution of materials, and the greatest strength will be found where the strain is most severe, and where the wear and tear is greatest. A great variety of weights and sizes are made, and in all of them will be found that symmetry of proportion, beauty of outline and perfection of balance for which this gun is so justly celebrated, and which is so pleasing to the sense of sight and touch of all true sportsmen.

The Parker gun is a distinctively American product, and has all the advantage of the American system of manufacturing, by producing an interchangeable gun, the parts

of which are all made to gauge, fit accurately, and are readily duplicated. The different parts are made by special machinery, and are subject to rigid inspection, so that no defective or imperfect part can find its way into the finished gun. The number of parts is reduced to a minimum, and the construction is so simple that any sportsman with no

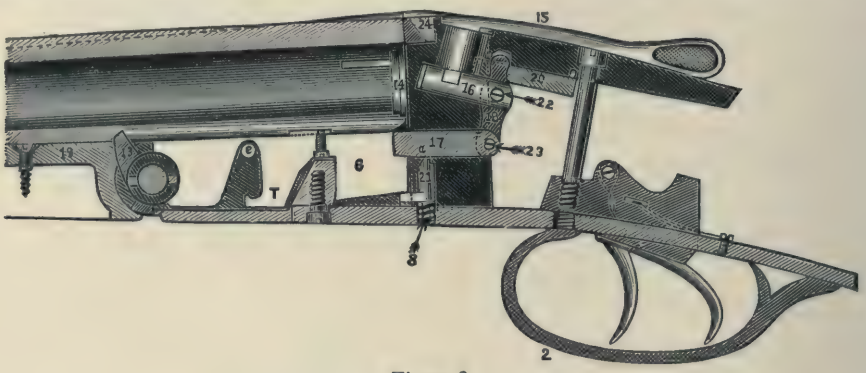


Figure 2.

tool but a screw-driver, can take his gun apart for cleaning or repairs. No breech loader has less to get out of order, and none will stand better the ordeal to which a breech loader is subjected. The springs used, aside from the locks, are such as can be made by any one, and the breaking of one or all of them would not interfere with a day's sport or the safe and successful use of the gun. All the materials are selected with the greatest care, and no metals but the best cast steel and wrought iron are used in its construction. The locking bolt is held back while the gun is open, doing away with the wear on the hinge joint, which all breech loaders are subjected to when the barrels are forced down against a

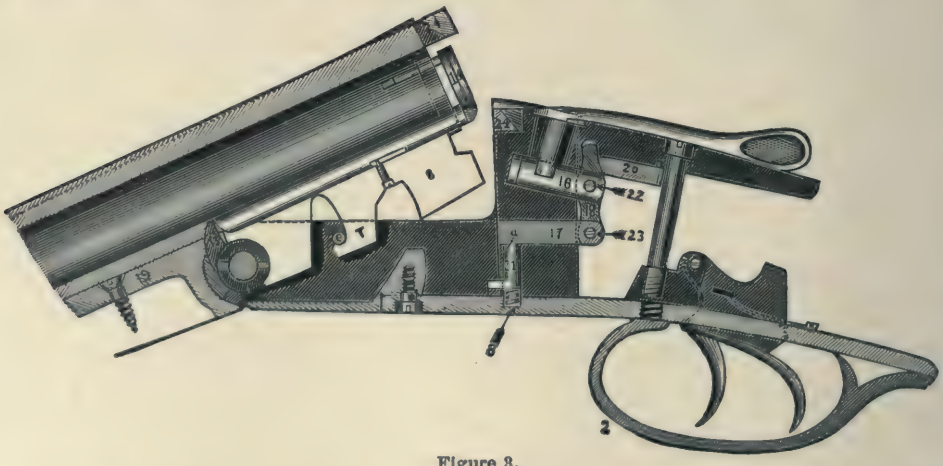


Figure 3.

strong spring in the rear of the bolt. The patent rebounding locks are all made of the finest materials and by skilled workmen.

Figure 2 shows the locking mechanism of the top action, the gun being closed. Figure 3 represents the gun opened. Pressing the thumb against the lever 15 throws it

to the right, and acting through the piece 16, forces the piece 18 to the rear. This piece being pivoted at the top withdraws the bolt 17 from the mortise which is cut in the lug 6, and releases the barrels, ready for the insertion of the cartridges. It will be observed that when the bolt 17 is back to the position as shown in Figure 3, the small hole which is drilled in the under side of said bolt comes directly over the trip 21, which by the assistance of the small spiral spring 8, is made to enter this hole in the bolt 17, and thereby holds it in position. This prevents the lug 6 coming in contact with the bolt 17 when the gun is closed. By means of spring 20 the action of *the lever 15 is positive*, not only to withdraw the bolt *from*, but to force it forward *into* the mortise in the lug 6. When the gun is closed, as shown in Figure 2, the sides of the extension rib 24, being upon the arc of a circle, with the hinge joint 13 as a center, have a bearing along their entire surface, and the extension rib fits securely into its seat 24 in frame. When the barrels are brought to place for firing, the bottom of the lug 6 strikes the trip 21, withdrawing it from the bolt 17, which then enters the mortise in the lug 6 and securely locks the gun, as shown in Figure 3. The taper bolt 17 locks the barrels positively firm, and the use of a taper bolt for fastening the gun gives it a decided advantage over others, as it does not allow a little dirt (which is very liable to get under the barrels when open) to prevent the gun from locking. Many times when shooting, sportsmen are balked this way, but this gun closes with the same ease and locks as securely if there is a little dirt in the way. When the gun is open the check hook T comes in contact with the pin e which avoids any strain on the joint 13, and thus prevents the gun becoming shaky by constant use.

The automatic extractor, used for top action, lifter action and hammerless, is shown in Figure 4. This draws the shells or cartridges from the barrels during the operation of opening the gun. The extractor 14 is inserted in a hole drilled in the lug 34, with its

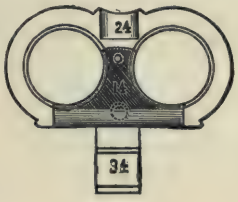


Figure 4.

rear end enlarged and extended into and around a portion of the chambers of the barrels as shown in Figure 4 (which represents an end view of the breech of the barrels). When the gun is closed the extractor 14 extends from the rear end of the barrels to the projection on the joint 13, and as the barrels swing on this joint 13, which remains stationary, this projection forces the extractor 14 from the rear end of the barrels, so that when they arrive at the position as shown in Fgure 3, the cartridges are withdrawn from them far enough to be entirely removed by the hand. After removing the cartridges and inserting others, the barrels are brought to place, the cartridges coming in contact with the face of the frame are forced into the chambers of the barrels, and the gun is ready for firing.

Thus it will be seen that the extraction and insertion of cartridges is accomplished *automatically and by a positive motion,* and in the most convenient and expeditious manner possible.

Figure 5 shows the locking mechanism of the lifter action, the gun being closed. Figure 6 represents the gun opened. These guns received the first premium grand

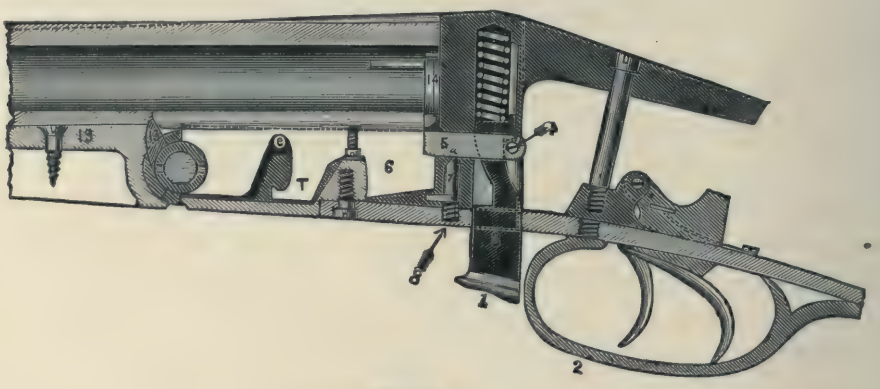


Figure 5.

medal and diploma over all competitors at the Centennial Exhibition, 1876, and at the Melbourne Exhibition 1881. They are manufactured with the improved check-hook and pin, the fore end lock, solid-head plungers, rebounding locks, and patent self-acting snap

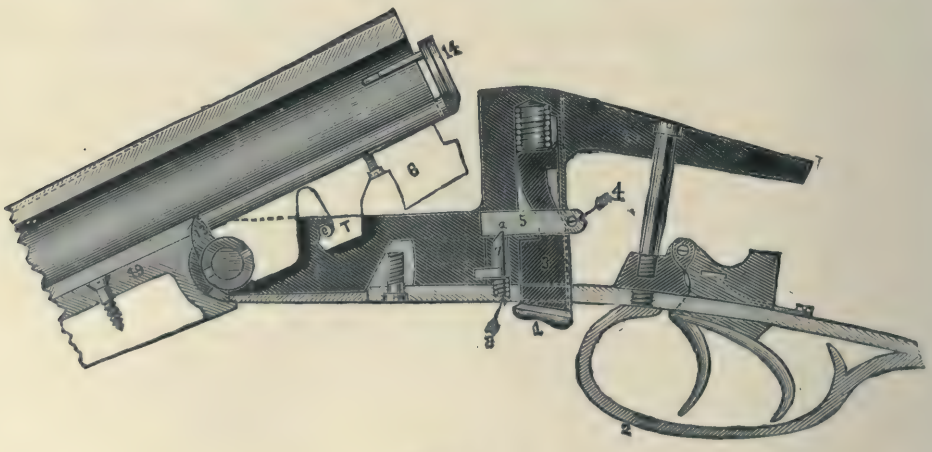


Figure 6.

action, which is both convenient and secure. The locking bolt is held back while the gun is open, doing away with the wear on the hinge joint, which all breech-loaders are subjected to when the barrels are forced down against a strong spring in the rear of the bolt. Pressing up on the finger-piece 1, in front of the guard 2, raises the lifter 3, and its beveled side, coming in contact with the screw 4, acts as a wedge to draw the bolt 5 from

the mortise which is cut in the lug 6, and releases the barrels, as shown in Figure 6, ready for the insertion of the cartridges. It will be observed that when the bolt 5 is back to the position as shown in Figure 6, the same hole which is drilled in the under side of said bolt comes directly over the trip 7, which by the assistance of the small spiral spring 8, is made to enter this hole in the bolt 5, and thereby holds it in position. The finger-piece 1 is solid and a part of lifter 3. The action of the *lifter* 3 is positive, not only to withdraw the bolt *from*, but to force it forward *into* the mortise in the lug 6. For the purpose of cleaning, it can be very easily removed by taking off the locks and removing the small screw 4 from the end of bolt 5, then press down on trip 7, which will allow the lifter to be withdrawn without removing either stock, guard or trigger-plate. The improved roll 13 gives great strength to the joint.

The Parker rebounding lock, used on the top and lifter action, is shown in Figures 7, 8 and 9 at full cock, half cock and with the hammer down on the plunger. The op-

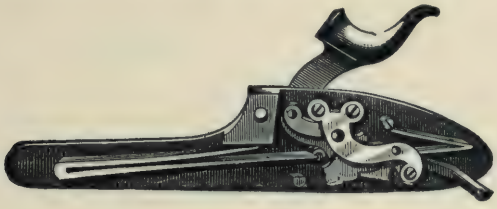


Figure 7.

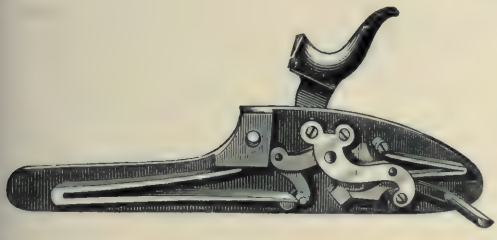


Figure 8.

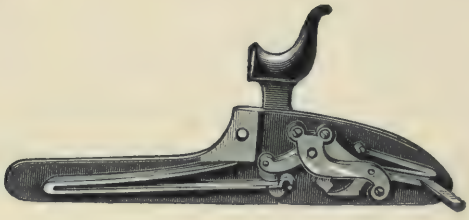


Figure 9.

eration of this lock is very simple, and renders all fire-arms using it safe from liability of a premature or accidental discharge. When the gun is discharged the main spring carries the hammer in the usual manner until the spring comes in contact with the stud in the plate and stops. The hammer, by its own momentum, now explodes the cap, and at this point is shown in Fig. 9, with the nose of the sear resting on incline of tumbler, ready to force it back to half cock as soon as the pressure is relieved from the trigger.

The Parker hammerless gun is a departure from other hammerless guns in many respects, one of which is the *spiral main* spring, and *applied as it is in this gun*, establishes its superiority over any spring made. Its action is quick, effective and durable, and it will stand six times longer than any leaf spring made. The cocking mechanism differs from all others in using one cocking slide to operate the hammers simultaneously. The advantage of this cocking device is two fold. First, doing away with two cocking devices

as used on all other hammerless guns. Second, the common fault of one hammer failing to come to full cock at *exact instant* with the opposite one is entirely overcome, as they are both compelled by this device to drop into cock notch at precisely the same instant. The cocking is easy and smooth from start to full cock. The action frame is long, insuring much greater strength and durability than it is possible to get with the short action so

Figure 10.

commonly used. The *patent rebound device* does away entirely with the annoyance of the nose of the hammer hanging in the indented primer in the operation of opening after firing. It is simple, effective and durable. The stop check or check hook is a neat and simple device to stop or check the downward motion of the barrels in opening the gun to load and requires no extra tools to dismount the barrels. The barrels of this gun can be detached and attached at all times, same as the hammer gun, without reference to the gun being cocked or not, thus avoiding the necessity of cocking it before replacing the barrels. All the working parts of this gun are attached to the solid iron work (instead of portions being attached to the wood), thus rendering the action of the gun in all climates positive and not liable to be thrown out of adjustment by the action of the atmosphere on the wood. For safety this gun is so constructed that the hammers can never be light-

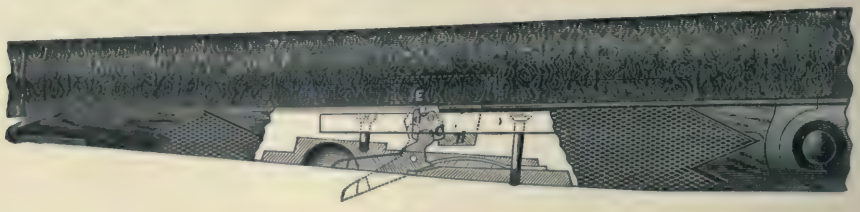


Figure 11.

ly let down to rest on loaded shells; an operation that is very dangerous. The safety for locking the trigger is automatic also positively and absolutely safe. When desiring to let the hammers down remove the shells and snap the hammers down as if firing the gun. Especial attention is called to the patent fore-end lock for fastening the fore-piece to the barrel, a sectional view of which is shown in Figure 11. Its neat appearance and convenience commends itself.

Messrs. Moran & Wolfersperger, Chicago, have invented an automatic ejector for hammerless shotguns. The invention consists simply of one ejector box or receiver, firmly fitted to the fore-end iron on the gun; two ejector hammers pivoted in box, extending through the fore-end iron, striking end of extractor rod with great force when released by sears; two V-shaped main springs, placed in a position to give a true and even tension against the ejector hammers; two sears pivoted in box set to abut against the ejector hammers with drag enough to stand the wear, and impossible to jar off, which is a great fault in some ejector mechanisms; two V-shaped sear springs.

The ejector hammers are set by closing of the gun, coming in contact with the extractor rods, and firmly set by the sears, which extend through the fore-end iron to the ejector sear trips in the frame of the gun. The ejector box contains only eight parts complete.

The frame of the gun contains two push rods connected to main spring plungers or hammer in frame of gun, which come in contact with two sear trip levers at the extreme end of the frame and pivoted; they come in contact with two sear trips which are extended from the frame of the gun, when the gun has been fired or hammers snapped down, causing the sears in the ejector box to be disengaged from the ejector hammers when gun is opened at the proper time and throw the empty shells clear from the barrels of the gun. Closing the gun reverses the action and sets the mechanism for action.

The new Parker automatic ejector is very simple in mechanism and requires no extra force for manipulation. The setting or cocking of the ejectors is done with a minimum friction, and the ejectors cannot move back and forth when the gun is opened and closed, unless the gun has been fired, so that it is hardly noticeable that an automatic ejector gun is being handled.

PEABODY RIFLE.

This rifle, invented by Mr. Henry O. Peabody, of Boston, Mass., is the parent of the Peabody-Martini and Martini-Henry rifles. The original Peabody was very much like the Martini-Henry, except that the spiral spring for actuating the firing-pin was placed in the stock in rear of the block. The type of this rifle ordered by the Turkish Government in 1873 is almost identical with that used in the British service, except that the cartridge is rather smaller and more symmetrical; the powder charge and weight of bullet, however, are the same. The range of this arm was so much superior to that of the Russian Berdan rifle employed at the same time that it gave the Turks an immense advantage over their Russian

adversaries. Nothing has ever happened in the history of firearms which shows more forcibly the great advantage which arises from the possession of a really first class powerful rifle more than the fighting about Plevna; the Russians at the time were armed with the Berdan rifle, and it appears that they were not prepared to meet a rifle with such an extremely long range as the Peabody-Martini.

General Todleben, in a letter to General Brialmont, states the number of Turkish bullets which fell among the Russian ranks when they were still 2,000 yards away from the defenders' position was such that divisions, which at the outset numbered from 10,000 to 12,000 men, were speedily reduced to a strength of from 4,000 to 5,000; that in other words, they lost half their effectives. Captain Kouropatkine, speaking of the attack upon Loftcha, states that at 2,000 yards from the Turkish position Russian soldiers were struck down by the defenders' bullets, and that at 1,500 yards men were falling rapidly on all sides; and General Zeddeler, who was present with the Russian guard when it received its "baptism of fire," at Gorni Dubniak, states that at 3,000 paces from the defenders' position the Russians began to suffer loss; that at 2,000 paces men were falling rapidly, and, as the attack progressed, the reserve suffered nearly as much as the firing line. See *Martini-Henry Rifle* and *Peabody-Martini Rifle.*

PEABODY-MARTINI RIFLE.

This rifle is a combination of the Peabody and Martini systems, the former covering the mechanism for closing the breech and extracting the cartridge shell, after the rifle has been fired, and the latter covering the device for igniting the cartridge. This rifle was adopted by the English and Turkish Governments, after long and exhausting trials in competition with all the prominent breech-loading rifles of the world. It endured the test of actual experience in war during the contest between Russia and Turkey, and obtained the highest reputation for solidity, accuracy, long range, and other desirable qualities of a military weapon. The official reports from the armies in the field, and the letters of army correspondents, unite in praise of the Turkish rifles. The parts composing the breech mechanism combine the greatest possible strength with simplicity of construction, and the system, in its present perfection, is the result of long and careful study to produce a rifle meeting all the requirements of military service. Its form is compact and graceful, and the symmetry of its lines is nowhere infringed upon by unseemly projections, which besides being offensive to the eye, are often prejudicial to the comfort of the soldier on the march or in the performance of its necessary manipulations. No movement of the barrel, or any other parts, except those immediately connected with the block, is required in the performance of any of its operations. These are performed in the simplest possible manner, and without in the least in-

fringing upon the strength and durability of the rifle, which is equal, in these respects, to the best muzzle-loader. In the operation of loading, the whole movement of the block is made within the breech-frame or receiver the end of the block-lever falling but a short distance from the stock. The block itself is a

strong, substantial piece, and when in position for firing, is so firmly secured as to ensure its perfect safety, as has been repeatedly shown in the severe tests to which it has been subjected. The position of the block, when it is drawn down for loading, is such as to form an inclined plane, sloping toward the breech of the barrel, and the groove in its upper surface corresponding with the bore of the barrel, facilitates the entrance of the cartridge so that it slides easily into the chamber, without the necessity even of looking to see that it is properly inserted. The adoption of the coil main-spring in place of the common gun-lock mainspring, is considered a great improvement. It has been found that, in several instances, where the coil main-springs were broken, the defects were not noticed, and the springs compressed in the blocks worked as usual. Had such mishaps occurred to the old gun-lock mainsprings, the arm would have been rendered useless. The accuracy and range of this rifle are very remarkable. The system of rifling used is that known in England as the Henry. There are seven grooves, of peculiar shape, with a sharp twist (one turn in twenty inches). After a long series of experiments, with different kinds of rifling, the English Arms Commission finally decided upon this ystem as giving the most satisfactory results, both with regard to accuracy and range.

The manipulations for loading and firing are of the simplest kind: Throw down the block-lever with considerable force, pressing with the thumb of the right hand; insert the cartridge; and return the lever to its place, which raises the block to its proper position when the rifle is ready for firing. After firing, throw down the block-lever with force, and the empty cartridge shell is thrown out clear from the rifle, leaving the chamber ready for the insertion of another cartridge. This extraction of the cartridge shell is effected by the action of an elbow lever, which throws it out with unerring certainty, the instant the block-lever is lowered. This elbow lever derives its power simply from the action of the block itself, and cannot become deranged, as its action is not dependent upon any spring and is of such strength as to prevent the possibility of breakage or derangement by any service

to which it can be subjected. If it is desired to preserve the cartridge shell for reloading, throw down the block-lever with a gentle movement, and it is drawn out into the groove of the block, from whence it can readily be taken by the person firing. See *Martini-Henry Rifle* and *Peabody Rifle.*

PHOENIX RIFLE.

This breech-loading rifle was formerly manufactured by the Whitney Arms Company. Like the Whitney and Kennedy rifles, which are improvements on it, it is very simple of construction, and perfectly strong, safe and durable, while the ease of manipulation in opening and closing the breech, and extracting the shell or cartridge cannot be surpassed. These arms have less parts than other breech-loading rifles in use, and the parts are of such form as to render them as strong and safe as rifles can be made. They have short top action, and are symmetrical in form. See *Kennedy Rifle* and *Whitney Rifle.*

PITCHER GUN.

The mechanism in this magazine arm is operated by a cover slide, connected with a handle which has a direct forward and back motion only without rotation. The receiver is in one piece, to which the breech-block is fitted, the front end of the latter admitting of a sliding motion, while the rear end of the bolt has in addition a vertical motion to lock and unlock. For this purpose a mortise is formed vertically through the lower half of the receiver, while its upper half is grooved lengthwise from the barrel back to the rear. The mortise serves the double purpose of a receptacle for the magazine case and a shoulder to sustain the bolt under discharge. Two latches, pivoted upon the upper side of the bolt in contact with the cover slide, impart vertical motion to the rear of the bolt to unlock the piece. A beveled surface upon the rear end of the breech-bolt, in conjunction with a rounded surface upon the under side of the cover slide closes and locks the piece. The magazine is not enclosed in any box, but is skeleton in form, made of one strip or piece of spring steel with upright guiding rods at the front end.

PUTNAM MAGAZINE GUN

This "straight pull" rifle, of original design, is loaded with a "clip" holding five cartridges, and when more fully developed will be certain to reach a high standard of excellence. In its present form the magazine is objectionable, because of its interference with easy and satisfactory manipulation. The magazine, placed in such a position through the breech as to present a similar appearance to that in the Winchester, is seriously in the way, and also detracts greatly from the symmetry and beauty of the gun.

QUACKENBUSH GUNS.

These guns, noted for accuracy and ornamental appearance, are made as a combined firearm and air gun, shooting a regular .22 caliber cartridge, TT shot, or .21½ dart and slug. The full length of the gun, Figure 1, is 40 inches, weighs 7½ pounds, and has an automatic cartridge extractor. As a cartridge rifle it is

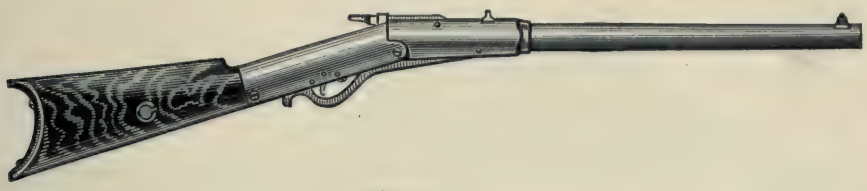


Figure 1.

as handy and shoots as strong as those more expensive. It is equally as perfect as an air gun, and as such it has an accurate range of 60 feet, and will shoot a slug or shot with sufficient force to penetrate ½-inch pine. The gun has a steel barrel, rifled. All the parts are extra heavy and constructed of best material to stand continuous service. It is an excellent long range air gun for gallery or field.

The *Safety* cartridge rifle, Figure 2, has a full length of 33 inches and weighs 4½ pounds. The caliber is .22 for regular "B B" short, long, and long rifle cartridges. It has a rebounding lock and quick twist. It has a rifled steel barrel, automatic cartridge extractor and adjustable rear sight; its stock is so fastened to the barrel that the two may be easily and quickly separated, making the arm handy to carry.

The *Junior Safety* rifle weighs about 4 pounds. The barrel, breech block, sights and operations of this rifle are about the same as in the regular safety rifle, Fig-

Figure 2

ure 2. It has a steel, nickel-plated skeleton stock and shoulder rest, which can be instantly detached for carrying in a small space. The form of the shoulder rest and the manner in which it is attached to the frame makes a firm stock, and one that comes to the shoulder easily.

REMINGTON ARMS.

The Remington hammerless gun is exceedingly strong and durable. The mechanism, which is very simple, can be readily seen in Figure 1, a sectional drawing of the double barrel shot gun, automatic ejector model. The cocking mechanism consists of hammers, cocking levers, triggers, main and sear springs. In opening the gun, the fore-end engages

Figure 1.

with the cocking levers, which raises the hammers to full cock, when the sears drop into position. The gun can be taken apart or put together with one or both hammers cocked or uncocked. This obviates trouble or the use of special tools in assembling, and does away with the snapping of hammers, or putting the gun away cocked, as required in some actions. The hammers can be let down without snapping, by breaking down the gun, pushing forward the safety slide and closing the action as the triggers are pulled. The cocking mechanism is so arranged that before the gun can be opened sufficiently to admit

Figure 2.

of a shell being inserted in the chamber, both hammers are cocked and the triggers are locked automatically.

To open the gun, push the top lever to the right; this retracts the main bolt and throws the safety plunger into position, thereby locking the triggers securely. This action being positive, the *gun cannot be opened without operating the safety mechanism.* The sports-

man desiring to use the gun without the automatic safety, can, by removing the stock, take out the safety plunger, thereby removing the automatic attachment, which will, however, allow of the safety being operated by the thumb.

The automatic ejector is composed of hammer, sear, center sear, main and sear springs, and is cocked by the action of the extractor when closing the gun. It is operated when the gun is fired by the main spring moving forward and lifting the ejector sear out of the ejector hammer notch. This allows the ejector hammer to fall on the center sear, where it remains until the gun is nearly opened, when the

Figure 3.

joint check engages with the center sear and raises it out of the ejector hammer notch. Then the ejector hammer, moving forward, strikes the ejector stem, causing the fired shell to be expelled from the gun. These guns, grade EE being shown in Figure 2, are made in 16, 12, and 10 gauge, varying in weight from 6½ to 10 pounds, and in about 30 grades.

Figure 4.

Figure 3 shows the No. 1 hammer double gun, a favorite style, made in 16, 12, and 10 gauge, with barrels 28, 30, and 32 inches in length, and weighing from 6¾

to 10¼ pounds. These guns are made for nitro powders, having both barrels choke-bored, and are made in 7 different grades.

The 1893 Model single barrel shotgun is shown in Figure 4. It is made in 10, 12, 16, 20, 24, and 28 gauge, with barrels 28, 30, 32, and 34 inches in length, and weighing from 5¾ to 6½ pounds. It is choke-bored and is one of the most popular low-priced guns on the market.

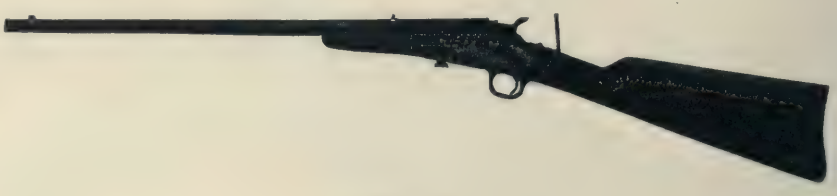


Figure 5.

The No. 6 Juvenile Model rifle, in .22 or .32 caliber, is shown in Figure 5. It is a light weight rifle, furnished with open front and sear sights and a tang peep sear. The weight of this arm is 3½ to 4 pounds and the length of barrel 20 inches.

The No. 4 Model rifle, in take-down style, made in .22 and .32 caliber, is shown in Figure 6. It has a weight of about 4¼ pounds and the barrel varies in length from 22½ to 24 inches.

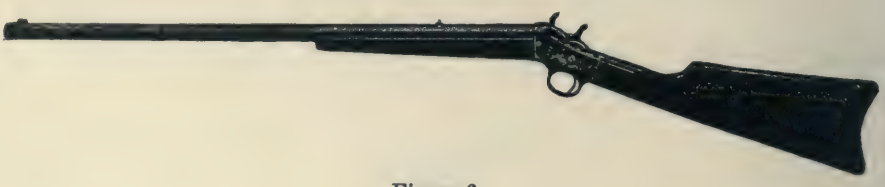


Figure 6.

The No. 2 Model rifle, designed for strength and simplicity, is made in .22 to .44 caliber, has graceful proportions and weighs from 5¼ to 6 pounds.

The No. 7 Model rifle, shown in Figure 7, is one of the latest models, and is a decided departure from the usual style. Its attractive lines, beautiful design and finish appeal to all especially interested in target and sporting rifles. It is fitted with especial Lyman peep rear sight and Beach combination front sight, and is made with a view of obtaining the utmost accuracy under the most scientific conditions. It is especially popular as a gallery rifle. It is made in .22 to .44 caliber, weighs 5 to 6¼ pounds, with barrels 24, 26, or 28 inches in length.

The No. 5 Model rifle is adapted to high power smokeless ammunition. It has a round smokeless steel barrel and is provided with sporting front and rear sights. It is made in calibers .30-30 smokeless, $7^{m}/_{m}$, .30 U.S. Army, .303 British, .32-40

high pressure, .32 Winchester special and .38-55 high presure. This arm weighs from 7 to 7¼ pounds and has barrels 24, 26, or 28 inches in length.

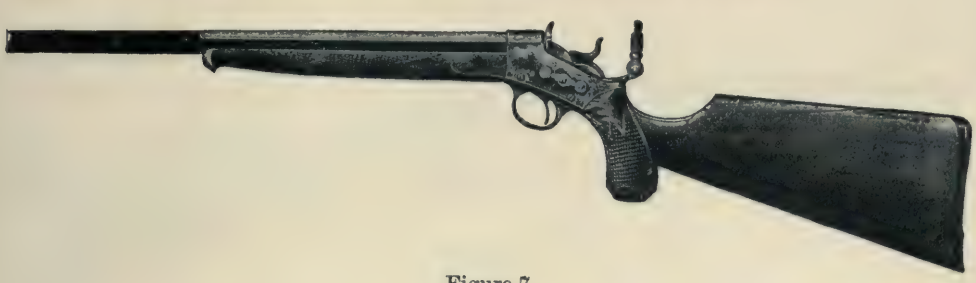


Figure 7.

The sporting and target rifle, No. 3, shown in Figure 8, is especially designed for long range hunting and target purposes, requiring the use of heavy charges. It has a solid breech block, with direct rear support, convenient side lever action and rebounding hammer, so that the arm always stands with the trigger in the safety notch, rendering premature discharge impossible. It is chambered for the new styles of straight shells, as well as other popular sizes, and, making a flatter trajectory than many other rifles, it is excellent for target and sporting uses. This Model is made in calibers from .22 to .50, weighs from 8 to 10 pounds, and has

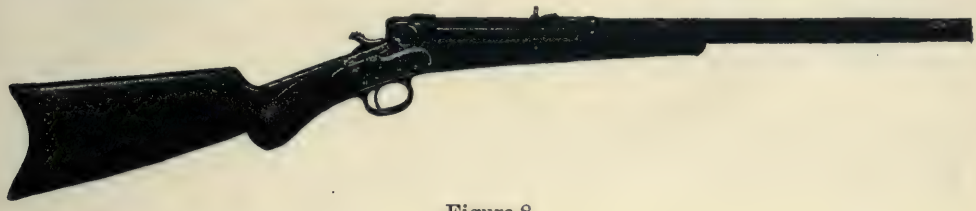


Figure 8.

barrels from 26 to 30 inches in length. It is also made with a special steel barrel adapted to the popular high power cartridges in calibers from .30 to .40.

The No. 3 Match rifle, the Model "B" of which is shown in Figure 9, has gained much popularity in short and mid range matches on account of its extreme accuracy, pleasing lines and fine workmanship. This rifle is also made in the mid range Creedmoor Model for use from 200 to 600 yards, and has short vernier, graduated and wind gauge sights, with spirit level.

The Schuetzen special target rifle, shown in Figure 10, is a modification of the No. 3 rifle, the falling breech block being actuated by a special combined trigger guard and lever of new pattern. This rifle was designed by some of our most advanced target experts and is a perfect arm of its class. It has a specially constructed set trigger finger guard, and vernier wind gauge rear sight, and is made for the popular target cartridges from .28 to .38 calibers.

The Remington-Lee sporting rifle, shown in Figure 11, was designed to embody the advantages possessed by the military bolt system magazine rifle. The

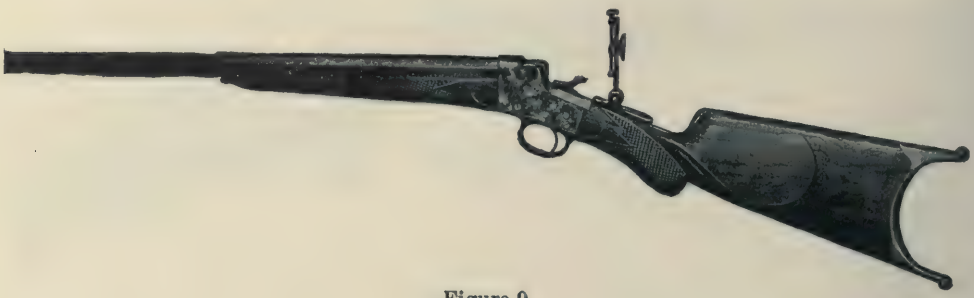


Figure 9.

enormous velocity, great penetration, flat trajectory and increased range possessed by this rifle, with the following desirable features, recommend it to sportsmen:

(*a*) By half cocking the piece the mechanism becomes locked, and in this con-

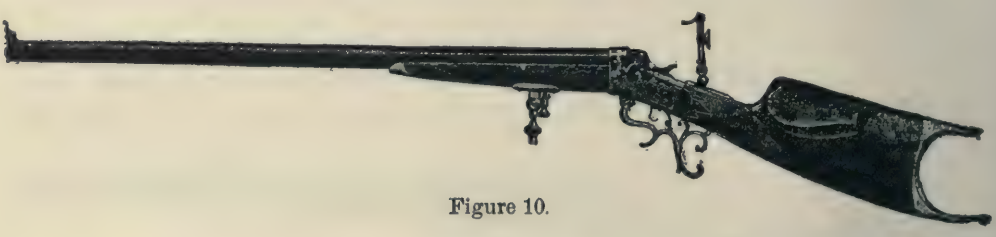


Figure 10.

dition its safety from premature discharge and the impossibility of accidentally opening the gun makes it particularly desirable for carrying on horseback or on the trail.

(*b*) Each rifle is furnished with four magazines holding five cartridges each, which will enable the shooter to discharge twenty shots in an incredibly short space of time and without stopping to replenish the magazines.

Figure 11.

(*c*) By pressing the magazine catch, in front of the trigger, the magazine and contents can be instantly removed without the possibility of a premature explosion, which frequently occurs where the cartridges have to be worked out by the manipulation of the action.

This arm has a half pistol grip, improved sporting sights, a round barrel made of special smokeless steel, and is adapted to the popular small bore calibers from 236 to .40. The weight varies from 6¾ to 8½ pounds.

The Remington-Lee small bore magazine rifle, a sectional view of which is shown in Figure 12, the magazine being charged and in position, is of the well known bolt type, adopted by military organizations throughout the world on account of its simplicity, durability, and ease of manipulation. The celebrated Lee rifle, in use by the Navy Department, has been altered and adapted to the modern smokeless high power ammunition, giving great penetration, velocity and flat trajectory with extreme accuracy. In addition to the bolt locking mechanism on the large caliber Lee, this arm has double locking shoulders on the bolt head, and is supplied with four magazines of five cartridges each, which can be placed in the action in the same space of time as is ordinarily consumed by the insertion of one cartridge in magazine arms of some other types.

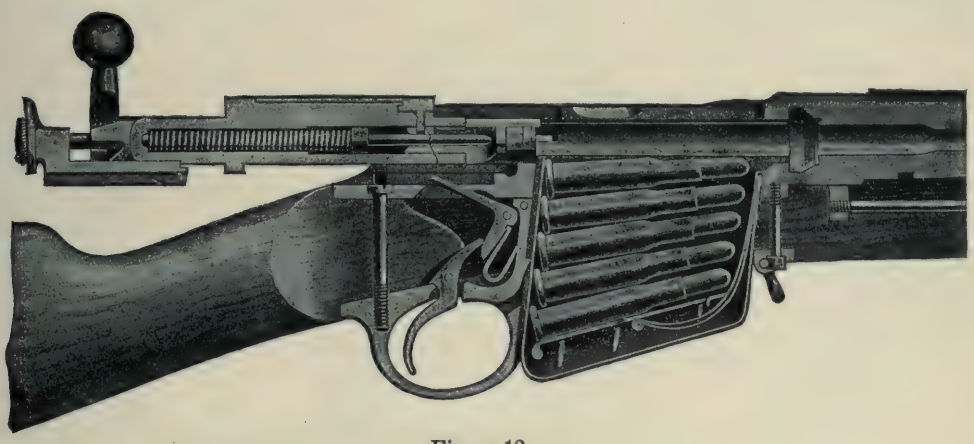


Figure 12.

The Remington-Lee magazine military rifle, shown in Figure 13, has a 20 inch special smokeless steel barrel—total length 49½ inches and weighs 8½ pounds. It is made for the .30 caliber Government cartridge shown in Figure 16, the $7^{m}/_{m}$ Spanish Mauser cartridge shown in Figure 17, the $7.65^{m}/_{m}$ Belgian Mauser cartridge shown in Figure 18, and $6^{m}/_{m}$ U. S. Navy cartridge shown in Figure 19. This rifle is also made up in a special military model, targeted for long range match shooting.

The Remington-Lee carbine, shown in Figure 14, has a total length of 39½ inches and a 20 inch barrel and weighs 7½ pounds. It is adapted to the same cartridges as the small bore rifle.

The Remington-Lee magazine military rifle used in the United States Navy, Great Britain, China, and other countries, has a total length of 52 inches, weighs

8¾ pounds, and has a caliber of .43 or .45 Spanish. It is a single breech loader that can be instantaneously changed into a perfectly safe magazine arm, giving an unequaled rapidity of fire when the time taken in recharging the magazine is considered. It has a fewer number of component parts than many other arms made. Every part is simple and strong. The rifle weighs 8¼ pounds without bayonet and can be used as a sporting arm. The breech system can be mounted or dismounted in ten seconds. The magazine may be attached or detached in one second. This is a modern form of magazine, and one of the best where continuous

Figure 13.

rapidity for many shots is required. It has been imitated or adopted in many modern forms of military guns. Cartridges are carried in the magazine, attached or detached, in the safest possible form, and under the best conditions to resist wear or deformation in transportation in the field. The Remington-Lee magazine rifle is one of the few military repeating arms which has demonstrated its superiority in rapidity with accuracy as a repeater over its execution as a single loader, in cases where the magazine must be recharged.

Figure 14.

The new Model small bore military rifle, shown in Figure 15, designed for smokeless powder, is noted for simplicity, strength, durability, and rapidity of fire. It was produced to meet the urgent demand for a high power rifle of the simple Remington system, with which the armies of South and Central America are so perfectly familiar, and to whom the complicated magazine arms have been a constant source of trouble and danger. This model has a barrel 30 inches long and weighs, without the bayonet, 8½ pounds. The bayonet weighs 1 pound. It is

adapted to the .30 caliber Government, the $7^{m}/_{m}$ caliber Mauser, Models Spanish and Brazilian, and the $7.65^{m}/_{m}$ Belgian Mauser cartridges.

Figure 15.

The Remington small bore carbine, shown in Figure 20, is the same in mechanism as the Remington small bore rifle, Figure 15, except that it has reduced length of barrel adapted for the use of cavalry or mounted police and also for infantry use in the thick underbrush. The total length of the arm is 36 inches, with a 20 inch barrel. It weighs 7 pounds and is adapted to the cartridges shown in Figures 16, 17, and 18.

Figure 16.

Figure 17.

Figure 18.

Figure 19.

The Remington auxiliary rifle barrels are now largely used and are popular. They extend the entire length of the shotgun barrel, and are held firmly in place by a thumb nut at the muzzle. They shoot accurately up to 500 yards, and can be inserted into any shotgun and taken out with perfect ease, thus making the most desirable combined shotgun and rifle. They weigh about two pounds.

The Remington Spanish Model .43 and .50 caliber rifles are of the original Remington system and more than a million of them have been manufactured and

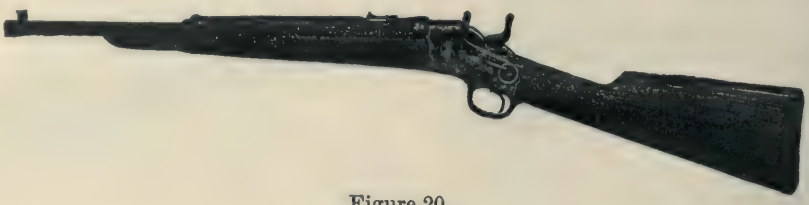


Figure 20.

sold. This model has a total length of 50 inches and weighs 9¼ pounds. The

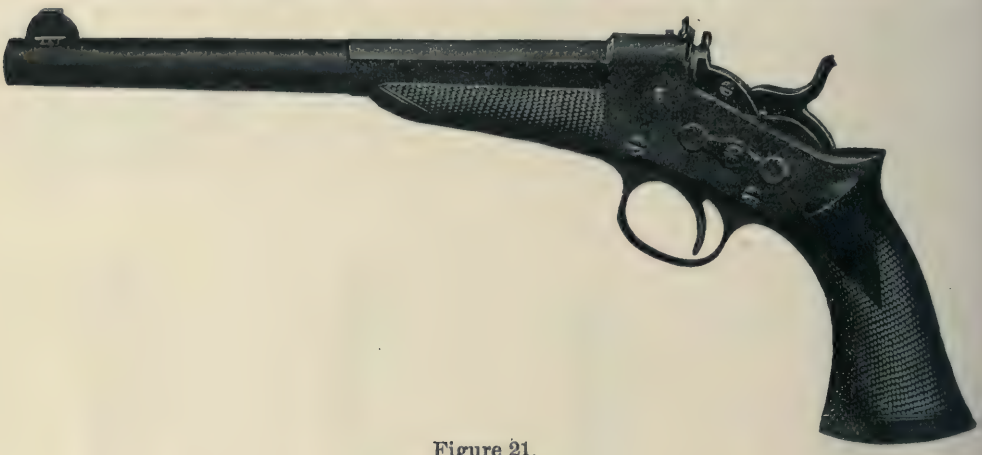


Figure 21.

carbine of this model has the same action as the rifle, a total length of 35½ inches, and weighs 7 pounds.

Figure 22.

The Remington light "Baby" carbine, .44 caliber, has a total length of 35½ inches and weighs 5¾ pounds, about double that of the Army revolver. For sporting, police and saddle use it is a very desirable arm.

The Remington new model target pistol, shown in Figure 21, is designed to meet the demand of pistol experts and shooting galleries for a well-balanced, accurate, and firmly adjusted arm. The breech mechanism combines simplicity, convenience and durability. The barrel is 10 inch, half-octagon, carefully bored, rifled and finished. The finely finished mehanism insures a uniform trigger pull of 2¼ to 3 pounds. The arm is provided with an ivory bead front sight, and adjustable wind gauge rear sight, and weighs 2½ pounds.

The Remington double derringer, shown in Figure 22, is the only double derringer now in the market, and is most compact and reliable. It is double shot, .41 caliber, rim fire, and weighs 11 ounces. See Lee *Straight Pull Rifle.*

REMINGTON THREE-BARRELLED RIFLE.

This arm, designed by Mr. G. R. Remington, has a fixed chamber closed by a movable breech-block, which rotates about a horizontal axis at 90 degrees to the axis of the barrel, lying below the axis of the barrel and in front. The locks complete are contained in the breech-block, which being lowered out of the way by the tang on its lower end, permits the insertion of the cartridges into the chambers through a perforated extractor plate. This plate being moved by the arm on the pivot of the breech block, withdraws the empty shells when the block is fully opened. A weak spring-catch in the stock holds up the tang of the breech-block when the piece is closed, and affords the only means of locking it.

ROBERTS GUN.

This rifle, resembling the Martini-Henry in some respects, has a fixed chamber closed by a movable breech-block, which rotates about a horizontal axis at 90 degrees to the axis of the barrel, lying above the axis of the barrel and in rear, being moved from above. The piece is opened by raising a hooked catch-lever, at the end of the tang of the breech-block, out of its notch in the tang of the receiver. This depresses the forward end of the block so as to expose the chamber. The reaction of the breech-block spring lying underneath the block throws up the front of the block sufficiently to keep the cartridge from falling out of the chamber before the breech is fully closed. The closing is done by returning the lever to its place, or automatically by cocking the piece. The back of the hammer in the latter case presses against the end of the slot in the tang of the breech-block in which it plays, and so raises the front of the block into place. The piece is locked by the position of the breech-block, which is also kept in place by the engaging of the hook of the catch-lever with a corresponding notch in the tang of the receiver. Extraction and ejection are accompanied by a bent lever pivoted to the

side of the receiver below the chamber, and struck by the breech-block face in its descent.

ROBERTSON RIFLE.

This breech-loading arm has a fixed chamber closed by a movable breech-block, which rotates about a horizontal axis at 90 degrees to the axis of the barrel, lying below the axis of the barrel and in front—being moved from below by a lever. By depressing the lever the block is pulled down by a link connecting the two. By reversing the lever the block is raised into place against the end of the barrel, and is locked by the middle joint of the linked combination rising above the line joining the other two, and causing the strain upon the block from the discharge to tend towards bringing the lever more closely into place. Extraction and ejection are accomplished by a small straight lever, swinging on a center below that of the block and struck by the block, during the opening, near the center of motion.

RUMSEY GUN.

This breech-loading rifle has a fixed chamber closed by a movable breech-block, which slides in the line of the barrel by indirect action, being moved by levers from below. The arm resembles in its general features the Winchester. Its peculiarity consists in having two magazine-tubes, one on each side of the barrel and beneath it. From these the cartridges are fed alternately into the corresponding carriers, which are moved up and down by levers operated by a sliding-rod. This rod is drawn to and from the operator by two thumb-pieces, one of which, for the right hand, is within the trigger guard, and the other lies along the barrel in a position readily accessible by the fingers of the left hand when supporting the piece in the natural position of firing. The mechanism for communicating this reciprocal motion to the carrier levers consists mainly of an oscillating lever lying between the other two, and its connections in the form of springs, stops, and pins, which are designed for directing the stroke on each of its sides alternately.

RUSSELL MAGAZINE GUN.

This arm contains many features of novelty. The breech-closing bolt operates by a handle preferably at the side of the arm as in other bolt guns, but instead of a partial rotation of the bolt in locking and unlocking, the force applied to the handle is at all times in a direction nearly parallel with the bore of the barrel. The locking is effected by a cross-shaft in the bolt a little longer than the diameter of the bolt, having cam-shaped ends which extend into seats in the receiver. In opening the breech these cam projections are turned by the first movement of the handle, which is a pivotal movement, until the bolt is unlocked, when a further backward movement of the handle gives a powerful cam action to start the cart-

ridge, and at the same time slightly starts the firing-pin backward. The final closing movement has the same powerful action to seat the cartridge in its chamber. The magazine feeds the cartridge sidewise, either up through the bottom of the receiver, as in the Lee gun, or at the side of the receiver, and in the latter case a swinging pusher forces the upper one of the column of cartridges sidewise into the receiver in front of the bolt.

RUSSELL-LIVERMORE GUN.

This magazine arm embodies the joint inventions of Major W. R. Livermore and Captain A. H. Russell, United States Army, in improvements in magazines and breech movements. The barrel and breech-bolt are the same as on the Lee-Speed, and the arm is adapted to that cartridge. The receiver in all essential features is also the same. The gun has a cut-off identical with that of the Lee-Speed and uses the Russell metallic feed case. This case is constructed of a single piece of bent sheet metal, which will contain just enough cartridges to fill the magazine of this gun, from which the magazine can be recharged as rapidly as a single cartridge could be placed in the receiver. These feed cases are little if any more costly that paper boxes, and are to be thrown away when empty.

RUSSIAN BERDAN RIFLE.

This Americanized breech-loading arm has a fixed chamber closed by a movable breech-block, which rotates about a horizontal axis at ninety degrees to the axis of the barrel, lying above the axis of the barrel, and in front. The piece is opened by drawing back the locking-bolt to its full extent, thereby cocking the piece, and then throwing the breech-block upward and forward by the handle on its side. It is closed by shutting the breech-block, and is locked by the friction of the rear face of the breech-block against the recoil-shoulder on the locking-bolt guide, against which the longitudinal motion of the hinge-strap slide, to which the block is attached, allows it bodily to slide under the influence of the discharge. It is also held in place by the entrance of the locking-bolt into the counter-bore of the firing-pin hole when the piece is fired. In drawing back the locking-bolt to open the piece it compresses the spiral mainspring which surrounds it, and riding over the point of the spring-sear is caught by it and retained against the tension of the mainspring when the support of the hand is withdrawn. When released through the trigger in the usual way it is impelled against the firing-pin, and so discharges the piece. Extraction is accomplished by an extractor swinging on the joint-screw and struck above its center of motion by the forward end of the breech-block near the completion of its movement in opening. Ejection is caused by accelerating the movement of the extractor by the ejector-spring.

SAVAGE ARMS.

It is the aim of the Savage Arms Company to manufacture the most perfect and best finished rifle on the market. Such parts as have been improved in the new model are so constructed that they are interchangeable in the Model 1895, thereby making it possible, when it is desired, for the owners of 1895 models to procure the improved parts and thus change their 1895 models into the present improved arm, Figure 1. The Savage rifle is a six-shot repeater of light weight. The day has passed when sportsmen resignedly overload themselves with heavy guns, when every ounce, toward the end of a long tramp, feels like pounds. The projecting hammer is eliminated. The hammer, once the most ornamental part of the gun and the pride of the gunsmith, has had its day, as well as its countless victims. The latest and best shot guns and revolvers are hammerless. The demand is for a hammerless rifle.

FIGURE 1.

The action is easily dismounted and assembled. One of the many valuable features is the concentric arm of the finger-lever which operates the working portions of the rifle, and at all times protects the trigger from being accidentally operated. Another point of superiority is the operation of the finger-lever, which on its backward movement compresses the main spring and cocks the enclosed hammer, thus pressing the rifle to the shoulder and steadying the aim. The movement of the finger-lever is short, and to operate it requires little power. The magazine is not a tube nor a box, but is circular in form, and is located within the protecting steel walls of the receiver, giving perfect immunity from accidents occasioned through the bullet of one cartridge impinging upon the primer of another; this arrangement insures a perfect balance of the arm without reference to the number of the cartridges in the magazine. Another important feature of the rifle is the *automatic cut-off*—a simple device which retains the magazine cartridges in reserve when the arm is used as a single loader; on omitting to place a cartridge in the breech opening, the *automatic cut-off* allows a cartridge from the magazine to be fed up into the chamber. The arm is a combined rapid-firing magazine and single-loading rifle.

Six different cartridges, shown in Figure 2, each adapted

to a different use, can be fired in the same rifle without any change or adjustment. The rifle is equally adapted for killing the largest as well as the smallest game, and shoots well at either short or long range. Numbers 4 and 6 are used for short ranges and in places where it would not be safe to fire full charges.

1 REGULAR SMOKELESS POWDER CARTRIDGE.

REGULAR BULLET.
Lead, with Nickel Cover.

2 EXPANDING SMOKELESS POWDER CARTRIDGE.

EXPANDING BULLET.
Lead, with Partial Nickel Cover.

3 BLACK POWDER CARTRIDGE.

REGULAR BULLET.
Lead, with Nickel Cover.

4 MINIATURE SMOKELESS CARTRIDGE.
Grooved Shell.

MINIATURE BULLET.
Lead.

5 PAPER PATCHED SCHUETZEN TARGET CARTRIDGE.

PAPER PATCHED BULLET.
Lead.

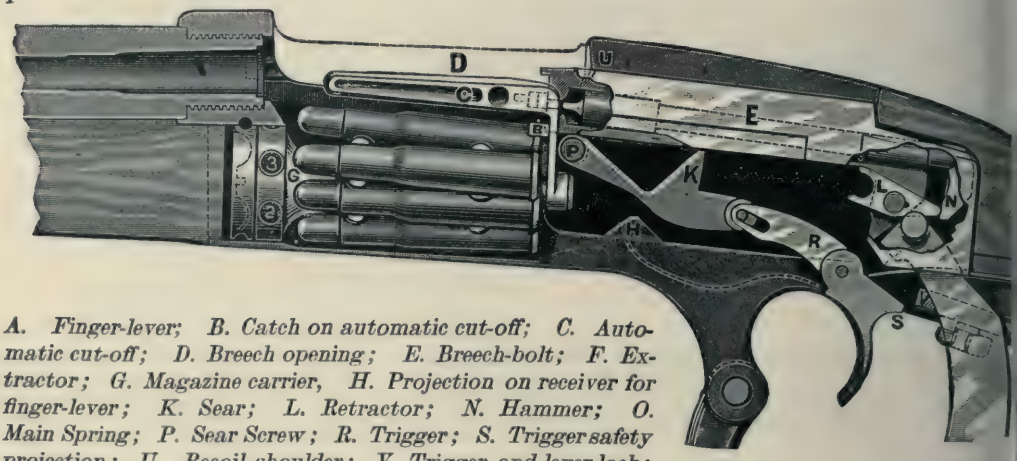
6 MINIATURE METAL COVERED CARTRIDGE.

MIN. METAL COV. BULLET.
Lead, with Metal Cover.

FIGURE 2.

The ejection of the discharged shell is positive, the shell being thrown to the right of the operator, the operation being accomplished by moving the lever downward. If the operator desires to use the gun as a single loader, he must place a cartridge in the breech opening and then bring the lever backward; this movement carries that cartridge into the chamber, breeches up and cocks the rifle ready to fire. If the operator omits to place a cartridge in the breech opening, and the lever is moved backward, a cartridge will be automatically taken from the magazine and carried forward by the breech-

bolt into the chamber—the rifle being then breeched up and cocked ready for use. The change from a single loader to a magazine rifle is always automatic. The construction of the rifle is simple, and the action is always reliable; all parts being made to guage, are interchangeable. The rifle is especially designed and built to use the strongest grades of high velocity smokeless rifle powder.



A. Finger-lever; B. Catch on automatic cut-off; C. Automatic cut-off; D. Breech opening; E. Breech-bolt; F. Extractor; G. Magazine carrier, H. Projection on receiver for finger-lever; K. Sear; L. Retractor; N. Hammer; O. Main Spring; P. Sear Screw; R. Trigger; S. Trigger safety projection; U. Recoil shoulder; V. Trigger and lever lock; Y. Indicator.

FIGURE 3.

Figure 3, shows the action open and Figure 4, shows the action closed. The magazine is charged while the system is open. Open the finger-lever *A* to the fullest extent. Insert the cartridges into the magazine by pushing them (head to rear) down, and under the catch *B* on the automatic cut-off *C*. The

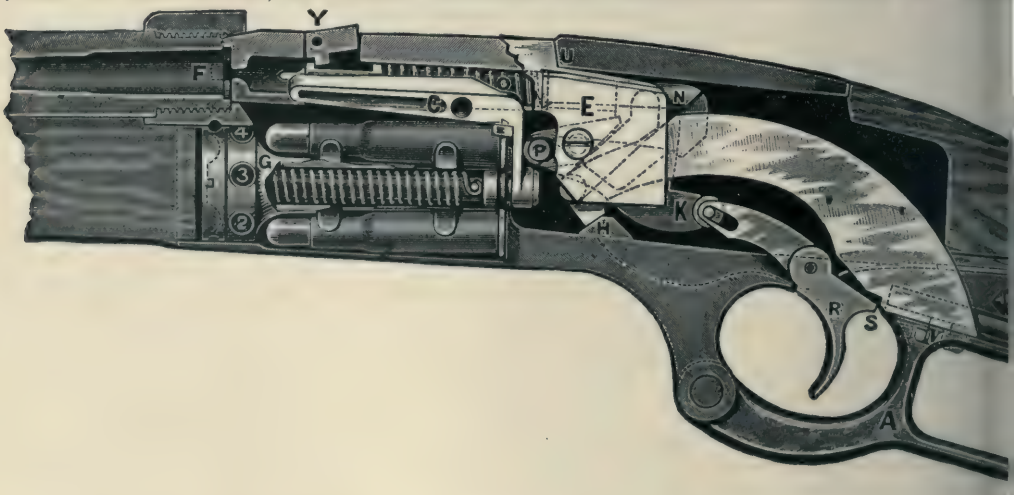


FIGURE 4.

thumb or fore-finger of the right hand should be used in this operation. The capacity of the magazine is five cartridges. A sixth cartridge can be inserted

in the breech opening *D* above the catch *B*. On closing the finger-lever *A* the cartridge in the breech-opening *D* will be carried forward by the breech-bolt *E* into the chamber of the barrel. The rifle is then ready to fire. When the hammer is at full cock, the indicator *Y* projects above the breech-bolt; when the rifle is fired or the hammer is down, the indicator is flush with the top of the breech-bolt.

THE RIFLE AS A SINGLE LOADER.

The act of placing a cartridge into the breech opening *D* forces the automatic cut-off *C* back into its recess in the receiver, retiring the uppermost cartridge in the magazine below the line of movement of the breech-bolt *E*, so that only the cartridge in the breech opening will be engaged by the breech-bolt on its forward travel.

THE RIFLE AS A MAGAZINE GUN.

If the operator does not place a cartridge in the breech opening *D*, and there are one or more cartridges in the magazine, the breech-bolt *E* on its forward travel will engage and carry forward into the barrel chamber the uppermost cartridge in the magazine. The automatic cut-off *C* has on its face a projection *T* which ejects the fired shells, after being withdrawn by the extractor *F* on the breech-bolt *E*.

LOADING THE MAGAZINE, MAGAZINE ACTION.

If it is desired to have the cartridges in the magazine and none in the chamber of the barrel, load one or more cartridges into the magazine, press with the finger of the left hand the automatic cut-off *C* back into its recess, keeping it back while the finger-lever *A* operates the breech-bolt *E* forward and beyond the point of engagement with the cartridge head in the magazine. Complete the closing of the action. When the action is closed, or the finger pressing back the automatic cut-off *C* into its recess, the numerals on the magazine carrier *G* show, through the opening in the receiver, the number of cartridges contained in the magazine. The breech-bolt *E* is positively operated by the finger-lever *A*, without any intermediate mechanism, and when closed ready for firing, is immovably locked by the finger-lever *A* resting on a solid projection at *H* in the receiver. The recoil of the discharge is supported at *U* and is in the direct line of the strain. The breech-bolt *E* carries the extractor *F*, retractor *L*, hammer *N*, main spring *O*, and indicator *Y*.

FIRING AND SAFETY MECHANISM.

The firing mechanism is operated as follows: If the rifle has been fired, the act of opening the finger-lever *A*, and thereby the breech-bolt *E*, rocks the retractor *L* by engagement with the sear pin *P*, and the hammer *N* (with the firing pin) is positively retracted and held back from the face of the breech-bolt *E*. The closing movement of the breech-bolt brings the hammer *N* in engagement with the face of the sear *K*, compressing the main spring *O*, and the rifle is fully cocked.

PREMATURE EXPLOSIONS ARE IMPOSSIBLE.

The firing mechanism can be placed in an uncocked position by holding back the trigger *R* while closing the finger-lever *A* The hammer *N* will in that case pass over, and not engage with the face of the sear *K*. This should always be done when laying the rifle aside, and the trigger should not be snapped when the chamber of the barrel is empty. The action can be locked by pushing forward the lock *V*, which locks the trigger and lever. The indicator *Y* shows the position of the firing mechanism

TO DISMOUNT THE RIFLE.

It will not be found necessary to dismount the *entire mechanism* for the purpose of cleaning the rifle. When the butt-stock is removed, most of the mechanism will be in plain view and can be oiled without further dismounting. If necessary the magazine mechanism can be removed independently of the other parts. To dismount—Remove the butt plate, the butt-stock screw and butt-stock; open the finger-lever to the fullest extent; remove the trigger spring-screw, trigger spring, bolt-stop screw and bolt-stop; remove the finger-lever, bushing screw, push out the finger-lever bushing; displace the finger-lever at the pivot joint; withdraw the breech-bolt; remove the trigger-pin, punching the same out from left to right; remove the sear screw; take out the sear and trigger; take out the finger-lever, remove the trigger and lever-lock; remove the fore-stock screw and fore-stock, unscrew the magazine spindle screw and remove it free from the receiver, remove the magazine carrier and magazine spindle, and then remove the automatic cut-off and spring.

TO DISMOUNT THE BREECH-BOLT

Remove the hammer bushing screw, pull out the hammer with the main spring, hammer indicator washer and bushing, turning the hammer to clear the indicator, punch out the firing pin securing pin, unscrew the firing pin and remove the retractor screw. Punch out the extractor pin from top to bottom; the extractor will then be free. Punch out the hammer indicator pin and the indicator will then be free. To separate the magazine spindle and the magazine carrier, pull the magazine spindle out of the magazine carrier; the magazine can then be removed.

Mr. Arthur Savage, the inventor, is seen in Figure 5, firing the Savage magazine rifle as a single loader with the following parts of the mechanism taken out:—Magazine carrier, magazine spindle, magazine spring, magazine spindle screw, automatic cut-off, automatic cut-off spring, retractor, retractor screw, trigger spring, trigger spring screw, bolt stop, bolt stop screw, trigger and lever lock. These parts constitute nearly one half the mechanism. The recoil is so slight that the rifle can be fired without the support of the fore and butt stocks.

FIGURE 5.

TO ASSEMBLE THE RIFLE.

Replace the parts in the reverse order from that given for dismounting, keeping in mind the following points;—Replace the automatic cut-off and the spring. Replace the magazine carrier, the magazine spindle, and the magazine spring together, and give tension to the magazine carrier by turning the spindle, with a screw-driver, from the right to left. Insert the spindle screw. Do not give too high a tension to the magazine spring, as it will make the loading of cartridges into the magazine unnecessarily hard. In replacing the retractor in the breech-bolt, be sure that the retractor is in retracting position, before replacing the hammer and breech-bolt. The model 1895 has a retractor spring. Owing to the increased pressure of smokeless powder, it has beed found impracticable to disconnect the barrel from the receiver to make a *take down*. All the strength possible is required at this junction. *Take downs* made on this principle very soon become loose, making the rifle useless. By removing the butt stock from the Savage rifle, as shown in Figure 6, the

FIGURE 6

arm can be packed in a trunk 33 inches long, inside measurement. To remove the butt stock, unscrew and remove the butt plate, loosen the stock screw, then quickly draw the stock back away from the receiver. By opening the

lever, the rifle is made shorter. Figure 7, illustrates a rear view of the magazine, empty and full, showing the position of the cartridges in the magazine.

EMPTY. FULL.

FIGURE 7.

The Savage military rifle has the same action as the sporting rifle, but is fitted with the usual military fore stock, bands and bayonet. The butt plate and sights are also of a military design, while the barrel is twenty-eight inches in length. This rifle embodies the following essential points of excellence, viz.: Safety, certainty of action, ease of manipulation, simplicity arising from few parts, less conditions required to load and operate the mechanism than any other magazine rifle, and great durability. The breech-bolt is in one piece strongly supported at both ends; the recoil is taken up directly in the rear and not at the side of the chamber. There are no projecting knobs, hammer or bolt handles to become entangled in straps and clothing; the rifle has a remarkably clear, smooth appearance, free from all protuberances.

The firing mechanism cannot be operated until the rifle is safely breeched up and locked; the firing pin is cammed back from the face of the breech-bolt in the first movement of the lever in unbreeching the rifle. Double loading or jamming of cartridges is impossible; shells are positively ejected, however slowly the mechanism is operated.

In loading, either as a single loader or magazine rifle, it is only necessary that the cartridges be placed down in the breech opening, heads to the rear. The act of placing the cartridge in the breech opening presses the automatic cut-off into its recess, thereby "cutting off" the cartridges in the magazine below. This automatic arrangement eliminates the necessity for a "cut-off" operated by the soldier, thus reducing the conditions for reserving the magazine cartridges.

If a soldier fails to place a cartridge in the breech opening, a cartridge will be fed up automatically from the magazine. The rifle can be alternately and automatically used as a single loading and as a magazine rifle. The extracting of empty shells is positive with the multiplied extracting power of over twelve to one; each empty shell is ejected from the rifle to the right before another cartridge can be loaded or fed up from the magazine.

A numerical indicator exposed through an opening in the frame always shows the number of cartridges contained in the magazine, and also shows

when the magazine is empty. Two movements only are required to extract and eject the fired shell, load, breech up and cock the firing mechanism, ready to fire. No special tools are required to dismount and assemble the action. The working mechanism is exposed to view by removing the butt stock. Dangerous pressures from compressed powders are avoided by holding all the magazine cartridges by their rims in a rotary sprocket, thus preventing the bullets from being pressed too far into the shells from the action of recoil.

Magazine cartridges can be safely removed from the rifle without cocking the firing mechanism. Cartridges are loaded into the magazine through the breech opening, thereby obviating any necessity for hinged trap doors, fillers or any coverings. Dangers arising from the use of high explosive powders in shells having defective heads or primers are wholly overcome by providing a solid steel breeching shoulder between the eyes and head of the operator and the chamber, making it impossible for the powder gas to escape to the rear.

The highly popular and reliable lever action is used in the Savage rifle. It enables the soldier to operate from the shoulder or aiming position; this action also permits of using the rifle in any position, either standing, sitting or lying prone. At Creedmoor the Savage rifle was placed in the hands of soldiers of the New York State guard who operated the rifle while lying prone, in competition with bolt action rifles, fully demonstrating the practicability of the Savage lever system for this position. A soldier can work a Savage rifle closer to the ground than he can under the same conditions a bolt action rifle. The lever guard on the Savage rifle and carbine makes it safe and reliable for the use of cavalry. It is impossible for bridle reins or straps to become entangled with trigger and thereby occasion accidents. The action of the lever is short and requires little power to operate, the arm being very quick and handy. The point blank military range is up to 600 yards.

In the matter of selection of improved fire arms for the National Guard of the State of New York, the Savage rifle was recommended by a Board appointed by Gov. Morton, who, however, argued economy as his reason for not making any change from the old black powder Springfield rifles. The late war with Spain has once for all demonstrated the folly of using single shot black powder rifles in modern warfare against smokeless magazine rifles. The Board referred to reported that the Savage magazine rifle, lever action, magazine holding five cartridges, in strength and fewness of parts, very close compliance with the "salient points" mentioned in the instructions for the consideration of the Board by the Adjutant General, ease of manipulation, and general all round excellence, won their unanimous approval it being the best military magazine rifle submitted for their examination. The Board also very critically examined a number of military magazine rifles of foreign invention, used in the Army in this Country and in Europe and were free to say that, all points carefully considered, the Savage magazine rifle was far superior in simplicity of construction, safety, durability, effectiveness, accuracy, beauty

of outline, ease and certainty of manipulation, and for the double and ready use as a single loader or as a magazine gun, to any foreign magazine arm inspected.

The perforations shown in Figure 8 were made by the .303 expanding bullet

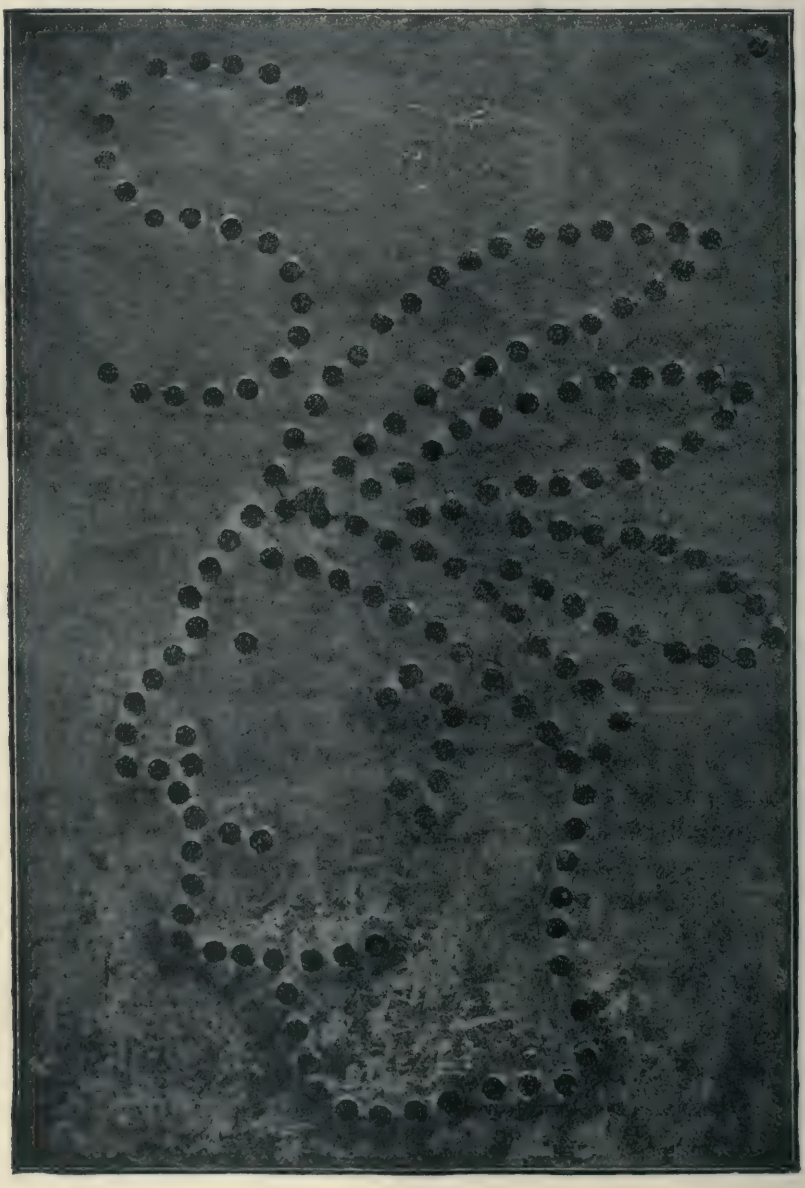


FIGURE 8.

and a regular charge of smokeless powder, fired from a Savage magazine rifle at a distance of thirty feet. The steel plate is $\frac{5}{16}$ inches thick. The holes are one half inch in diameter while the bullet is only .303 or about 30 caliber.

This is caused by the expanding of the bullet on the first impact. The penetration of the regular metal covered bullet in pine is about forty inches.

The largest game in the world, the royal Bengal tiger of India, the elephant and the rhinoceros of Central Africa, are now being successfully hunted and slain by men using the .303 caliber Savage rifles. Sportsmen who have never tried the small caliber rifles and smokeless-powder ammunition are somewhat skeptical as regards the killing or stopping power of the small metal-covered expanding bullets. These are far more deadly than black-powder ammunition, however large the caliber. The secret of the deadly effect of these small projectiles lies in their expanding qualities and extraordinary high velocity which imparts a percentage of their energy to the otherwise inert flesh and bone; and these substances, being acted upon by so quick a blow, become themselves projectiles, following a well known mechanical law, lacerating the surrounding tissues and bone, and leaving a path of destruction which is widened by resistance encountered by the bullet.

The conjunction of small caliber metal-covered bullet and the smokeless powder is necessary to secure high velocity. The high velocity resulting from the use of smokeless powder is only possible when confined by the small calibers. If a bullet is omitted from one of these cartridges and the primer struck, no explosion of the powder will occur. The small diameter of the bullet makes it necessary to lengthen the same, in order to secure sufficient weight.

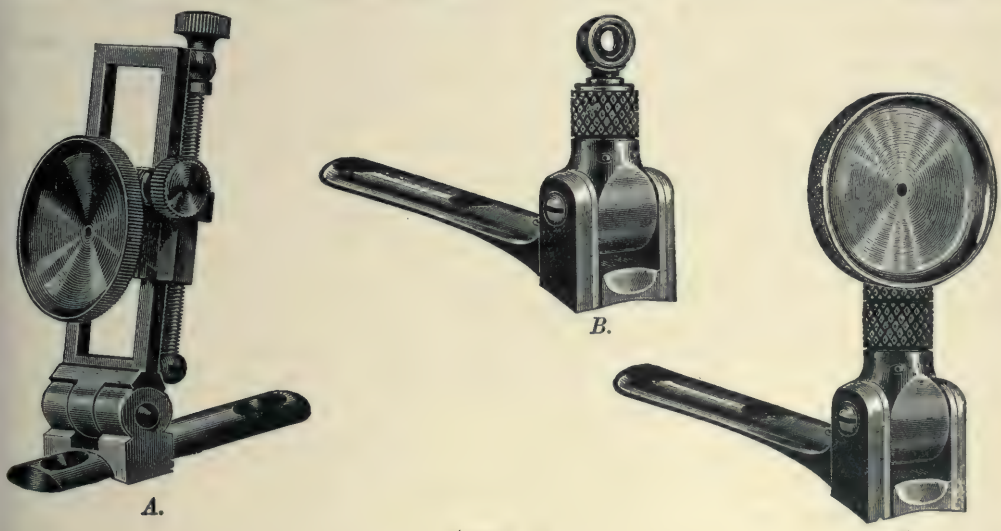


FIGURE 9.

The sharp pitch of the rifling, one turn in ten inches, is necessary to keep the point of the bullet end on and prevent key-holing. The rapid twist of the rifling and the great pressure of smokeless powder compels the use of some less yielding metal than lead, as a soft lead bullet would be blown directly out of the barrel; the bullet would strip. The body of the new bullet is formed of lead, covered with a metal jacket.

Sporting and target peep sights for the Savage .303 magazine rifle are shown in Figure 9. *A* is the Savage wind gauge peep sight; *B* is the Savage combination rear sight; and *C* is the Savage combination rear sight with cup disc.

FIGURE 10.

It can be used with or without the disc. The writer has made excellent targets with the Savage rifle using these sights and holds it in high favor. Figure 10 shows a target of 10 shots at 100 yards. Actual size bull's eye. Miniature lead bullet cartridge number 4.

A Mexican Board of Army officers selected by President Diaz, in 1897, reported most favorably on the Savage rifle. They reported it as one of voluntary repetition. In view of the number of shots made with the rifle without same being blocked in its mechanism or injured or broken in any way (the number of shots fired was about nine hundred), this Board reported it to have necessary strength and solidity, and on examination of the various parts of the weapon, found that these possessed the necessary resisting powers. The powder experiments proved satisfactory, the weapon resisting the charge, which was an excessive one, perfectly well.

The small .303 caliber expanding bullets, when they first appeared, excited some little derision among those who had always considered the large caliber bullet necessary to secure effective results. Their experience was only with black powder, and their deductions were correct, under those conditions. The immensely increased velocity imparted to these small .303 caliber bullets by modern smokeless powder is the secret of the enormous smashing power of the modern small caliber bullet. The soft nose of the expanding bullet expands on impact with the softest tissues, splitting the jacketed portion, deforming the whole bullet to such an extent that the wound made covers a larger area than ever before seen.

SCHOFIELD SMITH & WESSON REVOLVER.

This excellent arm, formerly largely used in the United States Army, is the Smith & Wesson revolver modified. The principal changes from the original Smith & Wesson revolver are in the extractor, the cylinder catch and the barrel catch. The barrel is joined to the frame by a joint screw. Under and behind the barrel projects the base pin upon which the cylinder revolves. This is kept in its place on its pivot by the inner hook of the cylinder-catch, and is held down by the cylinder-catch cam, the upper part of the middle portion of which is cut away and allows the catch to rise when the cam is turned to a certain position. See *Smith & Wesson Arms.*

SCHULHOF RIFLE.

The mechanism in this arm may be stopped and locked by a safety-bolt which is a sort of a swivel that may be turned into a notch in the operating lever below the frame. The manipulation of the arm is extremely simple. The magazine door is opened and the cartridges are either dropped in by hand or introduced by a charging-box. The magazine door having been closed, the cartridges may be fired in succession by operating the lever. Each time when the operating ring has been pulled back far enough to block the breech-bolt the finger meets the trigger protruding through the slit in the operating ring and the shot is fired. The magazine having been discharged, single fire may be kept up by dropping single cartridges into the top opening of the breech-case. For accurate shooting, the breech may be closed, putting the finger against the outside of the operating ring for pulling it back and then introducing the finger to pull the trigger for an accurately aimed shot.

SCOTT MAGAZINE GUN.

This breech-loading small arm has a fixed chamber closed by a movable barrel, which rotates about an axis parallel to the axis of the barrel. The gun is opened by cocking the hammer, releasing the barrel-catch, and allowing the barrel to revolve on an axis parallel to and beneath it, until the chamber comes opposite to the magazine. It swings aside the magazine lid as it passes over the mouth of the magazine, and is automatically loaded by the action of the magazine-spring. By reversing the action of the barrel, the barrel-catch springs into place and holds it shut. The gun has a sliding extractor moving in a spiral cam recess on the axis during the revolution of the barrel. There is no ejection—the shell readily drops out as the gun is opened.

SHARPS RIFLE.

This famous arm, which superseded the Hall rifle, belongs to that system in which a fixed chamber is closed by a bolt, by direct action, and in which the lock

is concealed. The receiver has a slot in its upper surface for the purpose of loading the chamber or filling the magazine. It is bored through at rear for the reception of the breech bolt, which is composed of two principal parts, viz.: the body and the locking-tube. The bolt is locked by lugs on the locking-tube, turning in corresponding cuts in the receiver. The bolt carries on its upper surface the extractor, which is of the ordinary spring-hook pattern, and in its axis the firing pin, which extends the whole length of the bolt. The spiral form of the face of the locking-tube, and of the shoulder of the bolt, is such as to cam the bolt up against the head of the cartridge when the bolt is locked.

On the rear face of the locking-tube are two spiral surfaces, which bear against corresponding surfaces of the firing-pin. When the handle is turned down to lock the bolt, the firing-pin spring is compressed between the shoulders on the pin, and nut on the extreme rear of the bolt. On withdrawing the nose of the sear, the firing-pin, under the influence of the spring moves forward and explodes the car-

tridge. The shell is ejected by the ejector-pin, which strikes against the lever of the carrier, when the bolt is withdrawn, and is driven forward against the lower side of the head of the shell, while the extractor is pulling on the upper. The firing-pin spring and rear of bolt are protected by a thin shell. The bolt is prevented from being drawn completely out of the receiver by the lever of the carrier and by a key striking on the upper surface of the extractor.

The magazine is in the tip-stock. When the breech-bolt is withdrawn the projection in which the ejector-pin is situated, strikes the lever of the carrier, tipping the latter up in a position oblique to the axis of the bore, bringing the point of the cartridge nearly opposite the center of the chamber. The carrier is held in this position by a pin and spring. When the bolt is closed the cartridge is driven in

the chamber, while a projection on the bolt strikes the lever, causing the front of the carrier to descend opposite the mouth of the magazine to receive another cartridge. The carrier is of such thickness at its front as not to uncover the magazine tube completely when the former rises. Cartridges are thus prevented from

escaping from the magazine except when the carrier is in position to receive them.

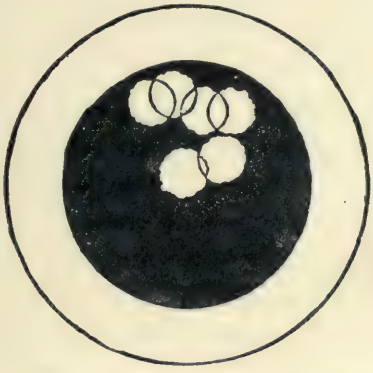
No magazine cut-off is applied to this gun; consequently it can only be used as a single loader when the magazine is empty.

As a magazine gun, three motions are necessary to operate it, viz., opened,

closed, fired. As a single loader, four motions are necessary, viz., opened, loaded, closed, fired.

SHARPS-BORCHARDT RIFLE.

Perhaps this was the most remarkable rifle of its time; it certainly did more to popularize rifles than ony other invention that had preceded it. The barrel is firmly secured to the stock, and the breech is closed by a vertical sliding breech-block, similar to that employed in the Hotchkiss quick-firing guns of to-day. The cartridge was made of cloth, having the end nearest to the breech-block closed by tissue paper, which was saturated with nitrate of potash. In some of the early types of this arm, the breech-block was made to cut off the end of the cartridge



and expose the powder on being closed. One of the principal advantages of this arm over others was that a supply of percussion caps was placed in the magazine, held in position by a spiral spring, and arranged in such a manner that the action of the breech placed a fresh cap on the nipple by the act of opening the breech.

The lever for working the breech formed a part of the trigger guard. The accuracy of this arm was very much superior to any other rifle of its time. The celebrated John Brown, of Osawatomie and Harper's Ferry notoriety, employed this form of rifle with great effect against the border ruffians of Missouri. The Sharps "Old Reliable" had an outside hammer. The Sharps-Borchardt was hammerless. Both used metallic cartridges in the later models.

SHARPS-HANKINS RIFLE.

This breech-loading, .50 caliber arm was largely used by the cavalry during the Civil War, and was afterwards issued to the Indians for sporting purposes. The barrel is 24 inches long and takes the rim-fire cartridge. It has the sliding action. Pressing down the lever releases the barrel, sliding it forward on the gun frame removes the empty shells, leaving the gun open to recive the new cartridge.

SHATTUCK GUNS.

The Shattuck single shotgun has been before the public for more than twenty years and still retains its high standard of excellence. It has the re-enforced breech, "Pieper's System," the barrel passing through a sleeve on which is the lug for locking barrel with frame, the whole being one solid piece of metal, thereby doing away with all brazing or soldering. The bolt or catch that engages with the lug on the barrel, consists of but one piece, making it a very simple and strong fastening. In unlocking and opening the gun it simultaneously unlocks the barrel from the frame and throws the hammer back so the trigger enters the safety or half-cock notch. Many prefer this to the rebounding lock, as the same result is obtained by a positive motion instead of a spring for throwing the hammer back to the safety notch. It is made in four sizes, 8, 10, 12 and 16 gauge, and is recommended when close, hard shooting is required.

A recent model is provided with a rebounding hammer. A simple device is provided for throwing the hammer into the safety notch after discharging the gun. This device is operated by the trigger, thereby doing away with a rebounding spring used in most guns, to perform this operation; without this spring it allows full force of the main spring to strike the firing pin, which removes in a great measure the danger of the gun missing fire. The gun is symmetrical in appearance and is the only single top lever gun having a double bolt, which is considered so essential in modern gun-making. The hammer being in the center is in direct line with firing, again lessening the chances for missing fire.

Mr. Shattuck has recently placed upon the market a very excellent double, hammerless gun, embracing many new and valuable features. The workmanship is clean and thorough and sportsmen highly praise its many good points.

SIMMONS GUNS.

The Simmons Hardware Company, of St. Louis, stand alone in the manufacture and control some of the finest and most satisfactory cheap guns now used. They are generally well indorsed by sportsmen. They are practically

Figure 1.

American made, although some of the parts are imported. Figure 1 shows the New Era, 12 gauge, 30 and 32-inch barrels; weight 7 to 8 1-4 pounds. This nitro hammerless gun is beautifully constructed and has an automatic ejector. Figure 2 shows a single barrel breech-loading shotgun, known as the Nitro

Figure 2.

Marvel. It is adapted for nitro powder machine-loaded shells. It has top snap, rebounding hammer, heavy reinforced breech and is choke bored. It is made in 12, 16 and 20-gauge, 30-inch barrel, and weighs 6 3-4 pounds. Fig. 3 shows

another excellent single barrel breech-loading gun for nitro powder. It bears the trade mark, "Western Arms Co.," is made in 12 and 16 gauge, barrels 30, 32

FIGURE 3.

and 34 inches in length, and weighs 6½ to 6¾ pounds. Figure 4 shows the Young America, single shot, with an automatic ejector and rebounding hammer. It is

FIGURE 4.

made in 12 gauge, with 30-inch barrel, and weighs 6¾ pounds. The Klean Killer Pigeon Gun is shown in Figure 5. It has snap rebounding hammer, is heavily

FIGURE 5.

reinforced at the breech and is choke bored. It is made in 12 and 16 gauge, with 30-inch barrel, and weighs 6¾ pounds. It is adapted for nitro powder machine-loaded shells.

SLEEPER RIFLE.

This breech-loading arm has a fixed chamber and a peculiar breech mechanism. It is opened by pressing an eccentric lever on the right side of the butt-stock, and thus throwing out the spring-butt-plate, so as to release the rear end of the chamber-lever, and to allow it to be then thrown down by the spring included between it and the stock. By closing the chamber-lever until its rearmost end engages with the butt-plate, the forward end catches the cartridge, as would be done by a pair of tongs.

SMITH GUNS.

The L. C. Smith hammerless gun, shown in Figure 1, has a new mechanical movement for cocking tumblers or strikers, which is different from any device that has ever been used for the purpose, and commends itself for simplicity, reliability and ease of manipulation. The simplicity and compactness of this device allows the use of a frame of the same dimensions as is used in the best proportioned hammer guns, and have ample strength in the angle frame. The bolting, joint check, and extractor mechanism are identical with the hammer gun, and stand without a rival for strength and durability. The cocking mechanism is composed of but two pieces, with no springs, pins or screws. The safety is simple and positive, and may be used as automatic or independent.

Figure 1.

The automatic ejector is a feature much appreciated by American sportsmen. This mechanism is the simplest possible. The main-springs being the ejecting force, it requires no more power to open the gun than an ordinary hammerless. The drawing, Figure 2 (partly in section), with the left-hand lock removed, shows the cocking and safety mechanism, also the automatic ejector mechanism. This ejector mechanism is composed of a pair of tumblers located in the forend

which bear upon the wrist-pins of the crank-shaft, both tumblers being locked by a single sear until the breech end of the barrels is raised above the frame, when

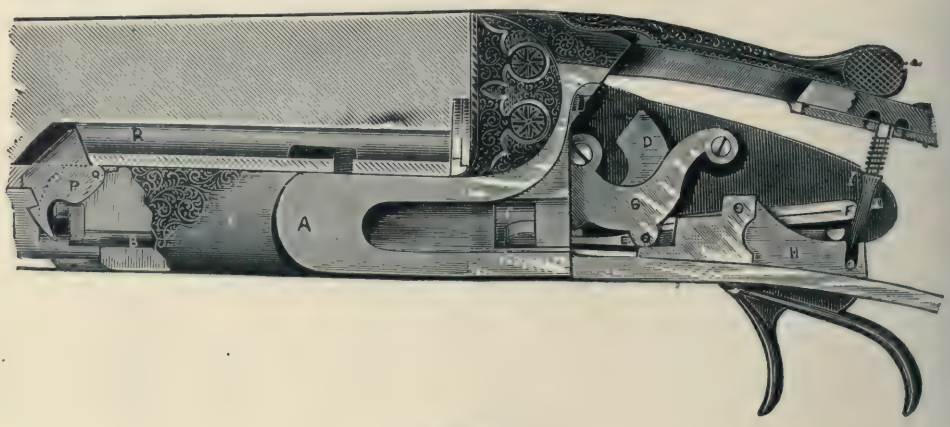


Figure 2.

the sear is pushed out of engagement with the tumblers, and the lock or locks which have been snapped operate their respective tumblers and expel the fired case or cases.

Always ready to anticipate the wants of sportsmen, the Hunter Arms Company have produced a new grade of this gun known as the *pigeon gun.* In this grade great strength and durability are combined with perfect fittings and unsurpassed finish. The new *nitro* steel barrels are pronounced by all sportsmen as being a decided step in advance. They are harder than a Damascus, also stronger, and have become very popular. They are thick both at breech and muzzle, and are specially adapted to stand the tremendous strain of many heavy loads of nitro powder. The combined automatic and independent safety found in this gun is excellent. In an instant a shooter by a motion of the thumb can change from automatic to independent, or *vice versa.* Thus the gun at the trap or in the bough-house can be fired all day without moving safety-slide, and in the field can be used with automatic, which locks triggers when the gun is opened for loading. The gun is distinctively a top-action gun, bolted or locked at as great a distance as is practical from the hinge-joint, to utilize the advantage of a long leverage, thus reducing the strain on the bolting mechanism to the lowest possible minimum. The rotary-bolt is made from one solid piece of steel, and is provided with a strong forward arm which passes completely through the mortise in the extension of the rib and under the solid metal of the frame three-sixteenths of an inch, which, together with the backward flange passing through the slot in the end of the extension, makes the strongest possible fastening.

SMITH AND WESSON ARMS.

These Arms, so long and favorably known, have now reached perfection. The Automatic Shell Extractor, Figure 1, is the first attractive feature. The exploded shells are ejected from the cylinder by the simple motion of opening the arm, which is then in position for loading. All the chambers of the cylinder being exposed at once, the process of loading is greatly facilitated. All models are furnished with interchangeable long and short barrels, for target and pocket use respectively. The manipulation of the Arm is extremely simple.

To load. — Half cock the Arm, raise the barrel catch to its full height, and tip the barrel forward as far as it will go. Place the charges in the chambers and return the barrel to its place, being sure to have the barrel catch down to its place when the Arm is ready for use.

Figure 1.

To eject the empty cartridge cases. — Grasp the barrel catch with the thumb and forefinger of the left hand, holding the breech of the barrel and cylinder downward, and with the right hand carry forward the lock frame and stock of the Arm until the ejector returns to its place, when the Arm is in condition to reload.

In the safety hammerless revolvers, the barrel catch is arranged to be operated by the thumb of the right hand.

To remove an exploded shell. — Open the Arm sufficiently to start the cartridges out a little, then close it again sufficiently to allow the ejector to return to its place; remove the exploded shell, and press the other charges home; close again, and the Arm is ready for use.

To remove the cylinder and extractor. — Open the Arm until the extractor protrudes about half way, release the cylinder and give it two turns to the left.

In the single and double action models, the cylinder is released by raising the barrel catch, and in the safety hammerless models, by pressing with the thumb of the left hand upon the cylinder catch in the barrel strap.

To replace the cylinder and ejector. — Open the Arm to its full capacity. Raise the barrel catch, *press* the cylinder forward upon the base pin and give it two turns to the *right.*

While carrying the revolver fully charged, allow the hammer to rest in the *safety catch.* After the first discharge, allow the hammer to rest on the *exploded cartridge* until the next discharge, and so on until all are fired. In such revolvers as have the rebounding lock, these latter precautions are unnecessary; as, by the action of the lock, which is automatic, the hammer will always be kept in the safety catch, and the revolver be secured from accidental discharge.

The great number of accidents recorded during past years, in the use and handling of the revolver, has made it evident that some decided change in this arm, by which these accidents shall be avoided, is not only desirable but necessary. To this end much time and thought has been expended, but not until quite recently has the object sought after been fully attained in the perfection of the Hammerless Safety revolver. Figure 2.

Figure 2.

It is well known to all familiar with the subject, that a very large proportion of the accidents with revolvers arises from some unintentional manipulation of the hammer. Either it receives a blow, is allowed to slip off the thumb in cocking, is accidently caught on some foreign object and partially raised, or is unintentionally left at full cock. The only other and a fruitful source of accident is the unintentional manipulation of the trigger. In the new hammerless safety revolver all these liabilities to accidents are made impossibilities first, by placing the hammer of the arm entirely within the lock frame so that no external force whatever can be applied to it, and second, by so arranging the trigger that it cannot be pulled except at the instant of deliberate firing, and only by this means. One very important feature of this arrangement is the safety of the arm in the hands of children, as no ordinary child can possibly discharge it. The new arm is also provided with a rebounding lock as an additional source of safety and protection. One of these revolvers may be carried with as little danger of injury to the person carrying it as if it were a block of wood, and yet it possesses in a high degree all the essential qualities of a

weapon of defense, or an arm for target practice. As a weapon of defense it has the advantage, on account of the hammerless feature, of being readily drawn from the pocket. As to weight and general appearance, the hammerless safety revolver is but one-half ounce heavier than the double action model of the same caliber, and fully as handsome in appearance. In addition to the above described elements of safety, this revolver has the automatic ejector as applied to all of the former models, and in short possesses every desirable quality of the well-known Smith & Wesson revolvers. Since their introduction in 1887, fully 300,000 have been placed on the market, and up to the present time, not a single accident in their use has been recorded. Figure 2 shows the 38 hammerless safety, model 1898. The hammer concealed within the lock frame and operated by the trigger, as in any self acting arm, is constantly locked by a safety latch, which is held in position by a spring. When held in the hand for firing, the natural press-

Figure 3.

ure upon the safety lever in the action of pulling the trigger raises the safety latch and releases the hammer. The safety lever and trigger must act in unison, and to discharge this arm in any but the proper manner is an impossibility.

The 32-44 target model shown in Figure 3, is single action, center fire. It is six shot, weighs 2 pounds 11 ounces and has a barrel 6½ inches long. The 38 caliber single action models 1880 and1891 have rebounding locks, are five shot, weigh 16 ounces and have barrels 3¼, 4, 5 or 6 inches in length. The 38-44 target model is six shot, weighs 2 pounds 9 ounces and has a barrel 6½ inches long. The 44 single action, Russian model, is six shot, weighs 2½ pounds, with barrels 4, 5, 6 and 6½ inches in length and has a rebounding lock.

The 32 double action has automatic shell extractor, is central fire, five shot, weighs 13 ounces and has barrels 3, 3½ and 6 inches in length. The *hand ejecting* 32 double ac-

tion model 1896 is shown in Figure 4. The action is very clearly seen. This arm is six shot, weighs 19 ounces and has barrels 3¼, 4¼ or 6 inches in length. It has a solid frame, swing out cylinder and rebounding lock. The 38 double action is five shot, weighs

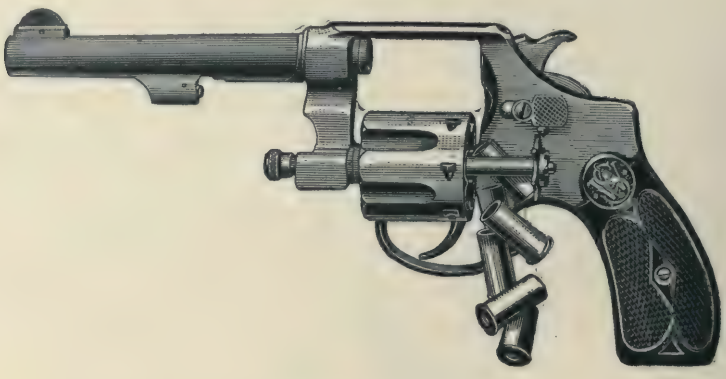


Figure 4.

18 ounces and has barrels 3¼, 4, 5 or 6 inches in length. The 44 double action, Russian and Frontier models, are six shot, weigh 2 pounds and 3 ounces and have barrels 4, 5, 6 and 6½ inches in length. The Frontier model is shown in Figure 5. The 44 Winchester model 1873 cartridge is adapted to this arm.

Figure 5.

The Smith and Wesson *single shot* target pistol, shown in Figure 6, has the automatic shell extractor, rebounding lock and the adjustable target sight. The following are its weights and calibers:

With	6	in.	Barrel,	32	Cal.,	1	lb.	3¼ oz.
"	6	"	"	38	"	1	"	2¾ "
"	6	"	"	22	"	1	"	4¾ "
"	8	"	"	32	"	1	"	4¾ "
"	8	"	"	38	"	1	"	4¼ "
"	8	"	"	22	"	1	"	6½ "
"	10	"	"	32	"	1	"	6 "
"	10	"	"	38	"	1	"	5½ "
"	10	"	"	22	"	1	"	8¾ "

The lock frame of this pistol is identical with that of the S. & W. 38 single action,

Figure 6.

model 1891 revolver, and the barrels and stocks of the two arms are interchangeable.

The .22 hand ejector, Model 1902, is shown in Figure 7. It is designed to meet the demand for an accurate and reliable .22 caliber revolver. The ammu-

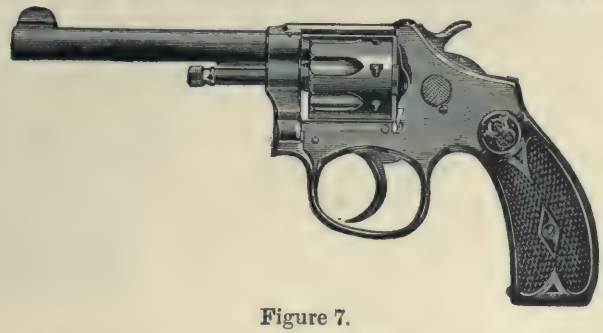


Figure 7.

nition best adapted for this arm is the .22 S. & W., which is practically the popular .22 long rifle cartridge, slightly crimped and strengthened to meet the special requirements. Regular .22 short cartridges may also be used.

The new Military .38 Model 1899 shown in Figure 8 is a strictly military arm, built to stand hard service, and is adapted for use in police departments where

the ordinary pocket revolver is not sufficiently powerful. It is solid frame, swing-out cylinder, double action and six shot. The lengths of barrels and weights are: 4 in., 1 lb. 13¼ oz.; 5-in., 1 lb. 14 oz.; 6½-in., 1 lb. 15¼ oz. The ammunition adapted to this arm is the .38 Smith & Wesson Special, United States Service cartridge (listed as .38 Long Colt), and the .32 Winchester repeating rifle cartridge. The .38 Smith & Wesson

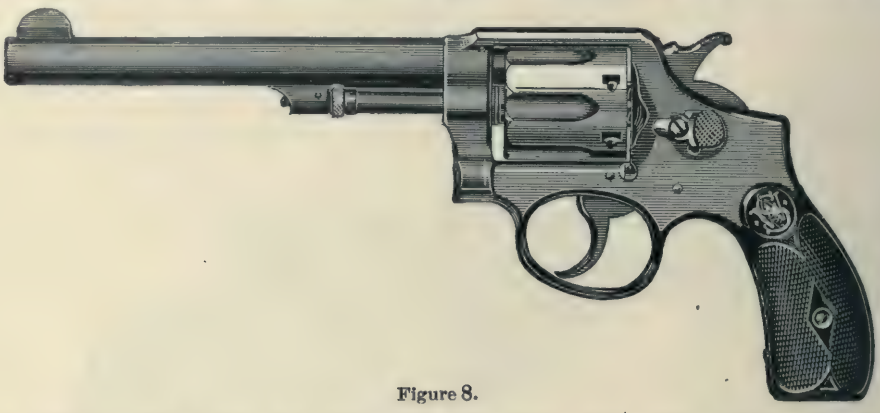


Figure 8.

Special contains 21½ grains of powder, and 158 grain solid base bullet. Penetration, 8½ ⅞-in. pine boards. This is a very powerful charge and extremely accurate. Gallery charge, 6 grains of powder and 70 grain round ball, loaded in the same shell. The Regular .38 United Service cartridge (listed as .38 Long Colt), is very accurate but not so powerful as the Special. It contains 18 grains of powder and 150 grain hollow base bullet. Penetration, 6½ ⅞in. pine boards.

The Smith & Wesson Bicycle model, shown in Figure 9, has all the advantages of

Figure 9.

the safety hammerless revolvers and cannot be accidentally discharged. Its light weight and convenient size make it an ideal arm for wheelmen. It is five shot. The ammunition adapted to this arm is the .32 Smith & Wesson, containing 10 grains of powder and 88 grain grooved or self lubricating bullet. The length of barrel is 2-in.; weight, 14 oz.

The Smith & Wesson New Military Revolver has many claims for superiority. The Government tests praise it highly. In double action revolvers, notches made in the soft steel of the cylinder, without being reinforced, would soon wear and spread so as to seriously impair the alignment and result in shaved bullets, which is fatal to accuracy. To overcome this wear and spread, a tempered tool steel pin is inserted into the side of the notch which comes in contact with the stop when the motion of the cylinder is checked. The stop is very strong, and is central under the cylinder. The hand which revolves the cylinder has nothing to do with holding it. All such arrangements simply force the cylinder out of line.

Another feature is the tempered tool-steel bosses, or collars, fitted into the frame, which, in connection with the raised collars of the lock-studs, keep the working parts central and reduce the friction to a minimum. These lock-studs are not merely pins driven into the frame but are made with large collars and screwed into the frame up to the collar, and stock of frame is compressed around them securely fastening them in place. The locking-pin works through a tempered tool-steel collar, fitted into the extractor, and locks into a tempered tool-steel collar fitted into the frame. The cylinder is now locked both front and rear, the locking pins in front and rear being operated by the same thumb-piece in frame. This front lock is most valuable for maintaining alignment. The collar in the extractor is slightly raised above the ratchet teeth and impinges upon the collar in the frame, thus preventing the ratchet teeth from coming in contact with the frame, and saving the cylinder from longitudinal wear and loosening. All these tempered tool-steel bushings, collars, etc., while preventing wear, reducing friction, keeping the alignment, etc., have an additional merit for a military arm that is not often taken into consideration. Being smooth and hard they are less liable to get badly rusted, and if badly rusted, being small, are not so liable to get stuck. For the same reasons dust and other dirt have little effect upon them. The expansion by heat by the most rapid firing possible is not noticeable, one thousand service cartridges having been fired from one of these revolvers in 46 minutes.

The loose hammer nose is a valuable feature, much more so than one would suppose at first glance. It is so arranged that its blow is in direct line with the cartridge, thus preventing the weakening of the top part of the primer, as is always the case with the raking blow of the ordinary solid hammer nose. Being loose, this nose permits the use of an aperture the exact size of the nose, and if a primer punctures, as they sometimes do, it cannot block the cylinder by filling in the aperture, as the aperture is completely filled by the nose of the hammer. With the solid nose, the primer is weakened at the top, and it is the top part of the aperture that is open. This is also a very strong hammer nose, and instead of breaking under severe strain, being loose, it will give enough to relieve the shock.

In this revolver the barrel is screwed into place, brought to perfect alignment by multiplying gauges, and pinned into position. This is a radical improvement over the method of screwing the barrel against the frame and depending upon the friction to hold the barrel in its proper place. The cylinder is so chambered that the bullet on leaving the mouth of the shell completely fills the end of the cylinder, thus preventing the gas from passing the bullet, or the bullet tipping and entering the barrel more or less sidewise. The barrel is of proper caliber, so that hollow base bullets are not necessary, as in those reveolvers where there is no positive cylinder stop. The cylinder is freed out under the extractor to keep any dirt which may accumulate from preventing the return of the extractor to its proper place. The yoke is also freed out so that it will close nicely with considerable dirt in the joint.

Many times a mounted officer or sportsman finds it necessary to load with one hand. The little device for preventing the cylinder from swinging loosely, and holding it in open position for loading, will be greatly appreciated at such times.

The ammunition for this arm is the regular .38 U. S. Service cartridge (listed as the .38 long Colt), containing 18 grains of black powder, or its equivalent in smokeless, and a 150-grain hollow base bullet.

This revolver is also chambered for the .38 Smith & Wesson Special cartridge which contains 21 1-2 grains of black powder and a solid base bullet weighing 158 grains. This cartridge is more accurate than the service charge and about 30 per cent. more powerful. The revolver is also bored for the .32-20 Winchester repeating rifle cartridge. This is a powerful and accurate cartridge, containing 20 grains of black powder and 115 grains of lead.

SMOOT GUN.

This breech-loading rifle has a fixed chamber, closed by a movable breech-block, which rotates about a horizontal axis at 90 degrees to the axis of the barrel, lying above the axis of the barrel and in rear being moved from above. The piece is opened by cocking the hammer and drawing back the thumb piece of the cam-lever. A projecting stud on the cam-lever playing in the cam recess of the breech-block draws it down into the position of loading. By simply reversing the movement of the cam-lever, the stud will act on the other side of the cam-recess and throw up the block until it is met and stopped by the front shoulder of the cam-lever striking against a corresponding shoulder near the front of the block. The motions of loading and closing may be combined by striking the thumb-piece with the palm of the right hand as the cartridge is passed into the chamber. The piece is then locked by the position of the breech-block and also its friction against the head of the cartridge when it is fired, by means of a double main-spring center-

lock of the most usual pattern. Extraction is accomplished by means of a sliding extractor, a stud on the inside of which plays in a cam-recess on the outer side of the cam-lever. After passing a certain point in opening the piece, the direct pull on the extractor ceases and the ejection is secured by the acceleration which is impressed on the extractor by the action of the ejector-spring on a cam formed on the lower surface of the ejector-lever. The upper end of which lever, striking a shoulder on the extractor, throws it into a groove connected with the cam-recess, driving the shell up the inclined surface of the breech-block until it is clear of the gun.

SPENCER RIFLE.

This arm is both a magazine and a single breech loader, seven cartridges being placed in a magazine in the butt which are thrown forward into the chamber as required. The breech-block is a sector pivoted beneath the level of the barrel, and retreating backward and downward, it exposes the rear of the bore for the insertion of the cartridge. The trigger guard forms the lever for moving the breech-block. This is probably the first magazine rifle that ever had an extensive use as a military arm. A large number of these rifles were issued to the northern troops in 1863 and 1864.

The action of this arm is very simple. When the chamber is closed, the point of the foremost cartridge rests against the carrier-block. When it is opened, which is done by depressing the lever-guard, this cartridge is pushed forward. By raising the lever-guard the cartridge is carried around and pushed into the mouth of the chamber which is firmly closed by the breech-block. The extractor is a flat lever, attached to the left side of the carrier-block, and withdraws the empty case by pressing against the under side of the rim. Another small lever, called the guide, falls into the space occupied by the carrier-block, and forms an inclined plane, up which plane the empty case moves to clear the piece. A key has been introduced into this arm, by which the supply of cartridges can be cut off or let on at pleasure, and enables the soldier to reserve all the cartridges in the magazine for an emergency. When the magazine is locked, the piece can be loaded directly from the cartridge-box, as a simple breech-loader. The operation of this key is simply to prevent the carrier-block from falling so far as to uncover the magazine; at the same time it falls far enough to uncover the chamber for the insertion of a cartridge by hand.

SPENCER-LEE MAGAZINE GUN.

In this arm, the breech-block is supported against the pressure of the gas, when the piece is fired, by a recoil block, solid with the guard, which has a circular recess concentric with the rear of the breech-block. The latter is slipped in the re-

cess sideways and has, when assembled, a motion of rotation in a vertical plane. The recoil block is in turn supported by the rear of the receiver. The trigger and the hammer are pivoted in the guard-plate, the nose of the former or the sear being held in position in the notch of the latter by the sear-spring. The main-spring is connected with the hammer and the under rear of the breech-block by swivels. When the trigger is pulled the head of the firing-pin is struck by the upper end of the hammer. The breech-block is operated by a cam-pin, with friction roller on the inside of the rear end on the left of two sliding bars, connected by the hand-grasp. The cam-pin travels in the groove on the left side of the breech-block, which also has a frog or switch, pivoted near its rear. When the cam-pin enters the groove, as it does when the forked side is forced to the rear, it rolls over the incline of the frog. The pin cannot rise, since the bars of the slide travel in grooves on the inside of the receiver. Hence, the frog must be pressed downward, and its point in turn, pressing on the bottom of the groove in the block, compels the latter to descend. When the pin passes out of the groove to the rear, the front of the breech-block would rise above the receiver under the pressure of the mainspring, if not held down by the extractor, as explained later on. When the slide is returned to its first position, the cam-pin travels on the lower side of the groove, the frog turnig freely about its pivot, and the front of the block is forced to descend to the level of the chamber. The piece is cocked in the act of opening the breech-block by the cam-pin coming in contact with the hammer and pressing it back until the nose of the sear enters the notch. At the front of the breech-block is a movable face or head, which is forced against the base of the cartridge during the closing of the breech. On the opening of the latter the head drops away, and thus facilitates extraction of the shells.

The magazine is known as the Lee, with very slight modification. It is attached to the under side of the breech-block, and rises and falls within. The breech-block is recessed on its under side sufficiently to receive a single cartridge. When this cartridge is drawn forward into the chamber, another from the magazine takes its right place in the block. It will be seen that the complete backward motion on the slide causes the block to descend, the shell to be pushed out on its upper surface, and then the block to fly up and eject the empty shell; the forward motion then carries a cartridge from the magazine into the chamber and causes the block to descend to its proper position in rear of it. A cut-off may be so turned as to limit the backward motion of the side, thus preventing the extractor passing beyond the shoulder. The block then cannot rise and bring the cartridges from the magazine opposite the chamber. The piece may then consequently be used as a single loader. When the cut-off is turned vertically downward, the piece may be used as a magazine gun. If turned upward to its farthest extent, a small pin, on

its under side, will enter a notch in the slide and lock it, and therefore the breech-block. Three motions are necessary to operate this piece as a magazine gun, viz., the movement of the slide to the rear, to the front, and the pulling of the trigger.

SPENCER-ROPER SHOTGUN.

This repeating shotgun is the joint production of Messrs. C. M. Spencer and Sylvester H. Roper. The distinctive feature of the arm, as now manufactured by Mr. Francis Bannerman, of New York City, is that the left hand is available for something more than a support to the barrel and as a regulator of the aim; but retaining these functions, becomes an essential factor of the system, relieving its neighbor of a large portion of its duties while itself actuating the retaining processes. The original model developing Messrs. Spencer and Roper's idea, carried 11 cartridges, which could be discharged at "will" in 4 seconds. The model, as recently perfected, has a capacity of 6 cartridges (experience having demonstrated that to be the suitable number for use and the best working of the piece), of which 5 are held in the tubular magazine beneath the barrel and 1 placed in the

chamber. The gun has no fore-arm, or tip, of wood; but about 6 inches in front of the frame embracing the magazine, and well insulated from the possibly heated barrel, is placed a bulge, of the same material as the stock or of hard rubber, termed the hand-rest, which connects with the flat side-bars or switches, occupying the interval between the barrel and the magazine. The manipulation of the gun is exceedingly simple. When once the magazine is filled, the piece is brought to the shoulder, and the fingers of the right hand in position about the trigger-guard, while the left hand grasps the hand-rest and poises the piece. A backward and forward movement of the hand-rest throws a cartridge into the carrier-block, cocks the hammer, projects the charge into the gun, and the trigger is pulled. The rapidity of emptying the magazine being limited only by the natural dexterity and experience of the operator.

The features of the late 1900 model are shown in the drawing. Double ex-

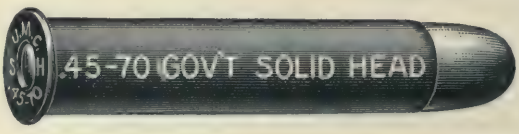
tractors grip the cartridge shell on each side, making it almost impossible for nitro powder to expand the cartridge shell in the chamber of the gun. The magazine on the model 1890 gun caused some inconvenience in taking the gun apart, owing to the spring and follower being detached. In this new model the spring and follower are fixed permanently in the magazine. The "Take Down" features consist of two thumb latches—one on the magazine screw, and the other on the screw that holds the barrel when in place. It is only necessary to turn these two latches in order to take out the magazine and unscrew the barrel.

SPORER GUN.

In this magazine gun, the magazine reservoir, holding five cartridges, is in the butt-stock, and from it through a tube the cartridges pass into the receiver. A cut-off permits the magazine to be held in reserve during single-loading fire.

SPRINGFIELD RIFLE.

This arm operates in a similar manner to the old English Snider. The breech-block is pivoted to the barrel, and moves upward and forward, leaving an opening sufficiently large to enable the cartridge to be inserted in the barrel with facility. The breech-block may then be returned into firing position, and the arm fired. A lock with an ordinary hammer is employed. This arm has been very extensively used in the United States Army. Caliber, 45; charge, 70 grains black; bullet, 405



grains. Eighty grains was the limit powder charge that could be used, as the cam latch worked loose with a greater charge. The first model had a bullet of 500 grains weight, and as a consequence kicked terribly. The barrel is of low steel. Its length is 32.6 inches; the thickness of metal at the breech is 0.297 inch; from this point it gradually diminishes (the exterior element being a slightly re-entering

curve), to the muzzle where it is 0.14 inch. The rifling consists of three plain concentric grooves, 0.235 inch wide, equal in width to the lands, 0.005 inch deep, with a uniform twist of one turn in twenty-two inches. The grooves start from the center of the throat; the bottom of them is, therefore, not continuous with the

surface of the chamber. The chamber extends 2.155 inch from the base of the bore, and is made slightly conical so as to facilitate the withdrawal of the cartridge

case. At the mouth of the chamber a *counter-bore* is cut for the head of the cartridge, and a slot is cut in the barrel for the reception of the ejector.

For all around work, the author highly approves an 8-pound model of the Springfield, designed for officers. The length of this barrel is 26 inches. The stock is checked "fore and aft" the breech, and is tipped with white metal. The rifle has a plain "buck-horn" sight on the barrel, graduated like the service-sight, and also has peep and globe sights. The globe-sight can be folded down on the barrel when its pin becomes an open front-sight, which is used with the buck-horn sight. The peep has a lateral as well as a vertical motion, and by turning the screw and loosening it, may be adjusted to counteract any deviation to the right or left. When at the bottom of the slide, the peep is adjusted for a range of 50 yards; when at the top it is adjusted for a range of 1,100 yards. The peep-sight may be folded down on the barrel either forward or backward. In the former position, the peep should be pushed to the bottom of the slide, or the hammer, in being cocked, will strike it. The globe-sight is distant from the buck-horn and peep-sights 20.8 inches and 32.75 inches, respectively. The rifle has a "single-set" trigger. When set, it is a hair-trigger; when unset, it is the ordinary service-trigger, requiring a pull of about 4 pounds.

SPRINGFIELD-ALLIN RIFLE.

This arm is a modification of the Springfield rifle. The cam-latch and thumb-piece are in one piece insead of being riveted together as in the 1870 model. It is fired by a center-lock, the main spring of which lies under the receiver, being dovetailed into it at its forward end. The firing-pin screw is replaced by a stop-pin, which is kept in place by the breech-block cap. In another model the lock-plate is of uniform thickness, about one-half that of the 1870 model, the main-spring bolster being replaced by a screw. The shape of the hammer and of the surrounding parts are changed, so as to promote economy of manufacture and ease of manipulation.

SPRINGFIELD-JONES MAGAZINE GUN.

This arm is known as the Springfield 1870 model, with alterations and additions

as follows: The firing-pin guard has been removed, and the outer end of the thumb-piece slotted in the direction of the axis of the barrel. This slot receives one end of a lever, which is secured by a pin about which it may turn in a direction toward the under side of the thumb-piece. A flat spring lying in a groove in the upper surface of the thumb-piece—to which it is secured by a screw, bearing on a flat and against a shoulder on the upper extremity of the lever, returns it to position and limits its motion in the reverse direction. An arm, securely attached by the tumbler-screw to the hammer, on which a shoulder has been cut to prevent rotation, bears against the lower end of the lever and raises the thumb-piece when the hammer is brought to the half or full-cock, and thus unlocks the breech-block. A piston, pivoted to the left side of the breech-block, is surrounded by a spiral spring, the rear end of which finds a bearing on a metal plate attached to the left-hand side of the stock, the front of which is bent at right angles to the receiver. A hole through the plate admits the rear end of the piston. When the breech-block is unlocked by the cocking of the hammer the spiral spring throws up the block and extracts the empty shell. The well of the receiver has been deepened at the rear, and the lower part of the breech-pin cut away to form a channel through which the cartridges may feed from the magazine, which is in the butt-stock.

SPRINGFIELD-STILLMAN RIFLE.

In this modified Springfield rifle, the lock is set in a prolongation of the tang of the breech-screw, and is altered mainly from the Sharps lock. The firing-pin screw is replaced by a stop-pin kept in place by the breech-block cap. In a later model, the shape of the ejector-stud is modified, and a lining inserted into the receiver, with the intention of facilitating the introduction of the cartridges.

STARR RIFLE.

An old breech-loading arm, using linen cartridges and fired with percussion caps. After considerable use in government service, several thousand of these guns were issued to the various Indian tribes for sporting purposes. They are now seldom seen. The caliber was .54.

STETSON MAGAZINE GUN.

This rifle has a fixed chamber, closed by a movable breech-block, which slides in the line of the barrel by indirect action, being moved by levers from below. The arm resembles, externally, in its operation, and in many of its features, the Winchester. It is locked in the act of closing the lever-guard, by a projection on the bolt being thrown upward in front of a shoulder in the upper portion of the frame. The empty shells are ejected through the same lateral opening by which the magazine is charged. It is provided with a cut-off for the magazine.

STEVENS ARMS.

For forty years the Stevens rifles have been celebrated for their accuracy and durability. In all the recent leading events they have been in the foreground, both for indoor shooting at gallery ranges and for outdoor shooting at the longer ranges. They are regularly made for the following cartridges: .22 short rim fire, .22 long rifle rim fire, .22 7-45 rim fire, .25 Stevens rim fire, .32 long rim fire, .25-20 Stevens center fire, .25-21 Stevens center fire, .25-25 Stevens center fire, .32 long center fire, .32-20 center fire, .32 "Ideal," .32-40 center fire and the .38-55 center fire. The .32-40 center fire cartridge is quite famous as a target and hunting cartridge. No more accurate shooting cartridge is made, and it can be recommended as particularly suited for target work at 200 yards in all kinds of weather. In the factory cartridge are used 40 grains of F. G. black powder and a grooved bullet 165 grains in weight. The target shooters, however, generally prefer the 185 grain bullet, grooved or patched, while for hunting purposes the lighter bullets, with varying charges of powder, may be used. The .38-55 center fire cartridge is equally accurate for target work, while more popular and efficient as a hunting cartridge, owing to its greater caliber and weight of bullet. The factory cartridge has a 255 grain bullet, and a charge of F. G. black powder, 48 grains in weight. For target work the 330 grain bullet, grooved or patched, with the shell full of powder, gives the best results. With this load (using the everlasting shell) the finest records have been made. The diameter of the bullet is .375.

The Ideal rifle, shown in Figure 1, is a single shot rifle for target and hunting purposes, and combines in one arm all the features developed by years of experience and practice. The "hang" is perfect, the outline graceful and attractive, while the action is simple, strong and durable. It is a take down rifle. The importance of this feature cannot be overestimated. There is the convenience of carrying your rifle in a Victoria case, or of packing in small compass for traveling (as, for instance, in a trunk), and when you are ready for it, use it. Then there is the advantage of having several barrels for one stock and frame. The combination makes several rifles, each just as good as a whole rifle, while the expense is much less. The rifleman may have a short, light .22 caliber barrel for short range; a .25 center fire barrel of medium or

FIGURE 1.

heavy weight for target and small game; a .32-40 and a .38-55, of suitable weights, for heavier shooting. Moreover, these barrels will each give fully as good results as so many complete rifles. Every rifleman knows the value of a perfect trigger-pull, and the difficulty of getting several rifles having exactly the same pull. Where one stock and several barrels are used, this is entirely overcome. These rifles are all made to "take down." The barrel is threaded and screws into the frame in the usual way, where it is held securely by a barrel-screw, which passes through the frame from below. To detach the barrel, throw the lever down, loosen the barrel-screw and unscrew the barrel from the frame. To put the rifle together, see that the point of barrel-screw is drawn out, so the threads on the barrel will escape it. When two barrels are used on the same stock, one a rim fire and the other a center fire, this necessitates two sets of breech-blocks, extractors and levers. To remove the breech-blocks, take out the lever and breech-block screw, when the block, extractor and lever will drop out. To replace, lay the extractor in place on the block. Push the block into place with the lever dropped down, and insert the lever-screw, then the block-screw. Draw the lever to place.

The Little Krag, No. 65, shown in Figure 2, is the latest Stevens production. It has a round barrel of the standard length of 20 inches and a single trigger.

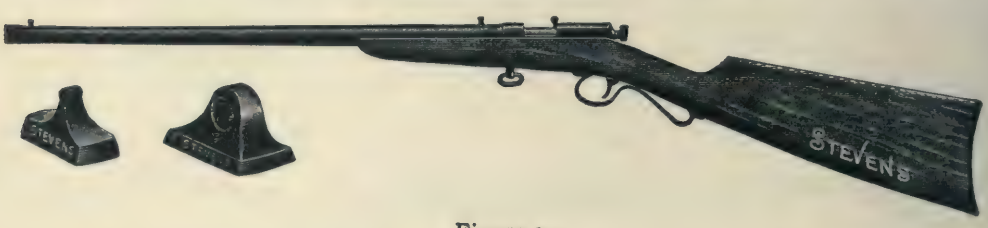


Figure 2.

It takes the .22 long rifle rim fire cartridge and will also shoot C. B. caps, .22 short or long. It has a bead front sight and a rear peep. The weight is 3¼ pounds, and the arm bids fair to becoming very popular.

The well-known Ideal range rifle is made for .22 short, .22 long rifle, .25 Stevens and .32 long rim fire cartridges; .25-20 Stevens, .25-21, .32-40 and .38-55 center fire cartridges. Standard length of barrel for rim fire cartridges, 26 inches; for center fire, 28 inches. Weight (with the standard No. 2 barrel), 26 inches, is 7¾ pounds. With the No. 3 barrel, 1 to 1½ pounds heavier; with the No. 1 barrel, 1 pound lighter.

The Ideal Schuetzen special rifle, shown in Figure 3, is designed to meet all the requirements of riflemen who want the best. No expense has been spared

to attain this end. The best points of the most approved models have been adopted, making this the most complete rifle ever made for the style of shooting in vogue among German riflemen. Every rifle is carefully tested from a machine rest, and a 3¾-inch group of 10 shots made at 200 yards, using the .32-40 or

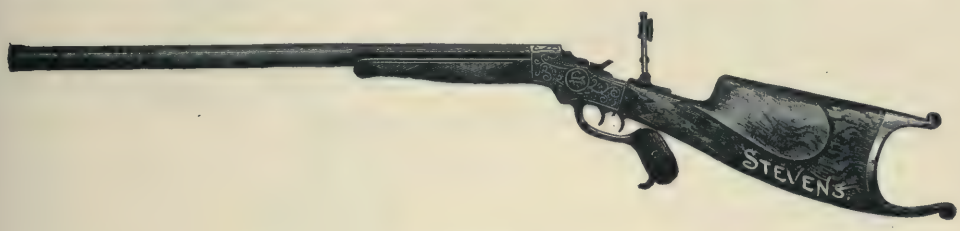


FIGURE 3.

.38-55 cartridges. The barrel is half-octagon; double set triggers, lever of special design. The muzzle sight is a hood attached to a fixed base, with interchangeable discs. The wind-gauge movement is secured on the Vernier by a sliding bar with screw attachment. Made for the .32-40 and .38-55 cartridges, with extra barrels to order for the .25-20 and .25-21 center fire cartridges and the .22 short, .22 long rifle and .25 Stevens rim fire cartridges.

The Vernier Hunters' Pet rifle is shown in Figure 4. It has a half-octagon barrel, Beach combination front sight, open rear sight and Vernier peep sight; detachable skeleton stock. With these sights we have a rifle which can be changed instantly from a hunting to a target rifle, and vice versa. It is made in three calibers for the following cartridges: .22 long rifle rim fire, .25 rim fire and .32 long rim fire. With an 18-inch barrel, the weight is 5¾ pounds.*

FIGURE 4.

The Vernier New Model Pocket rifle, shown in Figure 5, has a half-octagon barrel, Beach combination front sight, open rear sight and Vernier peep sight. With the open rear sight on the barrel, combined with the Beach and Vernier sights, we have a rifle which can be changed instantly from a hunting to a target rifle, and vice versa. In three calibers for the following cartridges: .22 long

*Not now manufactured.

rim fire, .25 rim fire and .32 long rim fire. The weight varies from 2 to 2¾

FIGURE 5.

pounds, according to the length of barrel.

The Stevens Favorite rifle, Figure 6, is a strong and thoroughly-made arm, perfect in symmetry, safe, accurate and portable. For this rifle the standard length of barrel is 22 inches; it is octagon to forward end of fore-end, and round the rest of its length. The stock is finely modelled and has a shotgun butt. The weight of the rifle complete is 4½ pounds. The action has a strong, case-hardened frame and solid breech-block. When the lever is down, an unobstructed view of the inside of the barrel may be had, and the barrel can be easily cleaned from the breech, without taking the rifle apart. This is a great advantage, as the only way to clean a small bore perfectly is to insert the rod at one end and draw the cloth through the barrel. It is made to take down. To one stock and

FIGURE 6.

frame may be fitted barrels of three different calibers, viz., .22, .25 or .32-caliber rifled barrels, and also .22 and .32-caliber shot barrels. One breech-block answers for both the .22 and .25, but for the .32 rifle or shot cartridge an extra breech-block and lever are necessary. This rifle cannot be supplied to use center fire cartridges. It is made for the .22 long rifle, .25 Stevens and .32 long rim fire only. The short, long and conical can be used with good results in rifles chambered for the .22 long rifle cartridges. B. B. caps and shot cartridges should never be used in .22 caliber rifled barrels. The .32 short rim fire cartridges can be used satisfactorily in rifles chambered for the .32 long rifle. The Favorite with a 20-inch barrel is a most convenient rifle for bicyclists.

The Stevens wind-gauge vernier sight, shown in Figure 7, presents a neater appearance than the ordinary mid-range vernier, for the thumb-screw at the top has been done away with, and the leaf otherwise shortened. The elevation is

secured by the rotating knurled thimble in the center of the leaf, under the eye-cup. Windage is obtained by means of the thumb-screw on the right side of eye-cup. The eye-cup is first loosened, when, with the thumb-screw, a side motion of one-eighth of an inch either way is obtained. By having the wind-gauge on the vernier, a lower base on the muzzle sight is possible, thus permitting the vernier to be shortened. Then, too, the danger of adjusting a muzzle wind-gauge on a loaded rifle is obviated. This sight has the combination eye-cup,

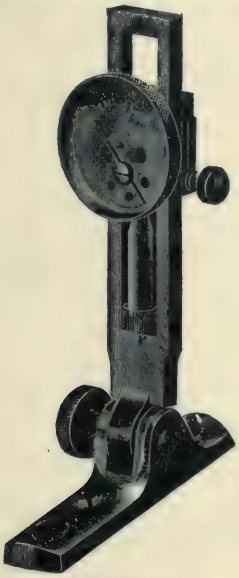


FIGURE 7.

FIGURE 8.

which permits several changes in size of aperture. The sight is made with extreme accuracy, and is finely finished. The eye-cup shown in Figure 8 has apertures of six different sizes, any of which can be placed upon the center in the most perfect manner and quickly, thus enabling the rifleman to select a size exactly fitting the eye for any kind of light, and also to match up with the front open hunting sight, the shaded bead or aperture for fine target work. As all men who shoot do not require the same aperture in the eye-cup, even under the same weather conditions, it has been found difficult and even impossible to furnish a standard size to fit all eyes, one wishing a larger and one a smaller aperture, and the writer knows several shooters who use three or four different eye pieces for the different conditions of light. This, however, is inconvenient in changing, and one is liable to lose or leave at home the one he most needs at the range for some particular match. By using the combination eye-cup these difficulties are overcome, and I most heartily recommend it to all who desire to do fine work with the rifle.

Among the younger generation of riflemen there has been, until recently, an impression that telescope sights are suitable only for men whose eyesight is

failing, and for the target-shooter, firing from a rest. This is, of course, a great mistake, and the number of riflemen now using telescopes for hunting and off-hand work is constantly growing. The tendency is toward telescopes of too high power. Glasses of 16 to 20 diameters are all right for the finest target work, but are unsuitable for hunting. Every error of holding is noticed and magnified. Then, too, the higher the power of the glass, the darker the field of vision. A glass of 4 to 10 diameters, especially designed for hunting, gives a large, bright field. In the woods, on a dark day, much better shooting is done with such a glass than with open sights; while many riflemen will get better results at the target also than with a high-power telescope. The Stevens Arms Company handle a large variety of telescopes. The features of the best glasses are, the arrangement for obtaining elevation, wide field of vision and brilliant illumination—permitting a quick sight to be taken and good shooting to be done in light so dim that ordinary sights could not be used.

The Stevens New Model Pocket shot gun is the same as the New Model Pocket rifle, but bored smooth and choked. It uses special "Everlasting" shells, .38 or .44 caliber, also made for .38-40 and .44-40 cartridges. This is an excellent gun for taxidermists, as it can be carried conveniently, and with the everlasting shells one may load with any size of shot desired. The breech-loading single barrel shot gun is made in 12 and 14 gauge, 30-inch barrel, and weighs 6 to 7 pounds. Also 12 gauge, 32-inch barrel, weighing 7 pounds.

The famous Stevens single-shot pistols are made after several models for different purposes. The largest, the Lord model, is shown in Figure 9. It has a larger frame and a much larger handle than the other models. It is fitted with open wind-gauge rear sight and bead front sight and is made in two

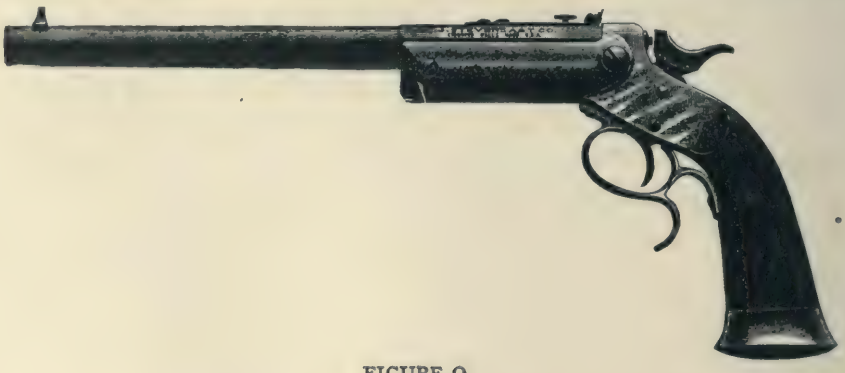


FIGURE 9.

calibers—.22 long rifle rim fire and .22 rim fire. With a 10-inch barrel, the weight is 3 pounds. This model can be bored and rifled for almost all of the American pistol cartridges, but few are made for larger than .25 caliber. The late Ira Paine used the Lord model pistol, in his exhibitions.

The Gould model, shown in Figure 10, is used by many experts. It is fitted with open wind-gauge rear sight and bead front sight, and is a light arm, neither burdensome to carry about, nor fatiguing for persons of moderate strength to shoot. It takes the .22 long rifle and .25 rim fire cartridges. With a 10-inch

FIGURE 10.

barrel, it weighs about 2 pounds, and with a 12-inch barrel, it weighs about 2¼ pounds. It is made to special order for the following center fire cartridges: .32 long, .38 long, .32-34 S. & W., and .38-44 S. & W.

The Conlin model, shown in Figure 11, is a duplicate of the Gould model,

FIGURE 11.

with the exception of the guard, this model having the spur-guard, which is preferred by many shooters.

The Diamond model, much smaller in size, is made in the following styles: No. 1, a 6-inch barrel, with globe front and peep sights, weight 10 ounces; No. 2, a 6-inch barrel, with open sights, weight 10 ounces; No. 3, a 6-inch barrel, with both open and peep sights, weight 10 ounces; No. 4, a 10-inch barrel, with globe front and peep sights, weight 12 ounces; No. 5, a 10-inch barrel, with open sights, weight 12 ounces; No. 6, a 10-inch barrel, with both open and peep sights, weight 12 ounces.

There are two other models made by the Stevens Arms Company, which have barrels 3 and 3½ inches in length, and consequently they do not shoot with the accuracy of the other models. They weigh one pound and are good, reliable pocket pistols, combining compactness with accuracy.

To operate these pistols, half cock the arm and press the stud on the side which releases the barrel, which will tip down, thus exposing the chamber in which the cartridge is placed. The action is then closed, the hammer cocked, and the arm discharged.

The Stevens Maynard, Jr., rifle, shown in Figure 12, recently introduced, is a thoroughly accurate and reliable arm. It is designed to replace the world renowned Maynard rifle, the first breech-loading rifle made, and retains that rifle's

FIGURE 12.

style of action. It is machine made and all parts are true to gauge and interchangeable. It has an 18-inch half-octagon barrel, measures over all 33 inches and weighs 2¾ pounds. The barrel is accurately bored and rifled, and chambered for the .22 short rim fire cartridge.

The new Crack Shot rifle is highly praised for accuracy and penetration. It has an automatic safety, positive in action, sliding into a notch in the hammer, thus making it impossible to discharge the arm until we are ready to do so.

The Stevens new single barrel shot gun, Figure 13, has just been perfected. It is bored for nitro powder and made in 12, 16 and 20 gauges, with barrels

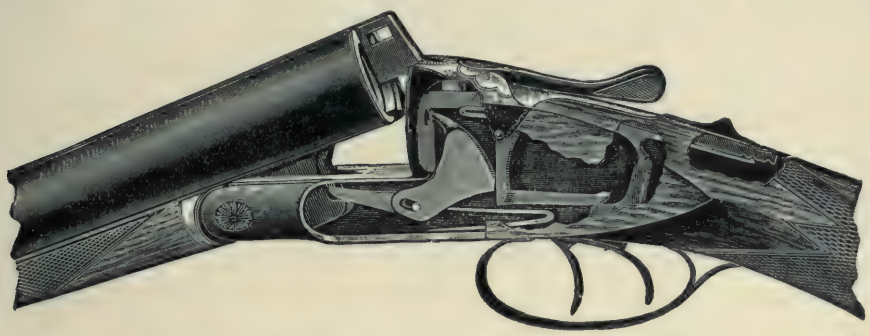
FIGURE 13.

ranging in length from 26 to 32 inches. It has an automatic shell ejector, and a special device by which the operator can at will change the gun from an ejector to an extractor by two turns of the screw.

SYRACUSE HAMMERLESS GUNS.

These guns are very high grade and are made especially to shoot nitro powder. The 12 gauge weighs from 6¼ to 8 pounds, while the 10 gauge weighs from 7 to 10 pounds. They are well balanced and have a very simple mechanism. There is not a screw in the locking device. There is a total absence of small springs and other small parts liable to breakage and derangements, the entire locking mechanism being hung on two pins. The frame is not cut away to a shell to receive the mechanism but is as strong and simple as that of the hammer gun. Owing to the simplicity of construction these guns have great strength and durability. The safety device is very strong and durable. There is no possibility of its jarring off and causing accidents.

A reference to the sectional drawing will show that the cocking arm, hammer and firing-pin are all in one piece. The hammer has a direct bearing on the lug with no intermediate pieces, making it the easiest and simplest cocking device ever used on a hammerless gun. The cocking and firing mechanism is contained in



the metal frame, thus avoiding the cutting away and weakening of the stock, a point all sportsmen will appreciate. The main spring forces a connection between the hammer and lug through the agency of a slot in the hammer, a very ingenious and valuable patent, making it possible to take the barrels off and put them on whether the hammers are up or down.

The fore-end fastener is new and *fastens* whether the barrels are on or off the frame; there is no trouble to attach the fore-end; it drops immediately into position. The whole gun can be taken apart and assembled again without other tools than a screw-driver, a feature that will please. The ejecting mechanism consists of two springs and two strikers, which give a direct blow to the extractors in a straight line, thereby making a most powerful ejector. The entire mechanism is contained in the fore-end, therefore, neither the frame nor the barrels are cut away and weakened, as is the case with nearly all other ejector guns. The latest product of the Syracuse Arms Company is known as THE SYRACUSE.

THOMAS GUN.

This breech-loading arm has a fixed chamber closed by a movable breech-block, which rotates about a horizontal axis at 90 degrees to the axis of the barrel, lying below the axis of the barrel and in front, being moved from above by a thumb-piece; as it descends it retracts the firing-pin by the action of the hammer-stop lever on the projecting head of the retractor, the notched body of which engages with a notch on the firing-pin, and it also presses down one end of the friction lever, the other end of which locks the sear and keeps the hammer from falling until the breech is closed. It is closed by reversing the movement of the block. The mechanism is such that the block is well secured against the effect of any accidental discharge in closing, and is afterward more completely locked by the descent of the hammer beneath the breech-block when the piece is fired. Extraction and ejection are essentially the same as in the Remington rifle.

TIESING MAGAZINE GUN.

This gun belongs to that system in which a fixed chamber is closed by a bolt sliding in line with the axis of the barrel and operated by a lever from below. The breech-bolt is a single piece, to which links are hinged at either side. These links are in turn connected by a knuckle-joint, with others, hinged to the receiver. These links support the bolt when closed, as in firing. The axes of the pivot about which the links rotate are in line with the axis of the bore. The construction is such that no strain comes on the pivots. The upper rear ends of the forward links lock in the receiver, giving additional support to the bolt. A groove on the inner surface of each rear link receives the end of a pin in the breech-bolt lever; motion of the lever is consequently accompanied by a corresponding motion of the links and, through them, of the bolt. The hammer is cocked by the end of the firing-pin when the lever is thrown open.

The piece is fired by a center-lock of the usual pattern. The magazine, which is in the tip-stock, is loaded through a gate in the side cover of the receiver. The carrier is pivoted at the rear of the receiver. The upper end of the breech-bolt lever is slotted. This slot receives the rear portion of the carrier. When the lever is thrown open the bottom of the slot strikes an arm, rotating the carrier about its hinge, bringing its front opposite the mouth of the magazine The reverse motion of the lever raises the carrier until its upper surface is parallel to the axis of the bore.

No wiping rod is provided with this gun, and there is no magazine cut-off. As a magazine gun, three motions are necessary to operate it, viz., opened, closed, fired. As a single loader, four motions are necessary, viz., opened, loaded, closed, fired. The gun carries nine cartridges in the magazine and one in the chamber.

TOWER MUSKET.

This ancient arm from the Niagara Frontier had quite a reputation. It was used by the British army during the wars of 1776 and 1812. It was afterwards made in this country, and weighed 9 pounds and 13 ounces. The lock-plate is stamped with a Crown and Tower. The arm may be seen in the collection of the Holland Purchase Historical Society, Batavia, N. Y.

TRABUE MAGAZINE GUN.

The receiver of this gun is bored through longitudinally for the breech-bolt in line with the barrel, and also below the barrel, in line with the magazine, which is in the tip-stock. It is also cut away at the side, forming at the rear a shoulder for locking the bolt, and at the same time an opening for inserting the cartridges into the chamber or magazine, and also for ejecting the empty shells.

The bolt is composed of three principal parts, viz., the body or locking-tube; the cocking-piece or hammer, into which the firing-pin is screwed, and the bolt-head, which carries the extractor. An arm of the latter is pivoted in a slot in the bolt-head; a small spiral spring bearing on the arm above the pivot causes the hook of the extractor to descend after it has passed over the head of the cartridge. The front part of the firing-pin passes through the spiral spring and through the extractor-arm. On the rear of the locking-tube is a small projection, which enters a corresponding notch in the front face of the hammer. When the bolt is unlocked, the projection, riding out of the notch, cams the hammer to the rear, withdrawing the point of the firing-pin within the face of the bolt.

The magazine is loaded through the receiver. The cartridges descend an inclined arm, on the inner side of the guard, when a finger on the under side of the bolt-head forces them into the magazine. They are prevented from escaping the latter by a spring-stop, which is pivoted to the left side of the receiver and operated by a push-button. The lower end of the stop springs through an opening in the side of the receiver just in front of the mouth of the magazine. When the piece is to be used as a magazine gun, the push-button of the magazine-stop is pushed to the front, the first cartridge under the pressure of the magazine-spring backs up the inclined arm of the guard until its head is checked by a notch in the receiver. If the bolt then be closed, the finger of its head runs under the cartridge and raises its front, when the bolt forces the cartridge into the chamber.

When the piece is to be used as a single loader, which can only be done when the magazine is empty, the cartridge-follower runs out from the magazine and forms a floor, so to speak, to the receiver, so that the cartridge, on being inserted into the receiver, is in line with the barrel. The closing of the bolt then forces it into the chamber.

TURNBULL REVOLVER.

An accurate repeating revolver, which fires sixteen shots without reloading, has been recently invented by W. J. Turnbull, of New Orleans. It has but three working parts, is light in weight, cannot possible get out of order, and should any of the cartridges fail to fire, all that is necessary is to press the trigger again to bring another cartridge into position and fire it. The handle of the pistol is the magazine and contains a chain of sixteen cartridges. This chain is moved with each pressure of the trigger, the same pressure firing one cartridge and pushing the next into position. The pistol is so constructed that a trigger is always ready to be pressed and therefore, the weapon can be fired as rapidly as the operator can press the trigger. There are four triggers, all of one piece of metal, and revolving so that while one of the triggers is ready for the pressure of the finger another is moving the hammer into position, and a third is ready to fall into place within the trigger guard.

UPDEGRAFF RIFLE.

This breech-loading small-arm has a fixed chamber closed by a movable breech-block, which rotates about a horizontal axis at 90 degrees to the axis of the barrel, lying below the axis of the barrel and in front, being moved from above by a thumb-piece. By bringing the hammer to the full cock, a link connecting its under surface with that of the breech-block throws the latter down into the position of loading. The hammer when released moves forward to the half-cock notch, and changes its point of bearing on the block to the other side of the center of motion, by engaging with a second link like that above mentioned. As the breech-block opens the firing-pin is withdrawn. The piece is closed by again bringing the hammer to the full-cock, the action of the link being reversed from the change of its bearing on the block. This can also be done by hand in the usual way. The piece is locked by the descent of the hammer beneath the block when the piece is fired. Extraction is accomplished by a disk pivoted on a hub formed on the side of the breech-block, and provided with the necessary radial arms. This disk is recessed for the head of the firing-pin retractor. Ejection is secured by accelerating the movement of the extractor, by a quick blow which it receives from the nearest link, at its release in the act of opening the piece.

VANCHOATE GUN.

This breech-loading rifle has a fixed chamber closed by a movable breech-block, which slides in the line of the barrel by direct action. It is opened by first cocking the piece, then raising the handle of the breech-bolt to a vertical position, and then withdrawing the bolt until it is arrested by striking against the upper end of the

recoil screw. In raising the handle, the beveled surface of the head of the firing-pin bears against the tip of the recoil-screw, and thus positively retracts the firing-pin. In withdrawing the bolt, it rides over the hammer and presses it back to the full-cock. The piece is closed by reversing the motion of the bolt. The tip of the recoil-screw prevents the firing-pin from moving forward until the breech is fully closed. It is locked by the base of the bolt-handle falling into a mortise in the side of the receiver. The piece is fired by a center-lock of the usual pattern. Extraction is accomplished by a spring-hook upon the side of the bolt. Ejection is caused by a sliding ejector playing into a groove in the bottom of the bolt, and, in the act of withdrawing the bolt, struck forcibly against the tip of the recoil-screw. This throws the shell around the hook of the extractor by which it is held, and expels it completely from the gun. It is impossible to move the bolt, in this arm, unless the hammer is at full-cock.

VOLCANO PISTOL.

This curious arm, practically a small Henry repeating rifle, at one time promised to rival the revolver. It derived its name from the terrific character of its explosion. It is now seldom seen or used.

WARD-BURTON RIFLE.

This breech-loading small arm has a fixed chamber closed by a movable breech-block which slides in the line of the barrel by direct action. As a single loader the piece is opened by turning up the handle of the breech-bolt so as to disengage the threads of the sectional screw, and then withdrawing the bolt. The motion of turning up the handle, in opening the piece, serves to revolve the firing-pin on its axis and to cause a spiral shoulder near its head to bear against a corresponding surface into which the back of the firing-pin guide is formed. The point of the firing-pin is thus retracted from the face of the bolt in the closing of the piece, so as to avoid the accidental explosion of the cartridge during this operation. In turning down the handle these shoulders are no longer opposed, and the firing-pin may then be driven forward in the usual way. For a similar reason the face of the bolt is made somewhat concave.

The piece is fired by a concealed lock moved by a spiral mainspring. The piece is cocked by compressing the mainspring by means of the firing-pin, which resting upon it, and catching on the sear-bolt in closing, is held back against the resistance of the mainspring, while the breech-bolt passes by, to the extent of the throw permitted the firing-pin. To fire the piece, the sear-bolt is drawn down out of the way of the trigger. To prevent the sear-bolt from accidentally slipping off the shoulder of the firing-pin when the mainspring is compressed, the surfaces in con-

tact are internotched, the annular groove so formed on the firing-pin, being cut, so as to permit the passage of the sear-bolt, when the breech-bolt is turned down into the position of firing. Extraction is accomplished by a spring-hook recessed on top of the bolt, and riding over the rim of the cartridge in closing, and ejection by a loose pin playing through the face of the bolt diametrically opposite to the extractor. This pin strikes the front of the sear-bolt in opening the piece. It thereby impinges against the lower edge of the cartridge head, and throws the cartridge-shell upward around the hook of the extractor, by which it is held, until it is clear of the gun. The piece may be dismounted by turning aside a stop-screw beneath the horizontal arm of the trigger. The sear-bolt may then be pulled down out of the slot in the bottom of the breech-bolt, so that the bolt may be withdrawn.

As a magazine gun it is opened as just described; and in drawing back the breech-bolt the front end of the slot in its lower surface strikes the upper lever-arm of the carrier, and throws up the tray in which its front part is formed. This tray supports a cartridge slantingly, so that the upper portion of the cartridge head shall project slightly above the bottom of the groove in which the bolt slides, while the point of the bullet is opposite the mouth of the chamber. The carrier is kept in this position by the action of the carrier-lever spring.

By reversing the movement of the bolt, its face catches against the head of the cartridge and shoves it up the incline of the carrier into the chamber. As its movement is completed the back end of the slot strikes the carrier-lever and forces down the carrier opposite the mouth of the magazine. In its descent it strikes a spring catch magazine-stop operating to restrain the issue of the cartridges from the magazine, and allows one to come out upon the tray.

The issue of cartridges from the magazine may be cut off by a slide operated by a projecting thumb-piece. The piece may then be used as a single loader, holding the magazine in reserve.

The head of the follower is covered with India rubber in order to serve as a cushion for the rebound of the cartridges in firing.

The magazine is charged from below by drawing back the bolt, thus raising the carrier and exposing the mouth of the magazine for the successive introduction of the cartridges.

This arm uses a special ammunition, the general plan of which is that of the cup-anvil service cartridge. The fulminate is protected from accidental ignition in the magazine by being placed at the apex of a central packet formed in the cartridge-head. See *Burton Magazine Gun.*

WESSON PISTOL.

Wesson single shot pistols, formerly made by Frank Wesson, at Worcester,

Mass., are operated as follows: The hammer is slightly raised and held by a pin pressed in from the side; a projecting stud is pressed at the bottom of the receiver, and the barrel turned over to one side, the shell of the exploded cartridge thrown

out by the extractor. These arms are well balanced, fitted with good sights of various styles and are accurate. They are much used by marksmen at this time, although not generally on the market.

WESTLY RICHARDS RIFLE.

This breech-loading small arm has a fixed chamber closed by a movable breech-block, which rotates about a horizontal axis at 90 degrees to the axis of the barrel, and lying above the axis of the barrel and in rear, being moved from below. In its general features this arm resembles the Martini, having, however, the lever separate from and pivoted in front of the guard, and by its movement in opening, cocking the true hammer lying concealed beneath the block, and impelled by a flat mainspring placed below the barrel. The blow of the hammer is directly delivered upon the cartridge, a groove for its movement being cut in the under side of the breech-block. The usual extractor in guns of this class is employed.

WHITE GUN.

In this magazine gun the permanent portion of the magazine mechanism is contained in a box located directly below the receiver; the remainder, in the form of a light packet, is introduced into the magazine with the cartridges which it holds. This packet is an essential portion of the mechanism. The gun has a cut-off.

WHITNEY RIFLE.

At the special request of President Jefferson, when Secretary of State in Washington's Administration, Mr. Eli Whitney undertook the manufacture of muskets for the United States, taking as a model the Charleville flint-lock, that being the most improved arm in use in Europe. In presenting his views to Mr. Jefferson in reference to the feasibility of making all arms interchangeable, Mr. Whitney met with most violent opposition, both English and French officers ridiculing the idea as an impossibility, and claiming that each arm would be a model and would cost at least one hundred dollars. Supported by the Government, Mr. Whitney prosecuted his labors, and established an Armory where the most perfect uni-

formity of parts was secured to the great satisfaction of his friend, Mr. Jefferson. The Springfield Armory was established in the year 1800, and the system invented by Mr. Whitney was put in force there. The English War Department was forced to adopt the same system, and put it to practical use in 1855 by importing a large amount of American machinery. Since that date other European governments have adopted the same general system, which is made especially necessary in the proper manufacture of breech-loading small arms.

The sporting rifle weighs 9 to 10 pounds. The barrel is 24 inches long. It carries when loaded 15 cartridges. See *Kennedy Rifle* and *Phoenix Rifle.*

WHITEMORE RIFLE.

This breech-loading arm has a fixed chamber closed by a movable breech-block, which rotates about a horizontal axis at 90 degrees to the axis of the barrel, lying below the axis of the barrel and in front, being moved from above by a thumb-piece. The arm is opened and cocked by drawing back a locking-piece, hinged to the hammer, and pressed against the frame by a spring lying between it and the hammer. It is closed and fired by drawing the trigger, the mainspring being placed beneath the barrel. The piece is locked by the engaging of the locking-piece, with a corresponding abutment on the frame, into which it is pressed by the locking-piece spring, just before the cartridge is struck by the hammer when the piece is fired.

Extraction is accomplished by a hooked-lever pivoted on the hammer, and moving bodily with it in the first instant of opening, and ejection is effected by striking the lower end of another similar lever pivoted to the side of the frame, by the end of the locking-piece, when the opening is nearly completed. A flap hinged to the top of the barrel may be interposed between the head of the cartridge and the hammer, so that the piece may be carried safely when loaded; the upper portion of this flap is formed into a sight base.

WILKESBARRE HAMMERLESS GUN.

This excellent arm has three fastenings; two under bolts locking on a wedge into the under lugs, and a top fastening in the extension rib, which is locked at right angles from the under bolts, and guarantees a gun which will stand a strain of nitro powder. One under lug is cut on a circle and fits close to a cross-piece on the frame which forces the breech against the face of the frame. The lock is very simple and strong. The cocking-rod and lever, working on the principle of a compound lever, cocks the gun easily and without any effort or strain on the fore end. All the lock work is in the frame, thus leaving the stock solid wood and no danger of cracking out or splitting from discharge of heavy loads or escape of gas.

WINCHESTER ARMS.

The repeating and single shot rifles, repeating shotguns, and ammunition of all kinds manufactured by the Winchester Repeating Arms Co. are justly celebrated for their superiority and absolute reliability. Over a million Winchester guns have been sold during the thirty years they have been upon the market, and to-day they are in general use all over the world. There is but one grade of Winchester guns, and that is the best. There is absolutely no difference in the quality of the materials used in the highest and lowest priced Winchester guns. Neither is there any distinction made in the tests to which different priced guns are subjected for strength, accuracy, and manipulation. The difference in the prices of the various styles of the different models of Winchester guns is due to the difference in exterior finish, ornamentation, or special features, which necessitate a greater amount of handwork than the standard styles. All the materials used in the manufacture of Winchester guns are the best that experience and money can procure. The barrels of the .30 and .303 caliber Model 1895;* .30 caliber W. C. F. and .25-35 caliber W. C. F., Model 1894;† 6 m/m. (.236) caliber Lee straight pull, U.S. Navy, and .45-70 caliber Extra Light weight, Model 1886‡ rifles are made of nickel steel, which has a tensile strength of over 100,000 pounds to the square inch. The barrels of Winchester guns of other calibers are made of extra high grade of steel, sufficiently strong to withstand much greater pressures than could possibly be developed by the cartridges they are intended to shoot. In making the frames, actions, and other parts of Winchester guns, extra grades of steel, especially adapted to the requirements of the respective parts, are used, which insures their strength, toughness, and lasting qualities. All the metallic parts, except the magazine springs, which are made of spring steel wire, screws, etc., are drop forged, no castings of any description being used in the Winchester guns.

An invaluable feature is that of interchangeable parts. All parts of Winchester guns are made to gauge, and are strictly interchangeable. For illustration: Any Model 1873 finger lever will fit any Model 1873 receiver; or, any Model 1897 shotgun action slide will fit any Model 1897 shotgun slide handle. To make parts that will interchange in this manner, like parts must be exactly alike to the minutest detail. To determine whether or not they are exactly alike in size and shape, or if the cuts and holes in them are made so as to coincide with the component parts, each part has to be gauged from one to forty different times. This system of interchangeable parts materially increases the cost of producing Winchester guns, nevertheless they are sold cheaper than guns made in a less costly and less careful manner. All purchasers of Winchester guns are benefited by this system of manufacture, as it enables them to replace a part broken or worn out by rough usage, at a trifling cost and without employing the aid of a gunsmith. Almost all parts of Winchester guns can be sent by mail, therefore a broken part can be replaced quickly and easily in any part of the world.

Gun makers agree that the most difficult part of a gun to make is the barrel. To do so successfully, requires a thorough knowledge of the subject, skilled experts, delicate and

* Also the .35—.405. † Also the .32 Winchester special. ‡ Also the .33.

exact machinery, and a comprehensive system of tests. The system by which Winchester barrels are made has made them famous all over the world for their unerring accuracy and strength. When a Winchester barrel has been "rough" bored, as the first boring is called, it is proved for strength by the English Government proof system. The barrel is locked to a firing table, loaded with a charge of powder and lead twice as great as could be put into the shell the barrel is to be chambered for, and fired. It is then carefully inspected and if the barrel shows the slightest sign of strain, or imperfection, it is condemned. It is next straightened and then given the second or "finish" boring. It is then straightened again, after which it is subjected to what is known as the "Winchester" or "Lead" test. This test never fails to disclose any imperfection in the interior of a barrel. In making this test, the barrel is held in a vise and a plug of lead the exact size of the bore placed in it at the breech and expanded or "upset"until it binds lightly and evenly all around the bore. The plug is then pushed gradually through the barrel with a copper rod by the expert conducting the test. The slighest variation in the diameter of the bore is instantly disclosed by the different pressure required to push the plug through the barrel. This test is repeated after the barrel is rifled, for the purpose of detecting any possible disturbance of the bore during the latter process. It is not necessary to submit shotgun barrels to the "Lead" test. They are tested by gauges which show a variation of a thousandth part of an inch.

One of the most difficult things to determine in making rifle barrels is the twist or rifling required to shoot a given cartridge to the best advantage. Cartridges of different or like calibers containing different weights of powder or lead require a different twist. A perfect twist is one which will spin a bullet fast enough to keep it point on to the limit of its range and its pathway through the air as near a straight line as possible. If the twist is too slow, the flight of the bullet will be untrue and it will "tumble" or "keyhole" as it is called when a bullet passes through the air in a lengthwise position instead of point on. On the contrary if the twist is too quick or sharp, the bullet is spun so rapidly that it is unsteady in its flight and wobbles like a top when it first begins to spin. The only sure way of ascertaining a perfect twist is by calculation and exhaustive practical tests. The Winchester Company have complete facilities for verifying all calculations for twist, which enable them to determine with positive certainty the twist that will give the best results with a given cartridge.

When Winchester guns are assembled, that is, put together ready for use, they are tested carefully for manipulation and accuracy. The test for manipulation consists of working the gun thoroughly with "dummy" cartridges and firing it as a single loader or repeater, slowly and quickly, to detect any possible defect in the action. If a gun is faulty in extracting, in handling the cartridges, or does not work smoothly, easily and rapidly, it cannot pass this test. Rifles are shot from three to ten shots, and shotguns from eight to fifteen shots to test their action.

If there is any one feature in which Winchester guns excel others, more than in an-

other, it is their remarkable accuracy. This is due to the excellence of Winchester barrels and to the care taken in targeting them. At the plant of the Winchester Repeating Arms Co. there are ranges from a 100 feet up to 200 yards. At these ranges every gun is shot to test its accuracy, the distance varying according to the caliber. A corps of experts devote their entire time to this work, and before a gun is passed by them, it must be capable of shooting seven consecutive bull's eyes on a standard sized target for the distance shot. All guns are shot to line up the sights, an expert changing them until they are properly aligned and given the proper elevation. A gun which does not make a good target is condemned. Shotguns are targeted at 40 yards. Choke-bore barrels are not accepted unless they shoot at least 300 pellets of shot inside a 30-inch circle, the testing load being 3 drams of smokeless powder and 1¼ ounces of No. 7½ chilled shot. Cylinder-bore barrels are targeted at 30 yards, the load given above being used. Guns that pass these tests for manipulation and accuracy are given a final inspection for exterior finish, etc., and then they are ready for market.

The Model 1902 single shot rifle, and the Model 1903 automatic rifle, caliber .22, embody the latest improvements in Winchester guns. The Model 1902 has a peep sight, a short trigger pull and a trigger guard of a new design which fulfills the purposes of a pistol grip. It is a "Take Down" and can be taken apart easily and quickly by simply unscrewing the thumbscrew located underneath the forearm, which releases the barrel and action from the stock. The action used on this gun is of the bolt type, and is exceedingly simple, consisting of very few parts. When the gun is cocked, the action is locked against opening until the firing pin falls. This permits carrying the gun cocked without liability of the action jarring open. The gun is cocked by pulling rearward on the firing pin, which is made with a nurled head, to afford a good grip.

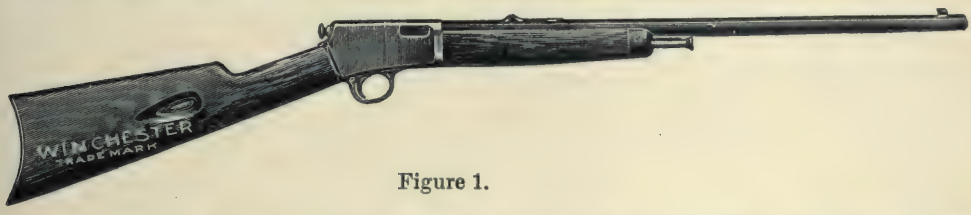


Figure 1.

The Model 1903 automatic rifle is a ten-shot, hammerless, "Take Down," using a new, inexpensive rim fire cartridge, loaded with smokeless powder and Winchester greaseless bullet. It is simple in construction and operation. After filling the magazine and throwing a cartridge into the chamber, all that it is necessary to do to shoot the ten cartridges that the magazine holds is to pull the trigger for each shot. The rifle can be shot as fast as the trigger can be pulled. The recoil from the exploded cartridge ejects the empty shell, cocks the hammer, and

throws a fresh cartridge into the chamber. The barrel is round and 20 inches long and is fitted with open front and rear sights. The length of gun over all is 36 inches and the weight is about 5¾ pounds. *To fill the magazine,* hold the gun muzzle down and turn the magazine plug, seated in the depression in the butt-plate, to the left, and draw out the magazine tube until the magazine follower clears the opening in the stock. Drop the cartridges, bullets foremost, through the opening in the stock into the magazine. Push in the magazine tube and lock it by turning the magazine plug to the right. *To use the gravity charger,* fill the charger by pushing five cartridges head first into each tube. Insert the spring end into the opening in the stock. Press downward and the spring will release the cartridges. Hold the muzzle down so that the cartridges will run in freely. *To load the gun* push quickly back the operating sleeve, which projects from the forearm, and let it spring forward. This cocks the hammer and throws a cartridge into the chamber. After this, the gun is loaded and cocked until the last charge is fired. *To unload the gun,* work the operating sleeve backward and forward with a quick and positive motion; or, draw the magazine tube entirely from the gun, and push back the operating sleeve. If it is desired to remove the cartridge from the chamber, draw the magazine tube out until the magazine follower clears the opening in the stock, and then push back the operating sleeve. *To take down the gun,* cock it by pushing in the operating sleeve. Press down the take-down screw lock and turn it to the left until it is free from the receiver. Draw the barrel and forearm directly forward.

The remaining Winchester product will be described in regular order, each Model being named for the year when introduced. The Model 1873 was the first repeating rifle to handle center fire cartridges and soon became famous the world over. The Model 1886 was designed to handle powerful cartridges loaded with heavy charges of powder and lead, and for large game shooting was a particularly desirable rifle. This arm is adjusted to the .33 Winchester Smokeless .38-56, .38-70, .40-65, .40-70, .40-75-260, .40-82, .45-70-405 U. S. Government, .45-70-500 U. S. Government, .45-70-330, .45-70-350, .45-85-350, .45-82-405, .45-85-300, .45-90, .50-100, and .50-110 Winchester cartridges. The Model 1890 rifle has a sliding forearm action. It handles .22 short, .22 long, and .22 Winchester rim fire cartridges, and is unequaled for small game shooting and target practice at reasonable ranges. The Model 1892 rifle is the embodiment of lightness, strength, and ease of manipulation, and is made for the .44, .38, .32, and .25-20 Winchester center fire cartridges. The Model 1894 was the first repeating rifle made to handle, successfully, the popular target cartridges known as the .38-55 and .32-40 and also the .32 Winchester Special, .30 and .25-35 Winchester center fire cartridges, the latter three cartridges belonging to the most modern type of high

powered smokeless powder ammunition. The Model 1895 is the only lever action box magazine rifle made. It is a powerful, accurate shooting weapon and handles the .30 U. S. Army, 303 British, .35 Winchester Smokeless, and .38-72 and .40-72 Winchester cartridges. The old Winchester single shot rifle is made in all desirable calibers from .22 to .50 and in styles to meet the requirements of all tastes, and for different kinds of shooting. The Winchester repeating shotguns are made in two models, the lever action in 10 gauge and the Model 1897 with sliding forearm action in 12 and 16 gauge. The Model 1897 is made in "Take Down" style. These guns are rapidly supplanting double barreled guns both in the field and at the trap. Properly handled Winchester guns seldom get out of order. That a gun is of a later model does not necessarily imply that it is any better, or that it has superseded earlier models. The different models of Winchester guns are designed to meet the requirements of different kinds of shooting and a diversity of tastes.

The Winchester repeating rifle, Model 1873, is conceded to be the most remarkable arm ever produced. It was the first repeating rifle made to use center

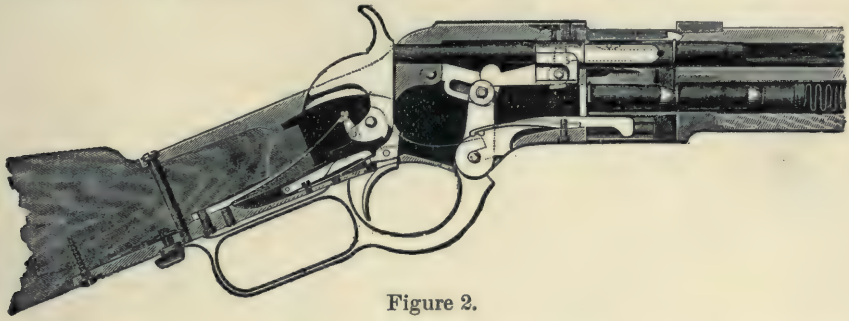


Figure 2.

fire cartridges, and for years the only one on the market. Up to the present time there have been over a million sold, and they are still in demand. It is improbable that any one style of arm will ever compare with the Model 1873 in popularity or in the number in use. Until a decade ago, practically all the big game killed in this and other countries succumbed to its accurate and deadly fire. It is a strong, accurate arm. It is absolutely safe, as the firing pin is automatically withdrawn when the gun is opened, and the trigger locked until the action is closed. It can be furnished with set triggers, in which case the trigger lock-saftey catch is omitted. It is made for .44, .38, and .32 center fire cartridges. The weights of this Model, full or half magazine, are as follows: Round barrel, 24 inches long or under, weight about 8½ pounds; Octagon barrel, 24 inches long or under, weight about 9 pounds; Half octagon barrel, 25 inches long or under, weight about 8¾ pounds; Carbine, 20 inch round barrel, weight about 7¼ pounds; Musket, 30 inch round barrel, weight about 9½ pounds, full magazine only.

The system and operation of Winchester repeating rifles, except models 1890 and

1895, are similar to those of the .44, .38, and .32 calibers of the model 1873, and can be readily understood from the sectional cuts of that model shown in Figures 2 and 3. Figure 2 shows the action closed and Figure 3 shows the action open. The magazine is loaded while the action is closed, as shown in Figure 2, by pressing down the spring cover on the right hand side of the receiver with the point of the cartridge, and inserting the cartridge through the opening thus made. The opening is closed by the spring cover as soon as the cartridge is inserted. This operation is repeated until the magazine is filled. When it is desired to load, the finger lever B is thrown forward to the position shown in Figure 3, and then returned to position shown in Figure 2. This motion throws out the shell or cartridge in the chamber, transfers a cartridge from the magazine to the chamber, cocks the hammer, and leaves the gun ready to fire when the trigger is pulled. The operation of loading is easily executed while the gun is at the hip, or at the shoulder, without taking the eye off the sights, thus enabling the shooter to fire as many shots as there

Figure 3.

are cartridges in the magazine without removing the gun from the shoulder, or losing sight of the object shot at. *To take out the barrel.*—Take out the two tip screws and the magazine ring pin; pull out the magazine tube and take off the forearm; then, before unscrewing the barrel from the frame, the breech pin must be thrown back by moving the finger lever forward—otherwise the attempt to unscrew it will break the extractor which withdraws the cartridge and ruin the breech pin. *To remove the breech pin. Models 1873 and 1876.*—After removing the side plates and links, take out the link pin and retractor: the piston can then be pulled out with the fingrs, first removing the hammer, or setting it at full cock.

The Winchester Model 1886 is the strongest repeating rifle made, and the only one that will successfully withstand the shock and strain of shooting such tremendous charges of powder and lead as are contained in .45–70–500 or .50–100–450 cartridges. This model is very popular with big game hunters all over the world on account of its strength,

accuracy and great killing qualities. This gun has been thoroughly tested on all kinds of game, and has invariably given such splendid satisfaction that it is doubtful if it will ever be equalled for the heavy cartridges it was especially designed to handle. The system differs from that of earlier Winchester models, as will be seen by the sectional drawings, Figures 4 and 5, showing the action closed and open, although it is operated by a finger lever, like the Winchester Model 1873. Only a short movement of the finger lever is required to load this gun, which makes it easy to fire rapidly while the gun is at the

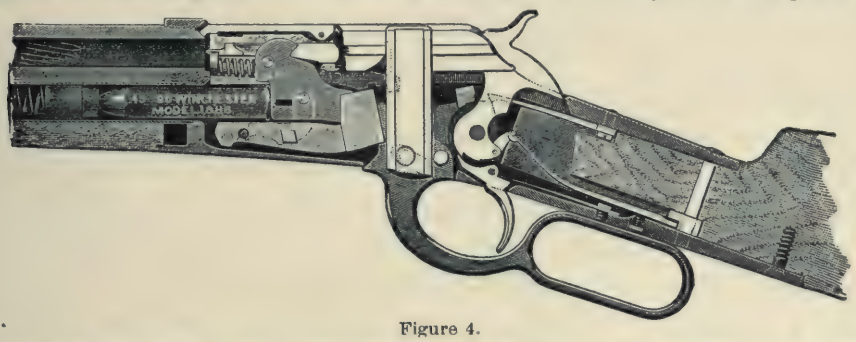


Figure 4.

shoulder. A glance at the sectional drawings of this model is convincing of the strength and simplicity of its locking device. The gun is locked by two bolts, having a motion like the old Sharp's breech-block, which show on the top of the gun when the action is closed. In this position the locking bolts lie one on each side of the breech bolt. Each bolt fits into a slot in the frame on one side, and into a similar slot in the breech-bolt on the other. The first opening motion of the lever withdraws and locks back the firing

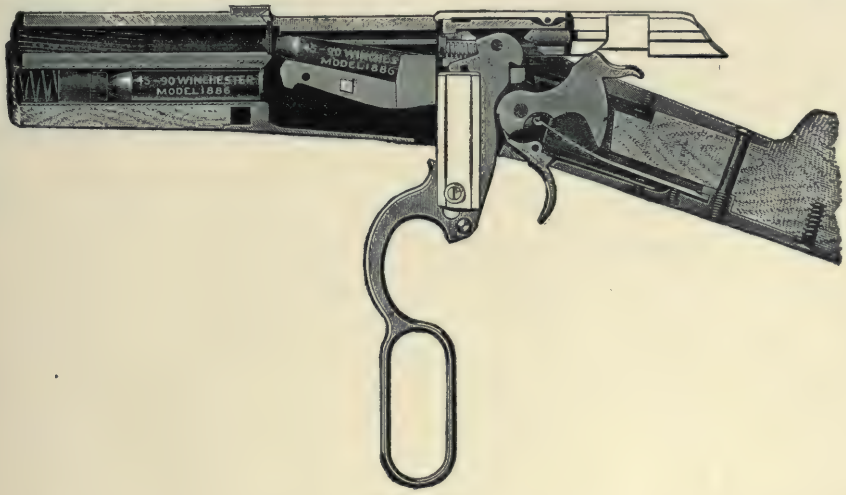


Figure 5.

pin until the gun is again ready for firing. A hook attached to the finger lever draws the cartridges out of the magazine into the carrier block, which enables the use of a light magazine spring, permitting the magazine to be filled easily. The cartridge is forced from the carrier into the chamber by the forward movement of the breech bolt. The arrangement

of the breech-bolt, finger lever, and locking bolt makes it easy to insert or eject a cartridge, and gives the action strength to withstand any charge.

The magazine is filled while the gun is closed, through the spring cover at the side, and is provided with a stop, which permits the use of cartridges of different lengths, having the same length of shell. For illustration: Guns chambered for the .45–70 cartridge will handle that cartridge with either the .405 or .500 grain bullet. Guns chambered for the .45–90 cartridge will handle the .45–85–350 solid ball, .45–82–405 solid ball, or the .45–85–300 hollow point express bullet cartridges. Guns chambered for .40–82 cartridges will handle the .40–75–260 cartridge of Winchester make. Rifles of this model, taking the .45–70 cartridges, should be used only with the .45–70 cartridges made by the Winchester Repeating Arms Co. In reloading the cartridges use the Winchester 2½ primer only. Never use in this gun a cartridge primed with a Berdan or copper primer. A rifle with a 26-inch barrel and full magazine will carry nine .45–70–405, .40–65, or .38–56 cartridges, or eight of the other thirteen cartridges for which this gun is made. Half magazine rifles will carry four .40–65, or .38–56 cartridges, or three of the other fourteen cartridges, in the magazine, and one in the barrel. Half magazine "Take Down" rifles

Figure 6.

will hold four cartridges in the magazine and one in the barrel. The standard length of barrel is 26 inches, but barrels are furnished up to 36 inches in length. Guns taking the .45–70 cartridge have the Sporting Leaf Sight, those taking the .50–110, .50–100 cartridges the Winchester Express Sight, and all others the Sporting Rear Sight. Guns of this model can be furnished with set triggers, if so ordered.

The Winchester Model, 1886 "Take Down" rifle, Figure 6, is a particularly handy and convenient arm. The ease with which it can be taken apart, and the small space it can be carried in, recommends it to all sportsmen. The barrel of the gun is attached to the frame by an interrupted screw, which makes it possible to detach the barrel from the frame with a one-quarter turn. The magazine barrel and fore-end are attached by a ring at the breech, so as to form one piece. This leaves the stock and action in one piece, and the barrel and all parts attached to it in another, so that the gun can be conveniently carried in a Victoria case like a shotgun, packed in a trunk or in bedding. Another feature of the "Take Down" style of gun is: When cleaning the gun the magazine can be screwed out and withdrawn entirely from the barrel, so that the later can be washed with water, if desired, without wetting the action or magazine. The interrupted

screw system used in Winchester "Take Down" rifles has been thoroughly tested, both in heavy ordnance as well as in small arms, and found to be fully as strong as the continuous screw. It is absolutely impossible for an accident to occur with a Winchester "Take Down" rifle on account of the gun not being put together properly. The Model 1886 "Take Down" rifle is made for the same cartridges and with the same variety of stocks as the regular style guns of this model, but only with 26 inch round, octagon or half octagon barrels. It is made with full or half magazine. Carbines, or barrels, longer than 26 inches are not furnished in "Take Down" style of rifle. To take apart Model 1886, 1892, and 1894 "Take Down" rifles, lift up the magazine lever found at the muzzle end of the magazine, and unscrew the magazine about one inch. Throw down the finger lever, and unscrew the barrel one-quarter of a turn to the left. Draw out the barrel from the frame.

In a new gun the barrel may unscrew with difficulty. If so, hold the gun by the forearm in the left hand, and strike the lower part of the stock with the right, so as to drive it to the right. To put the gun together, draw out the magazine about one-quarter of an inch. Throw down the finger lever. Slip the shank of the barrel into its place in the frame, in such a position that one-quarter of a turn to the right will lock the barrel to the frame.

If this gun becomes loose at the joint by wear, it may be readjusted by the following method: Take off the forearm of the gun. This will expose, on the front side of the receiver extension at the base of the barrel, three screws. By turning these up slightly any play between the ring and the front end of the receiver will be taken up, and the gun will go together without shaking, as before. This adjustment should not be used except in case of absolute necessity.

A very desirable feature of the Model of 1886 "Take Down" rifle is that of interchangeable barrels, as it enables every one to have practically two different guns for the slight additional cost of another barrel and magazine. As the action of the Model 1886 is the same for all cartridges it is made for, different caliber barrels can be used with the same "Take Down" frame. For illustration: A .38 caliber barrel, with magazine, forearm, etc, complete, can be interchanged with a .50 caliber barrel. Barrels of any of the other calibers for which this gun is made can be interchanged equally as well.

The Extra Light Weight Model 1886 rifle represents the lightest weight possible in a gun of such power, without the sacrifice of strength or good shooting qualities. Although this gun weighs only about six and three-quarters pounds, it is absolutely safe in every way. Before it was placed upon the market, this rifle was subjected to the severest of tests for strength, etc., all of which it underwent without displaying the slightest weakness of any sort. It is made to order according to the following specifications: Barrel, round, nickel steel, 22 inches long, chambered for the .45–70 cartridge only. Full magazine holding 7 cartridges, or half magazine holding 4 cartridges.

The Model 1886 Light Weight "Take Down" rifle is the embodiment of lightness

and convenience. Although this style of arm weighs only about seven and a quarter pounds, it is entirely safe and reliable. It will be made to order according to the following specifications: Barrel, round, nickel steel, 22 inches long, chambered for the .45–70 cartridge only. Full magazine holding 7 cartridges, or half magazine holding 4 cartridges.

Referring to Figures 4 and 5, *to dismount the gun*, remove the stock. Unscrew strain screw. Drive out the mainspring from left to right. Remove the carrier spring. Take out the hammer screw and tang with sear attached. Draw out the hammer. Remove the spring cover. Drive out the finger lever pin and bushing. Draw the locking bolts out from below. Pull back the breech-bolt until the lever connecting pin shows at the rear of the receiver. Drive out the pin. Draw out finger lever and carrier attached by the carrier hook. Remove the cartridge guide and magazine stop. *To assemble the gun*, put in the magazine stop and cartridge guide. Connect carrier and finger lever with the carrier hook, and put them into the receiver from below. Enter the breech-bolt at the rear, and press the upper end of the finger lever into its place in the breech-bolt. Push in the lever connecting pin. To do this it will be necessary to press back the ejector until the notch in the ejector corresponds with the pin. Push the bolt forward into the gun. Push up the locking-bolts from below. See that the cartridge guide enters its notch in the right hand locking-bolt. Replace finger lever pin and bushing. Replace the spring cover. Lay the hammer in place and push in the tang, drawing back the trigger, so that its point may not catch on the hammer. Push in the hammer screw. Replace the carrier spring. Replace the mainspring and stock.

The Winchester Model 1890, "Take Down," is the best light weight .22 caliber repeating rifle on the market with a sliding forearm action. It is handy, can be taken apart in an instant, and is an accurate strong shooting arm. The popularity of this model is attested to by the demand for it, which has been phenomenally large. It is well adapted for small game and target shooting, and is used by all the best professional fancy rifle shots in this country and abroad. Its light weight, and the ease with which it can be manipulated, makes it very desirable as a lady's gun. The action of this model is simple and strong. The parts are few in number, and made by the interchangeable system. The breech-block locks itself in plain view, and is of such size as to permit the use of a strong firing pin and extractor, and also to offer a good cover for the head of the cartridge. The action locks with each closing movement, and cannot be opened except by letting down the hammer or pushing forward the firing pin. The arrangement of the breech-block and hammer is such that the gun cannot be prematurely fired, nor the hammer pulled prematurely, causing a missfire. Rifles of this model are adapted to the regular .22 short, .22 long and .22 Winchester rim fire cartridges, the latter being especially designed for this gun, with inside lubricated bullet. A gun chambered for the .22 short cartridge will handle that cartridge only; a .22 long will handle the .22 long cartridge only, and so on. This model is made with 24 inch octagon barrels, plain triggers and

straight grip rifle stocks. *To charge the magazine*, turn the milled head at the top of the magazine until the magazine tube is unlocked. Draw out the inner tube until it strikes the stop. This will leave the loading hole open. Cartridges can then be dropped into the magazine until the same is full. The magazine of the .22 short gun will hold fifteen .22 short Winchester cartridges. The magazine of the .22 long gun will hold twelve .22 long Winchester cartridges. The magazine of the .22 Winchester rim fire gun will hold ten of those cartridges. After the magazine is full, press down the inner case. When clear down, turn to the left to lock it in place. If it is desired to empty the magazine without passing the cartridges through the gun, draw the inner tube out until it strikes the stop; turn it half around; it can then be pulled out entirely, and the cartridges dropped out of the mouth of the magazine. *To load the gun;* when the hammer is down, the motion of the handle backward and forward unlocks, opens, and cocks the gun, forces the cartridge into the chamber, and locks the gun. The gun once closed is locked, while the hammer stands at full or half cock. To open the gun without firing or letting down the hammer, push forward the firing pin with the thumb, and pull back the handle at the

Figure 7.

same time. When the gun stands at half-cock, it is locked both as to the opening of the breech and the pulling of the trigger. The hammer cannot be cocked by the motion of the breech-block from this position, but must be cocked by hand. *To take down the gun*, turn out the assembling screw (a stop pin prevents its dropping out); hold the arm by the barrel, with the left side down, and pull the stock from the barrel. Put the gun together in the same position, first letting down the hammer and pushing the breech-piece to its most forward position. It will not be found necessary to clean the action of this gun, unless it has had extraordinary usage. When the gun is open, the front of the breech-block may be wiped clean of grease, and when taken down the carrier can be cleaned. This is all that will be found necessary to do to the action. The barrel should never be left dirty. In calibers as small as the .22 too much care cannot be taken in keeping the barrel clean. A brass cleaning rod accompanies each gun.

The action of this Model is shown in Figures 7 and 8. *To dismount the gun*, take down the gun: All pins drive out from right to left. To take out the breech-block, remove the magazine ring pin; draw out the magazine; slide out the cover plate; lift out the action slide; press on the firing pin, unlock the breech-block and draw it out back-

wards. To take out the extractor, drive out the extractor pin from the bottom of the breech-block. To remove the firing pin, take out the firing pin stop screws and remove the firing pin stop. The firing pin can then be drawn out. To remove the hammer and carrier block from the tang, take off the stock, loosen the mainspring strain screw and the mainspring screw; slide the stirrup off the mainspring, pressing down the mainspring to accomplish this. The mainspring can then be swung out sideways. The assembling screw and assembling screw bushing can then be removed and the hammer taken out. Take out the trigger; loosen the trigger spring screw; drive out the trigger pin.

To assemble the gun, put in the trigger and trigger spring, carrier and hammer, and slip in the hammer pin. Slide the stirrup over the mainspring and tighten the mainspring screw and mainspring strain screw. Put the firing pin in the breech-block, and replace firing pin stop and stop screw. Replace extractor, driving in pin from top. Slip the breech-block into the frame. Replace action slide, and put on the slide cover. Replace magazine. To do this, turn the magazine so that the loading hole is next the barrel; slip the magazine stop spring in place; slide the magazine with stop spring in place so that the lower end of stop

Figure 8.

spring is under the magazine ring; turn the magazine so that stop spring comes next the barrel, and push it into place. Replace the magazine pin. Replace the butt stock.

The Winchester Model 1892 has the same system as the Model of 1886. Manipulated by a finger lever, the firing pin is first withdrawn; the gun unlocked and opened; the shell or cartridge ejected, and a new cartridge presented and forced into the chamber, the firing pin being held back until the gun is again locked. The locking bolts are always in sight, and, when the gun is closed, support the breech-bolt symmetrically against the force of the explosion. The same cartridges are used as in the Model of 1873,—.44, .38 and .32 Winchester center fire,—their widely extended sale having proved their value for general use, and in addition the .25–20 Winchester center fire cartridge. The gun is light, strong, handsome, and simple in construction. The standard length of barrel for this Model is 24 inches: but the barrels are made up to 36 inches. The .44 caliber rifle, with a 34 inch octagon barrel, will weigh about 6¾ pounds. The .44 caliber carbine, with a 20 inch barrel, weighs a little less than 5¾ pounds. The .38, .32 and .25 calibers will weigh a little more than the .44 of corresponding style.

The "Take Down" system used on the Model 1892 is the same as the one used so

successfully on the Models 1886 and 1894 Winchester repeating rifles. *To take the gun apart,* lift up the magazine lever found at the muzzle end of the magazine, and unscrew the magazine about one inch. Throw down the finger lever, and unscrew the barrel one-quarter of a turn to the left. Draw out the barrel from the frame. In a new gun the barrel may unscrew with difficulty. If so, hold the gun by the forearm in the left hand, and strike the lower part of the stock with the right, so as to drive it to the right. *To put the gun together,* draw out the magazine about one-quarter of an inch. Throw down the finger lever. Slip the shank of the barrel into its place in the frame in such a position that one-quarter of a turn to the right will lock the barrel to the frame. If this gun becomes loose at the joint by wear, it may be readjusted by the following method: Take off the forearm of the gun. This will expose, on the front side of the assembling ring at the base of the barrel, three screws. By turning these up slightly any play between the ring and the front end of the receiver will be taken up, and the gun will go together without shaking, as before. This adjustment should not be used except in case of absolute necessity. This rifle is made in .25, .32, .38, and .44 calibers, but only with 24

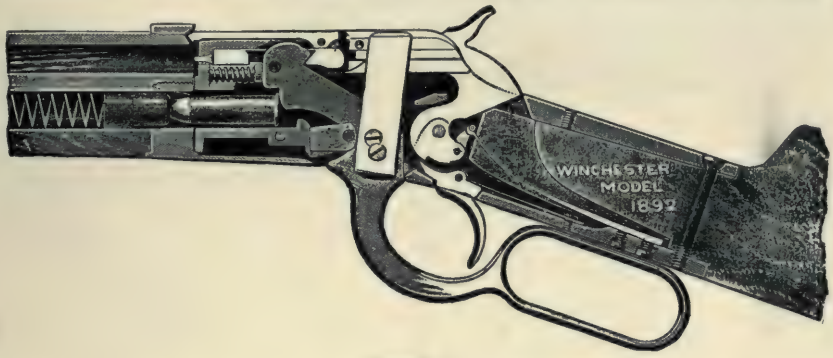


Figure 9.

inch Round Octagon, or half-octagon barrel. Carbines or any longer barrels are not furnished in the "Take Down" style of rifle. The .38 and .44 calibers of the Model 1892 "Take Down" rifles, having the same action, the barrels are made interchangeable so that any one wishing to use the two styles of cartridges, .38 Winchester center fire, and .44 Winchester center fire, may do so at a comparatively small increase over the cost of one rifle, by having two interchangeable barrels fitted to one frame and stock.

The action, closed and open, of the Model 1892 is shown in Figures 9 and 10. *To dismount the gun*, take off butt stock. Throw down the lever. Turn out the mainspring strain screw until it does not bear on the spring. Take out the mainspring screw and mainspring. Take out the hammer screw. Withdraw the tang and slip out the hammer. Remove the finger lever pin stop screw (this is the forward screw on the left-hand side of the frame). Drive out the finger lever pin. A hole is left on the right-hand side of the gun, through which a punch may be used to drive out the pin. The pin is opposite this hole when the breech-bolt is in the most forward position. Throw the lever down and draw out the lever with the locking bolts attached. Remove the breech-bolt. Take out

the two carrier screws and remove the carrier by pushing it backwards. Remove the cartridge guide screws and take out the guides. *To assemble the gun*, slip in the carrier from the lower side. To do this it will be necessary to push in the carrier stop so that the carrier will slip into place between the walls of the frame. Replace the cartridge guides. The cartridge stop spring in the left-hand guide should be assembled with its point under the cartridge stop and concaved side towards the receiver. Put in the bolt with the ejector, ejector spring, and collar assembled. Assemble the locking bolts upon the lever and push them, with the lever, into place from the lower side of the gun. Replace the finger lever pin and stop screw. Slip in the tang. Put the hammer in place and put in the hammer screw. Assemble the mainspring loosely on the tang. Catch the stirrup over the end of the mainspring before screwing it fast. Screw fast the mainspring screw and mainspring strain screw.

The Winchester Model 1894 is strong, light, and elegant. The breech-bolt, worked

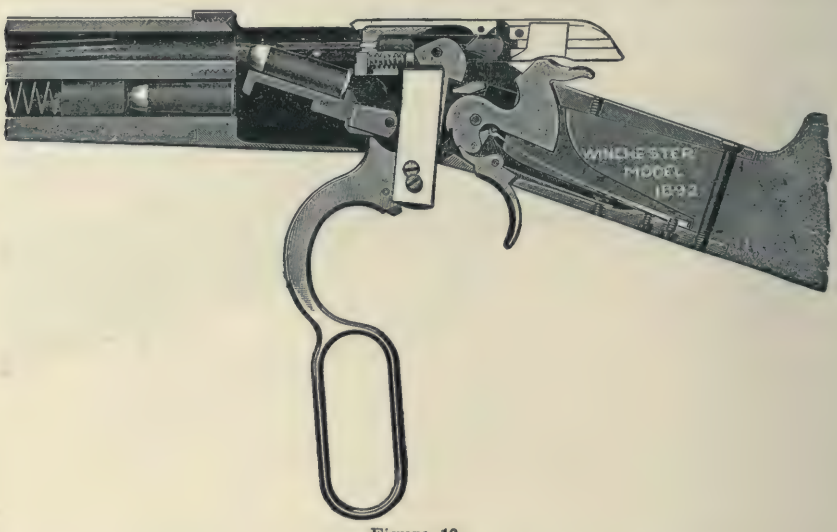


Figure 10.

by a finger lever, is automatically locked by a vertically moving block, which shows on the top of the gun when closed, and covers the whole rear of the breech-bolt. The firing pin is automatically withdrawn and the trigger locked until the parts are in firing position. A heavy hammer and a strong mainspring enable the use of the heavy Winchester No. 2½ primer, lessen the chance of misfires, and render unnecessary the use of a sensitive primer in the magazine. The arrangement of the parts is such as to smoothly, easily, and surely cock the hammer, pull out and eject the spent shell, draw the cartridge out of the magazine and insert it into the chamber. The standard length of barrels is 26 inches, and the barrels can be furnished in round, octagon, or half octagon styles. Guns of this model vary in weight from 7 to 7¾ pounds, according to the difference in style. There is also a slight variation, according to size of bore and shape of barrel. A gun with a 26 inch barrel, having a full magazine, will hold nine cartridges in the magazine, which, with

the one in the chamber, gives a total of ten shots at the command of the shooter. A gun with a 26 inch barrel, half magazine, will hold three cartridges in the magazine and one in the chamber. A "Take Down" rifle, with a 26 inch barrel and a half magazine, will hold four cartridges in the magazine and one in the chamber. Guns chambered for the .32-40 and .38-55 cartridges can be furnished with barrels up to 36 inches in length. Barrels chambered for the .25-35 or .30 Winchester cartridges are not furnished over 26 inches in length. Rifles of this model can be equipped with Winchester double set trigger, if so desired. The "Take Down" system used on this rifle is the same as the one used on the Models 1886 and 1892 Winchester repeating rifles. The extra light weight Model 1894 rifle is the lightest gun made that handles such a high-powered cartridge as the .30 caliber W. C. F. smokeless. This rifle is a hard, accurate shooter, and a strong, reliable arm. It is made to order according to the following specifications: Round, octagon, or half octagon barrel, 26 inches long or under, chambered for the .25-35 and .30 W. C. F., .32-40 and .38-55 cartridges.* Full magazine holding 9, or half magazine holding 3 cartridges.

The "Take Down" extra light rifle is similar to the latter rifle, the only difference being that it is a "Take Down," which increases the weight about ¼ pound. It can be

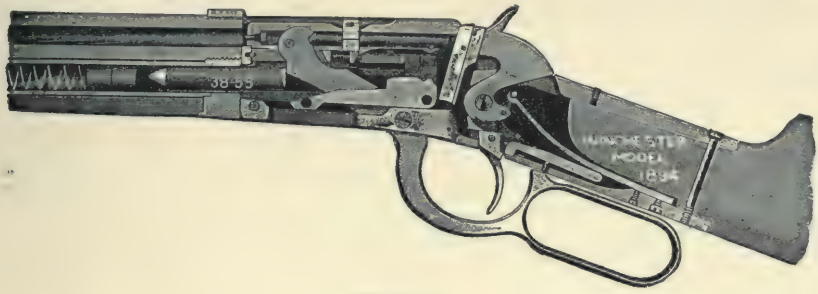


Figure 11.

furnished with interchangeable barrels, the .25-35 interchanging with the .32-40, and the .30 Winchester*interchanging with the .38-55. In the selection of cartridges for this model, for big game, soft pointed metal patched bullets should always be used in preference to full metal patched bullets, as the effect of the former on animal tissues is much more deadly.

The action, closed and open, of the Model 1894 is shown in Figures 11 and 12. *To dismount the gun*, take out the tang screw and remove the butt stock. Take out the finger lever pin stop screw and finger lever pin. Take out the link pin screw and link pin. Take out the finger lever and link. Take out the finger lever link screw, and separate the link from the finger lever. Take out the carrier screw from each side of the gun and remove the carrier. Take out mainspring screw and mainspring. Take out the hammer screw and hammer, holding up safety catch pin while doing so. Take out lower tang. Take out locking block. Take out the breech-bolt. Take out the cover spring screw and cover spring. Take out the carrier spring screw and carrier spring. *To assemble the gun*, put in the carrier spring and carrier spring screw. Put in the cover

*Also the .32 Winchester special.

spring and cover spring screw. Slip in the breech-bolt. Put the hammer in place, and slide the tang into place. Put in the hammer screw, remembering that the sear cannot be moved without pressing up the safety catch pin. Catch the mainspring onto the stirrup, and put in the mainspring screw. Slip in the locking block from the top. Put in the carrier and replace the carrier screws, one on each side. Assemble the link to the finger lever. Push the finger lever partly up into the gun, and catch the rear end of the link upon the locking block. Put in the link pin and the link pin screw. Close the link into gun, put in finger lever pin and finger lever pin stop screw. Slip on the stock, and put in the tang screw.

Figure 12.

The Winchester repeating rifle Model 1895, in Military and sporting patterns, was the first box magazine, lever action gun put upon the market. It is light in weight; handsome in form; safe, swift, and sure in action. The moving parts are few and strong. The parts are made to gauges by the interchangeable system—not fitted by hand and numbered separately. The complete gun has been tested at 60,000 pounds pressure with a .30 caliber Government shell and ball giving velocities of 2,400 feet per second. The regular velocity required for this cartridge is 2,000 feet. Each gun has been proved in the rough and finished condition, shot to prove the action, and sighted upon a 200-yard target. As a single loader, it can be shot 25 times per minute from the shoulder, with aim; as a repeater, at the rate of two to three shots per second, with aim. No other gun offers more advantages in rapidity of action, high velocity, and excellence of material and workmanship than this. The receiver, open at the top, permits the symmetrical locking of the breech-bolt. The first opening motion of the lever withdraws the trigger from contact with the sear, before the gun is unlocked, so that it is impossible to fire the gun except when fully locked. The continued opening motion of the lever draws down the locking bolt and withdraws the breech-bolt, cocking the gun and ejecting the cartridge or fired shell. The breech-bolt, passing over the hammer, presses the firing pin lock against the latter, and makes fast the firing pin. When the breech-bolt is in its rear

most position the hammer is made to hold it open by contact, so that the magazine may be easily loaded. When in this position, the upper cartridge in the magazine is so presented as to engage the breech-bolt. The closing action of the lever carries forward the breech-bolt, forcing the cartridge out of the magazine into the chamber. After the breech-bolt has reached its closed position, the locking bolt is lifted into place, first

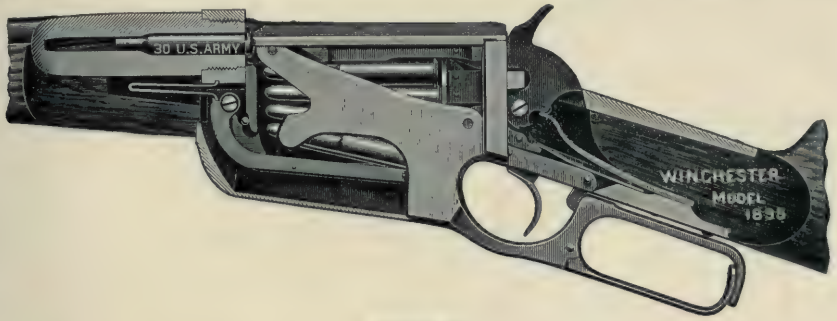


Figure 13.

locking the gun and afterward unlocking the firing pin. The final closing movement of the lever presents the trigger against the sear, leaving the gun in position for firing. The magazine of the box type, contains five cartridges, and the number in the magazine can always be known by opening the gun, if light serves, or by feeling, if light fails. The

Figure 14.

magazine follower presents the cartridges to the lower front edge of the breech-bolt in position to be forced into the chamber, and is arranged to prevent the escape of the cartridge following before the preceding one is in the grasp of the extractor, thus preventing the jamming of the gun by false movement. The disposition of the magazine and parts is such that the gun can be readily used as a single loader, keeping

the magazine in reserve. The mechanism of the system can be easily understood by examining the sectional drawings, Figures 13 and 14, in which the gun is shown closed and open, the left side being cut away to show the interior. *To dismount the gun,* remove the forearm, take out the carrier spring, and take off the butt stock. Open the lever and remove the carrier screw and magazine tip screw. These are the two lower screws on the forward end of the frame. Remove the magazine with inclosed carrier, turn out the mainspring strain screw, take out the mainspring screw and mainspring. Close the lever and take out the hammer screw and hammer. Remove the finger lever pin stop screw and drive out the finger lever pin from the forward hole in the right side of the frame. Remove the link pin. (This connects the link and the lower tang). The finger lever, link, and trigger can then be removed together. Take out the sear spring screw—the forward screw on the bottom of the tang—and the sear pin. Take out the locking bolt and

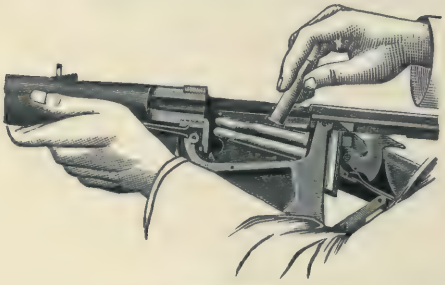


Figure 15.

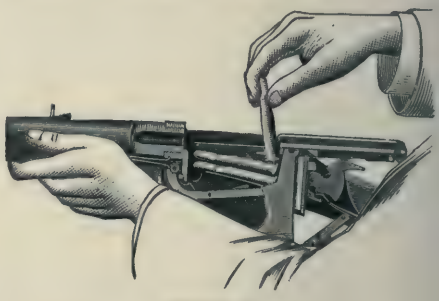


Figure 16,

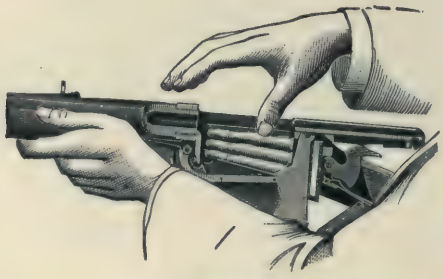


Figure 17.

breech-bolt. *To assemble the gun,* put in the breech-bolt, assembled complete with firing pin, extractor, and ejector. Put in the locking bolt. Put in the sear, sear pin, and spring. Put in the finger lever, and drive in the finger lever pin from the left side. Put in the finger lever pin stop screw. Attach the link to the lower tang by the link pin, and drive in the finger lever link pin, connecting the link with the finger lever. (The link should be attached to the tang with trigger and friction stud all assembled.) Put in the hammer and hammer screw. Put in the mainspring and mainspring screw, and turn up the mainspring strain screw. Put in the magazine with carrier in place. The carrier is held in place by the carrier screw entering from the outside of the frame. Replace the carrier spring. Put on the forearm and butt stock. *To load the magazine,* seize the cartridge between the thumb and the forefinger, the bullet lying under the first joint of the

forefinger. Push the head of the cartridge into the magazine just forward of the springs, forcing down the follower or the preceding cartridge, Figure 15. Push the head of the cartridge back between the springs until it lies against the face of the breech-block, Figure 16. Turn the bullet end of the cartridge forward and downward, following it with thumb or finger until it lies in position between the springs, Figure 17. The following are the weights: .30 Army or .303 British, 28 inch round barrel, weight about 8¼ pounds;* Carbine, .30 Army, 22 inch round barrel, weight about 8 pounds; Musket, .30 Army, 28 inch round barrel, weight about 9 pounds; .38-72 Winchester, 26 inch round barrel, weight about 7½ pounds; .38-72 Winchester, 26 inch octagon or half octagon barrel, weight about 8¼ pounds; .40-72 Winchester, 26 inch round barrel, weight about 7½ pounds; .40-72 Winchester, 26 inch octagon or half octagon barrel, weight about 8¼ pounds.

The cartridges adapted to the Model 1895 are all very desirable, either for big game, hunting or target practice. The .30 Army and .303 British cartridges* belong to the most modern class of high powered smokeless powder ammunition, and owing to their high velocity, flat trajectory, and great penetrating power, they have become favorites with the most experienced and successful big game hunters. There are no cartridges made which exceed in shocking and smashing effect the .30 Army or .303 British,* with steel jacketed soft pointed bullets. Their deadly effect upon big game has been thoroughly established by overwhelming proof. For big game hunting soft point bullets should always be used in the .30 Army or .303 British cartridges.* Black powder cartridges, or soft lead bullets, cannot be used in Model 1895 rifles chambered for the .30 Army or .303 British cartridges.* The .38–72 and the .40–72 Winchester cartridges, which the Winchester Model 1895 handle, are popular with many riflemen, on account of their power and accuracy. Soft lead, full metal, patched or metal patched soft point bullets, and either black or smokeless powder, give excellent results in these cartridges.

The Lee Straight Pull rifle, made by the Winchester Repeating Arms Co., in musket and sporting styles, has been adopted by the United States Navy. The Navy model weighs 8½ pounds and is 6 M/M (.236) caliber. It is furnished with adjustable sling and knife bayonet. It is 5 shot with a 28 inch barrel. The sporting pattern has a 24 inch barrel and weighs 7½ younds. See *Lee Straight Pull Rifle.*

The Winchester Single Shot rifle has the old Sharp's breech-block and lever, and is as safe and solid as that arm. The firing pin is automatically withdrawn at the first opening movement of the gun and held back until the gun is closed. The hammer is centrally hung, but drops down the breech-block when the gun is opened, and is cocked by the closing movement. It can also be cocked by hand. This arrangement allows the barrel to be wiped and examined from the breech. It is furnished with or without set trigger, with barrels of all ordinary lengths and weights, and for all standard cartridges. All .22 caliber rim fire rifles are fitted with a kicking extractor which throws the shell clear of the gun. To accommodate all tastes as to weights of single shot rifles, five sizes

*Also the .35— 405.

of barrels, numbering from 1 to 5, are made, No. 1 being the smallest. No. 4 barrel is made to accommodate those wanting a heavier gun and will increase the weight of a .38 caliber gun over that of one with a No. 3 barrel about 1½ pounds—other calibers in proportion. No. 5 barrel is the heaviest which can be made and will increase the weight of a .38 caliber gun over that of one with a No. 3 barrel about 2½ pounds—other calibers in proportion.

The single shot rifle system, action closed, is shown in Figure 18. *To dismount the gun*, take off the forearm. Take out the mainspring and ejector spring. Loosen the stop screw, and take out the finger lever pin. Draw out the breech-block by the finger lever with the hammer attached. The extractor will drop out. If it is desired to remove the trigger or sear, take off the stock. Remove the side tang screws and tang; the pieces attached to the tang can then be removed by pushing out the pins which hold them. Remove the sear spring screw and spring. *To assemble the gun*, replace the sear spring and screw. Mount the trigger and other parts of the lock on the tang and slide it into place. Replace the side tang screws. Assemble together the hammer, breech-block and

Figure 18.

finger lever, and hold them in the same relation to each other as shown in the cut; that is, the firing pin protruding, and the hammer against the breech-block. In this position push them from the under side of the gun partly into position. Put in the extractor, and push the whole into place, holding back the trigger, so that the sear may not catch on the hammer. Put back the mainspring, ejector spring and forearm. Replace the stock.

Winchester rifles which can be equipped with set triggers, take the following styles: Model 1873 single set trigger only. Models 1886, 1892, and 1894, double set trigger only. Single shot rifles, except those chambered for rim fire .22, .32, .38, and .44 W. C. F., .25–20, and .32 Ideal cartridges, the double set trigger, or the Schuetzen double set trigger only. Single shot rifles chambered for rim fire, .22, .32, .38, and .44 W. C. F., .25–20, .32 Ideal cartridges, can be equipped only with the single set trigger for single shot rifles unless made with a No. 3 barrel, in which case they can be equipped with the double set trigger, or Schuetzen double set trigger. *To use* the set trigger, (see Figure 1,) after the gun is closed and cocked, if the trigger is a single set, push the trigger forward

with the thumb until a click is heard and the trigger sets in a forward position. If it is a double set trigger, push the rear trigger forward until a click is heard. If it is a Schuetzen double set trigger, pull the rear trigger back until a click is heard. The trigger is then set, and a very slight pull will fire the gun. The trigger must be set after each shot. If it is desired to make the set finer, turn in the small screw directly back of the trigger. By turning it in just to the right point, the trigger can be made to pull very fine indeed.

It is but a comparatively short time since the Winchester repeating shotgun with the sliding forearm action, known as the Model 1893, was introduced, yet it is rapidly supplanting the double barreled gun at the trap and in the field. At first there was almost as much prejudice against this style of gun as there was against the repeating rifle when it was first introduced, but this quickly vanished when the wonderful performances and possibilites of the repeating shotgun became known. The United States Ordnance Board, after submitting a Winchester repeating shotgun to the severest tests for strength accuracy, penetration, endurance, excessive loads, defective shells, rust and dust, made the following official finding, which is copied from the U. S. Ordnance Reports:—

"In the preliminary examination of the shotgun, the Board was of the opinion that certain of the component parts—notably, the firing pin spring, cartridge stop spring, and sear—were too light and weak for hard service, but the results of the severe tests to which the gun was subjected showed that every part was strong and serviceable. The Board finds that the gun possesses the advantages claimed by the manufacturer. The sliding forearm movement insures the ease of manipulation from the shoulder, and the gun can be loaded, unloaded or fired with safety and sufficient rapidity. It is accurate, gives good penetration, especially with the cartridge containing heavier buckshot, and has little recoil. The working parts are few in number, and are simple, strong, and well made; and the Board is of the opinion that the arm is especially well adapted to the purpose for which it is intended. The Board has, therefore, no suggestions nor recommendations to make in the way of improving the gun for the use of sentinels in the military service."

The great success which attended the sale of the Model 1893 repeating shotgun led the manufacturers to offer a new form of this gun, which it seemed best, by reason of many changes and improvements, to call the Model 1897, although the users of the Model 1893 will recognize in it many points of similarity. The old form of sliding fore-end, breech-block, carrier block, hammer, and trigger have been retained, but in the detail many alterations are collected in the Model 1897 gun. The frame has been altered to use a 2¾ inch shell as well as a 2⅝ inch. The frame at the top has been covered over so that the ejecting of the shell is now entirely from the side. This adds great strength to the frame, and permits the use, without danger of jamming, of a 2¾ inch shell. A new lock, opening by recoil, or otherwise, at the will of the operator, has been put upon the gun. Under the slide handle, and acting against the stop on the magazine. is placed a spring. When the gun is closed, this spring pushes against the upper end of the action slide, and presses it toward the stock. A lever is hung in the carrier block; when the slide handle is

pressed forward, a spring in the rear end of the lever forces the forward end of the lever out and it catches against the notch in the action slide. While the hammer stands at full cock, the rear end of the lever is forced outward and its notched forward end holds the slide fast. When the hammer stands at half cock, the same occurs. But when the hammer has fallen, the spring which lies under the rear end of the lever forces the forward end of the lever toward the center of the gun. The spring under the slide handle, however, still holds the forward end of the lever in place, and the gun cannot be opened until a slight forward motion of the slide handle releases the lever. Thereupon it may be opened by pulling back the slide handle. In firing, the recoil of the gun gives the slight forward motion to the slide handle, releases the lever, and enables the immediate opening of the gun. It results from this that the gun awaits the explosion of the cartridge before opening. If the shell hangs fire, the gun will not come open in the hands of an operator who is holding back upon the slide handle with the intention of making a quick second shot. It will, however, come immediately open when the recoil of the gun occurs. To open the gun at full cock, a button upon the right hand side must be pressed. This throws off the recoil lock and allows the gun to come open by making a slight forward push of the slide handle. When the hammer has fallen without exploding the cartridge, it will be necessary to push forward the slide handle before the gun can be pulled open. At half cock the gun is locked against firing and opening. Double extractors are used. That on the left hand side guides the bolt, enabling it to be fitted close in the frame so that a tight breech joint obtains. Upon the right side of the carrier block a movable cartridge guide is placed. The motion of this guide is so great that, in connection with the overhang of the frame, the side opening of the gun is completely covered at the moment when the cartridge is lifted from the magazine by the carrier block. This prevents the escape of the shell when the gun is turned sideways in the act of loading. A new firing pin lock is also furnished, acting at the first opening motion of the carrier, so that the firing pin stands locked at all times, except when the gun is closed and ready to fire. The arrangement of the firing pin lock is such that the firing pin is always free at the time of firing, and the hammer has no other work to do than the moving of the firing pin. The firing pin is made lighter than in the Model 1893 gun. This enables a lighter mainspring in its turn, with shorter and lighter trigger pull. Two cartridge stops are furnished, one on each side opposite the mouth of the magazine. These carry the weight of the cartridges and the magazine spring equally at two opposite points on the head of the cartridge so that the cartridge is not deformed about the head from pounding in the magazine. The barrel of this gun has been proved with 9½ drams of powder, No. 5, and 2½ ounces shot. The gun assembled, has been proved with two shots, four drams of powder (special bursting), 1¼ ounce shot. It has been shot for pattern three shots, and to prove manipulation, eight to fifteen shots. With ordinary trap loads containing 1¼ ounce No. 8 shot the gun will be found to pattern 325 pellets in a 30 inch ring at 40 yards. This gun will use any load of smokeless powder which can be properly loaded in a 2¾ or 2⅝ inch, 12 gauge shell.

To load the magazine, turn the gun, when closed, so that the under surface of the carrier block can be seen. Lay the cartridge upon this and push it into the magazine. The magazine will contain five cartridges, which, with one in the barrel, make six at the command of the shooter. The backward and forward motion of the action slide carries the cartridge from the magazine into the barrel. *To unload the magazine,* open the gun. The cartridge in the chamber will be drawn out. The cartridge in the magazine will appear on the carrier block, and, by turning the gun, it can drop out on to the hand. Make

Figure 19.

an incomplete closing motion, and again open the gun; drop out the next cartridge, and repeat until the magazine is empty.

The action of the Model 1897 repeating shotgun, opened and closed, is shown in Figures 19 and 20. *To dismount the gun* see that all lateral pins are driven out from right to left, except hammer pin, which drives out from left to right. Remove band screw and band. Remove magazine stop screw from receiver. Grasp magazine at top and unscrew and remove from receiver by hand, action slide and slide handle remaining on

Figure 20.

magazine. Remove carrier pin stop screw from upper left hand side, rear end of carrier. Cock hammer, and while pressing action slide lock release pin, push carrier clear down with screw driver through side of receiver. Remove the carrier pin. Remove cartridge guide stop screw from right hand side of receiver near trigger guard. Pull carrier forward, down and out of receiver. Remove action slide lock release pin. Remove action hook screw from right hand side of the front end of breech-block. Remove action hook. Remove breech-block from the receiver. Remove butt plate screw and butt plate. Take

out receiver bolt and the washer found under butt plate. Pull off butt stock. Remove trigger pin. Remove trigger and trigger spring. Pull guard bow out to the rear. Remove right and left hand cartridge stop screws and cartridge stops. Assemble in reverse order. *To dismount parts attached to carrier,* uncock the hammer and remove sear spring screw and the sear spring. Remove sear pin and sear. Remove action slide lock pin screw (the small screw on the left side of carrier) and action slide lock pin and action slide lock. Remove action slide lock spring screw and action slide lock spring. Pull cartridge guide gently out from carrier and push upward until it rides over diamond shaped projection on upper corner of carrier, opposite hammer. This operation uncovers end of hammer pin. Remove action slide release pin plunger. Remove hammer pin and hammer. Remove mainspring strain screw. Remove mainspring pin, and mainspring drops out through rear end of carrier. Note that cartridge guide is not to be removed from carrier unless disabled. Assemble in reverse order. *To dismount parts attached to breech-block,* hold back right hand extractor pin (this may be done with a knife blade or very thin screw driver), lift out extractor and remove pin and spring from hole in breech-block. Drive out left hand extractor pin from upper side of breech-block and remove extractor.

Figure 21.

Remove firing pin lock screw and firing pin lock. Remove firing pin stop pin and firing pin. Assemble in reverse order. Note that in replacing firing pin lock it will be found most convenient to hold a small block of wood firmly against firing pin lock, and lower side of breech-block, while the firing pin lock screw is placed in position.

The Winchester "Take Down" repeating shotgun, shown in Figure 21, is the popular Winchester Model 1897, with a strong, simple serviceable, and handy take-down system applied to it. This gun can be taken apart and put together as easily and quickly as a double-barreled shotgun, and can be carried in a Victoria case, packed in a trunk, or rolled up in camp bedding. The take-down system used on this gun is similar to the one used on the Winchester "Take Down" rifles, which thorough and extensive trials have demonstrated to be faultless. The interrupted screw system—a feature found exclusively in the Winchester "Take Down" rifles—is used on the "Take Down" shotgun. This permits the removal of the barrel from the receiver by a one-quarter turn. When taken apart the stock and action of the gun remain in one piece, and the barrel, magazine and forearm in another, the last named parts being held together at the breech end by a

ring, called the receiver extension. There are no small pieces or springs to fall out and be lost when the gun is taken apart, and no particular knack is required to take down or put the gun together quickly and easly, the operation being as simple as that of loading. Besides being convenient to carry and very easy to clean, a feature which further recommends the "Take Down" is that it can be fitted with interchangeable barrels of the different lengths and different styles of bore.

The Winchester "Take Down" "Trap" gun is made in the 12 guage "Take Down" style only, and according to the following specifications: a 30 inch rolled steel barrel, chambered for 12 gauge, 2¾ inch shell, bored expressly to shoot nitro powder and to target 280 pellets, or over, of No. 7½ chilled shot, inside a 30 inch circle at 40 yards, with a load of 3¼ drams of nitro powder and 1¼ ounces of shot.

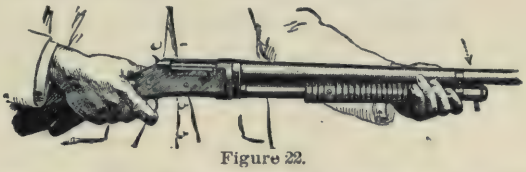


Figure 22.

The Winchester "Take Down" "Pigeon" gun differs from the regular and "Trap" "Take Down" guns in length of barrel, which is 28 instead of 30 inches, and in exterior finish. The action is the same as the regular Model 1897 "Take Down." This gun is made according to the same specifications as the "Trap" gun, except the barrel is 28 instead of 30 inches long and handsomely matted.

To take apart the "Take Down" shotgun, push out the magazine locking pin (the large pin found at the front end of the magazine, which pin answers as a lever to unscrew the magazine), and unscrew the magazine one-quarter turn. Pull the magazine and action slide forward and, grasping the barrel and magazine just ahead of the receiver extension, and holding the action slide forward, unscrew the barrel one-quarter turn, the magazine turning with the barrel. Pull out the barrel from the receiver, Figure 22.

Figure 23.

To put the gun together, grasp the barrel and magazine just ahead of the receiver extension, and holding the action slide forward, insert the shank of the barrel into its place in the receiver in such a position that a quarter turn to the right will lock the barrel into the receiver. Turn the barrel one-quarter turn to the right. Insert one finger of the right hand in the opening in the under side of the receiver and push up the carrier. Turn the magazine to the extreme left and push the magazine into the receiver as far as it will go. Turn the magazine one-quarter turn to the right, Figure 23, by means of the locking pin, and push in the pin. Care should be taken to hold the action slide forward when inserting and

screwing the barrel into the frame. If the end of the action slide is allowed to protrude, it will jam against and scratch the receiver, Figure 24.

If the gun becomes loose at the joint by wear, it may be re-adjusted in the following manner: Take the gun apart and remove the adjusting sleeve lock screw,

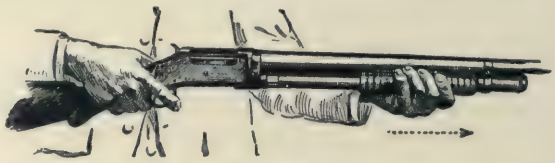


Figure 24.

found on the right hand side of the receiver extension. Draw out the adjusting sleeve lock, Figure 25. By turning the adjusting sleeve back one or two notches, the play between the receiver extension and the receiver will be taken up and the

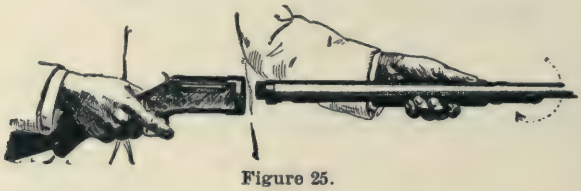


Figure 25.

gun will go together without shaking, as before. Replace the adjusting sleeve lock and the adjusting sleeve lock screw. This adjusting sleeve should be altered only when absolutely necessary.

The new Winchester repeating shotgun, Model 1901, is made in 10 gauge, is lever action and fires 6 shots. It is expressly bored to handle either smokeless or black powder, and is particularly well adapted for duck and wild-fowl shooting.

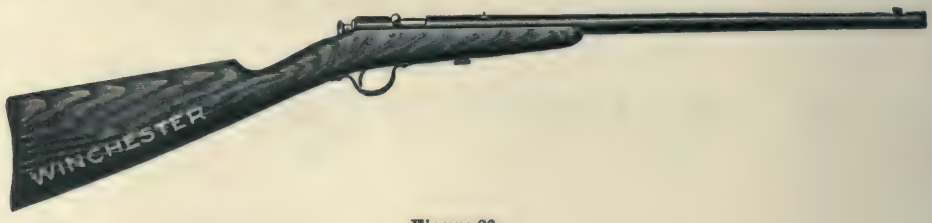


Figure 26.

This gun resembles in outline the original Winchester lever action repeating shotgun, but differs in detail. It has a tighter breech joint more completely supporting the shell in the chamber. A positive firing-pin retractor is provided. The finger lever is made separate from the breech-block and with a finger lever lock. When the action is closed, the gun is locked against opening by this finger lever lock, but is instantly released by a downward pressure on the finger lever.

The standard gun is made with a 32-inch rolled steel barrel, hardened and browned frame, and pistol grip stock of plain walnut, not checked, finished with a checked steel butt plate. Barrels for this model are bored to shoot close and hard. The stock is 12 3-4 inches long, and has a drop of 1 7-8 inch at the comb and 2 3-8 inches at the heel, Figure 26.

The operation of the Model 1901 is simple. To load the magazine, throw down the lever and push five cartridges through the carrier into the magazine, placing the sixth in the chamber. The forward and backward motion of the finger lever, which can be executed while the gun is at the shoulder, throws out the empty shell, raises a new cartridge from the magazine and places it in the chamber.

WOHLGEMUTH GUN.

This breech-loading small-arm has a fixed chamber, closed by a movable barrel, which rotates about an axis at 90 degrees to the axis of the barrel, horizontal and beneath the barrel. This arm is on the general plan of the Lefaucheux system, and uses pin-fire cartridges. One of the barrels is provided with a rifled lining, which, being removed, shows a smooth-bore barrel of larger caliber for the use of cartridges containing buch-shot.

The Elterich rifled bullet shell may be advantageously used with this gun. Into this shell is fitted a rifled steel barrel, chambered for insertion of small bullet cartridges. The outer shell is *slotted and bulged outward, which produces a springy effect,* and if the shell is pushed into the barrel of the shot-gun it will make a tight fit and not loosen, and prevent its falling out or shifting. The rifled steel barrel of

the shell is provided with an extractor which is so constructed that it will adjust itself to any ejector, common or automatic, found on single or double shot-guns sold in the market, and by opening the gun will throw the bullet cartridges from the barrel in the same way that an ordinary shell is extracted. With proper care thousands of shots may be fired with one of these shells. The drawing shows the shell for single and double barrel shotguns in 10, 12, and 16-gauge.

WORRELL RIFLE.

This breech-loading small-arm has a fixed chamber and a perforated block revolving in a mortised frame about an axis at right angles to its length. When closed the hole in the block lies in the prolongation of the bore.

WURFFLEIN ARMS.

The rifles and pistols made by William Wurfflein, of Philadelphia, are noted for accuracy of construction and excellent shooting qualities. The rifle, which is sin-

Figure 1.

gle shot breech-loading, is constructed on the tip-up barrel system, Figure 1, which is the quickest and handiest system in use. For safety and speed in loading and cleaning, effectiveness and accuracy, it has no superior. It stands foremost as to symmetrical model, style and beauty of workmanship. Figures 2 and 3 show the sporting and gallery rifles, with straight stock and pistol grip stock respectively. The barrel is octagon or half octagon, 24 inches long and is .22, .25 or .32 caliber rim fire, and .25, .32, .38 and .44 caliber center fire; weight 5 3-4 to

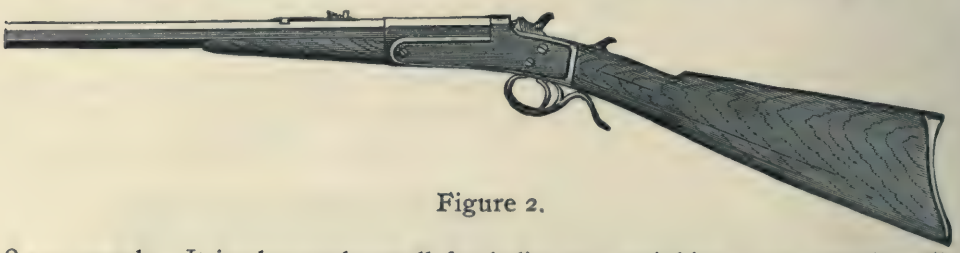


Figure 2.

8 1-4 pounds. It is also made small for ladies use, weighing 4 1-2 pounds. Figures 4 and 5 show the special mid-range target rifle, barrel half octagon, 28 or 30 inches long. The caliber is .25-20, .32-35, .32-40, .38-55 and .40-70, center fire,

Figure 3.

using everlasting shells or factory ammunition; weight 7 1-2 to 12 pounds. It is provided with vernier peep and wind gauge spirit level sights. It is also made of smaller bore, using .22 long rifle and .22 special Winchester cartridges.

The Wurfflein single shot, breech-loading gallery and target pistol, Figure 6, is constructed the same as the rifle. The Model is most symmetrical and finely bal-

Figure 4.

anced. It is quickly loaded and handy, and has no superior for accuracy and pene-

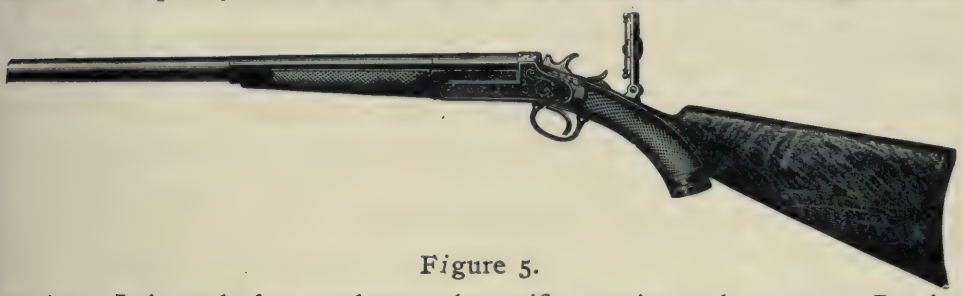


Figure 5.

tration. It is made for .22 short or long rifle, .25-rim, and .32 or .44 Russian

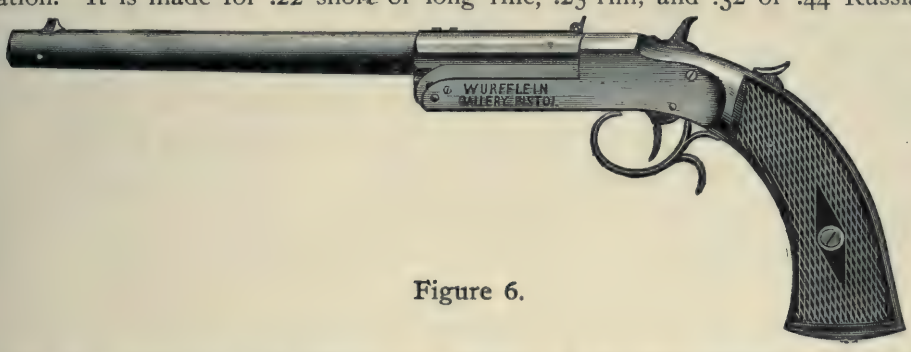


Figure 6.

center fire cartridges, and weighs 2¼ pounds. It is made with or without the spur on the guard. The barrels are 8 to 10 inches in length.

YAGER RIFLE.

This arm, sometimes known as the Mississippi rifle and modeled in 1842, was very popular in its day. It had a bayonet, a brown barrel, brass mountings, and there was a patch box in the stock. It shot a half ounce ball. Major Foster says that in the later forties, after the Minie bullet had been devised in France, some of the model 1842 muskets were rifled and fitted with sights, making a .69 caliber rifle, which shot the Minie bullet. This alteration in the arm was considered successful, and it led to the production of the United States rifle, model 1855.

YOUNG REPEATING SHOT GUN.

This arm, the invention of Mr. Charles A. Young, the well-known and popular trap shooter, is a single barrel, two shot gun without a magazine, designed for target and live bird shooting, and made to shoot nitro powders. It is hammerless, and made with a rib which enables the shooter to more easily and clearly line up the gun by making a stright line of sight. It is a take down, and has no extra length on account of the shell carrier. It has a solid breech block containing a groove large enough to admit the end of the barrel, making it absolutely safe. The action of the gun is simple and positive, very easy to operate and shoots any length of shells from 2½ to 3 inches.

To assemble the gun, place the butt of the stock under the right arm, grasp the stock at the pistol grip and put the forefinger over the safety finger slide that projects under the breech block in front of the trigger guard. To assemble the gun if it is not cocked, it is only necessary to slide it together.

To take the gun down, move the barrel out about one and one-half inches from the breech block and take the thumb of the left hand and press down on the front piece of the cocking rod and disconnect the same. Then, with the front finger of the right hand, push up the latch lever and hold this latch up until the barrel is removed.

In order to use this gun as a two shot gun, when the gun is closed, push backward on the safety button on the bottom of the breech block. This releases the carrier and permits it to come up and the shell is placed in the carrier and pushed down until the shell catches under the latch, which holds the shell down and the second load is placed in the barrel; the gun is closed and the shells are in the proper position. After the first shell is discharged, with the left hand push the barrel forward, giving it full stroke, then bring the same back and it is ready for the second shot.

In placing the shell in the carrier, take the same between the thumb and middle finger, front finger on top of the shell; slant the shell down and press back on the same. This will put the shell under the little finger which holds the shell in the carrier; then, if the front finger is pressed down and pulled back, the shell will go under the latch and remain down.

For trap shooting, where one shot is required only, close the gun, push forward on the safety button on the bottom of the breech block and this holds the carrier down and, for the single shot, place the shell in the barrel.

When the gun is closed, the barrel cannot be moved forward until the gun is fired or the safety finger slide in front of the guard pulled back. If the gun is loaded and it is desired to remove the shell without discharging the same, pull back on the safety finger in front of the guard and the gun will open and the shell can be removed.

Under the foregoing alphabetical arrangement appears the most prominent and generally well known varieties of the several Classes of Small Arms. A description of all varieties of all classes, aggregating several thousand in number, is in course of preparation, and will be issued in supplemental form, under the following headings: BREECH-LOADING GUNS—The barrel sliding forward; the barrel tilting up at the breech; the barrel tilting up at the muzzle, the barrel hinged to the stock; the barrel swinging laterally on a vertical pin; the barrrel rotating on a parallel pin; the breech-block drawn back by hand or lever; the breech-block swinging upward and forward; the breech-block swinging laterally forward; the breech-block swinging backward and downward; the breech-block swinging on a center or trunnions; the breech-block swinging upward and backward; the breech-block swinging laterally backward; the breech-block swinging downward and backward; the breech-block swinging on a longitudinal pin or hinge; the breech-block sliding vertically in a mortise; the breech-block sliding laterally in a mortise; faucet breech-block (chambered); faucet breech-block with a chamber in front; rotating sleeve on the barrel; gas operated and recoil operated. MAGAZINE GUNS—The barrel sliding forward; the barrrel tilting upwards at the breech; the barrel tilting up at the muzzle; the barrel hinged to the stock; the barrel swinging laterally on a vertical pin; the barrel rotating on a parallel pin; longitudinally reciprocating breech-bolt (spring-impelled firing-pin). Same with firing-pin impelled by a rotating hammer; the breech-block swinging upward and forward; the breech-block swinging laterally forward; the breech-block swinging backward and downward; the breech-block swinging on a center or trunnions; the breech-block swinging upward and backward; the breech-block swinging laterally backward; the breech-block swinging downward and backward; the breech-block swinging on a longitudinal pin or hinge; the breech-block sliding vertically in a mortise; the breech-block sliding laterally in a mortise; faucet breech-block (chambered); rotating carrier filled from a fixed magazine and discharged in the carrier; rotating carrier. MUZZLE-LOADERS. PISTOLS. REVOLVERS—Muzzle-loading, breech-loading.

At this time the only radical improvement in muskets under study is the application of the automatic principle, to the extent of causing the musket itself to effect its own reloading upon discharge. The principle has been already applied with some success to pistols, and its advocates claim that it is logically in the line of development of the magazine rifle, in reducing to a minimum the interval between aimed shots. Both tactical and mechanical questions are involved in the consideration of the possible desirability of the substitution of a semi-automatic musket for the hand-operated magazine rifle. Up to the present the mechanical invention has not solved its part of the problem.

During the last few years American gunmakers have manifested much interest

in *single triggers,* and this meritorious device is now largely adopted. The old double trigger does very well for game shooting in the field, but when it comes to the trap—particularly at live birds—many have witnessed the careful, studied finger shifting, and often painful laceration, which, continued at every shot, is bound to have effect on the strongest nerve and induce involuntary flinching. It is believed by many that the single trigger will remove a great many impediments which have existed in the past, marring both pleasure and scores. In the latest device the mechanism has an addition of a safety against the double or simultaneous discharge of both barrels. To render this impossible, a weight or counterbalance is attached to the trigger, which weight works as a block swinging device, between the first and second barrels, locking the mechanism between the two shots absolutely, so only one barrel at a time can possibly be discharged, when both hammers are cocked it shoots always the right barrel first and the left barrel second. Either hammer, however, can be cocked and fired by the single trigger separately.

The Philadelphia Arms Company, the Union Fire Arms Company, the Torkelson Manufacturing Company and the Heal Rifle Company have recently engaged in the manufacture of small arms possessing meritorious features.

The Philadelphia Arms Company manufacture the *A. H. Fox* hammerless gun, which combines the best mechanical principles known to the gunmaker's art with an extremely simple and strong mechanism. The parts are interchangeable.

The locks are cocked by the dropping of the barrels. The cocking roll, which turns on the hinge-pin as the barrels drop, pushes back the cocking slide, which slide in turn pushes back the hammer, and at the same time compresses a spiral mainspring. The sear then engages in the cock notch and holds the hammer back and the mainspring under compression until released by pulling the trigger in the usual manner. The barrel locking mechanism prevents the gun from shooting loose, especially when heavy charges of smokeless powder are used. A rotary

bolt, which locks through an extension rib, draws the barrels back and down to the frame and holds them absolutely tight. The bolt is tapered or wedge shaped on its wearing surface, and arranged so that as it wears it works in further and thus by its wedge shape compensates for wear.

The Union Fire Arms Company are now putting on the market a single and double barreled shot gun, a double barreled automatic ejector shot gun, and a six shot magazine shot gun, all of excellent design and quality and bored for nitro powder. The double barreled hammerless, with or without an automatic ejector, is 12 gauge, full choked, with a very simple and effective mechanism. The hammer gun has the hammers in the top of the frame instead of on the side, and is as smooth in outward appearance as a hammerless. The six shot magazine repeating shot gun is a take down, having a solid breech block and a covered mechanism and is hammerless. An indicating trigger enables the user to cock or uncock the gun without working the magazine.

The Torkelson Manufacturing Company make a specialty of their single trigger double barrel hammerless gun, and their single barrel gun, made in automatic ejector and non-ejector. This Company has recently taken on the manufacture of the *New Worcester* hammerless gun, for a description of which the reader is referred to page 242. In the single trigger gun, the mechanism is such

that it is absolutely impossible to discharge both barrels at once, and when one barrel is fired the trigger changes automatically to the other without any attention from "The man behind the gun." When shooting at the trap most sportsmen use the left barrel, in such cases the trigger can be set for that barrel, and there will be no "pulling the wrong trigger" and loosing the bird; or if it is desirable to use the right barrel the trigger can be set in an instant without taking the gun from the shoulder, or changing the position of either hand or finger, by pushing the rocker forward. The safety mehcanism is automatic, and of simple construction, easily taken out and assembled, and is positive in its action. The single barrel

gun is choke-bored for black and nitro powders. It is provided with a heavy lug which has a slot milled near the breech end to correspond with a cross bar in the receiver; by this construction the strain of the discharge is divided between the cross bar and joint bolt, a feature of great importance, securing both strength and safety. The taking down is done by simply removing the spring latch joint bolt from the left side of the receiver. The receiver or action, which contains all the lock work, is made in one piece, particular attention having been paid to the proper distribution of material, the greatest strength being found where the strain is most severe. The manner of fastening the stock to the receiver, as shown in the drawing, is novel; instead of having the round tang extend into the stock in the usual way, the wood is inside and the steel tangs on the outside. This, together with the two undercuts in the receiver, gives a treble lock-joint which for strength and neatness cannot be excelled. The hammer is of the low type and rebounding

The Heal Rifle Company are making a specialty of a rifle chambered for .22 caliber long or short rim fire cartridges, firing twenty shots per minute. It has a front wedge sight and an adjustable rear peep sight; the latter being adjusted by the turning of a screw. The take down principle is simple and convenient—turning the take down screw out of the hub the barrel can be lifted out of the stock. Reversing the operation puts it together. To load, the pushing of the lever opens the action for the cartridge, which after being dropped into the opening provided for the purpose, requires no further attention whatever, for on closing the action the breech bolt carries the cartridge into the chamber in the barrel. By pulling the thumb nut backwards the rifle is cocked ready for firing, and after firing, the exploded shell is automatically ejected by opening the action for the next load.

The new *Springfield Magazine Rifle* now under construction and taking the place of the Krag-Jorgensen (see page 197), while possessing many improvements on the latter, is far from what might be considered the best and most practicable arm for our troops. The principal points of its difference from the Krag-Jorgensen are the use of two lugs instead of one for holding the bolt against the rearward pressure of the powder, with resulting increase of strength sufficient to enable a velocity of 2,300 feet per second to be obtained; the housing of the magazine in the stock directly below the chamber instead of having it project to one side. In addition to these there are various changes of details which both improve the rifle and cheapen and accelerate its production. The arm is supplied with a cleaning rod which can be partially pulled from its place below the barrel and held with a catch so as to form a bayonet. Its great advantage is that it lightens the weight made up of the gun, bayonet, and bayonet scabbard, and by dispensing with the latter two as separate articles to be carried permits the soldier to carry with him an intrenching tool of sufficient size and weight to be serviceable. There are differences of opinion as to the value of the rod bayonet;

although less effective as a bayonet alone than the one now in use in the service, it is undoubtedly of some value in converting the musket into a pike, and in view of the increasing prominence of the intrenching tool and the decreasing occasion for the use of the bayonet its experimental substitution is in line with apparent progress in subordinating the latter to the former.

The piece is centrally fed by means of clips, each of which holds five cartridges. It has a caliber of .30 inch, and the rifling is made up of four grooves of a depth of 0.004 inch, the twist being one turn in 10 inches. The bullet weighs 220 grains, which is the same as that of the Krag-Jorgensen, but the powder charge has been raised from 37.6 to 43.3 grains. In spite of the considerable increase in its power the weapon has been greatly reduced in weight; for while the Krag-Jorgensen rifle weighs 10.64 pounds, the Mauser 10.5 pounds, and the German military rifle 11.54 pounds, the new weapon weighs only 9.47 pounds. It follows, as a matter of course, that, with such high velocity and fairly heavy bullet, the trajectory is correspondingly flat, the maximum ordinate of the 1,000-yard trajectory being only 20.67 feet as against 25.8 feet for the Krag-Jorgensen gun, a very material difference.

The cartridge for the .30 caliber arm consists of the *case, bullet, primer* and *charge of smokeless powder.* The case has a *flanged head, primer seat,* conical *body, shoulder,* cylindrical *neck,* and is made of brass. The bullet is lubricated, and has a core of lead and tin composition jacketed with cupro-nickel; it has three grooves, and the mouth of the case is crimped into the front groove to secure the bullet in place. The core is composed of 1 part of tin and 25 parts of lead by weight; this proportion is varied slightly in order to keep the weight of the finished bullet constantly at 220 grains. The primer is composed of a *cup,* made of cartridge copper and containing the *composition,* a water proofed paper *disc,* and a brass *anvil.* In plan, the anvil is a circle with two small semicircular portions removed from opposite sides; these two openings form vents for the passage of the flame from the composition to the powder. The powder is of the nitro glycerine type. Up to the present time three different American powders have been used (Peyton, Du Pont and Laflin & Rand W. A.). The charge varies with the powder used from 35 to 42 grains. The primer composition is known as H-48, and consists of 8.63 per cent. sulphur, 25.12 per cent. antimony sulphide, 49.61 per cent. potassium chlorate and 16.64 per cent. glass crystals. The weight of the cartridge complete varies from 435 to 442 grains.

The standard instrumental velocity, at 53 feet from the muzzle, of this ammunition in the rifle, is 1,960 feet per second, with an allowed variation of but 15 feet per second on either side of the standard. This instrumental velocity at 53 feet corresponds to a muzzle velocity in the rifle of about 2,000 feet per second. The velocity in the carbine is 80 feet per second less than in the rifle.

SHOOTING RULES.

DEFINITION OF TERMS.

BROKEN TARGET.

A broken target is one which has at least a visible piece or pieces broken from it, or which is completely reduced to dust, or which has a visible section broken from it even though such section be broken into dust by the contestant's shot.

DUSTED TARGET.

A dusted target is one from which more or less dust is knocked by the contestant's shot, but which shows no visible diminution in size therefrom. A dusted target is not a broken target.

DULY NOTIFIED.

A contestant is duly notified to compete when his name is called out by the Referee, Scorer or other person authorized to do so by the Management. If a squad hustler is furnished, it is a matter of courtesy only, and does not in the least relieve the contestant from responsibility. It is the duty of each and every contestant to be promptly on hand to compete when called to do so. Failing therein, each contestant is responsible for his acts of negligence.

PULL.

Besides being a command to the Puller, the command "Pull" is a declaration by the contestant that he is in the competition, and, thereafter, he must abide by the result.

BALK.

Any occurrence, not chargeable to the contestant, which directly and materially interferes with him and the equity of the competition after he calls "Pull," constitutes a balk, if it deters him from shooting or if it coincidentally interferes with him when he actually shoots; but if he shoots after the balk occurs, he must abide by the result. The Referee shall alone decide on a claim of balk, and the claim can be made only by the party directly interested. Misfires, a half-open trap, etc., are considered as balks. A balk, when allowed, restores the contestant to a complete new inning.

DISQUALIFICATION.

Disqualification carries with it a forfeiture of all entrance money and rights in the competition to which it relates.

JARRING BACK.

Jarring Back is a term which denotes that from the concussion of the first barrel the safety has been jarred back to safe. The slipping back is not infrequently caused by the thumb of the shooter, but whatever may be the cause, the contestant must abide by the result.

WALK AROUND.

Walk Around denotes that, after shooting, each contestant walks to the consecutive firing point to shoot again. After shooting at No. 5, the contestant next shoots at No. 1.

NO BIRD OR NO TARGET

After the Referee declares a "no bird" or a "no target," such bird or target is thereafter no part of the competition and is irrelevant to it.

WIDELY DIFFERENT ANGLE.

When a target varies more than thirty degrees either way, in shooting at known angles, it may be refused by the contestant, but he does so subject to the decision of the Referee as to whether it was a legal angle or not.

SIMULTANEOUS DISCHARGE.

A Simultaneous Discharge is one wherein both barrels are discharged together, or nearly together, from any cause.

DEAD BIRD.

A bird is scored as being dead if it is gathered legally; and legally is according to the requirements of the rules.

LOST BIRD.

A bird is lost when it escapes beyond the boundary, even though it be killed.

PIVOT MAN.

In squads of six, the system of shooting is "walk around," and, five men at the firing points, the man in waiting is the pivot man. When No. 1 shoots, the pivot man takes his place at No. 1 firing point, and, each contestant moving to the next place, No. 5 man, after shooting thereafter, is the pivot man.

INNING.

The term "inning" denotes a contestant's time at the firing point, commencing with the call of "Pull" and ending accordingly, as specified in these Rules.

INTERSTATE ASSOCIATION TRAP SHOOTING RULES.

TARGETS.

RULE 1.—THE MANAGEMENT

SECTION 1. The Management of the INTERSTATE ASSOCIATION reserves the authority to reject any entry without giving any reason therefor, and to disqualify, in whole or in part, any contestant who acts ungentlemanly, or disorderly, or who handles his gun dangerously.

SECTION 2. The Management or its authorized representative shall appoint a Referee or Referees, or a Referee and Judges, and a Scorer or Scorers, and a

Trap Puller or Trap Pullers, and such other assistants as it may deem to be necessary.

RULE 2.—THE REFEREE.

Besides attending to the special duties as set forth hereinafter, the Referee shall adjudicate the competition. He shall distinctly announce the result of each shot by calling out "dead" or "broke" when the target is broken, and "lost" when the target is unbroken. He shall decide all other issues which arise in relation to the direct competition. His decision in all cases shall be final.

RULE 3.—THE REFEREE AND JUDGES.

Whenever a Referee and Judges are appointed, the Referee's sole duty shall be to decide any and all disagreements between the Judges, and, pending the issue thereof and the Referee's decision thereon, there shall be no competition. The Judges shall assume the responsibilities and are vested with the authority set forth in Rule 2 concerning the Referee, except that, in case of any disagreement between them, they shall forthwith submit it to the Referee, and his decision thereon shall be final.

RULE 4.—THE SCORER.

The Scorer shall keep an accurate record of each shot of each contestant. Accordingly as the Referee calls "dead," "broke" or "lost," the Scorer shall promptly respond with the call "dead," "broke" or "lost." He shall mark the figure I for "dead" or "broke," and a O for "lost." The Scorer's record of the competition so kept shall be the official score, and it shall govern all awards and records of such competition. When possible to do so, the Scorer shall keep the scores on a blackboard, plainly placed in view of the contestants. He shall announce the total of each contestant's score at its close.

RULE 5.—THE PULLER.

SECTION 1. The Puller shall have charge of springing the traps. He shall spring the trap or traps instantly in response to the contestant's call of "Pull."

SECTION 2. The Puller shall have an unobstructed view of the contestants at the firing points.

SECTION 3. When a mechanical device is used to determine which trap shall be sprung, the Puller shall be so placed and shall so act that any contestant at the firing point cannot know in advance which trap is to be sprung.

SECTION 4. The Management may appoint an assistant Puller to take charge of the mechanical device, and to require that the traps be sprung accordingly as determined by it.

SECTION 5. If the Puller springs the traps so negligently or so irregularly as to impair the equity of the competition, the Management may forthwith remove him.

RULE 6.—CONTESTANT.

SECTION 1. A contestant is prohibited from loading his gun at any time other than when he is at the firing point. In single target shooting, he shall place only one cartridge in his gun, and he shall open it and remove therefrom the cartridge or empty shell before turning from or leaving the firing point. Should any contestant willfully violate this Section of this Rule, or violate it after having been warned, the Referee or the Management may fine him from $1.00 to $5.00, or may disqualify him.

SECTION 2. When at the firing point ready for competition, the contestant shall give distinctly the command "Pull" to the Puller, and, after giving such command, such contestant is unqualifiedly in the competition.

SECTION 3. All claims of error must be made before or immediately after the close of a score by the contestant, or the contestants, directly interested in it; otherwise any claim of error shall not be considered.

SECTION 4. A contestant may hold his gun in any position.

SECTION 5. A contestant must be at the firing point within three minutes after having been duly notified to contest; failing therein, he may be fined $1.00 by the Referee or the Management, or may be disqualified. However, when so requested by a contestant, the Referee may grant a reasonable delay to him.

SECTION 6. Shooting on the grounds in any place other than at the firing points is prohibited.

RULE 7.—CHALLENGE.

A contestant may challenge the load of any other contestant, under Section 2 of Rule 11. Such challenge must be in writing, and signed by the challenger, and must have $5.00 forfeit posted therewith in the hands of the Management. On receipt of such challenge, the Management shall obtain a cartridge or cartridges from the challengee when he is at the firing point, and if, after public examination of the cartridge or cartridges so obtained, the Management finds that the challengee was violating Section 2 of Rule 11, he may be disqualified or not, according as the Management deems the offense to have been wilfully committed, or otherwise. In case the challengee is wholly innocent of any violation of Section 2, Rule 11, the $5.00 forfeit shall be paid to him; otherwise it shall be returned to the challenger.

RULE 8.—TARGETS.

SECTION 1. If a contestant does not shoot in any of the instances herewith specified, the Referee or Judge shall declare a "no target," but if the contestant shoots the result shall be scored, respectively:

(a) when the trap is sprung at a material interval of time before or after the call of "Pull.";

(b) when the trap is sprung without any call of "Pull";

(c) when a target which should be thrown at a known angle is thrown at a widely different angle;

(d) when, in single target shooting, two targets are thrown at the same time;

(e) when, five known traps being used, a target is thrown from any trap other than the one which corresponds in number to that of the firing point at which stands the contestant whose turn it is to shoot.

SECTION 2. It is a "no target," and the Referee shall allow another target, or targets (b) respectively:

(a) when a contestant shoots out of turn;

(b) when in double shooting both barrels of the contestant's gun are discharged simultaneously;

(c) when two contestants, or when a contestant and a non-contestant, shoot at the same target;

(d) when there is a misfire of the contestant's gun or cartridge. A contestant who uses a gun or cartridge which has once misfired in the competition must abide by the results if he knowingly uses either in the competition thereafter;

(e) when a broken target is thrown. It is a "no target," whether hit or missed;

(f) when a contestant is balked;

(g) when there is any other reason not provided for in these Rules, if, in the allowed without charge. Competitors not present at the firing-points at the hour opinion of the Referee, it materially affects the equity of the competition:

SECTION 3. In double-target shooting, if the contestant does not shoot, the Referee shall allow him another pair when one target follows the other after a material interval of time, instead of taking flight simultaneously.

SECTION 4. In double-target shooting, the Referee shall declare "no targets," whether the contestant shoots or not, respectively:

(a) when only one target is thrown;

(b) when both targets are broken by one shot;

(c) when one target is a piece or both targets are pieces.

SECTION 5. When, in double-target shooting, the contestant uses a magazine gun, it is "no targets," and the Referee shall allow another pair, respectively:

(a) when, in the attempt to eject the empty shell, the head of it is pulled off, thereby leaving an obstruction in the chamber of the gun and preventing the reloading for the second shot;

(b) when, after the first shot is fired and the gun is opened properly, the extractor fails to extract the empty shell.

SECTION 6. When, in double-target shooting, the contestant uses a magazine

gun, it is not "no targets," and the Referee shall not allow another pair, respectively:

(a) when, after the first shot, the empty shell, although it be extracted from the chamber, is not ejected from the gun, thereby preventing the reloading for the second shot;

(b) when there is any failure to shoot, caused by a cartridge too thick or too long, or any failure whatsoever caused by a loaded cartridge.

RULE 9.—LOST TARGET.

Except in the cases otherwise provided in these Rules, the Referee shall declare the target "lost," respectively:

(a) when a contestant fails to break the target;

(b) when the contestant fails to fire because his gun was unloaded or uncocked, or because the safety was faultily adjusted, whether from his own oversight or not; or when he fails to shoot from any other cause chargeable to his own oversight or neglect.

RULE 10.—BROKE.

The Referee or Judge shall declare the target "broke" or "dead" when it is broken in the air under the conditions prescribed by these Rules. A dusted target is not a broken target. Shot marks in a "pick up" shall not be considered as evidence of a broken target.

RULE 11.—GUNS AND LOADS.

SECTION 1. No contestant shall use a gun whose bore is larger than a 10-gauge.

SECTION 2. No contestant shall use any load of shot greater than one and one-quarter ounce, any standard measure, struck.

SECTION 3. Any contestant who uses reloaded ammunition must abide by the results. See Rule 9 (b).

RULE 12.—TRAPS, SCREENS, FIRING POINTS.

For the competition, the Management shall provide five traps, or three traps Sergeant system.

Five Traps—The five traps shall be numbered 1, 2, 3, 4, 5, from left to right, consecutively. In competition, the traps may be pulled from left to right, or from right to left, as may be determined by the Management. Each trap shall have sufficient power and adjustment to throw the targets not less than 40 yards, nor more than 60 yards, and with a flight not less than 6 feet nor more than 12 feet high at a point 10 yards from the trap. The traps shall be set approximately level, equi-distant from each other, three or five yards apart, and placed in a straight line.

SECTION 1. Pits or screens shall be used to protect the trappers. The screens shall not be higher than is necessary for such protection.

SECTION 2. The management shall see that the traps are properly set and adjusted at the beginning of the competition, and so kept to the finish thereof.

SECTION 3. The firing points shall be in a straight line, parallel with the line of the traps. They shall be 16 yards therefrom in single-target shooting other than handicaps. (See Rule 20 for double-target shooting.)

Firing Points—The firing points shall be numbered 1, 2, 3, 4, 5, from left to right, and shall be three or five yards apart, accordingly as the traps are three or five yards apart.

RULE 13.—SQUADS.

SECTION 1. Contestants shall shoot in squads of five, except in case of Section 2 of this Rule. In 10-target events each contestant shall shoot at two targets at each firing point, consecutively. In 15-target events, each contestant shall shoot at three targets at each firing point, consecutively. In 20-target events, each contestant shall shoot at four targets at each firing point, consecutively. In 25-target events, each contestant shall shoot at five targets at each firing point, consecutively.

SECTION 2. In case the Management deems it best for the contestants to compete in squads of six, it shall be after the manner called "walk around."

RULE 14.—FLIGHTS, KNOWN TRAPS, KNOWN ANGLES.

The flight of targets shall be: Nos. 1 and 4 shall throw right-quartering targets; Nos. 2 and 5, left-quartering targets; No. 3, a straightaway; the flights from Nos. 1 and 5 shall cross that of No. 3 at a point not less than ten yards nor more than twenty yards from No. 3; the flight of No. 2 shall cross that of No. 1 at a point not less than five yards nor more than ten yards from No. 1; the flight of No. 4 shall cross that of No. 5 at a point not less than five yards nor more than ten yards from No. 5.

RULE 15.—KNOWN TRAPS, UNKNOWN ANGLES.

When shooting is at unknown angles from known traps, the contestant shall know which trap is to be sprung, but shall not know the flight of the target. The Management shall require the trappers to change the flights frequently.

RULE 16.—UNKNOWN TRAPS, KNOWN ANGLES.

SECTION 1. The contestant shall stand at No. 3 Firing Point. The traps (except the last) shall be sprung as determined by an indicator or other device. The contestant in an inning shall shoot at five targets, one from each of the five traps, always knowing his last trap.

SECTION 2. In case of a broken target, the trap throwing such target shall be reloaded, and for it, and the remaining unsprung traps, the puller shall deter-

mine by the device a new combination, the previously sprung traps being omitted in this new combination.

RULE 17.—UNKNOWN TRAPS, UNKNOWN ANGLES.

When unknown traps and unknown angles are used, the competition is conducted precisely as set forth in Rule 16, except that the angles are unknown.

RULE 18.—REVERSED ORDER.

The contestants shall shoot in squads of five. Contestant No. 1 has a target from No. 5 trap; contestant No. 2 has a target from No. 4 trap; contestant No. 3 has a target from No. 3 trap; contestant No. 4 has a target from No. 2 trap; contestant No. 5 has a target from No. 1 trap. Then continue as set forth in Rule 13, Section 1.

RULE 19.—EXPERT RULE, RAPID FIRE.

Contestants shoot in squads of 6, "walk around." An indicator or other device shall be used to determine the order in which the traps shall be sprung. No. 1 shoots at a target to be thrown from any one of the five traps; thereafter, as determined by the device, each contestant, in turn, shoots at a target from any one of the traps which remain filled; thus, for No. 1, there are five filled; for No. 2, there are four filled, and so on to No. 5, who has one filled, and that one is known. The sixth man is the pivot man. In case of a broken target or balk, the puller will observe the same procedure as in Rule 16, Section 2, except that the angles are unknown.

RULE 20.—SHOOTING AT DOUBLE TARGETS.

SECTION 1. In shooting at double targets it may be one man up, at 14 yards, or squads at 16 yards. Three traps shall be used. The Management will use Nos. 1, 2, 3, or Nos. 2, 3, 4, or Nos. 3, 4, 5, of a set of five traps. The first trap shall throw a left-quarterer, the second trap a straightaway, the third trap a right quarterer.

SECTION 2. The pairs shall be sprung in the following order: first pair from Nos. 1 and 2; second pair from Nos. 2 and 3; third pair from Nos. 1 and 3; fourth pair from Nos. 1 and 2; fifth pair from Nos. 2 and 3, and so on, in this order to the finish of the event. For each pair, the traps must be pulled simultaneously.

RULE 21.—SERGEANT SYSTEM.

SECTION 1. In the Sergeant System, 3 traps placed four feet apart in a straight line shall be used.

SECTION 2. The firing points shall be in the segment of a circle whose radii are 16 yards.

SECTION 3. The firing points shall be three or five yards apart, between Nos. 1 to 5, consecutively.

SECTION 4. The flights shall be unknown angles.

SECTION 5. The targets shall be unknown traps.

RULE 22.—CLASS SHOOTING.

Class shooting signifies that the contestants who tie for first, second, third, etc., have won the money allotted to their respective classes. They shall shoot off or divide the tie as the Management shall elect.

RULE 23.—HIGH GUNS, HIGH SCORES.

High guns or high scores signify that the contestants making the high scores take in the order of superiority all the cash or prizes. In case of ties, the high guns are determined by shooting off, miss and out. The gun which stays the longest, is first; the one which stays next longest, is second, and so on.

RULE 24.—TIES.

The ties shall be shot off at the original distance and at one-fifth of the number of targets in the event to which the tie refers.

NOTE.

The conditions governing the use of a magazine trap are precisely the same as those governing in the Sergeant system, in Sections 2, 3 and 4.

INTERSTATE ASSOCIATION TRAP SHOOTING RULES.

LIVE BIRDS.

RULE 1.—THE MANAGEMENT.

SECTION 1. The Management of the Interstate Association reserves the authority to reject any entry without giving any reason therefor, and to disqualify, in whole or in part, any contestant who acts ungentlemanly, or disorderly, or who handles his gun dangerously.

SECTION 2. The Management or its authorized representative shall appoint a Referee or Referees, and a Scorer or Scorers, and a Trap Puller or Trap Pullers, and such other assistants as it may deem to be necessary.

RULE 2.—THE REFEREE.

Besides attending to the special duties as set forth hereinafter, the Referee shall adjudicate the competition. He shall distinctly announce the result of each contestant's shot or shots by calling out "dead" when the bird is gathered according to rule, and "lost" when the bird escapes beyond the boundary, except as provided in Section 1 (d) of Rule 9, and in Section 8 of Rule 12. He shall decide all other issues which may arise in relation to the direct competition. His decision in all cases shall be final.

RULE 3.—THE SCORER.

The Scorer shall keep an accurate record of the shot or shots of each con-

testant. Accordingly as the Referee calls "dead" or "lost," the Scorer shall promptly respond with the call "dead" or "lost." In keeping a contestant's score, the Scorer shall use the figure I to denote that one barrel was used to effect the kill; the figure 2 to denote that two barrels were used to effect a kill, and a O to denote that the bird was lost. The Scorer's record of the competition, so kept, shall be the official score, and it shall govern all awards and records of such competition. At the close of each contestant's score, the Scorer shall distinctly announce the total of it.

RULE 4.—PULLER.

SECTION 1. The Puller shall have charge of springing the traps. He shall spring a trap instantly in response to the contestant's call of "Pull."

SECTION 2. The Puller shall have an unobstructed view of the contestant at the firing points.

SECTION 3. When a mechanical device is used to determine which trap shall be sprung, the Puller shall be so placed and shall so act that any contestant who is at the firing point cannot know in advance which trap is to be sprung for him.

SECTION 4. The Management may appoint an assistant Puller to take charge of the mechanical device and to require that the traps be sprung accordingly as determined by it.

SECTION 5. If the Puller springs the traps so irregularly or so negligently as to impair the equity of the competition, the Management may forthwith remove

RULE 5.—CONTESTANT.

SECTION 1. A contestant is prohibited from loading his gun at any time other than when he is at the firing point, and he shall open it and remove therefrom all cartridges or empty shells before turning from or leaving the firing point. Should any contestant wilfully violate this Section of this Rule, or violate it after having been warned, the Referee or the Management may fine him from $1.00 to $5.00, or may disqualify him.

SECTION 2. When at the firing point, ready for competition, the contestant shall, to the Puller, distinctly call out, "Are You Ready?" When the Puller responds "Ready," he thereby signifies that he is ready to spring the trap promptly to the contestants's demand. When ready for the bird, the contestant shall distinctly give the command "Pull," and thereafter he is unqualifiedly in the competition.

SECTION 3. A contestant may hold his gun in any position.

SECTION 4. A contestant must be at the firing point within two minutes after having been duly notified to compete; failing therein, he may be fined $1.00 by the Referee or the Management, or the Management may disqualify him. However,

the Management, if good cause is shown for it, may grant a reasonable delay to a contestant, as, for instance, when his gun breaks down, etc.

SECTION 5. After a contestant fires his first barrel, he must fire his second barrel immediately or leave the firing point.

SECTION 6. If a contestant has a misfire or apparent misfire, he shall forthwith hand his gun unopened to the Referee for inspection. It shall thereupon be the Referee's duty to try both triggers if the gun has double triggers, or the trigger if the gun has only one trigger, before opening the gun or cocking it. Should the cartridge which has misfired or apparently misfired be exploded when thus tried, the Referee shall declare the bird "lost." If in the case of a misfire or apparent misfire the contestant opens his gun before handing it to the Referee the bird shall be declared "lost."

SECTION 7. A contestant may stand back of the mark assigned to him at the firing point if he chooses to do so, but the mark assigned to him shall be the official mark.

SECTION 8. When firing, the contestant's feet shall be behind the firing mark assigned to him.

SECTION 9. Shooting on the grounds in any place other than at the firing point is strictly prohibited.

RULE 6.—CHALLENGE.

Any contestant may challenge the load of any other contestant under Section 2 of Rule 14. A challenge must be in writing and signed by the challenger, and must have $5.00 forfeit posted therewith in the hands of the Management. On receipt of such challenge, the Management will obtain a cartridge or cartridges from the challengee when he is at the firing point, and if, after public examination of the cartridge or cartridges so obtained, the Management finds that the challengee violated Section 2 of Rule 14, he may be disqualified or not, accordingly as the Management deems the offense wilful or otherwise. In the case that the challengee is wholly innocent, the forfeit aforementioned shall be paid to him; otherwise it shall be returned to the challenger.

RULE 7.—DEAD BIRD.

The Referee shall declare the bird "dead," when it is gathered within bounds under the conditions enjoined by these rules. (See Rule No. 9, Section 1, (b).)

RULE 8.—LOST BIRD.

The Referee shall declare the bird "lost" after the call of "Pull," respectively:

(a) when the bird is once outside of the boundary, except as provided in Section 1 (d) of Rule 9, and Section 8 of Rule 12;

(b) when the bird dwells, even for the briefest moment, on the top of the boundary enclosure, whether it perches thereon or not;

(c) when the contestant fails to fire because his gun was unloaded or uncocked, or because the safety was faultily adjusted, or because of any other reason chargeable to his own oversight or neglect;

(d) when the contestant, after leaving the firing point, returns and shoots again at the same bird, or when, after firing one shot, he opens and closes his gun, and shoots again at the same bird.

RULE 9.—NO BIRD.

When the Referee declares "no bird," it gives the contestant another inning, with the use of both barrels.

SECTION 1. The Referee shall declare "no bird" and shall allow another bird, respectively:

(a) when, in his opinion, the bird, being on the ground and not having been shot at, cannot fly properly, whether it has been on the wing or not;

(b) when a bird is on the ground when a contestant fires his first barrel, if the bird is afterward gathered within bounds. If a bird is on the wing when the first barrel is fired, and is killed on the ground with the second barrel, it is a dead bird;

(c) when the bird walks in one yard from the traps, or when, after having been on the wing and still being unshot at, it alights between the traps and the dead line, and thereafter walks toward the contestant at all;

(d) when the bird, after being shot at, escapes through any opening in the boundary, the same being permanent or not, if, in the opinion of the Referee, it could not have escaped otherwise;

(e) when the bird is shot at also by someone other than the contestant, if, in the opinion of the Referee, the bird could have been gathered had there been no such interference, or if he considers that such interference constitutes a balk;

(f) when a contestant, through his own fault, shoots and kills from a mark which is nearer than the one assigned to him. If he misses, the bird is lost;

(g) when both barrels of the contestant's gun are discharged simultaneously;

(h) when a contestant's gun or cartridge misfires from an imperfection of either (Rule 8, c.);

(i) when the contestant, to avoid endangering life or property, does not shoot;

(j) when seven balls have been thrown at a bird, whether it has been on the wing or not;

(k) when the contestant is balked. Whether the interference constitutes a balk or not, is for the Referee alone to decide. In case a claim of balk is allowed to a contestant, it gives him a right to a new inning and the use of both barrels;

(l) when the trap is not sprung with reasonable promptness to the command

"Pull," or when the bird, not having been on the wing, refuses to fly after the trap has been sprung, if in either instance the contestant declares "no bird";

(m) when the bird is caught in the trap and there held long enough for the contestant to cover such trap before the bird can take wing;

(n) when the bird is hit by a missile;

(o) when a contestant has a misfire with the first barrel, if he does not fire the second (except as provided in Rule 14, Section 4);

(p) when, after firing his first barrel, he has a misfire with his second barrel if he does not kill the bird with the first barrel (except as provided in Rule 14, Section 4);

(q) When he has a misfire with both barrels (except as provided in Rule 14, Section 4);

(r) when, the overground system being used, a trap or traps are unfilled before the contestant shoots.

SECTION 2. In case the contestant uses a magazine gun, it is a "no bird," and the Referee shall allow another bird, respectively:

(a) when the head of the empty shell is pulled off in the attempt to eject it, thereby obstructing the chamber of the gun and preventing the reloading of it for the second shot;

(b) when, after the first shot is fired and the gun is opened properly, the extractor has failed to extract the empty shell.

SECTION 3. In case the contestant uses a magazine gun, it is not a "no bird," and the Referee shall not allow another bird, respectively:

(a) when, after the first shot, the empty shell, although it be extracted from the chamber, is not ejected from the gun, thereby preventing the reloading of it for the second shot;

(b) when there is any failure to shoot caused by a cartridge which is too thick or too long, or by any other failure of any kind whatsoever, caused by a reloaded shell.

RULE 10.—NO BIRD, IF REFUSED.

If a contestant refuses to shoot under any of the following circumstances, the Referee shall declare "no bird," and shall allow another bird; but if the contestant shoots, the result shall be scored, respectively:

(a) when the contestant has not given the order to "Pull" and the trap is pulled nevertheless;

(b) when, in single bird shooting, two or more birds are liberated at the same time. If a contestant shoots at both birds, he shall be required to pay for both, and shall also be fined $1.00 by the Management. The first bird shot at is the only one which can be scored dead or lost under these circumstances.

RULE 11.—REFUSAL TO FLY.

SECTION 1. When, on the trap being properly pulled, the bird refuses to fly, the Referee shall forthwith order to be exercised such means as are provided by the Management to make such bird fly. A bird, hit by a ball or pushed by a flushed rope, shall be governed by Rule 9, Section 1 (n). A contestant cannot call a "no bird" after the bird has been on the wing, but if he desires to make such bird a "no bird," he may shoot it on the ground, in which case it will be governed by Section 1 (b) of Rule 9.

SECTION 2. In case of possible doubt as to whether a bird has been "on the wing" or not when it has flipped up, the Referee shall declare it "on the wing" when, in his opinion, it was so, and shall promptly so inform the contestant by calling out "on the wing."

RULE 12.—GATHERING.

SECTION 1. To be scored dead, the bird must be gathered within two minutes after it falls to the ground or is legally killed on the ground, excepting as provided in Section 4 of this Rule. The Management may appoint, or may permit the contestant to appoint, someone to gather the bird, or a dog may be used for that purpose. The moment that the bird touches the ground, the Referee shall order it gathered.

SECTION 2. Only one man or one dog may be used at a time to gather any one bird.

SECTION 3. When the gatherer does not know the whereabouts of the bird, the Referee or someone else appointed by him may give the gatherer such information as may be necessary to aid him in respect to it, but no one other than the Referee shall be allowed to accompany the gatherer.

SECTION 4. When a dog is used to gather a bird and he cannot find it, in such case the time limit shall not apply. Such dog shall be called in, and, after he is in control, the Referee shall appoint someone to gather the bird, whereupon the time limit shall apply.

SECTION 5. In case of a dog pointing when gathering, the time lost by such act shall not count as a part of the time limit. The Referee may send someone to urge the dog off the point, or he may direct that the dog be called in, after which the Referee will proceed under Section 4 of this Rule.

SECTION 6. The bird, when once within the grasp of the gatherer's hand, if the gatherer be a person, or within the grasp of the gatherer's mouth, if the gatherer be a dog, shall be scored as dead.

SECTION 7. The gatherer, whether man or dog, should go directly to the bird without any prejudice whatever to any contestant's interests. It devolves

upon each contestant to so kill his birds that they can be gathered without any extraordinary strategy or effort.

SECTION 8. Should the dog break away or be liberated to gather the bird before it has touched the ground and, while chasing the bird, it passes beyond the boundary, the Referee may allow the contestant another bird, provided that the Referee is of the opinion that the bird would have been gathered within the time limit if the dog had not interfered.

SECTION 9. The Puller shall not spring the trap until the trapper and

RULE 13.—MUTILATION.

The mutilation of birds is prohibited. Any contestant who is convicted of violating this rule, or of conniving at its violation, shall forfeit all rights in the contest.

RULE 14.—GUNS AND LOADS.

SECTION 1. In the Grand American Handicap Tournament no contestant shall use a gun whose bore is larger than a 12-gauge, nor whose weight is over 8 pounds; nor use in any other competition a gun whose bore is larger than a 10-gauge.

SECTION 2.—No contestant shall use any load of shot, exceeding one and one-quarter ounce, any standard measure, struck.

SECTION 3. Any contestant who uses reloaded ammunition must abide by the results.

SECTION 4. Any contestant who knowingly uses a gun or cartridge which has once misfired in the competition must abide by the results.

RULE 15.—SHOOTING OUT OF TURN.

Whenever the Referee deems it necessary to do so, for the purpose of saving time, etc., he may require any contestant to compete, whether it is such contestant's turn to compete or not. Shooting out of turn does not affect the competitive standing of any contestant.

RULE 16.—TRAPS.

SECTION 1. In all competition there shall be used five ground traps, placed five yards apart, in the segment of a circle whose radii are thirty yards, the center of which circle is the center of the thirty-yard firing point. A straight line drawn through this center, and the center of the boundary, should pass through the center of all the other firing points, whether more or less than thirty yards. The traps are designated by numbers from left to right, namely, No. 1, No. 2, No. 3, No. 4, No. 5. The Management shall see that the traps are in working order and so kept during the competition.

SECTION 2. When the overground system of trapping is used, the Referee will require that each of the five traps contains a bird when the contest-

ant is at the firing point. When the underground system is used, the trappers are required to exercise their best endeavor to keep the traps filled.

RULE 17.—BOUNDARY.

SECTION 1. The boundary shall be a dead line, and a segment of a circle whose radii are fifty yards, and whose center is No. 3 trap. The dead line is the chord of the circle, and its center is bisected by a line drawn from the center of No. 3 trap through the center of the firing points. The center of the dead line is thirty-three yards from the center of No. 3 trap. The Management reserves the right to change the boundary when occasion requires.

SECTION 2. When the boundary is marked by stakes, or anything else which does not show the continuous arc of the circle, the boundary shall be straight lines from stake to stake, etc., consecutively. In case such boundary is used, a bird, lying on the line, or touching it when gathered, is a dead bird.

RULE 18.—DIVISION OF MONEYS.

Unless otherwise provided, the moneys of the competition shall in the division be governed by class shooting.

RULE 19.—TIES.

Should there be any ties in a contest, they will be shot off as soon as possible after the contest is finished, under the same conditions of handicaps, etc., excepting the number of birds, which will be as follows: In 10-bird events or less, 3 birds; 11 to 25 birds, inclusive, 5 birds; 26 to 50 birds, inclusive, 10 birds; 51 to 100 birds, inclusive, 25 birds. Any contestant in any tie may be paid on demand his pro rata share of the money, unless the conditions prescribe that all ties shall be shot off.

RULE 20.—UNFINISHED COMPETITION.

In case that darkness or bad weather stops the competition, such competition shall be postponed to a date not later than two weeks thereafter. Should the contestants fail to agree on a time and place, the Management will name the time and place to hold such unfinished competition. Any contestant who fails to appear in any contest at the time and place set for it, loses by default and forfeits all his rights therein.

RULE 21.——PROTESTS.

All protests or claims of any nature whatsoever, concerning the competition of a competitor, must be made before the next competitor shoots. The Referee's decision is final.

RULE 22.—CHANGES AND AMENDMENTS.

The management reserves the right to make any alterations and amendments to these rules whenever it deems it for the best interests of all concerned to do so.

TRAP RULES OF THE AMERICAN SHOOTING ASSOCIATION.

INANIMATE TARGET SHOOTING.

RULE 1.—JUDGES AND REFEREE.

Two Judges and a Referee, or a Referee alone, shall be selected by the Management, or the contestants, whose decision shall be final.

RULE 2.—DUTIES OF THE REFEREE.

The Referee shall see that the traps are properly set at the beginning of the match, and kept in order to the finish. He shall endeavor to make the targets conform to the flight and direction indicated in Rule No. 7. He shall test any trap upon application of the shooter at any time by throwing a trial target therefrom. He may at any time, and must when so requested by a contestant, select one or more cartridges from those of a shooter at the score, and publicly test the same for proper loading. If the cartridge, or cartridges, are found to be improperly loaded. The shooter shall suffer the penalty as provided for in Rule No. 11.

RULE 3—SCORER.

A Scorer shall be appointed by the Management, whose score shall be the official one. All scoring shall be done with ink, or indelible pencil. The scoring of a lost target shall be indicated by a "O," and a broken target by the figure "I."

RULE 4.—PULLER.

A Puller, or Pullers, shall be appointed by the Management, whose duty it shall be to see that the trap or traps shall be instantly sprung when the shooter calls "Pull," and shall be placed in such a position that the shooter will have no means of knowing by his actions which trap is to be pulled. In single target shooting he shall pull the traps as decided by a trap-pulling indicator, or other means that may have been provided by the Management, so that the shooter will have no means of knowing from which trap the target is to be thrown.

RULE 5.—PULLING THE TRAPS.

SECTION 1. Traps may be pulled in regular order from 1 to 3, or 1 to 5, or *vice versa,* if so decided by the Management.

SECTION 2. If the shooting is from traps to be pulled in regular order, the shooter may refuse the target from the trap not so pulled; but if he shoots, the result must be scored .

SECTION 3. If the trap is sprung before, or at any noticeable interval after the shooter calls "Pull," he can accept or refuse the target; but if he shoots, the result must be scored.

SECTION 4. If the Puller, or Pullers, do not pull in accordance to the indicator, or other means provided, they shall be removed and others substituted.

RULE 6.—ARRANGEMENT OF TRAPS.

All matches shall be shot from three or five traps, set level, three or five yards

apart, in the segment of a circle, or in a straight line. When in the segment of a circle, the radius of the circle shall be eighteen yards. In all cases the shooter's position shall not be less from each trap than the rises provided for in Rule 7. The traps shall be numbered from 1, on the left, to No. 3 or No. 5 on the right, consecutively, according to the number used.

RULE 7.—ADJUSTING TRAPS.

SECTION 1. All traps must be adjusted to throw the targets a distance not less than 40 yards, nor more than 65 yards.

SECTION 2. The elevation of the target in its flight at a distance of 10 yards from the trap shall not be more than 12 feet, nor less than 6 feet.

Traps Nos. 1 and 5 shall be set to throw the targets so that the line of flight shall cross that of the straightaway target at a point not less than 10 yards nor more than 20 yards from trap No. 3.

SECTION 3. After the traps are set for these angles, if the target for any reason shall take a different course it shall be considered a fair target, provided that the Referee decides it offered a fair shot to the contestant.

RULE 8.—SCREENS.

Either pits or screens, or both, may be used, but the screens must not be higher than is actually necessary to fully protect the trapper.

RULE 9.—THE RISE.

In single target shooting the rise shall be: 18 yards for 10-gauge guns; 16 yards for 12-gauge guns; 14 yards for 14 and 16-gauge guns; 13 yards for 20-gauge guns.

In double target shooting the rise shall be: 16 yards for 10-gauge guns; 14 yards for 12 gauge guns; 12 yards for 14 and 16-gauge guns; 11 yards for 20-gauge guns.

RULE 10.—CALIBER AND WEIGHT OF GUNS.

No gun of larger caliber than 10-gauge shall be used, and the weight of all guns shall be limited as follows: 10-gauge, 9 pounds 4 ounces; 12-gauge, 8 pounds 4 ounces; 14 and 16-gauge, 7 pounds 12 ounces; 20-gauge, 7 pounds 8 ounces.

RULE 11.—LOADS.

Charge of powder unlimited. Charge of shot not to exceed one and one-quarter ounces American Association, or Dixon's measure, struck. Any shooter using a larger quantity of shot shall forfeit his entrance money and rights in the match.

If, in the opinion of the Management, with the unanimous consent of the contestants, a shooter has not wilfully violated this rule, his entrance money shall be returned to him.

RULE 12.—LOADING GUNS.

In single target shooting, only one barrel shall be loaded at a time, and the cartridge shall not be placed in the barrel until after the shooter has taken his position at the score.

In double target shooting, both barrels shall be loaded at the score. Cartridges must be removed from the gun before leaving the score.

RULE 13.—POSITION OF GUN.

Any the shooter may adopt.

RULE 14.—SINGLE TARGET SHOOTING.

When the traps are set in the segment of a circle, each contestant shall shoot at three or more targets before leaving the score. If two targets are sprung at the same time and the contestant does not shoot, it shall be declared "no targets"; but if he shoots the result must be scored.

RULE 15.—DOUBLE TARGET SHOOTING.

Both traps must be pulled simultaneously, and each contestant shall shoot at three or five pairs, consecutively, thrown as follows; If three traps are used, the first pair shall be thrown from 1 and 2, the second pair from 2 and 3, the third pair from 1 and 3, the fourth pair from 1 and 2, and the fifth pair from 2 and 3.

If five traps are used, the first pair shall be thrown from 2 and 3, the second pair from 3 and 4, the third pair from 2 and 4, the fourth pair from 2 and 3, and the fifth pair from 3 and 4.

If one target is thrown, it shall be declared "no targets."

If a target be lost, it shall be declared "no targets." If one be a fair and the other an imperfect target, it shall be declared "no targets." But if the shooter accepts an imperfect target, or targets, the result must be scored.

If both targets are broken by one barrel, it shall be declared "no targets." If the shooter fires both barrels at one target intentionally, it shall be scored "lost targets." But if the second barrel be discharged accidentally, it shall be "no targets."

RULE 16.—UNKNOWN ANGLES.

In unknown angles each trap must be so changed as to throw the target in a different direction from the one last thrown by it. The extreme angles at which the targets are thrown, shall not be greater than those provided for by Rule 7.

If an unfair target is thrown, it shall be declared "no target;" but if accepted by the contestant the result must be scored.

RULE 17.—RAPID FIRE SYSTEM.

When all the traps are set in a straight line and the rapid firing system is to be used, there shall be a screen before each trap on which shall appear the

number of the trap, from No. 1 on the left, and each shooter shall stand at score opposite the trap from which the target is to be thrown for him to shoot at.

After he has shot at his first target he shall pass to the next score to the right, and so continue until he reaches the end of the score, when he shall return to the score opposite No. 1, and continue as before until his score is finished. If shooters are annoyed, or there is delay in shooting by the smoke of previous shots, the traps may be pulled in reverse order, commencing with the trap on the right.

RULE 18.—CLASS SHOOTING.

All contestants who are tied on highest score shall divide first money, and those tied on next highest score divide second money, etc. Should a majority in any tie decide to shoot it out, high gun to take purse, any individual in said tie shall have a right to withdraw with his *pro rata* of money.

RULE 19.—BROKEN TARGETS.

A target to be scored "broken," must have a perceptible piece broken from it while in the air. A "dusted" target is not a broken target. No target shall be retrieved for shot marks.

If a target be broken by a trap, the shooter may claim another target; but if he shoots, the result must be scored.

RULE 20.—ALLOWING ANOTHER TARGET.

SECTION 1. The shooter shall be allowed another target for the following reasons:

A—For a target broken by the trap.

B—For any defect in the gun, or load, causing a mis-fire.

C—If the contestant is interfered with, or balked, or there is other similar reason why it should be done, the Referee may allow another target.

SECTION 2. If the shooter is balked at known traps, he shall have another target from same trap. But if the balk occurs at unknown traps, the indicator shall again be turned and a new combination used barring traps which have been fairly sprung.

NOTE.—When a shooter in breaking his gun to put in the shells fails to break it far enough to cock the gun, it is considered his own carelessness, and not sufficient excuse for the allowance of another target.

RULE 21.—LOST TARGETS.

Targets shall be scored lost if the shooter fails to load, cock, adjust safety on gun, or pulls the wrong trigger.

RULE 22.—TIE SHOOTING.

SECTION 1. All ties shall be shot off at the original distance, and as soon after the match as practicable, at the following number of birds:

Ties on all Single Targets.—In single target matches of 25 targets, or less,

on three traps, 3 targets; five traps, 5 targets. In matches of 26 targets to 50, inclusive, on three traps, 6 targets; five traps, 10 targets. In matches of over 50, on three traps, 15 targets; five traps, 25 targets.

Ties on Double Targets.—In double target matches of ten pairs or less, on three traps, 3 pairs. In matches of more than ten pairs, five pairs thrown from traps 1 and 3. If five traps are used, the same number shall be thrown in each case, from traps 2 and 4 (unless otherwise arranged by the Management, and so stated or understood previous to the beginning of the match).

SECTION 2. If in a series of matches the result prove a tie, such tie shall be shot off at the original number of targets.

RULE 23.—ANNOUNCING THE SCORE.

SECTION 1. When two Judges and a Referee are serving, one of the Judges shall announce the result of each shot distinctly, and it shall be called back by the Scorer.

If the second Judge disagrees with the decision of the Judge calling, he shall announce it at once before another target is thrown, and the Referee shall decide it. In case of another target being thrown before the Referee's decision, the target so thrown shall be "no target."

SECTION 2. At the close of each shooter's score the result must be announced. If claimed to be wrong, the error, if any, must be corrected at once.

RULE 24.—SHOOTER AT THE SCORE.

In all contests the shooter must be at the score within three minutes after his name is called to shoot, or he forfeits his rights in the match.

RULE 25.—FORBIDDEN SHOOTING.

No shooting will be permitted in the enclosure other than at the score; and in case there is no enclosure, no shooting within 200 yards of the score, without the consent of the Management.

LIVE BIRD SHOOTING.

RULE 1.—REFEREE.

A Referee shall be appointed by the contestants, or the Management, whose decision shall be final.

RULE 2.—DUTIES OF THE REFEREE.

The Referee shall see that the traps are properly set at the beginning of the match, and kept in order to the finish, and that they are kept properly filled. He may at any time, and must when so requested by a contestant, select one or more cartridges from those of a shooter at the score, and publicly test same for proper

loading. If the cartridge, or cartridges, are found to be improperly loaded, the shooter shall suffer the penalty as provided in Rule 15.

RULE 3.—SCORER.

A Scorer shall be appointed by the contestants, or Management, whose score shall be the official one.

RULE 4.—PULLER.

A Puller shall be appointed by the contestants, or Management, and shall be placed at least 6 feet behind the shooter, and it shall be his duty to pull the traps evenly and fairly for each contestant, and instantly after the shooter calls "Pull." He must use a trap-pulling indicator, or other device that may be furnished by the Management, so that the shooter will not know which trap is to be pulled. All traps must be filled before the shooter calls "Pull."

If more than one bird is liberated, the shooter may call "no bird"; but if he shoots, the result must be scored. Should the Puller not pull in accordance with the indicator, he shall be removed and another Puller substituted.

If the trap is pulled before, or at any noticeable interval after, the shooter calls "Pull," he can accept or refuse the bird; but if he shoots, the result must be scored.

RULE 5.—ARRANGEMENT OF TRAPS.

All matches shall be shot from five ground traps, placed five yards apart, in the segment of a circle. The radius of the circle shall be 30 yards from the shooter's score. The traps shall be numbered from No. 1 on the left to No. 5 on the right, consecutively.

A ground trap is one that lies flat with the surface on the ground when open, and gives the bird its natural flight in starting.

RULE 6.—THE RISE.

The rise shall be: 30 yards for 10-gauge guns; 28 yards for 12-gauge guns; 26 yards for 14 and 16-gauge guns; 25 yards for 20-gauge guns.

The shooter's feet must be back of and not on the shooting mark.

RULE 7.—BOUNDARY.

The boundary for both single and double bird shooting shall be the segment of a 50-yard circle and a dead line. The circle shall be drawn from a point 10 yards beyond the center trap on a line from the shooter's score, and it shall terminate where it joins the dead line, which shall be drawn at a distance of 30 yards from the center trap, and at right angles with a line drawn from the shooter's score to the center trap.

RULE 8.—BIRDS REFUSING TO FLY.

When a bird refuses to fly such artificial means as have been provided by the Management may be used to start it, by direction of the Referee. A bird hit with

a missile shall be declared "no bird." The shooter may declare a bird refusing to fly when the trap is pulled, "no bird." If a bird walks one yard toward the shooter it shall be declared "no bird" by the Referee.

RULE 9.—GATHERING BIRDS.

A bird to be scored dead must be gathered within the bounds before another bird is shot at, and within three minutes time, by a dog or person appointed by the shooter for that purpose. No extraneous means shall be used, and no other person shall be allowed to assist in gathering. If the gatherer can not locate the bird, he may appeal to the Referee to locate it for him. When the bird is retrieved by a man, it shall be scored dead when brought to firing point; but when dog is used, the bird shall be scored dead when the dog has had him in his mouth. All birds challenged must show flesh shot marks to be scored "dead."

RULE 10.—BIRDS KILLED ON THE GROUND.

A bird killed on the ground with the first barrel is "no bird." But it may be killed on the ground with the second barrel if the first is fired while the bird is on the wing. If a bird is shot at on the ground with the first barrel, and the shooter uses the second barrel, and the bird escapes, it is "lost bird." But if the bird is killed, it shall be "no bird."

RULE 11.—MUTILATING BIRDS.

No mutilation of birds will be allowed, and if it is proved to the Referee that any contestant has wilfully mutilated a bird, or is a party thereto, the Referee shall declare all his rights in the match forfeited.

RULE 12.—OUT OF BOUNDS.

If bird settles on top of boundary fence it must be scored lost. Where grounds are not enclosed and any part of bird is on the boundary line, after killing it shall be scored "dead bird." Where fence is used for boundary and bird escapes through hole in same it shall be scored "no bird." A bird once out of bounds must be scored a "lost bird," except where otherwise provided.

RULE 13.—BIRDS SHOT AT BY ANOTHER PERSON.

If a bird be shot at by any person other than the shooter at the score, the Referee shall decide whether it shall be scored, or another bird allowed.

RULE 14.—POSITION OF GUN.

Any the shooter may adopt.

RULE 15.—LOADS.

Charges of powder unlimited. Charge of shot not to exceed one and one-quarter ounces American Association, or Dixon's measure, struck. Any shooter using a larger quantity of shot shall forfeit his entrance money and rights in the match.

RULE 16.—CALIBER AND WEIGHT OF GUN.

No gun of larger caliber than a 10-gauge shall be used, and the weight of all guns shall be limited as follows: 10-gauge, 9 pounds 4 ounces; 12-gauge, 8 pounds 4 ounces; 14 and 16-gauge, 7 pounds 12 ounces; 20-gauge, 7 pounds 8 ounces.

RULE 17.—LOADING GUN.

No gun shall be loaded except at the score. Cartridges must be removed from the gun before leaving the score.

RULE 18.—LOST BIRD.

If a gun is not cocked, or the safety not properly adjusted, and the bird escapes, it shall be scored a "lost bird."

RULE 19.—BOTH BARRELS DISCHARGED SIMULTANEOUSLY.

If both barrels are discharged simultaneously and the bird escapes, the contestant shall be allowed another bird, the same as provided in Rule 21. But if the bird is killed it must be declared "no bird."

RULE 20.—MIS-FIRE WITH THE FIRST BARREL.

If the shooter's gun mis-fire with the first barrel he shall be allowed another bird, but if he uses the second barrel and misses, the bird must be scored "lost bird." But if killed with the second barrel, on the wing, it shall be scored "dead bird."

RULE 21.—MIS-FIRE WITH THE SECOND BARREL.

If a mis-fire occurs with the second barrel, the shooter shall have another bird, using a full charge of powder only in the first barrel. He must, however, put the gun to his shoulder and discharge the blank cartridge in the direction of the bird, and the bird must be on the wing when the first barrel is discharged.

RULE 22.—SHOOTER AT THE SCORE.

In all contests the shooter must be at the score within three minutes after his name is called to shoot, or he forfeits his rights in the match.

RULE 23.—LEAVING THE SCORE.

A shooter having fired his first barrel and left the score, can not return to fire his second barrel.

RULE 24.—BALK.

If a contestant is balked or interfered with, or there is other similar reason why it should be done, the Referee may allow another bird.

RULE 25.—ANNOUNCING THE SCORE.

The Referee shall announce the result of each shot distinctly and it shall be called back by the scorer, and at the close of each shooter's score the result must be announced, and if claimed to be wrong, the error, if any, must be corrected at once.

RULE 26.—TIE SHOOTING.

All ties shall be shot off at the original distance, and as soon after the match

as practicable, at the following number of birds, unless otherwise agreed to by all contestants:

In matches of 10 birds or less, 3 birds; in matches of 11 to 25 birds, inclusive, 5 birds; in matches of 26 to 50 birds, inclusive, 10 birds; in matches of 51 to 100 birds, inclusive, 25 birds.

If in a series of matches the result prove a tie, such tie shall be shot off at the original number of birds.

RULE 27.—CLASS SHOOTING.

All shooting shall be class shooting, unless otherwise stated.

RULE 28.—ENDANGERING PERSON OR PROPERTY.

If a bird shall fly so that to shoot at it would endanger any person or property, it shall not be shot at, and the Referee shall allow another bird.

RULE 29.—FORBIDDEN SHOOTING.

No shooting shall be permitted within the enclosure other than at the score, and in case there is no enclosure, no shooting within 200 yards of the score, except by those at the score, without the consent of the Management.

DOUBLE BIRDS.

RULE 1.

The rules for single bird shooting shall govern double bird contests, when not conflicting with the following:

RULE 2.—DOUBLE RISES.

The double rises shall be from two traps of any kind, 10 yards apart, pulled simultaneously. The rise shall be: 26 yards for 10-gauge guns; 24 yards for 12-gauge guns; 22 yards for 14 and 16-gauge guns; 21 yards for 20-gauge guns.

RULE 3.—ALLOWING ANOTHER PAIR.

Both birds should be on the wing when shot at. Should only one bird fly, the shooter shall have another pair of birds if he does not shoot, or if he does shoot and kills the bird on the wing. But if he shoots and misses, the bird shall be scored lost, and in such event he shall shoot at another pair of birds, with a full charge of powder only in one barrel. The Referee shall load the gun, not allowing the shooter to know which barrel contains the full charge, and which contains the powder charge only.

RULE 4.—MIS-FIRE WITH THE FIRST BARREL.

If the shooter's gun mis-fire with the first barrel, he will be entitled to another pair of birds, if he does not shoot his second barrel. But if he fires his second barrel the result must be scored, and the shooter shall shoot at another pair of birds, with a full charge of powder only, in one barrel, as provided for in Rule 3.

RULE 5.—MIS-FIRE WITH THE SECOND BARREL.

If the shooter's gun mis-fire with the second barrel, the result of the first barrel must be scored, and the shooter shall shoot at another pair of birds with a full charge of powder only in one barrel, as provided for in Rule 3.

RULE 6.—LOST BIRD.

If a shooter fire both barrels at one bird intentionally, it shall be scored "lost birds." But if the second barrel be discharged accidently, it shall be "no birds."

RULE 7.—NO BIRD.

If both birds are killed with one barrel, it shall be declared "no birds," and the shooter shall shoot at another pair of birds.

RULE 8.—TIES.

All ties must be decided in shooting off as follows: In matches of 5 pairs or less, at 2 pairs; in matches of 6 to 10 pairs, inclusive, at 3 pairs; in matches of 11 to 20 pairs, in clusive, at 6 pairs; in matches of 21 to 50 pairs, inclusive, at 10 pairs.

SYSTEMS OF DIVIDING MONEY.

CLASS SHOOTING OR THE PERCENTAGE SYSTEM.

In the old days, when there were but few Trap Shooters and a small number of entries, the purses were usually divided 60 and 40 per cent. As the number of entries increased, the number of moneys increased to four or five. This system gives rise to injustice and encourages "dropping for place," and has, therefore, been almost wholly discontinued except for live birds.

Two moneys, 60 and 40 per cent.; three moneys, 50, 30 and 20 per cent.; four moneys, 40, 30, 20 and 10 per cent.; five moneys, 30, 25, 20, 15 and 10 per cent.; six moneys, 27, 23, 17, 13, 11 and 9 per cent.

THE EQUITABLE SYSTEM.

Mr. Jesse E. Pumphrey, of Columbus, Ohio, was the originator of this system. It offers no inducement for "dropping for place,' as the man who kills the most will always be paid the most. The principal criticism that has been made to this system is, that there is not a sufficient difference between the winnings in the various places. Every shooter getting into the money is paid his pro rata of the purse, according to the number of targets or birds he has killed. This is determined by the net amount of the purse and the number of targets or birds killed by those who have shot into the money.

THE ROSE SYSTEM.

Shortly following the Equitable System came the Rose, invented by A. R.

Rose, Salida, Colo. This system very closely resembles the Equitable, but instead of figuring the exact value of each target or bird, the various moneys are represented by a scale of points which are not arbitrary, but may be changed at pleasure, making as much difference as may be desired, between the various moneys. In this respect it differs from the Equitable and is an improvement over that system where a shooter who goes straight receives but a fraction more than one who loses one or two—it being conceded that it is much more difficult to kill all, than a portion.

HIGH GUNS.

The most recent addition to the systems of purse division is the High Guns. This system, used almost entirely in live bird shooting, is rapidly becoming very popular—the more so as it becomes better understood. The opposition that this system met with at the start arose from the belief that but a very small percentage of the entries would get into the money, but when considered as made use of in the Grand American Handicap with two moneys for every ten entries, or as made use of in many of the gun clubs, two moneys for every five entries—in the latter case making ten moneys in every twenty-five entries—the opposition died away, and the system has become quite popular. The money is divided by percentage, but the system is entirely distinct from class shooting.

HOW TO SELECT A RANGE.

This important work is generally left to a committee appointed by the president. In selecting a range, endeavor to find a level tract of land for the purpose. Avoid places where there are ravines or gullies, as they create strong currents of air. A space cut through the woods makes the range favorable for shooting. Choose a place which will permit placing the targets at the north, and endeavor to find a location where a natural backing of earth to the targets can be secured. It is desirable to have the firing points for the different distances side by side. Measure the distances accurately with a steel tape measuring line and stake them off. If the land is level, dig a pit deep enough to completely shelter the marker when he stands erect in it; if the land is not level, or is too wet to use a pit, build a butt or shelter, which should be not less than five feet deep, of solid earth at the top. Build up both sides of the inside of the pit or shelter with logs or stone work. Use paper targets only; they are the safest and best. Arrange the targets thus: Build a frame a little larger than the target. Tack over the frame some thin, strong cloth, drawn tight; paste the target on this cloth. This mounted target should be fitted into another frame or sash, which is erected back and over the pit or to one side of the butt or shelter; then the target can be raised and lowered like a window by the marker in the pit or drawn behind the shelter.

When absolute safety is secured the firing can begin. There are a number of ways to mark the shots. The following are suggested:

1. The marker has a long pole, on the end of which is a round disc about 6 inches in diameter, one side of the disc being painted white, the other black. When the shot strikes the target the marker places the disc over the shot hole, showing the white side when in the bull's-eye, black if outside. He then displays a card having the count in figures on it. The target is then pulled into the pit, the shot-hole pasted, after which the target is returned to its exposed place.

2. Another plan is to employ a wooden plug with a card disc attached. After the shot, the target is pulled to the pit, the plug is placed in the shot-hole, the target raised for another shot, and the value of the shot signalled by a hand pointing to figures. The marksman at the firing point, by aid of a telescope and disc, readily sees the exact location of the shot. After the second shot is fired the first hole is pasted, and the plug transferred to the second shot-hole.

HOW TO CONDUCT A TARGET TOURNAMENT.

1. The grounds should be as level as possible, with unobstructed sky as a background. The cashier's office or tent should be central and 30 yards or more from the shooting scores. Shelter for shooters when in action or resting, tables or racks for guns and plenty of chairs or benches should be always provided. The shooting score should be roped off and no person allowed inside but the shooters at the score, the squad immediately to follow and those whose duties require their presence. Spectators should be arranged on the left and right, or immediately in rear of the shooting scores.

2. Arrangement of traps should be according to American Association Rules: Five traps five yards apart, or the W. G. Sergeant system, three traps four feet apart. Pit for trappers, three feet deep and eight feet long, with screen to protect nine feet long and three feet high. The shooting scores should be five in number, two yards apart, circular in form and sixteen yards from center trap; five to constitute a squad. Each contestant fires, in ten bird event, twice before moving; in fifteen bird event, three times, and so on, according to number of targets in event, shooting always at known trap and unknown angle. This arrangement is commended as the most pleasing and satisfactory in results.

3. Targets enough for the entire day's shoot should be unpacked, and conveniently placed before the tournament begins, in order to avoid delay and confusion later on. They should not be exposed to rain or to the sun on a hot day. Each target should be tried before placing in trap by pulling in opposite directions.

4. The Manager should be a man of experience, able to instruct and direct his assistants, settle all disputes, prevent friction and keep up the general interest.

5. The Referee should have good eyes and good judgment, and should be familiar with trap shooting. He should stand to the right and left of shooters near the scorers, and should call "dead" or "lost" distinctly, so that contestants and scorers can plainly hear. His decisions should be final.

6. The Cashier has a very trying and responsible position. He should be courteous, of even disposition and not easily excited. He should also be a good penman and accountant. He should make all entries in a cash book, should record all totals of scores on a separate card or book, receive and pay out all moneys, and be personally responsible for the cash. He should, before opening up, provide himself with plenty of change.

7. The Assistant Cashier should transfer names from cash book to score sheets, check the totals of scores received from scorers, verifying same, furnish newspaper reporters with scores, keep the scores in order, each event by itself and according to number of squad, and assist the Cashier in every way.

8. The Squad Hustler should exert himself to give prompt movement to the various events, should receive score sheets from the Assistant Cashier, place names on blackboard, call up squad and see that each man is in his place, hand score sheet to scorer, and then proceed in same way to get next squad in readiness. When he hands to scorer the score sheet of second squad, he should receive from him the score sheet of first squad and compare its scores with those on the blackboard. If found correct, he should pass it to the Assistant Cashier at the same time receiving from him the score sheet for next squad. If score sheet and blackboard do not agree, he should stop the shooting, call the attention of the Referee and the individual interested.

9. The Scorers should make faithful record of all "dead" or "lost" birds, as called out by the Referee. There should be two scorers, one to record on score sheet and one to record on blackboard; or, if there is no blackboard, each to record on separate score sheet. They should be near each other, should keep their eyes off the targets and on their work, and should take turns in calling back to the Referee, to show that they have heard correctly.

10. The Trap Puller should be situated about two yards behind No. 3 score, and should watch each shooter closely, so that he may both hear and see him call. He should promptly pull, the instant the call is made, as the failure to do so is sure to disturb the shooter.

11. The Trappers should be strong, active young men, and carefully instructed in placing targets and operating traps. They should keep the tension springs on carriers carefully adjusted so as not to break targets because too light, or to let them fall out because too loose. They should also keep working parts oiled, and should be sure that targets are not cracked or imperfect.

12. Added money is an attraction to a tournament, and contributes much to its success now-a-days, though formerly it was not thought necessary. It is, however, liable to abuse, and often results in driving the smaller clubs out of the tournament, because not able to afford this extra money. A medium course should be adopted where clubs can not afford to add to purses, such as guaranteed purses with surplus added. A liberal guarantee would probably have the same effect in interesting shooters as added money.

13. Division of moneys is an important consideration. The Rose system tends to the equalization of moneys, but takes away the chance of winning a big purse alone, for which all shooters strive. It has the merit, however, of preventing, to considerable extent, "dropping for place," that bane of all tournaments.

14. Handicaps may be imposed by means of added birds, varying distances and styles of shooting. This method of conducting a tournament meets with favor or disfavor according to the locality. In determining its advisability in a given case, there should be taken into account the general sentiment prevailing among shooters in the section where the tournament is to be held.

15. Style of shooting should be to imitate as far as possible live bird or field shooting. Machine-like methods should be broken up, both barrels should be brought into action and the "unexpected" should be an important element. Wherever it can be introduced, there should be one or more events each day requiring targets at eighteen to twenty-one yards rise, unknown traps and angles, and the use of both barrels.

16. The programme should be printed in neat and tasty manner, and should contain information as to how to reach the grounds, rules, conditions, handicaps, styles of shooting, prizes, purses, and whatever may be useful to attendants at the tournament.

17. In general: American Association Rules should govern. "Dropping for place" should be strictly prohibited. Everything should be done to secure large attendance, but the real success of a tournament depends upon good order, the fairness, smoothness and dispatch with which the various events are conducted and the faithful carrying out of all promises.

HOW TO CONDUCT A LIVE BIRD TOURNAMENT.

Much that has been said in relation to the Target Tournament will also apply in this case. Nor is it necessary to repeat the general rules observed by the American Association in Live Bird Shooting. A few words only of special advice will be offered.

1. The grounds should be as level as possible and large enough for a fifty-yard boundary. There should be an open sky to shoot against. The boundary

should be distinctly marked by stakes or flags, or, better still, by a low wire fence, in that it prevents birds that strike inside from bounding out. Spectators and those not actually employed in running the tournament should be kept at a good distance to the rear or side. The shooter should be entirely isolated, and no loud talking or remarks pertaining to him while at the score should be permitted by the Referee, who has power in such matters.

2. Traps and methods of trapping vary considerably. Ground traps, of which there are several different styles, give general satisfaction. The method of trapping in favor at a number of the principal shooting parks is what is called the Elliott underground system. It is thought to work smoothly and expeditiously. The trappers and birds are located in an underground chamber or cellar. The trapper loads the trap from underneath through a hole in the bottom of the trap. The dead birds are retrieved by a dog or boy from the score.

Another method of trapping, and which is meeting with favor, is that recently introduced by E. D. Fulford. A pit is made three feet deep, five feet wide and about twelve feet long, and is situated between and just back of Nos. 2 and 3 traps. To prevent shot from striking downward into the pit, a board a foot high can be placed back of the pit and banked up with earth in a sloping manner. Two boys or men with a crate of birds can lie in the pit and trap and retrieve from them. A bell or gong can be arranged near the edge of the pit with a rope leading back to the score, and trappers can be notified from there, by ringing same, when to load trap and when to retrieve. This system, with regulations carefully observed, is free from danger and is saving of time and labor.

Where a club can not afford the first-named system, or has not grounds suitable for the second, the old style can be used, the trapping and retrieving being done from the score. A good fast dog retriever is better than a boy or man; but when a dog is not available, two good, active boys are necessary, one to load trap and one to retrieve.

3. The handling of birds is an important matter. The birds should be kept in a large, roomy place, with plenty of light. The place should be kept clean, and gravel should frequently be scattered on the floor. The birds should have plenty of water and food until about eighteen hours before the shoot takes place, when they should be deprived of food. They should be carried to the shooting grounds in good sized crates, and should be taken from crates to traps by the trapper, with the ends of both wings, the tail and feet held in his hands. No mutilation of birds should be allowed, and all wounded birds should be immediately killed.

4. In regard to methods of shooting, where there is a large number of entries, the event can be shot in squads, each squad shooting entirely out before the next

squad begins. But this is generally considered unfair, as the weather conditions may change before the shoot is over, thus favoring some at the expense of others. The better way is, for each shooter to take his turn, and so on, through all the entries, until an event is finished.

No outside shooting at escaped birds should be allowed, except by permission of the Referee or Manager.

5. In awarding prizes, high guns, or miss and out, are generally conceded the best, and are the most popular methods of dividing purses. The method of class dividing is not generally regarded with favor, as it cuts the money into too small portions.

PISTOL SHOOTING IN AMERICA.

For many years pistol shooting in America was regarded as a lost art. A great many years ago some very fine single shot muzzle loading pistols of the duelling type were manufactured in this country. These arms produced great accuracy. With the introduction of the breech loading pistol and metallic cartridges pistol shooting lost its popularity, but about 1885 pistol shooting was revived. The reawakening of this sport was mainly due to great improvement in metallic cartridges. It soon became apparent that with modern metallic cartridges the work of the old duelling pistol could not only be equalled but surpassed, and the facility of loading and firing was so great that pistol shooting as a sport could be indulged in with little or no fatigue.

As pistol shooting increased in popularity the leading shooting clubs of America decided that for out-door shooting 50 yards was the proper range, and the Standard American target, as used at 200 yards for rifle shooting, was almost universally adopted throughout the United States. Most of the rifle clubs in the United States made pistol shooting an auxiliary to their sport and built ranges for this department of shooting.

After the revival of pistol shooting, it was followed in a desultory manner, but about 1887 it became very popular, and great efforts were made to establish and maintain records. The records of pistol shooting in America are from 5 shots to 100 shots, and mainly at a distance of 50 yards on the Standard American target.

Five-shot scores are usually fired in large tournaments. In the usual club competitions it is customary to issue tickets in matches of ten shots each. It was several years before the score of 99 out of a possible 100 was secured, the first being made by E. J. Darlington, of Wilmington, Del., on July 5, 1890. On Dec. 30, 1893, H. S. Harris, of the Massachusetts Rifle Association, at Walnut Hill, tied this aggregate, and on Jan. 6, 1894, he duplicated that aggregate.

The pistol shooters of America continued to shoot against this record of 99 out of a possible 100, and it was not until Nov. 8, 1898, that C. H. Taylor, of the Philadelphia Rifle Association, secured the first 100 out of a possible 100, 10 shots at 50 yards on the Standard American target. This score produced a great sensation among the postol marksmen of the United States, although Mr. Taylor had made enough fine scores before this time to prepare expert shots for his remarkable score.

On May 13, 1899, Thomas Anderton, of the Massachusetts Rifle Association, secured the second perfect score of 100 out of a possible 100 on the same target.

On April 20, 1901, E. E. Patridge, of the Massachusetts Rifle Association, made with a pistol in 10 shots on the Columbia target at 50 yards, at Walnut Hill, Mass., a score of 24, which is the record score under the foregoing conditions.

REVOLVER SHOOTING RECORD OF AMERICA.

For a long time a popular impression prevailed that a revolver was not an accurate arm. A revolver with poor ammunition is certainly unreliable, but a first-class revolver with superior ammunition is an arm of precision far beyond what most persons believe. It is a significant fact that soon after metallic ammunition was introduced for revolvers, the United States ordnance officers and those interested in revolver shooting believed that 25 yards was about the extent of range for which the military revolver could be relied upon. Nearly all the tests of the Government were made at that range and shorter distances. Other revolvers of smaller caliber were rarely shot at a distance beyond 10 or 12 yards.

It was in 1886 that the first revolver match was introduced at the meeting of the National Rifle Association, the range being 25 yards, and the target the old Creedmoor target. The match called for 3 scores to count a possible 150 points. The highest scores in this match were 143, 140 and 134. About this time the editor of a well-known sportsman's publication made the statement that little or nothing was known about the accuracy the revolver possessed; that with the ammunition of that time, and with improvements that could be made in the ammunition, the revolver was an arm of great accuracy at a distance far beyond what most people believed.

About this time a match was announced for revolvers in the spring meeting of the Massachusetts Rifle Association, the distance being 25 yards, and the target the Standard American target. Among the marksmen who shot in this competition was the well-known professional marksman, Chevalier Ira Paine, who was then in the height of his fame as a revolver shot. On his sixth entry he secured the possible 50 out of a possible 50 in 5 shots, and accompanied that

score with two of 49 out of 50, making an aggregate of 148 out of a possible 150, or the 15 shots, not consecutive, in a circle 5.54 inches in diameter, his perfect score of 50 being all on or in a circle 3.36 inches in diameter.

Soon after Chevalier Paine's performance at Walnut Hill the club members secured the possible, or so near the possible, so often that it was decided to double the range, and on Oct. 15, 1886, Chevalier Ira Paine offered to give a demonstration of his skill in revolver shooting by firing 100 shots on the Standard American target at 50 yards, until then an unheard of distance for revolver shooting. He shot Union Metallic Cartridge Co.'s ammunition, and made 791 points. The result of this shooting was telegraphed over all the United States and to Europe. It was considered the most remarkable piece of marksmanship with the revolver on record, but within six months several American amateurs surpassed that record one making 801 points, another 827, and a third 837.

Major C. C. Foster, of Massachusetts, on March 17, 1887, fired a 100-shot record with a revolver on the same conditions as Chevalier Paine, and secured 841 points, 70 of the 100 shots being bullseyes. This record was surpassed by F. E. Bennett, on Nov. 4, 1887, by a score of 857 points, and again on Nov. 14, 1887, he broke that record by a score of 877 points.

On Dec. 23, 1887, W. W. Bennett raised the 100-shot revolver record of the United States to 914 points. Great rivalry existed between the Bennetts and Chevalier Paine, which resulted, after a prolonged newspaper controversy, in a match with revolvers for $1,000 a side under the following conditions: Six hundred shots, 100 shots a day for six consecutive days, at a distance of 50 measured yards, on the Standard American 200-yard rifle target; revolvers .44 caliber, with 3 pound pull, not over 6 1-2 inch barrel, ammunition to be factory made.

Chevalier Paine withdrew on the fifth day of the contest. He made a protest which, according to the conditions of the match, was referred to the secretary of the National Rifle Association of America, who decided that F. E. Bennett had won the match, and he was awarded the title of revolver champion of America and the stakes.

While preparing for this match at Walnut Hill, Mr. Bennett did some of the finest shooting with the revolver ever done in the world. It was his custom to fire 100 shots a day under regulation conditions. Careful record of his shooting was kept. He shot full charge U. M. C. ammunition in all his practice, and secured in 100 shots 907, 909, 915 and 912 points.

PISTOL AND REVOLVER SHOOTING RULES.

The following are the revolver and pistol shooting rules generally followed

throughout the United States, and which have governed all the important competitions in this department of shooting in recent years in this country.

In all matches, when not otherwise mentioned, either the single-shot pistol, magazine pistol, or revolver will be permitted upon equal conditions; but if matches call for any particular arm, the shooting must be done with that arm

CLASSIFICATION OF ARMS.—A, Military revolver; B, Any revolver; C, Pocket revolver; D, Magazine pistol; E, Any pistol.

A.—MILITARY REVOLVER: A revolver that has been adopted by any Government for armament of its Army or Navy, or such as is constructed for military service, provided it conforms in model, trigger pull, sights and ammunition to revolvers used in military service.

B.—ANY REVOLVER: A revolver of any caliber, maximum weight, 3 pounds; maximum length of bore, including cylinder, 10 inches.

C.—POCKET REVOLVER: A revolver of .32 or .38 caliber; maximum weight, 25 ounces; maximum length of barrel, exclusive of cylinder, 4 inches.

D.—MAGAZINE PISTOL: A pistol with a magazine other than a revolving magazine; maximum length of bore, 10 inches.

E.—ANY PISTOL: Any breech or muzzle loading pistol; maximum weight, 3 pounds; maximum length of bore, 12 inches.

TRIGGER PULL.—The minimum trigger pull shall be 4 pounds for a military revolver; 2 1-2 pounds for any revolver; 4 pounds for a magazine pistol; 2 1-2 pounds for a pocket revolver, and 2 pounds for any pistol.

SIGHTS FOR REVOLVERS AND PISTOLS.—The front and rear sights must be open; the notch of a rear sight, to be considered open, must be as wide at the top of the notch as at any part; no aperture or peep sights, nor any manner of covered sights, shall be permitted. On a military revolver and on a pocket revolver the front and the rear sights must be fixed. On any revolver and on any pistol a lateral sliding bar or wind gauge may be used on a rear open sight, also any elevating front or rear open sight. Front and rear sights on any revolver and any pistol must not be more than 10 inches apart. The use of a notch for a front sight will not be permitted. Sights may be smoked or blackened in any desired manner. Sights on military revolvers shall not be altered.

AMMUNITION.—If factory ammunition is called for it shall be of any make, of any established manufacturer, generally procurable in stores and brought to the shooting point in unbroken boxes, with the label of the manufacturer intact.

CLEANING.—In match shooting, competitors may clean their arms between scores or between series of shots, provided such cleaning does not delay the firing, which shall be at the rate of one shot a minute, when time limit is required.

In matches confined to revolvers, the cylinder must be fully charged, or a

sufficient number of chambers charged to complete the score or series. With magazine pistols the magazine must be fully charged or contain sufficient cartridges to complete the score or series.

LOADING AND FIRING.—No arms shall be loaded except at the firing point, the muzzle of piece being kept in the direction of the target till the arm is either discharged or unloaded. Misfires shall not count; but an accidental discharge shall, in every instance, be scored a shot.

POSITION.—The position shall be as follows: Standing, free from any artificial support, the pistol or revolver held in one hand only, with the arm extended free from the body, and unsupported in any way.

TARGETS.—The Standard American target, full size, having an 8-inch bullseye, shall be used in matches at 50 yards distance with any revolver and any pistol. The same target reduced to one-half size, having a 4-inch bullseye, in matches at 30 yards distance. The same target reduced, and having a 2 3-4-inch bullseye, in matches of 20 yards distance.

The United States elliptical bullseye shall be used in all military matches with military revolver and with magazine pistol. The bullseye shall be an ellipse 8x10 inches for 50 yards and over, and other regulation lines to conform, and the same target one-half the size for lesser ranges. Any other target approved by the Executive Committee may be used.

MARKING AND SCORING.—Unless otherwise specified each competitor shall have a separate target provided, and shall fire his score throughout, when the target will be examined by the scorer, and the score recorded.

VALUE OF SHOTS.—If a bullet touches a line the count of that line is given; shots on or within that line count the same. The eye alone shall determine the count. Placing a bullet or other articles in the shot-hole or touching the shot-holes in any way is not permitted.

APPEALS.—In case of a challenge or if dissatisfaction in any way connected with the shooting, in matches or practice, being referred to the Executive Officer, he or his representative shall render a decision. Should his decision be unsatisfactory, an appeal may be made in writing to the Executive Committee; the decision of the majority of this Committee shall be final.

RULES GOVERNING RIFLE COMPETITIONS.

I.—MANAGEMENT.

1. All meetings for competitions will be conducted by an Executive Officer, aided by 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 club as, in his judgment, are necessary.

3. The Executive Officer and assistants are required to see that the regulations are rigidly complied with by competitors and others.

4. They will see that the competitors are stationed in rear of firing points, and that each competitor remains there until called by the score-keeper to take his position at the firing-point. The score-keeper will be seated in rear of the firing-point.

5. Score-keepers 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 score-keeper during the progress of the match, but in such a manner as not to interfere with or inconvenience the score-keeper.

7. Any competitor feeling himself aggrieved by the ruling of the Executive Officer may make to the Secretary a statement of his grievance in writing.

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 must have a maximum weight ten pounds, minimum pull of trigger three pounds; with 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. Competitors shall submit their rifles and ammunition for inspection whenever required.

III.—Targets.

Creedmoor Target.

The following described targets are now in general use:

Creedmoor targets are divided into three classes, as follows:

1. First Class, to be used at all distances over 600 yards. Targets, 6x12 feet.
   Bullseye, circular, 36 inches in diameter.
   Centre, circular, 54 inches in diameter.
   Inner, square, 6 feet x 6 feet.
   Outer, square, 6 feet x 12 feet.

2. Second class, to be used at all distances over 300 to and including 600 yards. Target, 6x6 feet.

Bullseye, circular, 22 inches in diameter.
Center, circular, 38 inches in diameter.
Inner, circular, 54 inches in diameter.
Outer, the remainder of the target.

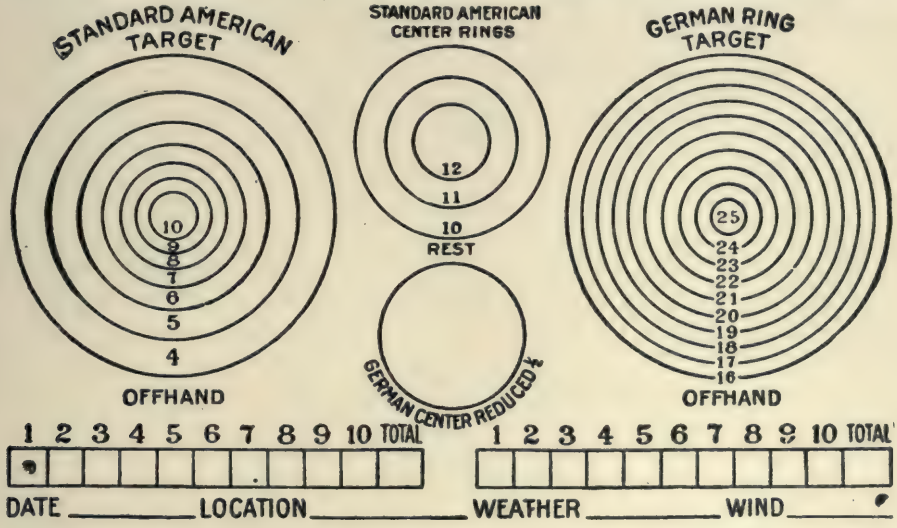
3. Third Class, used up to and including 300 yards. Target, 4 by 6 feet.

Bullseye, circular, 8 inches in diameter.
Center, circular, 26 inches in diameter.
Inner, circular, 46 inches in diameter.
Outer, square, 4 by 6 feet.

The Creedmoor target is not generally used now for 200 yards shooting, but it is still popular for mid-range and long range.

German Ring Target.

Bullseye, 12 inches. The whole target, including bullseye, divided into circles



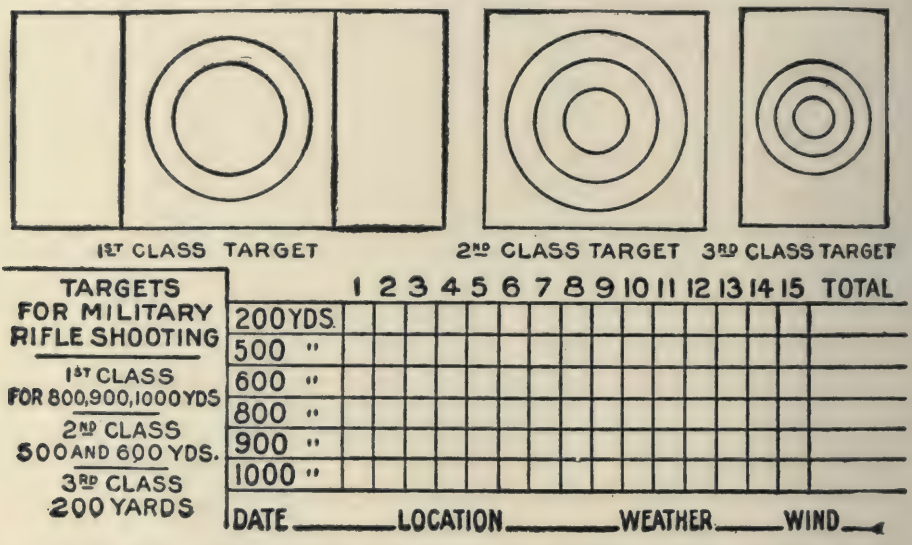
3-4 inch apart, the centre circle being 1 1-2 inches, and counting from 25 down to 1.

Standard American Target, 4 by 6 Feet.

Count	10.	Bullseye, circular,	3.36 inches diameter.
Count	9.	Bullseye, circular,	5.54 inches diameter.
Count	8.	Bullseye, circular,	8.00 inches diameter.
Count	7.	circular,	11.00 inches diameter.
Count	6.	circular,	14.80 inches diameter.
Count	5.	circular,	19.68 inches diameter.

Count	4.	circular, 26.00 inches diameter.
Count	3.	circular, 34.22 inches diameter.
Count	2.	circular, 46.00 inches diameter.
Count	1.	The remainder of the target, 4 by 6 feet.

For rest shooting add circle inside of ten 2.33 inches in diameter; inside of



eleven circle add another circle 1.41 inches in diameter; these circles count 11 and 12, respectively.

Columbia Target.

Bullseye, 12 inches. The whole target, including the bullseye, divided into circles 1-2 inch apart. The centre circle, being one inch in diameter, counts 1, the second circle counts 2, and so on out to 26. A shot outside the 26 circle counts 27.

IV.—Marking, Scoring and Signalling.

The value of shots on the Standard American target is shown on the 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; signal, white and black 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 $.—

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 first one 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, 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 hip or 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 the 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 rules 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.

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 a choice of prizes unless otherwise stated.

The Executive Officer shall have power to appoint assistant officers, and supply badges to same.

Regular Shooting Days shall be as the Directors may order.

VIII.—Penalties.

1. Competitors must make themselves acquainted with the regulations, as the plea of ignorance shall 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 decision 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 rifle 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 shooter firing upon the wrong target, shall be fined, to be paid before he proceeds with his score, and the shot shall be recorded a miss.

As the residuum of smokeless powder, if not completely removed, corrodes the bore in a short time, care is required in cleaning the arm after firing. If gas escapes at the base of the cartridge, it will probably enter the well of the bolt through the striker hole. In this case the bolt mechanism must be dismounted, and the parts and well of the bolt thoroughly cleaned. Any part that may appear to move hard can generally be freed by the use of a little oil. *Cedaroleum,* one of the latest and best lubricants and rust preventives, is very convenient for use. It is put up in a collapsible tube, with an injecting point. It will quickly remove the residue of the nitro powders as well as black, and act at the same time as an anti-corrosive. It is impervious to dampness and salt water, making it desirable for shooting near or on the sea.

HOW TO ORGANIZE A GUN CLUB.

When a party of sportsmen desire to organize a Gun Club, a few of the leading spirits should appoint a time and place for a meeting, and invite all interested

to be present. A gun or sporting goods store is an excellent place to meet. The meeting should be called to order by one of the promoters, and a Chairman and Secretary should be elected to act until a permanent organization is effected. After the object of the meeting has been sufficiently discussed, and all present who desire to become members of the proposed Club have given their names, a Committee of three or five should be appointed to suggest a name for the Club and to draft a Constitution and By-Laws for permanent organization, the Committee to have authority to call a meeting again when ready to report. At the second meeting action should be taken on the report of the Committee, and the organization should be completed by electing officers. A Committee should be appointed to secure suitable grounds, to prepare same and to purchase traps, targets and whatever is necessary for an outfit.

A Constitution should, in general, embrace the following subjects: Name of Club, object, officers and method of electing same, duties of officers, conditions of membership and method of electing to same, fees, initiation and annual dues, method of dealing with members in arrears, how membership may be terminated, forfeiture of rights and interests, how the Constitution may be amended.

By-Laws should pertain to times of meeting, order of business, regulations for shoots, management of ground, purchase of supplies, reports and auditing same, and whatever the individual Club may find its peculiar circumstances may require.

The following are the customary officers and their duties: A President, whose duties are to preside at meetings, enforce order and the rules of the Club, and exercise a general supervision of its affairs; a Vice-President, who acts in the absence of the President; a Secretary, who keeps a record of the membership and the proceedings of meetings, issues notices and attends to correspondence; a Treasurer, who collects and disburses funds on order of the Club, and is expected to attend to ordinary purchases; a Captain, who has the management of shoots and the enforcement of rules on the grounds.

GAME LAWS.

It has been found more convenient for those contemplating a hunt to know *when game may be killed,* rather than when protected. This article, therefore, gives the open season instead of the closed. The dates indicate the time during which it is permitted to kill game. For example, "October 1 to January 1," signifies that during the months of October, November and December the game mentioned may be killed.

Careful examination has been made of all game laws in the United States

and Canada, and the following digests, while brief and free from the customary verbiage, will be found sufficient for all ordinary purposes and in strict accordance with the latest public enactments.

In the United States and Canada (or British Possessions) laws protecting song and insectiverous birds and their nests and prohibiting all unsportsmanlike methods, such as swivel and other than shoulder guns, batteries, blinds, sneak or punt boats, night hunting, hunting by artificial lights, hounding, crusting, snares, traps, disturbing roosts and nests of birds and fowl, are so almost universal that it is not necessary to repeat or specifically mention them under the various States, Territories or Provinces. They can always, however, be safely taken for granted.

It is not necessary to mention the fines and punishments. In general, it may be said that infractions of game laws are punishable by heavy fines and sometimes by imprisonment also.

IN THE UNITED STATES.

Reference can only be had in this brief space to general laws. In certain States indicated, there are local laws embracing one or more Counties. Sportsmen contemplating an extended shoot in those States should consult local authorities and make sure of avoiding trouble.

ALABAMA—Quail, partridge, grouse, pheasant, woodcock, prairie chicken, November 15 to March 1. Turkey, February 1 to March 1. Deer, September 1 to December 31. Squirrel, black or gray, fox, July 1 to February 1. Protected: Chinese, Mongolian and English pheasant. Prohibited: Killing deer in stream, pond, or lake; exporting; Sunday hunting. Local laws.

ARIZONA—Quail, partridge, grouse, pheasant, duck, goose, brant, snipe, rail, October 15 to March 1. Male deer, turkey, November 15 to December 15. Protected: Camel, elk, mountain goat or sheep, female deer, spotted fawn and antelope. Prohibited: Killing of more than one deer in a day or three in a season, or more than 25 duck or quail in a day; exporting.

ARKANSAS—Quail, October 1 to March 1. Turkey, September 1 to May 1. Deer, September 1 to March 1. Pinnated grouse, prairie chicken, October 31 to December 1. Prohibited: Exporting. Non-residents taxed $10.00. Local laws.

CALIFORNIA—Quail, partridge, grouse, sage hen, duck, rail, curlew, ibis, plover, October 1 to February 1. Dove, squirrel, August 1 to February 1. Male deer, August 1 to October 1. Protected: Female deer, spotted fawn, antelope, elk, mountain sheep, Mongolian or English pheasant, or bobwhite or Eastern or Chinese quail, or English partridge. Prohibited: More than 3 deer in one season, 25 quail, partridge, snipe, curlew, ibis, or 50 ducks or 20 rails in one day. Exporting. Local laws.

COLORADO—Turkey, prairie chicken, sage chicken, grouse, August 15 to Oc-

tober 31. Duck, goose, snipe, curlew, brant, swan, crane, September 1 to April 15; in altitudes exceeding 7,000 feet, September 15 to April 15. Pigeon, dove, July 15 to September 30. Deer and antelope having horns, August 1 to November 5. Elk having horns, October 25 to November 5. Protected: Quail, pheasant, partridge, ptarmigan, bison, buffalo, mountain sheep, beaver. Prohibited: Killing, by one person, more than 50 ducks and 25 other birds in one day, or more than one elk, antelope and deer, or two antelope, or two deer, instead of one of each, in one season; trespassing or shooting from public highway.

Connecticut—Quail, woodcock, ruffled grouse, gray squirrel, October 1 to November 30. Snipe, plover, rail, gallinules, mud-hen, shore birds, September 1 to March 31. Goose, duck, brant, September 1 to March 31. Hare, rabbit, October 1 to December 31. Protected: Mongolian or Chinese pheasant and deer. Prohibited: Killing more than 50 rail, snipe, plover, shore birds, per day, or 5 ruffed grouse per day, or 36 in one year; Sunday shooting; exporting.

Delaware—Quail, partridge, pheasant, rabbit, November 15 to December 31. Reed bird, ortolan, rail, September 1 to February 1. Goose, swan, brant, duck (except wood duck), October 1 to April 15. Woodcock, at all times. Prohibited: Hunting when ground is covered with snow; exporting. Non-residents taxed $5.00 for first and $2.00 for each subsequent year.

District of Columbia—Quail, November 1 to March 15. Woodcock, July 1 to January 1. Prairie chicken, September 1 to March 15. Turkey, ruffed grouse, pheasant, November 1 to December 26. Squirrel, rabbit, November 1 to February 1. Duck, goose, brant, snipe, plover, September 1 to April 1. Rail, ortolan, reed bird, marsh blackbird, September 1 to February 1. Protected: English ring-neck or other foreign pheasants. Prohibited: Sunday hunting.

Florida—Quail, turkey, November 1 to March 1. Deer, October 1 to January 31. Prohibited: More than 5 deer in one season; more than 4 turkeys and 25 quail to one person, or 6 turkeys and 50 quail to one party in one day; sale of deer; exporting from County where killed. Non-residents taxed $10.00.

Georgia—Quail, partridge, pheasant, turkey, November 1 to March 15. Dove, August 15 to March 15. Deer, fawn, September 1 to January 1. Prohibited: Sunday hunting. Exporting partridge, quail.

Idaho—Quail, October 31 to December 1. Partridge, pheasant, grouse, prairie chicken, sage and fool hen, August 15 to December 1. Duck, goose, swan, August 15 to March 1. Deer, antelope, mountain sheep or goat, September 1 to January 1. Elk, September 1 to December 1. Protected: Moose, caribou and beaver; Mongolian pheasant; buffalo and bison, indefinitely. Prohibited: Killing in one season more than 4 each of deer, antelope, mountain sheep or goat, or two elk; exporting.

ILLINOIS—Quail, legal at any time, but will be confiscated except November 1 to December 20. Pinnated and ruffed grouse, prairie chicken, pheasant, partridge, September 1 to September 30. Dove, August 1 to December 1. Snipe, plover, September 1 to April 25. Duck, goose, brant, all water fowl, September 1 to April 15. Turkey, September 1 to January 15. Squirrel, July 1 to December 1. Protected: Deer, imported pheasants, cacubis, chucker partridge, sand grouse, black India partridge. Prohibited: Sale of quail, prairie chicken, ruffed grouse, squirrel, turkey, killed in State; exporting without license. Non-residents taxed $10.00. License permits taking from State 25 birds of all kinds killed by himself.

INDIANA—Quail, ruffed grouse, prairie chicken, pinnated grouse, November 10 to January 1. Squirrel, June 1 to October 1, and November 10 to January 1. Duck, goose, brant, November 10 to April 15, and September 1 to October 1. Dove, August 15 to October 1, and November 10 to January 1. Protected: Deer, turkey, all kinds of pheasants. Prohibited: Killing of more than 24 quail or duck in one day; sale of quail; Sunday hunting; exporting. Non-residents' license, $25.00.

INDIAN TERRITORY—All game protected, except for immediate subsistence while passing through the country.

IOWA—Quail, ruffed grouse, pheasant, turkey, November 1 to January 1. Prairie chicken, September 1 to December 1. Woodcock, July 10 to January 1. Duck, goose, brant, rail, plover, sandpiper, marsh or beach birds, September 1 to April 15. Squirrel, June 1 to September 1. Beaver, mink, otter, muskrat, November 1 to April 1. Protected: Deer, elk, goat, indefinitely. Prohibited: Killing quail on public highway; hunting for market; killing more than 25 birds or fowl in one day; trespassing; exporting. License for non-residents, $10.00.

KANSAS—Quail, December 1 to 31. Grouse, prairie chicken, August 15 to October 1. Dove, plover, July 15 to September 15. Protected: Pheasant, meadow-lark. Prohibited: Selling, exporting.

KENTUCKY—Quail, partridge, pheasant, November 15 to January 1. Woodcock, June 20 to February 1. Dove, August 1 to February 1. Turkey, September 1 to February 1. Duck, goose, August 15 to April 1. Squirrel, June 15 to February 1. Deer, September 1 to March 1.

LOUISIANA—Dove, quail, partridge, pheasant, October 1 to March 1. Turkey, October 1 to May 1. Wood duck, blue wing teal, August 1 to May 1. Other ducks, September 1 to April 1. Deer, September 15 to February 15. Prohibited: Hunting at any time by idlers, vagrants, professional sportsmen, pot hunters.

MAINE—Grouse, partridge, woodcock, September 15 to December 1. Quail, October 1 to December 1. Plover, snipe, sand piper, August 1 to May 1. Duck, April 1 to April 30, September 1 to December 1. Bull moose, October 15 to Decem-

ber 1. Deer, October 1 to December 15. Protected: Capercailzie, all kinds of pheasant, except ruffed grouse; cow or calf moose. Prohibited; Killing more than 15 birds, except sand pipers, or more than 70 sand pipers in one day, and more than one bull moose or two deer in a season. Exporting.

MARYLAND—Quail, partridge, turkey, ruffed grouse, pheasant, November 1 to January 1. Woodcock, July 1 to July 31, September 1 to January 1. Dove, August 15 to December 24. Snipe, plover, August 15 to May 1. Water rail, ortolan, reed bird, rail bird, September 1 to November 1. Duck, goose, swan, brant, November 1 to April 10. Rabbit, November 1 to February 1. Squirrel, September 1 to December 1. Local laws.

MASSACHUSETTS—Quail, woodcock, partridge, October 1 to December 1. Plover, snipe, sand piper, rail, all shore, marsh, and beach birds, July 15 to May 1. Wood duck, black duck, or teal, September 1 to March 1. All other kinds of duck, September 1 to May 20. Gray squirrel, hare, rabbit, October 1 to March 1. Protected: Deer, pinnated grouse, wild pigeon, gull, tern; Mongolian, English and golden pheasants. Prohibited: Pursuit of wild fowl by seam or naphtha boats; Sunday hunting; exporting; sale of woodcock or partridge. Local laws.

MICHIGAN—Quail, partridge, spruce hen, woodcock, October 20 to November 30. Partridge, Upper Peninsula, October 1 to November 30. Jack snipe, blue bill, canvas back, widgeon, pin-tail, whistler, spoon-bill, water-ball, saw-bill ducks, March 2 to April 10, and duck, goose, brant, snipe, plover, all water fowl, October 1 to November 30. Deer, November 8 to November 30. Fox, black and gray squirrel, October 15 to November 30. Otter, fisher, marten, November 15 to May 1. Mink, raccoon, skunk, muskrat, November 1 to August 31. Protected: Prairie chicken, Mongolian and English pheasants, turkey and pigeon, beaver, moose, elk, caribou; deer, in nine counties and the island of Bois Blanc; deer in red coat, fawn in spotted coat. Prohibited: Exporting; selling. Non-resident license for deer, $25.00.

MINNESOTA—Quail, partridge, pheasant, October 1 to December 1. Dove, snipe, prairie chicken, pinnated, white-breasted and sharp-tailed grouse, September 1 to November 1. Upland plover, woodcock, July 4 to October 31. Duck, goose, brant, all water fowl, September 1 to January 1. Deer, November 10 to November 30. Moose and caribou, with antlers, November 15 to November 20. Protected: Imported pheasants. Prohibited: Killing by one person more than 3 deer in one season; 1 moose, 1 caribou, or more than 25 birds in one day; killing fawn, elk; selling quail, partridge, ruffed and sharp-tailed grouse, prairie chicken, pheasant, duck, goose, brant, all water fowl; exporting. License required to hunt deer, elk, caribou, moose, non-residents paying $25.00. Non-residents license for all game from citizens of States having like provision, $25.00.

MISSISSIPPI—Quail, turkey, October 1 to May 1. Dove, lark, deer, September 15 to March 1. Laws pertaining to deer and turkey not applicable in 12 counties. Boards of Supervisors generally given full authority in relation to game in their respective counties. Local laws and ordinances.

MISSOURI—Quail, prairie chicken, partridge, pheasant, turkey, November 1 to January 1. Woodcock, dove, lark, plover, August 1 to January 1. Duck, October 1 to April 1. Deer, October 1 to January 1. Prohibited: Exporting from counties where killed and selling quail, pinnated grouse, prairie chicken, deer, turkey; hunting by non-residents

MONTANA—Grouse, prairie chicken, fool hen, pheasant, partridge, September 1 to December 1. Sage hen, turtle dove, August 1 to December 15. Goose, duck, brant, swan, September 1 to May 1. Male elk, September 1 to November 1. Deer, mountain goat, September 1 to January 1. Protected: Moose, bison, caribou, buffalo, quail, pheasant, mountain sheep, antelope, beaver, female elk. Prohibited: Killing more than six deer or mountain goats or two male elks in a calendar year or 20 grouse, prairie chicken, fool hen, pheasant, sage hen, turtle dove, partridge in one day.

NEBRASKA—Prairie chicken, sage chicken, grouse, October 1 to November 30. Duck, goose, brant, swan, crane, all water fowl, jack snipe, Wilson snipe, yellow legs, September 1 to April 15. Pigeon, dove, plover, April 15 to October 30. Deer and antelope having horns, August 15 to November 15. Protected: Quail, elk and beaver. Prohibited: Killing more than 10 geese or brants, or 25 other game birds in one day, or more than one deer and one antelope in a season; shooting from highway; exporting. Non-resident license, $10.00.

NEVADA—Sage hen, July 1 to March 1. Dove, July 15 to November 1. Goose, duck, sand hill crane, mud hen, plover, curlew, snipe, woodcock, valley quail, prairie chicken, bittern, September 1 to March 15. Male deer and antelope, September 1 to November 1. Protected: Pheasant, mountain quail, female deer and antelope, fawn, caribou, elk, mountain sheep and goat, beaver and otter. Prohibited: Exporting; selling, killing more than two deer or antelope in one season.

NEW HAMPSHIRE—Woodcock, ruffed grouse, partridge, quail, Wilson snipe, September 15 to December 15. Plover, yellow leg, sand piper, duck (except sheldrake and loon), rail, August 1 to January 31. Deer, in counties of Coos, Carroll and part of Grafton, October 1 to December 15. Sable, otter, fisher, October 15 to March 31. Gray squirrel, raccoon, September 15 to January 1. Hare, rabbit, October 1 to March 31. Protected: Blue heron, bald eagle, moose, caribou, elk, fawn and beaver. Prohibited: Killing of more than two deer in one season; exporting; selling of woodcock, partridge, duck and grouse.

New Jersey—Quail, partridge, grouse, pheasant, squirrel, hare, rabbit, English pheasant, November 10 to January 1. Woodcock, July 1 to July 31 and October 1 to January 1. Gray, English and Wilson snipe, March 1 to April 30 and August 25 to December 31. Reed bird, rail bird, marsh hen, September 1 to December 31. Grass and upland plover, dove, August 1 to September 30. Duck, goose, other water fowl, September 1 to May 1. Prohibited: Sunday hunting; trespassing; exporting.

New Mexico—Quail grouse, prairie chicken, pheasant, partridge, turkey, deer and antelope with horns, September 1 to December 1. Protected: Elk, fawn, ibex, mountain sheep or goat, beaver and Mongolian pheasant. Prohibited: Exporting.

New York—Quail, November 1 to December 15. Woodcock, September 16 to December 15; grouse, September 16 to December 15; in Ulster, Sullivan and Greene counties, October 1 to December 15. Wilson snipe, yellow leg, plover, rail, mud hen, gallinule, surf bird, curlew, water chicken, jack snipe, shore bird, September 1 to April 30. Duck, Goose, brant, swan, September 1 to April 29; Jefferson county, September 1 to January 31. Deer, September 1 to November 15. Black and gray squirrel, September 1 to December 15. Hare, rabbit, opening of season ranges from September 1 to November 1, and closing from December 15 to February 14, in different counties. Local laws on mink, muskrat and fox. Protected: Spotted fawn, moose, elk, caribou, antelope, beaver, Mongolian ringnecked and English pheasant. Prohibited: Exporting; crusting or yarding deer; killing more than two deer in one seacon. Local laws.

North Carolina—Quail, partridge, robin, lark, mocking bird, turkey, November 1 to March 15. Duck, all water fowl, November 10 to March 10. Deer, October 1 to December 31. Protected: Quail or partridge from net or trap. Prohibited: Hunting on Sunday; exporting. Local laws.

North Dakota—Prairie chicken, pinnated, sharp-tailed and ruffed grouse, woodcock, September 1 to October 15. Duck, goose, crane, brant, September 1 to May 1. Deer, November 10 to December 1. Protected: Quail, English and Chinese pheasant, swan, buffalo, moose, elk, caribou, mountain sheep, antelope, beaver and otter. Prohibited: Killing more than 25 birds or water fowl per day, or more than five deer in one year; selling. License for year, residents, 75 cents; non-residents, $25.00.

Ohio—Quail, turkey, rabbit, November 10 to December 1. Woodcock, squirrel, August 1 to September 1. Rail, plover, snipe, November 10 to December 1 and March 10 to April 20. Duck, goose, swan, coot, mud hen, September 1 to December 15 and March 15 to April 20, Sundays and Mondays excepted. Protected: Prairie chicken, ruffed grouse and pheasants of all kinds. Prohibited:

Selling; Sunday hunting; exporting; killing of more than 18 quail, woodcock, geese, plover, snipe, 25 duck, 10 squirrel, 6 pheasants, prairie chicken or grouse; shooting at quail, except when they are flying; shooting at pigeon on nesting ground or within one-half mile of roosting place. Non-resident license, $25.00.

OKLAHOMA—Quail, October 15 to February 1. Prairie chicken, turkey, September 1 to January 1. Plover, dove, August 1 to December 31. Protected: Mongolian and other pheasants, deer and antelope. Prohibited: Exporting.

OREGON—Prairie chicken, ring-necked pheasant, quail, partridge, October 1 to December 1. Grouse, ruffed grouse, October 1 to December 1. Both groups limited to ten in one day. Duck, goose, swan, September 1 to March 1; Jackson, Klamath and Lake counties, September 15 to January 1; Coos, August 1 to February 1. Limited to 100 in one week or 50 in one day. Water rail, upland plover, August 1 to January 1. Silver gray squirrel, October 1 to January 1. Buck deer, antelope, moose, mountain sheep, July 15 to November 1. Female deer, August 15 to November 1. Deer, antelope, counties of Grant, Harney, Malheur, Baker, October 1 to 15. Protected: Spotted fawn and elk, China pheasant, Tillamook, Josephine, Jackson, Coos, Curry, Clatsop counties; ruffed grouse, Tillamook county; English partridge, capercailzie, moor hen, turkey, woodcock, silver, golden, copper, green Japanese and Reeves pheasant.

East of CASCADE MOUNTAINS—Sage hen, grouse, ruffed grouse, except Wasco county, August 1 to November 1. Prairie chicken, except Wasco county, October 15 to November 15. Wasco county, prairie chicken, quail, August 1 to October 15. Protected: Imported pheasants, quail, bobwhite quail, except Klamath and Lake counties; prairie chicken, except Wasco county.

PENNSYLVANIA—Quail, partridge, prairie chicken, grouse, turkey, pheasant, squirrel, black and gray fox, October 15 to December 15. Woodcock, July 1 to 31 and October 15 to December 15. Plover, July 15 to January 1. Rail, reed bird, September 1 to November 30. Water fowl, September 1 to May 1. Hare, rabbit, November 1 to December 15. Deer, elk, November 1 to 30. English, Mongolian and Chinese pheasants, October 15 to December 15. Prohibited: Sunday hunting; killing deer in stream, pond or lake; killing game for sale; exporting; killing more than two deer in one season, or more than 15 quail, 2 turkeys, 10 each of pheasant and woodcock, in one day.

RHODE ISLAND—Woodcock, ruffed grouse, partridge, quail, October 15 to December 15. Black and wood duck, August 15 to March 31. Goose, brant, duck (except black and wood), peep, plover, snipe, yellow leg, shore birds, no close season. Rabbit, hare, gray squirrel, October 15 to January 1. Protected: Pheasant (not including ruffed grouse) and deer. Prohibited: Exporting of woodcock, quail or ruffed grouse.

South Carolina—Quail, partridge, woodcock, pheasant, turkey, November 1 to April 1. Dove, August 1 to March 1. Deer, in ten counties, August 1 to February 1; other counties, September 1 to January 1. Protected: Mongolian and ring-necked pheasants. Non-residents taxed $25.00. Local laws.

South Dakota—Quail, prairie chicken, pinnated, sharp-tailed and ruffed grouse, woodcock, September 1 to January 1. Plover, curlew, September 1 to May 15. Duck, goose, brant, crane, September 1 to May 1. Deer, elk, buffalo, mountain sheep, November 1 to January 1. Protected: Beaver, antelope and otter. Prohibited: Selling; exporting; killing more than 25 birds or fowl in one day, or more than one elk, one buffalo, three deer, four antelope, one mountain sheep, in one year. Non-resident license, $25.00.

Tennessee—Quail, partridge, November 1 to March 1. Deer, by residents only and for own consumption, August 1 to January 1. Local laws.

Texas—Quail, partridge, October 1 to March 15. Prairie chicken, August 1 to February 1. Turkey, September 1 to April 1. Deer, September 1 to January 1. Antelope, September 1 to January 1. English and Mongolian pheasants, August 1 to February 1. Prohibited: Exporting; sale of deer or antelope killed in State.

Utah—Quail, October 1 to March 1, in Kane and Washington counties only. Partridge, pheasant, prairie chicken, sage hen, grouse, August 15 to December 1. Dove, July 1 to December 1. Duck, goose, snipe, brant, swan, October 1 to January 15. Deer, October 15 to November 15. Protected: Quail, except in counties specified; Mongolian, Chinese and English pheasants, pinnated grouse, elk, antelope, mountain sheep, buffalo, bison, beaver and otter. Prohibited: Exporting; killing more than two deer in one season.

Vermont—Quail, duck, English snipe, goose, plover (other than upland), partridge, woodcock, September 1 to December 31. Pheasant, English partridge, October 1 to November 19. Upland plover, August 15 to November 30. Rabbit, hare, September 1 to April 30. Otter, November 1 to April 1. Deer having horns, October 22 to October 31. Protected: Moose, caribou, beaver. Prohibited: Killing duck or goose between 7 P. M. and 5 A. M.; killing more than one deer in one year, or more than 5 birds or twenty ducks in one day; exporting.

Virginia—Quail, partridge, except in Fluvanna county, October 15 to January 1. Pheasant, ruffed grouse, turkey, west of Blue Ridge, September 15 to February 1; east of Blue Ridge, October 15 to January 15. Woodcock, November 1 to April 1; Alexandria and Fairfax counties, July 4 to January 1. Marsh hen, not later than June 20. Willet, not before July 15. Gull, not before September 1. Duck, goose, all water fowl, September 1 to May 1. Deer, August 15 to January 1. Prohibited: Non-residents in most counties. Local laws. Protected: Mongolian and English pheasants.

WASHINGTON—Grouse, partridge, prairie chicken, sage hen, ptarmigan, native pheasant, August 15 to December 1. California mountain and valley quail, bob-white, imported pheasant, August 15 to December 1. Sage hen, prairie chicken, east of western boundary of Okanogan, Chelan, Kittitas, Yakima and Klickitat counties, September 15 to November 15. Plover, rail, crane, duck, swan, all water fowl, August 15 to March 1. Deer, September 15 to December 15. Male moose, elk, caribou, antelope, mountain sheep, goat, September 1 to November 1. Protected: Spotted fawn, quail, sage hen, prairie chicken in Kittitas and Yakima counties; female moose, elk, caribou, antelope, mountain sheep and goat. Prohibited: Killing more than four deer or one each of elk, moose, antelope, or two each of caribou. mountain sheep or goat in one year; hunting deer between sunset and sunrise; exporting.

WEST VIRGINIA—Quail, partridge, November 1 to December 20. Ruffed and pinnated grouse, pheasant, prairie chicken, October 15 to December 15. Snipe. March 1 to July 1. Woodcock, July 15 to November 1. Turkey, September 15 to January 15. Duck, goose, brant, October 1 to April 1. Deer, October 15 to December 15. Protected: Fawn. Prohibited: Exporting deer, turkey, quail, pheasant, ruffed grouse; killing more than 12 quail or partridges in one day. Non-residents taxed $25.00.

WISCONSIN—Woodcock, partridge, pheasant, prairie chicken, grouse of all kinds, plover, snipe, September 1 to November 30. Duck, brant, all water fowl, except goose, September 1 to December 31. Goose, September 1 to May 1. Rabbit,, squirrel, July 1 to May 1. Otter, marten, fisher, beaver, February 1 to May 1. Deer, November 10 to November 30; protected in Fond du Lac, Sheboygan, Manitowoc and Calument counties. Protected: Swan, Mongolian, Chinese and English pheasant, and quail of all varieties; fawn. Prohibited: Killing more than two deer in one season; exporting more than one deer to each coupon of license, or more than 50 birds or fowl, owner accompanying; trespassing. Non-resident license $25.00 for deer; other game, $10.00.

WYOMING—Partridge, pheasant, prairie chicken, prairie hen, grouse, August 15 to December 1. Sage chicken, July 15 to October 15. Snipe, green shank, tattler, godwit, curlew, avoset, plover, duck, brant, goose, September 1 to May 1. Deer, elk, mountain sheep or goat, antelope, September 1 to December 1. Protected: Quail, swan, moose, beaver and Mongolian pheasant. Prohibited: Exporting without permit from Justice of Peace; killing in one season more than two elk, two deer, three antelope, one mountain sheep or goat.

YELLOWSTONE PARK—Prohibited at all times: Hunting, killing, wounding or capturing of any bird or wild animal, except dangerous animals, and then only in self-defense.

BRITISH POSSESSIONS IN NORTH AMERICA.

British Columbia—Grouse, all kinds, prairie chicken, hare, caribou, moose, elk, September 1 to December 31. Duck, heron, plover, meadow lark, bittern, September 1 to February 28. Deer, mountain goat or sheep, September 1 to December 14. Beaver, November 2 to March 31. Otter, marten, November 2 to March 31. Protected: Female and young caribou, elk, moose, mountain sheep or goat, fawn, English pheasant, partridge and quail of all kinds. Prohibited: Killing in one season more than 5 caribou, 10 deer, 2 elk, 2 moose, 5 mountain goats, 3 mountain sheep, 250 ducks; exporting; buying or selling heads of mountain sheep. Non-residents taxed $50.00.

Manitoba—Prairie chicken, grouse, pheasant, partridge, September 15 to November 14. Woodcock, plover, quail, snipe, sand piper, August 1 to December 31; upland plover, July 1 to December 31. Duck, September 1 to December 31. Male of deer, capri, antelope, elk, wapiti, moose, reindeer, caribou, September 15 to November 30. Prohibited: Sunday hunting; exporting; killing more than 100 birds in one season or more than 20 in one day, or more than 2 of deer, capri, antelope, elk, wapiti, moose, reindeer, or caribou, in one year. Non-residents taxed $25.00.

New Brunswick—Partridge, September 15 to November 30. Woodcock, snipe, duck, goose, brant, September 1 to December 1. Deer, moose, caribou, east of River St. John, September 15 to December 31. Mink, fisher, sable, October 15 to March 31. Protected: Female and young moose; pheasant, robin and beaver. Prohibited: Sunday hunting. License for hunting moose and caribou—residents, $2.00; non-residents, $30.00. Local laws.

Newfoundland—Partridge, grouse, willow grouse, ptarmigan, September 15 to January 12. Plover, snipe, curlew, all migratory birds, excepting geese, September 15 to January 12. Rabbit, hare, September 15 to March 1. Caribou, July 16 to September 30 and October 21 to January 31. Otter, October 1 to March 31. Foxes, October 15 to March 14. Protected: Moose, elk and beaver. Prohibited: Exporting, except through custom house. License for non-residents to kill caribou, for two stags and one doe, good four weeks, $40.00; for three stags and one doe, good six weeks, $50.00; for five stags and one doe, for two months, $80.00.

Northwest Territories—Partridge, grouse, prairie chicken, September 15 to December 15. Duck, snipe, sand piper, August 23 to May 5. Deer, elk, moose, caribou, antelope, November 1 to December 15. Mountain sheep or goat, October 15 to December 15. Protected: Buffalo. Prohibited: Exporting; killing by

one person more than three game animals in one season or more than 20 of any game bird in one day. Non-residents taxed $15.00.

Nova Scotia—Woodcock, snipe, teal, blue-winged and wood duck, September 1 to March 1. Partridge, October 1 to November 30. Rabbit, hare, October 1 to February 1. Moose, caribou, September 15 to January 1. Beaver, mink, November 1 to February 28. Protected: Moose, caribou in Cape Breton, pheasant, spruce partridge, blackcock, capercailzie, sharp-tailed grouse, deer and elk. Prohibited: Killing in one season more than two each of moose or caribou. License for non-residents, $10.00 to kill birds, hares, rabbits, and $30.00 to kill other game.

Ontario—Quail, November 1 to December 15. Grouse, all kinds, pheasant, partridge, woodcock, snipe, rail, plover, black and gray squirrel, hare, September 15 to December 15. Duck, all kinds, September 1 to December 15. Goose, swan, September 15 to May 1. Deer, November 1 to 15. Muskrat, January 1 to April 1. Moose, reindeer, caribou, November 1 to 15. South of Canadian Railway, from Mattawa to Port Arthur north, and west of this line, October 16 to November 15. Protected: Elk, wapiti, English and Mongolian pheasants, beaver, otter, cow-moose, fawn or young deer. Prohibited: Sunday hunting; killing deer in water; killing more than 2 deer, 1 bull moose, 1 bull reindeer or caribou; exporting. Non-residents taxed $25.00.

Quebec—Divided into two zones: Zone 1, comprising all of province south and west of Saguenay River; Woodcock, snipe, plover, curlew, tattler, and piper, September 1 to February 1. Birch or swamp partridge, September 1 to December 15. White partridge, ptarmigan, hare, November 1 to February 1. Duck, September 15 to March 1. Pied-ducks or divers, September 1 to April 15. Deer, moose, September 1 to January 1. Caribou, September 1 to February 1. Mink, otter, marten, pekan, fox (red and yellow not protected) and raccoon, November 1 to April 1. Muskrat, April 1 to May 1. Bear, August 20 to July 1. Prohibited: Killing more than one moose, two deer, or two caribou in one season.

Zone 2, comprising all of province north and east of Saguenay River—Same as in Zone 1, except as follows: Birch or swamp partridge, September 15 to February 1. White partridge, ptarmigan, November 15 to March 1. Hare, October 15 to March 1. Muskrat, November 1 to April 1. Otter, October 15 to April 15. Caribou, September 1 to March 1. Prohibited: Killing more than four caribou in one season.

In both Zones—Prohibited: Yarding or cruising. Non-residents taxed $25.00 for general permit, $20.00 for fur animals, $10.00 for birds for the season or $1.50 per day for short period.

INDEX

PARKER POINTS

PERFECT

BALANCE
MATERIAL
WORKMANSHIP
SHOOTING
QUALITIES

The only Perfect Ejector Gun Yet Produced

OLDEST MAKES OF SHOT GUNS
IN THE UNITED STATES

Send for Catalogue

PARKER BROS.

N. Y. SALESROOMS
32 WARREN ST.

Meriden, Ct.

IN PREPARATION.

A Carefully Revised New Edition of

FARROW'S
Military Encyclopedia,

The Only Complete Compendium of Military Knowledge Ever Published,

Is now in course of preparation. As the two editions which have already been exhausted are in many particulars obsolete, owing to the important changes that have lately been made in the military world, this third edition is regarded as an absolute necessity because

There is no Other Book in the World that Contains this Information, all of which is of such Vital Consequence to Military Men.

WHAT IT IS

Farrow's Military Encyclopedia, as its name implies, is a compendium of information upon all military subjects. Emanating from the great military institution at West Point, it represents many years of the most diligent and careful work upon the part of its editor, Edward S. Farrow, late of the United States Army, and formerly Assistant Instructor of Tactics at the United States Military Academy. In this work he received the assistance of the greatest military geniuses of the world, many of whom contributed original articles relative to military science. The military knowledge of the world, ancient and modern, foreign and domestic, is embraced within its pages. It is the only military encyclopedia published in this or any other country, and is universally recognized as the world's standard authority upon military affairs.

The third revision, which is now being concluded under Cap-

tain Farrow's personal direction, will make the work complete to the latter part of 1904.

WHO SHOULD OWN IT

Farrow's Military Encyclopedia is absolutely indispensable to every military man who desires to have accurate information upon all military subjects always at hand. This is pre-eminently a military age, for not only are a large proportion of the citizens of every civilized nation now connected with military organizations, but there is every reason to believe that the world is on the verge of an international conflict that will surpass any war that history has ever recorded. As the result, such a work as Farrow's Military Encyclopedia is indispensable as a reference work in the library of every gentleman who desires to keep in touch with the movements of the times, or to be well informed concerning the improvements in arms and appliances of war which have been so great during the past few years as to almost entirely overshadow the advancement in any other single department of human endeavor.

STYLES AND PRICES

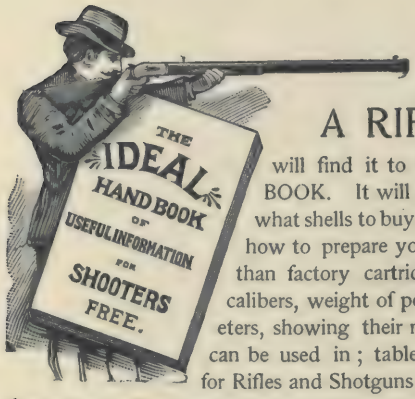
The third edition of Farrow's Military Encyclopedia will be published in four volumes, and will be profusely illustrated with models, diagrams, and maps that will actually illustrate the text. Printed upon heavy calendered paper, and bound in a variety of bindings, any one of which will be conspicuous for its attractiveness as well as for its durability, the work will be one that will be worthy a prominent position in any library.

Although the price of Farrow's Military Encyclopedia will be similar to that charged for other works of that class, the desire to obtain advance subscriptions has led the publishers to prepare a special proposition which will be submitted to those who are interested. If you desire to obtain the greatest reference work of the century upon easy terms, this is the time to file your application. Full particulars will be furnished by

THE BRADFORD COMPANY,

147 East 27th Street, New York.

EVERYONE



WHO SHOOTS

A RIFLE, PISTOL, OR SHOTGUN

will find it to their interest to possess a copy of the latest IDEAL HAND BOOK. It will tell you what powder is best adapted to the different calibers, what shells to buy, and how to preserve them ; how to make your own bullets ; how to prepare your own ammunition, that will be CHEAPER and more RELIABLE than factory cartridges. The book contains the names of all cartridges, their calibers, weight of powder, weight of bullets, their composition and correct diameters, showing their measurements in thousandths of an inch, and what arms they can be used in ; table reducing Drams to Grains, showing powder measurements for Rifles and Shotguns with *Nitro* and *Black Powders ;* also how many shells of all the various calibers can be loaded with one pound of powder, the same with shot ; how to find out the twist in any rifle barrel. In the book you will find the twist of all of the various rifles, HIGH or Low pressure, as made by the different American Manufacturers to-day ; also the proper loads of HIGH and Low pressure powders, as advised by the various Powder Manufacturers, for RIFLES, PISTOLS, and SHOTGUNS, and much other useful information of interest to shooters.

THE IDEAL HAND BOOK

is also a complete Catalogue, illustrating and describing all of the various IDEAL implements that are now made by the

IDEAL MANUFACTURING CO.,

who are continually inventing new implements for shooters that are up to date.

EVERY DEALER in Firearms, and EVERY SHOOTER Should Have a copy of the Latest HAND BOOK.

"EVERYONE" who sends us 3 TWO-CENT stamps for a copy will make

A BULL'S-EYE

ADDRESS

IDEAL MANUFACTURING CO.,

No. 45 U Street, New Haven, Conn.,

U. S. A.

PLEASE MENTION AMERICAN SMALL ARMS.